# Halal logistics and the impact
# of consumer perceptions

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## MANAGEMENT SUMMARY

This report describes the research on halal logistics, which is part of a research project on 'Effective Halal Supply Chains: *Principles to improve the Halal integrity of chicken meat supply chains'*. Halal logistics is based on three basic principles:

- Avoiding (cross) contamination
- Avoiding mistakes
- Ensuring that operations are consistent with the expectations of the Muslim consumer.

Logistical literature is available on the first two principles whereas the last one has never been addressed before. A logistical system is composed of a large number of variables, which have to be managed properly in order to deliver final products in the right quantities at the desired time and quality at the right place and at a reasonable cost. This puts challenging requirements on the quality of the different logistics processes, especially in view of the specific characteristics of the halal food chain.

This leads to the following problem formulation: *What are the Muslim consumer requirements concerning the distribution of halal meat and how can logistics be arranged accordingly?*

A consumer survey followed as a logical method since group sessions from the International Halal Integrity (IHI) alliance on the topic of halal logistics and its literature revealed that the consumer opinion is necessary to measure, to develop a logistical standard and to conclude where the Critical Control Points (CCPs) of the halal food chain really are.

The focus of the report is on the physical distribution according to Christopher (1998) and Van Goor (1993), which comprises of transportation, sea/airports, warehouse/storage and supermarkets (retailers)

The survey revealed that complete separation of halal food from non-halal is necessary in Malaysia. The minimum separation in the Netherlands is acceptable when distribution and storage takes place in separate carton boxes. They would like to see a separate fridge or rack to be assured that cross-contamination cannot take place during display in the supermarket. Another important outcome is that the responsibility of halal logistics is both brand- and retail- oriented and consumers are willing to pay more for products, which are distributed according to a halal logistics upcoming standard. Furthermore, the research can be used as a starting point for the upcoming international standardisation of halal transportation in Muslim and non-Muslim countries around the world.

## PREFACE

Halal is becoming more and more mainstream in the Netherlands, nowadays it is available at supermarkets like Albert Heijn and Plus. For my internship I had the opportunity to go to Malaysia where, as one of the frontiers on halal products, I could witness how the sale of halal products is implemented. My introduction to the world called 'halal' was a special experience by itself. The difficulties within this subject were best shown during the World Halal Forum '09 in Kuala Lumpur which I visited. The contradictions and differences within the Islamic world itself are fascinating, where even the definition of halal itself is unclear.

I take this opportunity to thank my external supervisor ir. Marco Tieman who gave me insight in the logistical world, known as halal logistics. He took me under his wings as one of the experts in this specific area where his guidance was always helpful.
Furthermore I would like to express gratitude to my supervisors dr. ir. Sirp de Boer and dr. Peter Schuur from the University of Twente for their opinions, critical reviews and effort, which contributed a lot to make my last phase of completing my study to a success. Finally I would like to thank my friends and family for their support and interest shown during my stay in Malaysia and the final steps of my graduation. With a special notification for my little sister who let me sleep at her house for a couple of months, without complaining.

*Rudy Bruil,*
*Enschede, 1 April 2010*

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# 1. INTRODUCTION

The research is part of a wider PhD research conducted by Marco Tieman, PhD candidate with UiTM in Malaysia on the topic of halal logistics. My contribution to this research is a consumer perception survey conducted in Malaysia and the Netherlands and the possible implications for the logistics model.

This chapter covers the background and the objectives of this thesis. Section 1.4 will explain the problem statement and 1.5 presents the research question. The final section of this chapter discusses the relevance.

## 1.1 Background

The halal industry has seen a tremendous growth over the past few years, seeing increasing demand for halal from both Muslim and non-Muslim consumers (Food Management, 1999), inquiries about halal know-how from the manufacturers, more participation from suppliers of halal-compliant raw materials, and more research to proof the benefits of halal products.

Leading retailers as Carrefour in France and Albert Heijn in the Netherlands have been introducing halal meat in their product assortment. Previous attempts in a retail environment were often unsuccessful because of lack of insights in food purchasing and consumption behaviour of Muslims (Ramdani, 2005), as well as uncertainty with respect to the specification and labelling of halal (Bonne & Verbeke, 2008).

Moreover, related service providers such as logistics, Islamic finance, cosmetics and pharmaceuticals have also found a spot to fill in this burgeoning and lucrative industry that is estimated to be worth USD 2.1 trillion (Halal Journal, 2009) annually. Ultimately, with this growing trend and trade opportunities, many cries have been heard for a unified halal standard that may have improved the trade of Halal goods.

With the upcoming standardization of the halal market, the cost-efficiency will probably expand even more. Within these standards production-flows will be faster and more secure (Muhammad, 09).

## 1.2 What is Halal?

First of all halal are things or actions, that are permissible or lawful under *Shariah*. Within this research only the dietary laws of halal are important. The halal dietary laws define food products as "halal" (permitted) or "haram" (prohibited). A few items go into the category of

"*Makrooh*" or "*Shubhah*" (questionable to detestable). The law deals with the following five issues; all but the last are in the animal kingdom.

- Prohibited animals
- Prohibition of blood
- Method of slaughtering/blessing
- Prohibition of carrion
- Prohibition of intoxicants

First of all, the animal must be of an acceptable species and it must have been bred in a natural way. Second, the animal must be alive at the time of slaughter and must die of bleeding rather than as a consequence of stunning. Third, any sane, adult Muslim can slaughter the animal by cutting the front part of the neck with a very sharp knife and evoking the name of Allah during the cut, preferably with the animal turned towards Mecca. Slaughtering by hand is preferred, however, in Western European countries mechanical or machine slaughter of birds is gaining acceptance among Muslims. Fourth, at any time of the slaughter process, Islam advocates humane treatment of animals for example animals should be well nourished, rested and not stressed before slaughter. Finally, distribution and retailing of halal meat is critical to prevent cross-contamination with non-halal meat.

## 1.3 Research Objective

In order to keep halal meat halal and not being judged as haram, a good logistics system is necessary. The International Halal Integrity Alliance (IHI) has produced a logistical standard (IHIAS,2009) which is based on best practise from the logistical point of view. Halal and non-halal should be completely separate from each other. This is based on three assumptions (IHIAS, 2009):

- Avoiding (cross) contamination
- Avoiding mistakes, and
- Ensuring that operations are consistent with the expectations of the Muslim-consumer.

The consumer perception has not yet been integrated in this standard and can have a lot of impact on how halal logistics is being operated. At the moment the IHIAS (2009) produced a minimum and a preferred standard, which is developed as a foundation for standards in Muslim and non-Muslim countries.

Above information resulted that the perception of the Muslim consumer with regard to halal is unknown and has to be measured in order to effectively design a halal logistics system. With the results out of consumer perception it is possible to design the minimum standard, since the preferred standard is based on absolute separation. Also important in measuring the perception of the Muslim consumer about halal logistics is to know whether the market is retail- or brand driven. The perception will furthermore clarify whether there is a difference between Muslim consumers in a Muslim country and Muslim consumers in a non-Muslim country.

*The research objective is to try to clarify what the perception of the Muslim consumer is towards halal logistics and the implications it could have for the physical distribution of halal meat.*

## 1.4 Problem Statement

The upcoming standardisation of halal meat designed by several authorities has major logistical consequences. Organisations cannot decide themselves whether their products are halal compliant. Checking the halal compliance of products is the task of halal certifiers. Worldwide, there are numerous halal certifiers, most of them applying different guidelines and logos (Regenstein et al. 2003). This results in a lot of different guidelines and regulations for halal products. But the certification is not at stake in this research. This research is only concerned about the logistical consumer perception of halal products.

As far as the literature can verify, the consumer perception has never been measured before. Therefore the target population for the research are Muslim consumers in general. Due to the limited possibilities they will only be measured in Malaysia and the Netherlands. A Muslim consumer could have a far more extreme or loose perception regarding the transportation of halal meat than a non-Muslim consumer. There is a possibility that European Muslims have a completely different perception than Asian Muslims.

## 1.5 Research Question

**The resulting problem formulation is:**

*What are the Muslim consumer requirements concerning the distribution of halal meat and how can logistics be arranged accordingly?*

**1.6 Research relevance**

The research is a contribution to the PhD study of ir. M. Tieman who researches halal logistics, but could also count as a contribution to the whole Muslim society. The consumer perception of logistics of halal has as far as the literature shows never been measured before and could have a substantial impact on the way halal goods are transported in the near future.

## H2. LITERATURE REVIEW

This chapter begins with explaining halal logistics based on articles of M. Tieman (2009). Section 2.2 will present the Malaysian standard, which is the most globally used standard and the standard according to the IHI alliance and the Halal Food Production according to Chaudry and Riaz (2004). Several logistical frameworks will be discussed and the definition of consumer requirements will be explained. This chapter concludes with the theoretical framework for this research.

### 2.1 Halal logistics

As stated before, the basic principle of halal transportation is to ensure physical segregation of halal cargo from non-halal cargo in transport. This is to avoid cross contamination, avoiding the possibility of making mistakes and ensure that the transportation system is aligned with the expectations of the various Muslim consumers (IHIAS, 2009).

Halal logistics is about embedding excellence in the supply chain during the sourcing, production and distribution processes. When a manufacturer puts a halal logo on products, it is a promise that sourcing, manufacturing and distribution is halal-compliant. The consumer assumes that the manufacturer takes care to ensure halal compliance throughout the supply chain. This means there is a need for halal storage facilities worldwide (Tieman, 2008).

Halal logistics asks (as any other logistical model) for key performance indicators (KPI) that have to be checked. More checkpoints could be needed, to ensure that everything goes according to a halal standard. For example tracking and tracing could be of great assistance (Tieman, 2009).
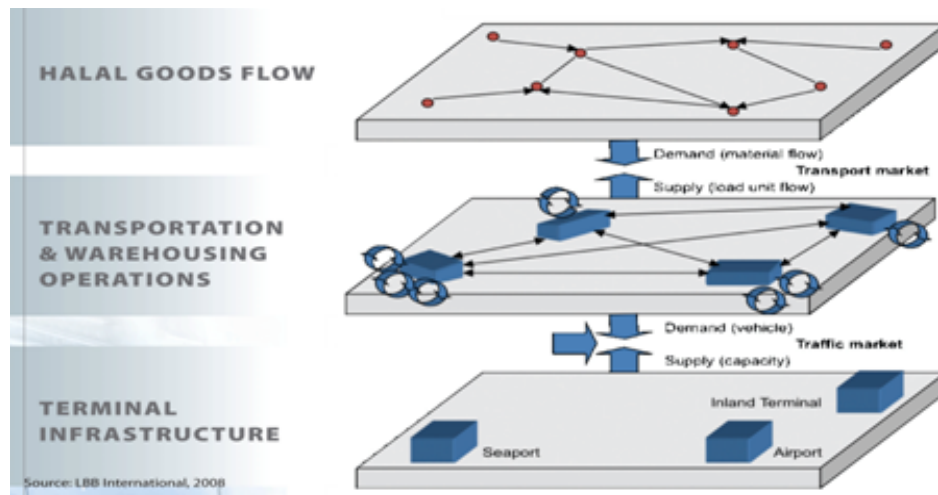
**Figure 1: Halal Logistics, Source: M. Tieman, 2009**

## 2.2 Identifying the Standard

There is no logistical standard yet which is used across the world. A first attempt is made by the IHI Alliance in Malaysia, which was hosted and developed through discussions and sessions across the world by international experts from within the Islamic and logistical industry. The first draft was published during the World halal Forum '09 in Kuala Lumpur by M. Tieman (chairman of the logistical committee). But first the official published standards as in; the MS 1500:2004 and the halal Food Production standard according to Chaudry and Riaz (2004), which are already used, will be revealed.

### 2.2.1 Malaysian Standard 1500:2004

The most used halal standard is the Malaysian Standard (MS) 1500:2004. This is the Malaysian standard and well known as the most widely respected and adopted. The MS 1500:2004 contains the definitions and the requirements for halal and guidelines for slaughtering, and certification. The written rules that are meant for the logistics of halal are the following:
- *The standard for product storage display and servings*:
All halal food that is stored, displayed, sold or served shall be categorised and labelled halal and segregated at every stage so as to prevent them for being mixed or contaminated with products that are non-halal.
- *Product processing, handling and distribution:*
All processed food is halal if it meets the following requirements:
a) The product or its ingredients do not contain any components or products of animals that or non-halal by Shariah Law or products of animals that are not slaughtered according to Shariah

law;

b) The product does not contain anything in any quantity that is decreed as najs by Shariah law;

c) The product or its ingredients are safe and not harmful;

d) The product is prepared, processed or manufactured using equipment and facilities that are free from contamination with najs; and

e) During its preparation, processing, packaging, storage or transportation, it shall be physically separated from any other food that does not meet the requirements specified in items a), b), c) and /or d) or any other things that are decreed as najs by Shariah law.


## 2.2.2 Halal Food Production

According to Chaudry and Riaz (2004) the first reference to halal food production and its requirements, written for the food manufacturer and food product developer, is their own halal industrial production standards.

Halal Food Production (2004) describes the domestic and international halal food market, halal food laws and regulations and guidelines for the production of halal food and industry standards for halal production. Chaudry and Riaz state that there is potential for significant negative ramifications if a non-halal product is boxed in error into a halal-certified box. If packaging inventory variances cannot be explained to the halal supervisory organization, all halal products produced become suspect, which may result in a suspension of halal certification of all halal products in inventory unless and until cleared.

Segregating *sealed* halal and non-halal products in shipping is not required. However, fresh non-halal meat, which can leak meat juices through packaging materials, should be segregated. If all packages are properly sealed to prevent cross-contamination, there is no need to separate halal food products from non-halal food products in shipping.

To assure that only properly prepared products carry halal certification, it is critical to implement controls over packaging and labels so that the manufacturer cannot label non-halal products as halal in error. The supervisory organization must have a written agreement between the company and its supplier(s) of printed packaging and labels that all purchase orders for such materials must carry the approval signature of the supervisory organization prior to shipping to the manufacturer. Subsequently, the supervisory organization must account for a reasonable amount for packaging materials inventory compared with purchases and production (output). Any significant variations require a written explanation of the variance to gain assurance that no non-approved production was labelled as halal.

Under no circumstances may a company put the supervisory organization's name and/or symbol on its packages as certified halal unless previously approved in writing by the

supervisory organization. All products labelled as halal should also carry the supervisory organization's name and/or symbol.

### 2.2.3 International Halal Integrity Alliance Standard: Logistics Module

The IHI alliance standard for logistics is developed in accordance to guidelines adapted from ISO/IEC, Guidelines for International Standards Development and refers to the MS 1500:2004 and the Halal Food Production by Chaudry & Riaz (2004).

It is the first international guideline for logistics. The content of the logistic standard is the process of managing the procurement, movement, storage and handling of materials, parts, livestock, semi-finished or finished inventory both food and non-food, and related information and documentation flows through the organisation and the supply chain in compliance with the general principles of Shariah. This standard provides requirements and procedures in managing the movement, storage and handling of materials, parts, livestock and semi-finished or finished inventory both food and non-food through the organisation and the supply chain in compliance with the general principles of Shariah.
This standard is applicable to activities covered under warehouse, transportation and terminal. It is not applicable to materials handling covered under animal slaughter and processing, processed food and food service.
It is extremely important that halal products are segregated from non-halal products, to avoid cross contamination and mistakes and to ensure that operations are consistent with the expectations of the stakeholders.

The concept of halal logistics is incomplete without coupling it with best practice logistics, that is, traceability is in place, an unbroken cold chain is ensured, protection of shelf life by short supply chain lead times and high hygiene and sanitation standard.

*As an example for halal transportation in the standard:*

1. There is no mixing of halal goods with non-halal goods in case of bulk shipments.
2. There should be no mixing of halal goods with both severe and medium nasj in one container or common transportation storage.
3. There is no mixing of halal goods with non-halal goods in one pallet and/or load carrier.
4. There is a physical segregation of halal cargo from non-halal cargo through tertiary packaging (such as shroud, shrink wrap) or containerisation.

In comparison Chaudry and Riaz shipment standards state; "Segregating *sealed* halal and non-halal products in shipping (i.e., LTL common carriers) is unnecessary. However, fresh non-halal meat, which can leak meat juices through packaging materials, should be segregated. If all packages are properly sealed to prevent cross-contamination, there is no need to segregate halal food products from non-halal food products in shipping."

As stated by the IHI alliance; one of the key points is to be aligned with the stakeholders' needs. Nevertheless all these standards and restrictions are based on Islamic (governmental) regulations and on 'best practise' of logistics, whereas the opinion of the consumer has not been taken into account.

## 2.3 Food Supply Chains

Van der Vorst (2000) made adjustments for Food Supply Chain in the logistics model of Cooper. According to Van der Vorst (2000) Supply Chain Management (SCM) is the integrated planning, co-ordination and control of all business processes and activities in the supply chain to deliver superior consumer value at least cost to the supply chain as a whole, while satisfying the variable requirements of other stakeholders in the supply chain.
The supply chain not only includes the manufacturer and its suppliers, but also transporters, warehouses, retailers, service organisations and consumers themselves (Davenport, 1993). Within this research the perception of consumers is measured during the segregation at a few of these levels (transport, warehouses and retailers).

Food Supply Chain Network (FSCN) is the analysis of a supply chain within the context of complex networks of food chains. Each of the elements in the framework is directly related to the objectives of the FSCN. One can focus on three generic value propositions, which can be found separately or combined.

1.  Network differentiation and Market segmentation where the target is to differentiate as a chain to meet the specific demands of customers (like the Muslim population);
2.  Integrated Quality, where the target is to meet the increasing demand of consumers, governments, NGOs and business partners for safe and environmental friendly produced products; and
3.  Network optimisation, where the target is cost reduction through a streamlined and efficient chain/network with rational information supply.

Especially the network differentiation is important when it comes to the halal food chain. Referring to section 2.1 where the whole supply chain prefers to be separated to sustain the certainty of halal could be seen as a form of network differentiation. This is according to Van der Vorst (2005) to meet customer demands. The key point is that the customer requirements have never been measured before. The target for network differentiation in combination with

network optimisation is to gain cost reduction through a streamlined supply chain. This should be the focus for halal distribution as well.

## 2.4 Defining Consumer Requirements

Section 2.1 and 2.2 made clear that there is no measurement of consumer needs concerning halal logistics. The next step is to construct an approach how to measure these consumer needs. How to define these requirements? In section 2.5 the halal Critical Control Points (CCPs) will be explained. These CCPs will help to define the consumer requirements and describe those factors that need special attention. The perception of the consumer will reveal consumer needs and in what way a logistical model can help in this matter. Section 2.6 will explain physical distribution according to Van Goor (1993).

## 2.5 Halal Critical Control Points

In food supply chain Hazard Analysis Critical Control Points (HACCP) is a systematic preventive approach to food- and pharmaceutical safety that addresses physical, chemical, and biological hazards as a means of prevention rather than finished product inspection. HACCP is used in the food industry to identify potential food safety hazards, with the attention that key actions, known as Critical Control Points (CCPs) can be taken to reduce or eliminate the risk of the hazards. The system is used at all stages of food production and preparation processes including packaging.

Control points occur throughout the entire supply chain, because there is a risk for cross-contamination at all stages, as halal meat becomes haram for example when in contact with pork meat. According to Kirwan (2006) halal is a typical example of a socially constructed quality criterion, which incorporates not only the physical properties of the product but also the conditions under which it is produced, distributed, and retailed. Bonne and Verbeke (2007) came with a conceptual framework for analyzing the socio-technical construction and quality coordination of halal meat using HACCP as a potential quality assurance system. They made a framework that illustrates how an HACCP approach can derive from the Actor-Network Theory and Conventions Theory principles with the aim to produce and market desired credence qualities.

The Actor-Network Theory (ANT) (Callon, 1991) is a way of analyzing how actors in a network negotiate whether and how certain product attributes and their production method will be included in the product specification.

The Convention Theory (CT) focuses on quality, in particular on the social and cognitive construction of quality, hence, also offering an appropriate theoretical framework for the examination of socially constructed food quality criteria (Kirwan, 2006). Conventions are defined as a set of mechanisms and rules involving the content of product specifications, roles of third parties, strategies of product differentiation and labelling (Sauvée, 1998), and are used for defining and recognizing the quality of products and for solving problems related to quality uncertainty (Vannoppen et al., 2004). It is in line with the Convention Theory to get a specific outset of how halal meat should be transported and coordinated. Riaz and Chaudry (2004) stated that the halal control points are at each and every step from farm to fork.
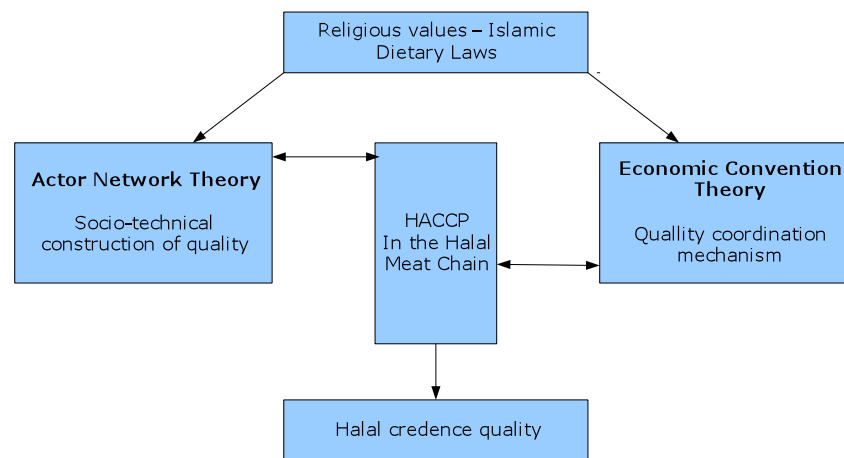


**Figure 2: Conceptual framework for analyzing the socio-technical construction and quality coordination mechanism for halal credence quality (source: Bonne and Verbeke, 2007)**

A total or integrated halal quality approach would require that the entire halal meat chain is controlled in accordance with the HACCP principles. So HACCP should not only take place at the abattoir or food processing stage, but also during the physical distribution stage, as in external transportation, warehousing and storage (Van Goor et al., 1993).
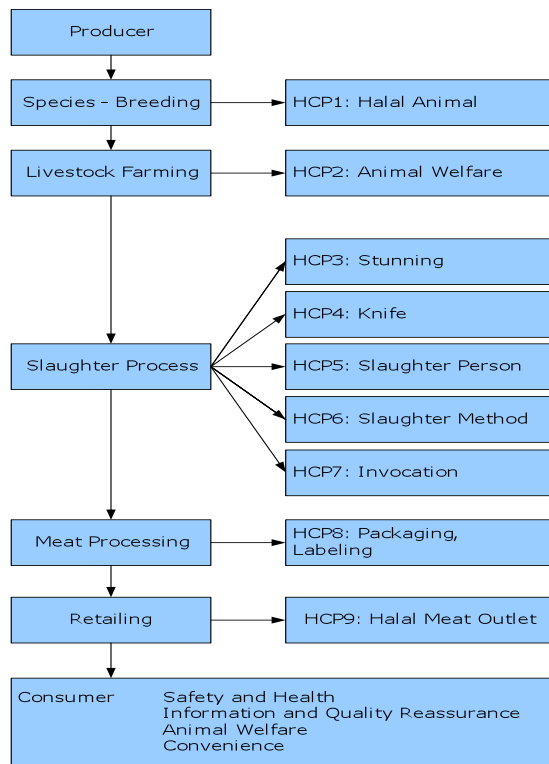
**Figure 3: The halal meat chain and identification of Halal Control Points (HCP) Based on Riaz and Chaudry (2004)**

## 2.6 Physical Distribution

This thesis focuses on physical distribution. Physical Distribution Management according to Van Goor (1993) manages the control and values of the products from the end of the production phase to the end-consumer (see figure 4). Physical Distribution is much more than transportation only. Physical Distribution according to the logistics platform: The movement and storage functions associated with finished goods from manufacturing plants to warehouses and to customers; also, used synonymously with business logistics. Physical Distribution is an efficient way of supply of goods between the producer and the wholesaler/consumers according to the right place and the right time. Or like Peter Drucker stated: "Physical Distribution is the Last Frontier of Cost Effectiveness"

Physical Distribution deals with the storage and/-or warehousing of products, all the possible problems and solutions according to storage within distribution channels, direct or indirect distribution, choice of storage or warehouse, choice of transportation, but also variables as routes or customs.

In halal logistics it is important to know the segregation levels formulated as consumer requirements during transportation, warehousing, shipment and in the supermarket. What

kind of packaging do they demand? Is vacuum packing enough or do we need carton boxes? Where will be the minimum segregation possibility in sea- or airport or during the storage in supermarkets?
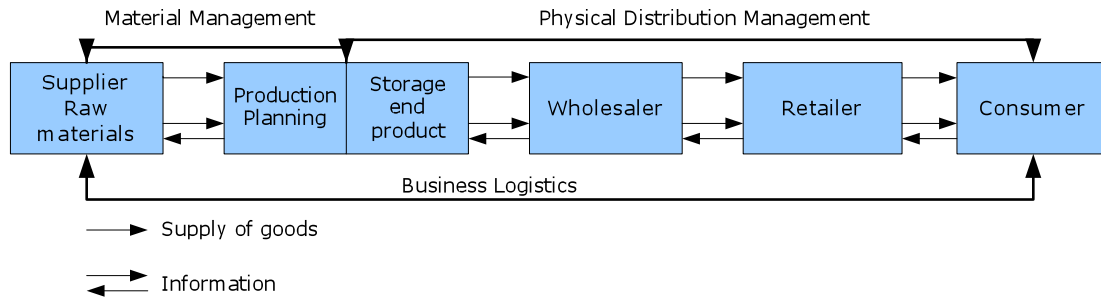


**Figure 4: Terminology Supply of goods (Van Goor, 1993)**

## 2.7 Research Framework

Section 2.2 identified the regulations and standardisation at this moment. The consumer opinion to be measured and the theories described in the section 2.3 till 2.6 form a platform to develop requirements for the physical distribution of halal meat.

According to Chaudry & Riaz (2004) and Bonne & Verbeke (2007) there is a CCP between and within every step of the chain. The focus of this research is on the physical distribution part during the logistics, so the processing and slaughtering of halal meat is not included, (see also figure 3 and 4). This research tries to define what the limitations and actual CCPs are during the physical distribution process. The integrated CCPs within the physical distribution part of the halal food chain are shown in figure 5 below.

When we combine the Actor-Network Theory (ANT) (Callon, 1991) and the Convention Theory (Kirwan, 2006) with the network differentiation approach of Van der Vorst (2005) within the halal food chain, the focus is on quality control, the role of the different stakeholders within the network, and on the specific requirements of customers. Quality control will be in focus with the CCPs. The responsibility of the different stakeholders will have to be measured as well as the requirements of the customers, which is unknown.

In combination with the afore mentioned regulations of Chaudry & Riaz (2004) and MS 1500:2004, the goal is to find the consumer requirements for all stakeholders involved. The HACCP Convention Theory from Verbeke is a search for the sustainability of halal quality, which is one of the most important factors to protect and prevents halal from becoming non-halal. Van Goor (1993) mentioned not to focus on transportation only, but also on warehousing and storage during the physical distribution cycle. The layout of the structure of

warehouses and distribution centres as well as the transportation phase itself is important.
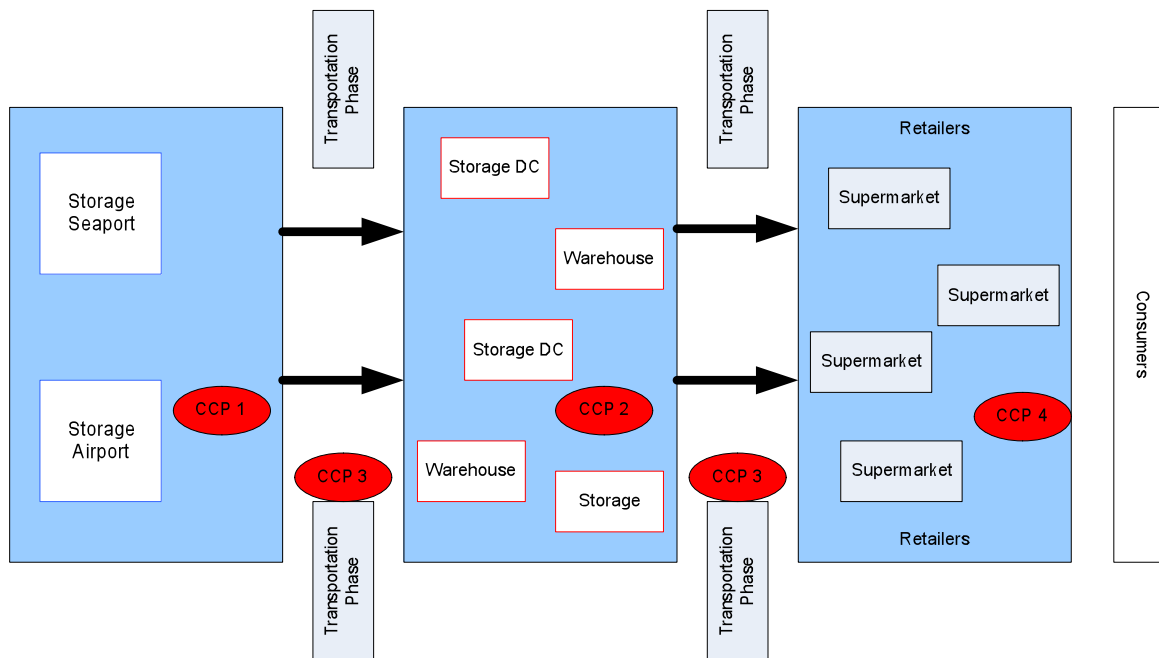


**Figure 5: Possible CCPs during physical distribution**

In order to complete the theoretical framework, it is necessary to determine the research subjects or variables that need to be measured. Using the literature, the halal criteria (IHI standard, MS 1500:2004, Chaudry & Riaz, 2004), the definition of physical distribution (Van Goor, 1993) and of halal CCP (Chaudry & Riaz, 2004; Verbeke, 2004) are determined. Together with the above mentioned literature, this research aims to identify the consumer perception about where these actual CCPs are and what the minimum separation is during transportation and/or storage during these CCPs in Malaysia and the Netherlands. Figure 5 will be used as a starting point for the research. The minimum separation during these stages needs to be measured under Muslim consumers to actually determine the CCP.

- CCP1: Regarding import and export. What is the minimum separation during storage at a Sea- or Airport?
- CCP2: Regarding storage: What is the minimum separation during storage in Warehouses and Distribution Centres?
- CCP3: Regarding Transportation: What is the minimum separation during Transportation?
- CCP4: Regarding Retailers: What is the minimum separation during display in the Supermarkets?

The literature used in this chapter will be needed as a background to locate the CCPs and to construct the variables that need to be tested and measured. A critical control point is- a step-

or procedure in a food manufacturing process at which control can be applied and, as a result, a food safety hazard can be prevented, eliminated, or reduced to an acceptable level. It is necessary to establish critical limits for each critical control point. A critical limit is the maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce to an acceptable level. For these critical limits the consumer opinion, which will be translated as requirements, are crucial. These requirements will reveal what the maximum or minimum physical separation levels are at each stage during physical distribution of halal meat.

| Research Subject | Literature | Data Collection Strategy | Sources |
|---|---|---|---|
| Halal criteria | Chaudry & Riaz (2004); MS 1500:2004 | Group Sessions | IHI and M. Tieman documentation |
| HACCP | Bonne and Verbeke (2007); Chaudry & Riaz (2004) | Survey | WHF sessions, Interviews |
| Physical Distribution | Goor (1993), Ballou | | M. Tieman, IHI alliance documentation |
| Quality Control | Van der Vorst (2005); Verbeke et. al (2004) | Survey | Interviews |

Those consumer requirements have to be measured with using a survey. Some other variables are unknown but also important to measure according to the International Halal Integrity (IHI) alliance. Such as; "Who is responsible for halal logistics according to the consumers?" and, "Is it a retail- or a brand driven responsibility?" Another important variable to measure is whether the consumer is willing to pay for possible extra costs which could result from these requirements? The research design and construction in chapter 3 will go into further detail of the survey.

# H3. METHODOLOGY

Chapter 2 introduced relevant theoretical concepts to deal with the problem statement. This chapter discusses how these concepts can be applied to solve the problem statement. Section 3.1 and 3.2 discusses the approach to identify the consumer perception towards halal logistics, after which section 3.3 till 3.5 will present an approach for the survey that has to be conducted in order to identify developments for logistics in terms of consumer requirements. Section 3.6 concludes with the most important findings of this chapter.

## 3.1 Research Design

The literature in chapter 2 revealed that according to Muslim authorities the logistical limitations are implemented according to their own regulations. These regulations are possibly not yet in line with the perception of the Muslim consumer, as this perception has not been measured before.

The optimal method to conduct multi-cultural research is a questionnaire using standardized questions enables one to be confident that the questions will be interpreted the same way by all respondents (Robson, 2002). The research design will therefore be as illustrated in figure 6.
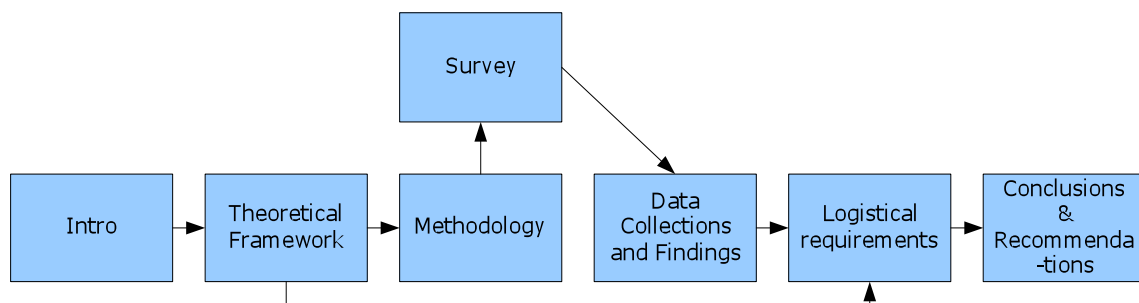


**Figure 6: Research Design**

## 3.2 Data Gathering

Using a questionnaire is the method to collect social data out of a population. This is why a questionnaire will be designed to gather the data for this research (see also chapter 4). To sustain a high scientific level, the survey will be developed with the help of a thorough literature research. The problem of a survey could be that the consumers/interviewees are asked about a subject they probably have never thought of before, so it is important to develop a good survey design.

The survey will be conducted in Malaysia and in the Netherlands. Therefore the data consists of information from a Muslim country and a non-Muslim country. Furthermore, Malaysia applies strict regulations for halal and it is the first country with an official halal standard. The Muslims in the Netherlands are a minority where the presence of halal is still in its beginning and a growing market (Shoemaker, 2006; Islamonline.net, 2009).

Most important is- which variables should be measured? The perception of the Muslim consumer about the segregation in the supermarket, during transport, warehousing and in Sea/Airports is unknown. The variables have been set through special workgroup sessions of halal experts who are responsible for the development of an international halal standard for logistics. The variables are defined through focus groups; some are amended according to Cristopher (1998).

**Logistics**
Logistics involves the management of order processing, inventory, transportation and the combination of warehousing, materials handling, and packaging, all integrated throughout a network of facilities. The goal of logistics is to support procurement, manufacturing, and market distribution operational requirements (Bowersox, 2002).

**Transport**
Transport is the operational area of logistics that geographically moves and repositions inventory. Three factors are fundamental to transportation performance: (1) cost, (2) speed, and (3) consistency.

**Warehouse/Storage**
Within the warehouse, materials handling is an important activity. Products must be received, moved, stored, sorted and assembled to meet customer order requirements.

**Sea/Airport**
Shipping consists of order verification and transportation equipment loading. Similar to receiving, firms may use conveyors or unit load materials handling equipment such as lift trucks to move product from the staging area into the transportation vehicle. Relative to receiving, warehouse shipping must accommodate relatively low-volume movements of a mixture of product, thus reducing the potential for economies of sale. Shipping unit loads is becoming increasingly popular because considerable time can be saved in vehicle loading.

For each participant the questionnaire consists out of four parts.
1. General data (socio-demographic data)
2. Items to measure their preferences on the Independent variables (segregation level)
3. Items to check their integrity as a Muslim (dependent variable)
4. Item to measure their Willingness to pay

## 3.3 Methods of Analyses

The table below describes the methodology that is needed for the survey. The theoretical backgrounds for the other research subject were already given in chapter 2. The research subjects for the survey will be further explained in the following paragraph and chapter 4.

| Research Subject Survey | Literature | Data Collection Strategy | Sources |
|---|---|---|---|
| Survey | Babbie (1990), Ajzen (1991) | Literature Research | |
| Consumer Requirements | | Survey | Interviews |
| Responsibility | | Survey | IHI group sessions, WHF sessions. |

The data from the questionnaire will be analysed using the statistical package SPSS 17 which is the latest version in this series of statistical programming. Several tests will be used to provide answers. These tests will be explained in the appendices using Abd Rahim Md Nor (2009). The results of these tests will indicate the differences and similarities between the Muslims in The Netherlands and Malaysia exist regarding their respective perception on halal logistics. The results will clarify which Critical Control Points (CCPs) should be identified or could help to make a logistics model according to consumer' needs in the future.

## 3.4 Survey design

In this section the construction of the questionnaire will be clarified. The variables and the links between the variables will be given.

| Independent Variables | Moderating Variables | Dependent Variables |
|---|---|---|
| A) Segregation at supermarket Segregation at transport C) Segregation at Storages D) Segregation at Sea/Airports E) Responsibility of Halal Logistics | 1. Religion 2. Country 3. Age 4. Gender 5. Education | Willingness to pay Compromise Integrity |

**Table 1: Variables to Asses**

- Independent Variables: IV
- Dependent Variables: DV
- Moderating Variables: MV

## 3.5 Survey Construct

Questions 1:
Where is the responsibility (IV) of regulating halal Logistics? Will it be a manufacturer or a retail driven development (IV) according to Muslims (MV) and countries (MV)?

Question 2:
Level of integrity (DV) is measured through Food Quality, Health, Food Safety and Animal welfare and is expected to be highly influenced by the country (MV) living in and by education level (MV).

Question 3:
The level of compromise is measured through the perception of toyyib, kosher and avoidance of haram ingredients and is expected to be influenced by education level (MV) and country (MV) living in.

Questions 4, 6, 8, 10:
Assessment of preferred level of segregation (IV), highly dependent on religion (MV) and education (MV)

Questions 5, 7, 9, 11:
The assessment of a minimum level of segregation (IV) is possibly influenced in relationship to religion (MV) education (MV) and country (MV) living in. This is based on focus group sessions undertaken by ir. M. Tieman in the Netherlands, Hong Kong and Malaysia.

Question 12:
The willingness to pay (DV) is measured through how many percent the interviewee is willing to pay for a halal logistic system and is expected to be influenced by religion (MV), country (MV) they live in, education level (MV) and gender (MV).

## 3.6 Conclusion

Based on the rules of basic questionnaire design and consumer behaviour a survey has been made. The variables are all linked together in the survey construction which is backed-up by the thorough literature review. All this background information resulted in a consumer questionnaire that can be conducted in multiple countries and will be elaborated in chapter 4. With the help of statistical program SPSS 17.0 the results will reveal differences and/or similarities between the Muslim consumers in non-Muslim countries and Muslim consumers in Muslim countries.

These results will represent an indication of the perception of the Muslim community and whether it is applicable to make a chain that meets the specific demands of the Muslim consumer. The target is extending halal integrity throughout the supply chain.

## H.4 Survey

### 4.1 Data Collection Method

A questionnaire is designed to gather the data for this research. Using a questionnaire is the method to collect social data out of the population. For each participant the questionnaire consisted of four parts.

1. General data (socio-demographic data)
2. Items to measure their preferences on the Independent variables (segregation level)
3. Items to check their integrity as a Muslim (dependent variable)
4. Item to measure their Willingness to pay

### 4.2 Survey criteria

The survey has to comply with certain criteria to be useful as input for a PhD research. First of all the target population has to be certified. Questions have to be clear and well understood. Only a short introduction must be needed to introduce the interviewees to the subject. Consumer bias has to be avoided and most important is that the questionnaire has to provide the data needed.

- Clear questions
- Questions must be well understood
- Avoid Consumer Bias
- Provide the data needed.

The questionnaire itself has to follow certain steps. All questions and variables asked have to be backed up by a thorough literature research. The survey has to be tested and controlled to make sure that the questions asked provide the required answers. Every adjustment made has to be tested as well. There has to be a logical sequence in the questions and the questionnaire has to be consistent because otherwise it can cause confusion.

The Theory of Planned Behaviour (TPB; Ajzen, 1988, 1991) proposes a model about how human action is guided. It predicts the occurrence of a specific behaviour provided that the behaviour is intentional. The model is depicted in Figure 8 and represents the three variables which the theory suggests will predict the intention to perform certain behaviour. Intentions are the precursors of behaviour.
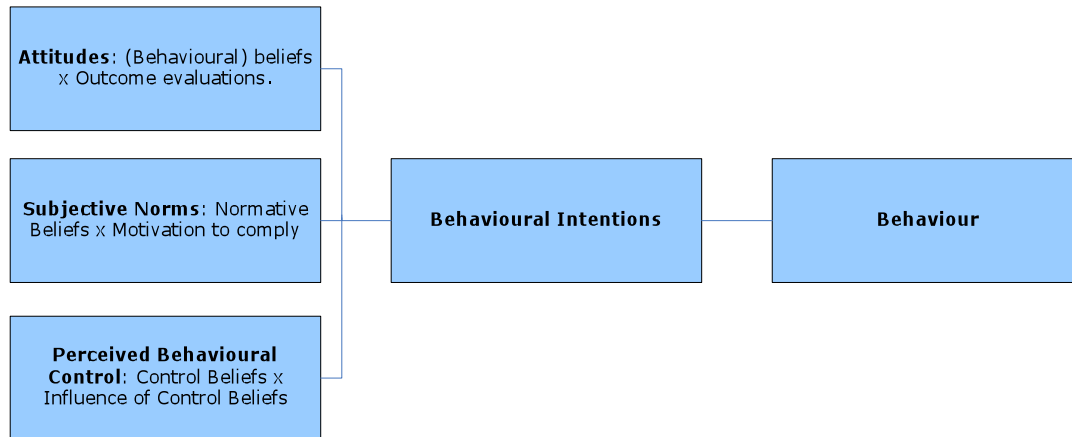
**Figure 7:** Theory of Planned Behaviour by Ajzen (1991)

The questionnaire developed for this research has to admit to certain criteria. The subject is rather unknown to the consumer. Every question has to be asked as simple as possible and understood by everybody in order to get the right answers.

## 4.3 Consumer Behaviour

Consumer behaviour makes it difficult to make a proper survey. Consumers have no time and are difficult to convince without a reward. Since there is a limited budget for the survey, the questionnaire itself has to be as simple as it can be. Only a short introduction should be enough to convince consumers the necessity of the research.

This also means that the sequence of the questions asked has to be logical and meet certain small but important rules. Especially with questions asked about a subject where the majority has never thought of or cared about before, questions should be asked the right way. This is needed to make sure you get the right answers. The use of close-end questions is hereby the best way. The use of a likert-scale makes it easier to answer and to run statistical tests afterward.

Even a simple matter of a likert scale is not easy. There is an endless diversity on the type of scales. To make sure that people are not immediately driven to choose the 'no opinion' option or 'neither disagree nor agree' there is chosen for a 7 point likert scale. The format used is especially designed in a way that consumers are less intended to choose the mid-path.

Below is an example of different types of likert scales. In which the new and used question is applied to discourage people to choose for a neutral answer and rather go for a slightly agree (#5) or disagree (#3) answer. People are less likely to choose a neutral answer in a seven-

point scale then in a five-point scale within a research with less information (Matell and Jacoby, 1972). The 7 point-scale is also conforming the design of Ajzen (1991) and used by Verbeke (2004, 2005, 2007) in his halal researches.

New question asked:

| a. I will buy low quality Halal meat (that might not be very hygienic) | Strongly Disagree          Strongly Agree |
|---|---|
| | 1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7 |

Old question asked:

a.      I will buy low quality Halal meat (that might not be very hygienic)

O Strongly Disagree  O Disagree  O Neutral  O Agree  O Strongly Agree

Simple rules apply to get the best results (Babbie, 1990):
- Natural sequence of time
- Most familiar to least familiar
- Avoid items that look alike
- Sensitive questions should be well after the start of the survey
- End with easy questions

Furthermore a research has to follow certain steps before it can be actually applied. The survey has to be tested first. 20-50 cases are usually sufficient to discover the major flaws in a questionnaire (Sudman, 1983, p. 181). After the test version, questions will be adapted and tested again, until the survey is ready for exploitation. Since the survey will be conducted in multiple countries it has to go through a translation phase as well. The first test version conducted in Malaysia revealed that questions 5, 7, 9 and 11 (see also appendix 1) were asked inadequately and made consumers choose for dedicated separation because the phrase: "I would prefer" was included. The second test version was mainly necessary because there were troubles with the Willingness to pay (WtP) questions number 12 and 13, whereas 12 wasn't included in first version and the options where formulated in a open form instead stated options like 0-5%, 5-10% etc.

## 4.4 Survey literature

Last year, focus groups were held in Malaysia, Hong Kong and the Netherlands on the topic of Halal logistics. The participants came from different backgrounds; academia, food industry, logistics industry, Halal authorities and governments. From these sessions it follows

that the core of Halal logistics is the physical segregation of Halal goods from non-Halal goods, based on:

1.   Avoidance of cross-contamination.
2.   Avoidance of mistakes.
3.   Perception of the Muslim consumer.

Number 1 and 2 can both be achieved through best practice logistics, but are connected with number 3, which has a religious foundation. Therefore the level of segregation from the perception of the Muslim consumer has to be measured through a survey.

The concept of quality is very broad and can be approached from different scientific perspectives, like social, psychological and nutritional. As shown by Grunert et al. (2002) the consumers' perspectives at the quality of meat can be measured in an extrinsic and an intrinsic way. People experience quality as in taste, since this is of the primary role of a consumers' food choice in general (Grunert, Bech-Larsen, & Bredahl, 2000; Richardson, N., MacFie, H.J.H. and Shepherd. 1994).

Food safety is asked in relationship with logistics because of the growing concern consumers have about food safety. Much research has being undertaken in this field because of the "food scares" like the mad-cow disease and salmonella. Although food has never been as safe as today, the consumer perception is the opposite (Snijder, van Kapen, 2002).
According to Kennedy (1988) food safety issues are a matter of trust, since consumers cannot directly measure food safety risks for themselves. Consumers must rely on the integrity of the food industry and the ability of the government to regulate to protect them. This explains the question about responsibility of Halal logistics.

Health or hygiene is a quality dimension that has become very important to many consumers, and a number of studies indicate that, today, health is as important as taste (Verbeke, 2005), and that consumers form preferences based on this dimension of longer life and one on higher quality (Roininen et al. 2001: Grunert et al. 2002).

A comparison can be made between social embeddedness and the relation with 'good' food. This also addresses animal welfare and a strong belief in the basic integrity of livelihoods built around the growing, rearing and preparation of food (Sage, 2003). This can be compared with the integrity according to Halal meat.

Cultural differences are influencing both the content and structure of consumer means-end perception of product/service value (Overby et al. 2005), which could increase or decrease the willingness to compromise. According to Verbeke (2005) age and gender influence the

willingness to compromise during his study in willingness to compromise taste on behalf of health.

When analyzing consumer intentions, an important question is what factors cause intention development. The presumption is that beliefs are key elements in forming attitudes, intentions and eventually in influencing behaviour. Beliefs represent the base set of information that a consumer has about an object or concept (Fishbein and Ajzen, 1975).

Economic literature indicates that the Willingness to Pay (WTP) generally depends on socio-demographic entities, such as education, demographic characteristics and income. As income is too personal and incomparable between the countries, the linkages between WTP and education level and country of residence are chosen. Like Roe et al. (2001) stated, WTP varies from low to high income, from low education degree respondents to high education degree and so on. Different social status and background are the crucial determinants of individual preferences (Botonaki et al. 2006). The willingness to answer questions on income is very sensitive, as it has to do with a certain level of privacy (Singer, 1984). Therefore there is chosen for a measurement on educational level instead of income. Income is also less trustworthy because of the major GDP differences between Malaysia and the Netherlands.

The socio-demographic characteristics asked are based on the basic characteristics and all have been previously tested in an endless list of other surveys concerning different kind of food matters (Diamantopoulos et. al, 2003; Verbeke, 2004 and 2005; Dali et. al, 2007; Han and Harrison, 2006). Education, age, gender, country are all asked for several significant reasons. Religion must be included in this survey because of the relevance to its commitment to Halal meat. Some previous studies also include number of children, but these are mostly obtained in surveys concerning food quality and food safety. Since this study is focused on logistics, number of children can be seen as irrelevant, and the same can be concluded for consumers' marital status.

Religion has to be asked because it plays a significant role in influencing social and consumer behaviour. The intensity of belief and religion indicates statistically significant differences, which can have important implications for consuming (Fam et al. 2004) and of course whether or not they have to eat Halal meat.
Because the consumers have relatively less knowledge of logistics, there is chosen for the usage of a seven-point scale because of the chance on more differentiation in answers. There is no exact optimum of scale points used (Schumete et al. 2007; Matell and Jacoby, 1972). However people are less likely to choose a neutral answer in a seven-point scale then in a five-point scale within a research with less information (Matell and Jacoby, 1972). The structure of the seven-point likert scale is based on the work of Ajzen (2002) and Francis et. al (2004).

Seven- point scales have been used in an endless list of previous studies like Verbeke (2005), Hill and Scudder (2002). According to Fink and Kosecoff (1982, 1985) it is important to start with the rather sensitive questions and end with easy questions. This explains the structure of the survey, ending with the socio-demographic figures and beginning with the questions about integrity and compromise.

## 4.5 Conclusion

A proper survey is developed in order to get the results that have to be measured. All the questions and variables asked had to be justified through a thorough literature research. Because consumer behaviour is at stake, the survey had to meet certain criteria. Before the final survey (Appendix 1) was developed, the survey had to be tested first, to see if all questions were well understood and interpreted. There were two test-surveys necessary before the final survey was conducted.

# H5 Data Collection and Findings

This chapter will elaborate on the results of the survey. The segregation level from both countries will be revealed. Each section will begin with the means (averages) and will be explained with graphs.

## 5.1 General information

The research that was conducted in Malaysia has a respondent population of 265 at several places across Kuala Lumpur. Of the 265 respondents, 251 are Muslim. The research conducted in The Netherlands has a respondent population of 259 of which 250 are Muslim. The questionnaires that were not usable are not included within these numbers, the criteria for exclusion is shown in the table below and based on Malhotra (2004).

| Criteria Excluded Questionnaires | |
|---|---|
| Incomplete | Parts of the questionnaire may be incomplete. More than 5 questions unanswered |
| Similarity | The questionnaires are numbered: when two following numbered questionnaires were completely similar answered, one of the two was excluded |
| Contradiction | The pattern of responses may indicate that the respondent did not understand the questionnaire or took it serious. |
| Little Variance | For example, a respondent has checked only 4s on a series of seven-point rating scales |

**Table 2: Criteria Exclusions**

The final sample consists of 45% male, 55% female for Malaysia. Within the Netherlands the sample consists of 71.6% male and 28.4% female. The largest group of the sample is between 20 and 35 years old and most of them have a Turkish or Moroccan background. Malaysia has a sample of 60% between 20-35 old and the Netherlands 50%.

The educational level shows a remarkable result: 63% of the Malaysian responders have an educational level of a bachelor degree, whereas the Netherlands has an average between secondary school and diploma (comparable with VMBO). In the Netherlands the higher educated Muslims are harder to track down instead of in Malaysia where you can go to Muslim universities.

## 5.2 Logistical Responsibility

The halal food chain deals with different members within the supply chain and the different roles each of them perform. The halal chain is characterised by supply chain collaborations within the network of potential partners who all search for requirements that are demanded on them. This is why it is important to know who is responsible in consumer point of view for the logistics in halal food chain.

| Mean | Malaysia | Variance | The Netherlands | Variance |
|---|---|---|---|---|
| Government through regulations | 6.19 | 1.21 | 4.44 | 2.23 |
| Halal Authority | 6.39 | 0.96 | 5.93 | 1.01 |
| Manufacturer of halal products | 6.33 | 1.06 | 5.76 | 1.45 |
| Supermarket | 5.23 | 2.69 | 4.78 | 2.41 |

**Table 3: Logistical Responsibility**

As displayed in the example in section 4.3, answers are based on a 7-point likert scale, whereas number 7 is equal to 'strongly agree' and number 1 equal to 'strongly disagree'. As shown in table 3, the level of responsibility within Malaysia is divided among every measured authority. In the Netherlands the responsibility is mostly seen as a responsibility of the halal authority and the manufacturer of the halal products. Nevertheless the supermarket and government are not free of responsibility in the eyes of the Muslim consumers. Collaboration between the stakeholders is demanded.

The variance in the Netherlands among the variables 'government' and 'supermarket' are quite high. The consequence of a large variance is that, the larger the variance, the more the individual values differ, and therefore the more the values of the "average" differ. So there is a lot of differentiation when it comes to the responsibility level of supermarkets for both countries including the government for the Netherlands.

## 5.3 Segregation level

| Mean | Malaysia | Variance | The Netherlands | Variance |
|---|---|---|---|---|
| Supermarket | 3.64 | 1.47 | 2.09 | 1.40 |
| Transport | 3.66 | 1.98 | 2.14 | 1.47 |
| Storage | 3.73 | 1.83 | 2.14 | 1.65 |
| Airports | 3.52 | 1.65 | 2.06 | 1.50 |

**Table 4: Segregation Level**

Stated in the table above, the differences between the Netherlands and Malaysia are quite obvious. The minimum level of segregation on behalf of every aspect differs significantly from each other. If we take a look at the means of the supermarket in both countries, we can see a mean of 3.64 in Malaysia and 2.09 in the Netherlands. These questions are based on a five point choice model. An example is shown in table 5 below. According to the mean, the minimum segregation level of halal meat in the supermarket in Malaysia would be between *'No mixing of halal and non-halal meat in the same fridge or rack'* and *'No mixing in the same zone'*, whereas the level of segregation in the supermarket within the Netherlands is almost comparable with *'No mixing in the same (shelf) section'*.

| 5. What is the __minimum__ segregation required at the supermarket? (Tick only one) |
| --- |
| **O**    Does not matter, as long as the Halal meat is vacuum packed |
| **O**    No mixing of Halal and Non-Halal meat in the same (shelf) section |
| **O**    No mixing of Halal and Non-Halal meat in the same fridge or rack |
| **O**    No mixing of Halal and Non-Halal meat in the same zone of the supermarket |
| **O**    A dedicated Halal supermarket |

**Table 5: Question Example**

Segregation level during supermarket display according the mean:
Malaysia:
- *No mixing of halal and Non-halal meat in the same fridge*
- *No mixing of halal and Non-halal meat in the same zone*

The Netherlands:
- *No mixing in the same (shelf) section*
- *No mixing on the same rack*
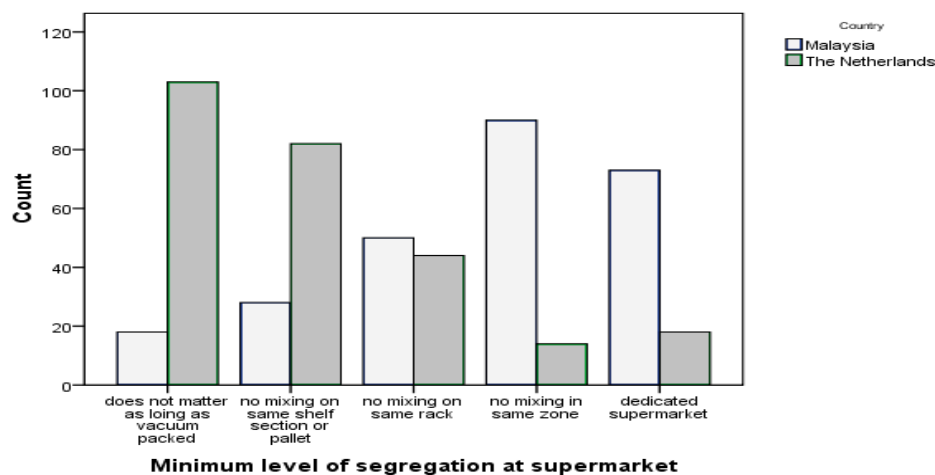
Separation during transport according the mean:

Malaysia:

- *No mixing of halal and Non-halal meat on the same load carrier or pallet*
- *No mixing of halal and Non-halal meat in the same container or vehicle*

The Netherlands:

- *No mixing of halal and Non-halal meat in the same carton box*
- *No mixing of halal and Non-halal meat on the same load carrier or pallet*
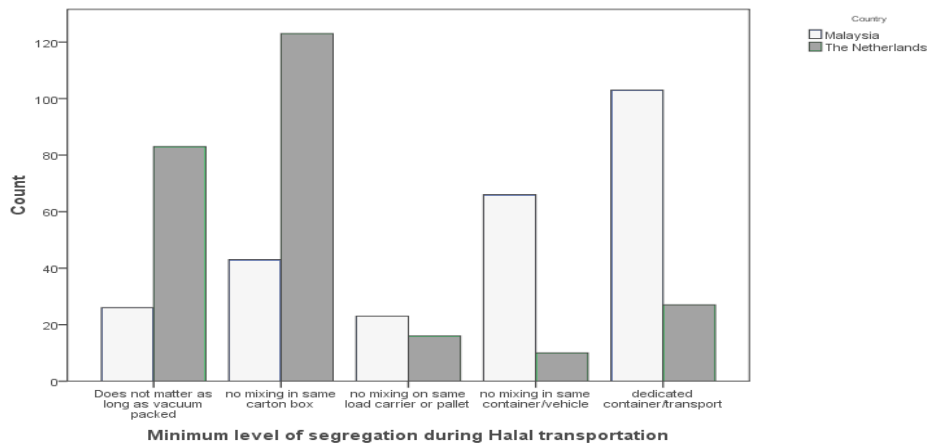


Segregation level during Storage according the mean:

Malaysia:

- *No mixing of halal and Non-halal meat on the same load carrier or pallet*
- *No mixing of halal and Non-halal meat in the same warehouse section*

The Netherlands:

- *No mixing of halal and Non-halal meat in the same carton box*
- *No mixing of halal and Non-halal meat on the same load carrier or pallet*
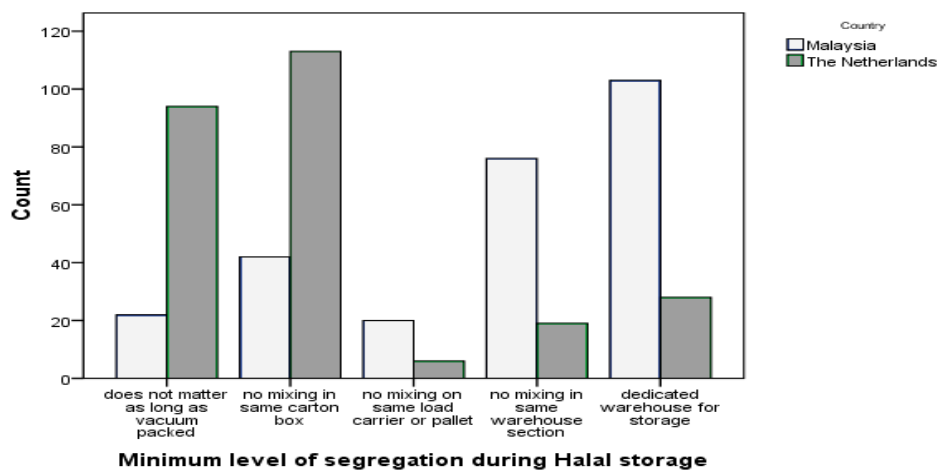
Segregation level during Sea/airport according the mean:

Malaysia:

- *No mixing of halal and Non-halal meat on the same load carrier or pallet*
- *No mixing of halal and Non-halal meat in the same section*

The Netherlands:

- *No mixing of halal and Non-halal meat in the same carton box*
- *No mixing of halal and Non-halal meat on the same load carrier or pallet*
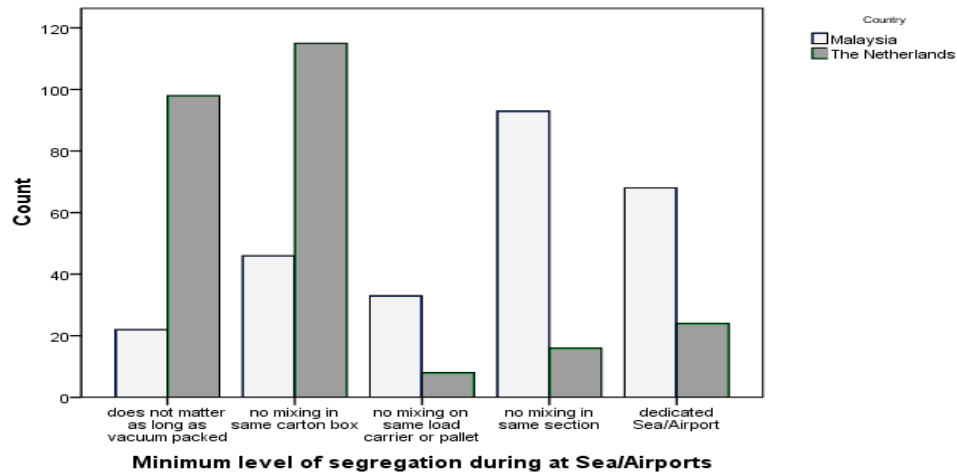


All the separation levels show a significant difference between the Netherlands and Malaysia. These differences have major logistical consequences, since the segregation in the Netherlands is much lower than in Malaysia. The lower standards that the 'Dutch' Muslims show can be seen as a positive outcome. There is a smaller flow of products in the Netherlands whereas the costs of the last mile are the most expensive. Imagine transportation to a supermarket with a separate halal truck, or within the regular truck, but with a dividing wall in between.

Complete separation from farm to fork will cost a lot of money. The attainability of a consumer contribution could be necessary to fund any logistical consequences; hence the willingness to pay is an important variable to measure.

## 5.4 Willingness to Pay (WTP)

In the Netherlands 65.8% is willing to pay extra for their halal distributed products, in Malaysia 90.2% is willing to pay more. This could be seen as quite strange because halal products are not as easy to get in the Netherlands as they are provided in Malaysia. Another remarkable point is the fact that halal distribution in the Netherlands is more expensive then in Asia. So there has to be room for compensation.
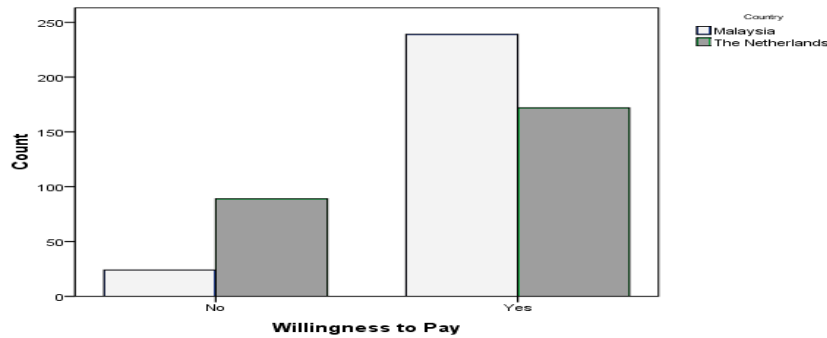
The next question asked in the survey was the actual amount (in percentage) they are willing to pay extra. Malaysia has a mean of 3.80 (out of 7), whereas the Netherlands has a mean of 2.10 (out of 7). This equals a WTP percentage around the 17% in Malaysia and around 9% in the Netherlands (see also graph below).·

Logistical differentiation will cost money, so the WTP for these extra costs are important to know. Whereas the percentage of 10% will cover all the extra charges is not in my sight, but the knowledge that 65.8% of the Muslim consumers are willing to pay certain coverage gives at least some opportunities for the halal market.
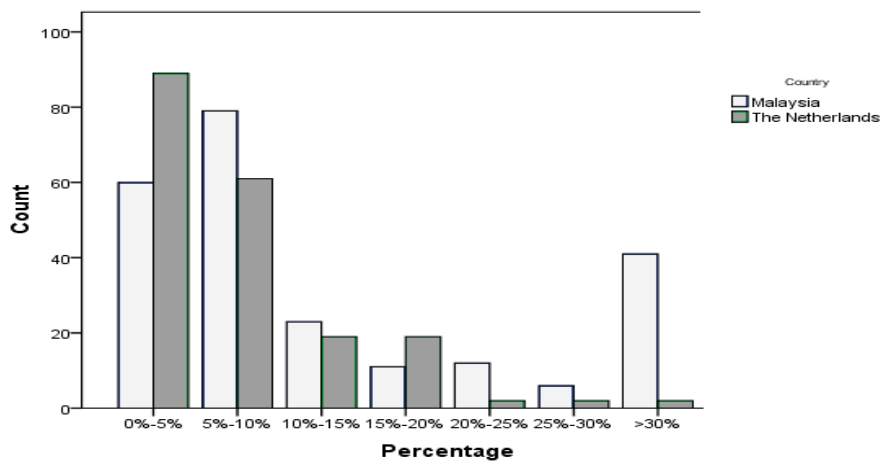


## 5.5 Socio-Demographic Statistics

To make a complete profile of the Muslim consumers it is important to see if there are any socio-demographic differences between the two countries, like differences between male or female, influence by age and/or education on the answers given at the survey questions.

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· There is a group of the measured population which has major influences on the mean, because they were all willing to pay the maximum amount. This group of Muslims don't care about the costs as long as they have the certainty that everything they eat is 100% halal.

Based on the construct of section 3.5 there are significant differences between the two countries on all questions asked. The differences on the level of responsibility and WTP were already shown in previous sections 5.2 till 5.4. The level of integrity and compromise (question 2 and 3 in the survey) show a significant difference on 95% certainty as well (see appendix).

Socio-demographic differences can also be displayed through gender, education and age. These differences will be explained per country. A view examples (per country) of possible connections will be shown, other tables will be displayed in the appendix. To start with the level of responsibility: In Malaysia there is no significant relationship between the level of education, gender, age and the level of responsibility. None of the socio-demographic seems to influence the answers given on responsibility. Table 6 shows the significance.

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Government through regulations | ,410 | 1 | ,410 | ,402 | ,527 |
| | Halal Authority | ,946 | 1 | ,946 | 1,011 | ,316 |
| | Manufacturer of Halal Products | ,191 | 1 | ,191 | ,200 | ,655 |
| | Supermarket | ,263 | 1 | ,263 | ,102 | ,750 |
| Education | Government through regulations | 4,492 | 4 | 1,123 | 1,101 | ,357 |
| | Halal Authority | ,489 | 4 | ,122 | ,131 | ,971 |
| | Manufacturer of Halal Products | 3,206 | 4 | ,801 | ,838 | ,502 |
| | Supermarket | 6,353 | 4 | 1,588 | ,615 | ,653 |
| Age | Government through regulations | ,844 | 3 | ,281 | ,276 | ,843 |
| | Halal Authority | ,821 | 3 | ,274 | ,293 | ,831 |
| | Manufacturer of Halal Products | 4,284 | 3 | 1,428 | 1,493 | ,217 |
| | Supermarket | 17,945 | 3 | 5,982 | 2,314 | ,077 |

**Table 6: Significance responsibility**

The level of compromise shows a possible connection with gender on the variable 'low quality halal food' whereas the women show a far more negative point of view then men. This is with a F-ratio of 4.247 which was significant at the level of 0.05 level (p=0.041). Differences were also shown at the variable 'high quality halal food', with a F-ratio of 6.538 which was significant at the level of 0.05 level (p=0.011). Table 7 shows the significance. The level of education and age shows no differences.

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|--------|--------------------|--------------------------|-----|-------------|------|------|
| Gender | Low quality Halal food | 12,883 | 1 | 12,883 | 4,247 | ,041 |
|  | High quality Kosher food | ,722 | 1 | ,722 | ,204 | ,652 |
|  | High quality that doesn't contain Haram | 18,862 | 1 | 18,862 | 6,538 | ,011 |

**Table 7: Significance Integrity vs. gender**

The level of separation is in Malaysia not influenced by age and education. But there is a possible significance with gender related to the supermarket and separation during storage. This is shown in table 7.

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|--------|--------------------|--------------------------|-----|-------------|------|------|
| Gender | Minimum level of segregation at supermarket | 5,593 | 1 | 5,593 | 4,822 | ,029 |
|  | Minimum level of segregation during Halal transportation | 5,328 | 1 | 5,328 | 3,051 | ,082 |
|  | Minimum level of segregation during Halal storage | 4,977 | 1 | 4,977 | 3,180 | ,076 |
|  | Minimum level of segregation during at Sea/Airports | 3,673 | 1 | 3,673 | 2,409 | ,122 |

**Table 8: Significance Separation vs. Gender**

In the Netherlands there is a possible relationship between the level of integrity and education as shown in table 9 below. Table 10 shows where the differences are made.

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|--------|--------------------|--------------------------|-----|-------------|------|------|
| Education | Food Quality | 20,896 | 4 | 5,224 | 4,483 | ,002 |
|  | Health | 5,434 | 4 | 1,359 | 1,330 | ,260 |
|  | Animal Welfare | 25,593 | 4 | 6,398 | 5,976 | ,000 |
|  | Food Safety | 7,925 | 4 | 1,981 | 2,031 | ,091 |

**Table 9: Integrity vs Education**

| Count | | Highest Education | | | | | |
|-------|--|---------|-----------|---------|----------|--------|-------|
|  |  | Primary | Secondary | Diploma | Bachelor | Master | Total |
| Food Quality | Strongly Disagree | 2 | 0 | 0 | 2 | 0 | 4 |
|  | Quite Disagree | 0 | 0 | 1 | 0 | 0 | 1 |
|  | Neither | 0 | 10 | 5 | 0 | 2 | 17 |
|  | Slightly Agree | 2 | 37 | 34 | 8 | 0 | 81 |
|  | Quite Agree | 2 | 12 | 28 | 5 | 0 | 47 |
|  | Strongly Agree | 2 | 27 | 40 | 16 | 2 | 87 |
|  | Total | 8 | 86 | 108 | 31 | 4 | 237 |

**Table 10: Count Food Quality**

The level of compromise shows a possible connection with education as well on all variables asked. Hereby we have to notice that the respondents out of the category Masters' degree and Primary education are not well represented. The respondents with a Bachelor' degree are overall more strict then fellow respondents.

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Education | Low quality Halal food | 65,040 | 4 | 16,260 | 5,458 | ,000 |
| | High quality Kosher food | 108,589 | 4 | 27,147 | 19,107 | ,000 |
| | High quality that doesn't contain Haram | 40,832 | 4 | 10,208 | 6,146 | ,000 |

**Table 11: Compromise vs. Education**

It is not possible to draw conclusions for Muslims with a primary (8) or a masters'(4) degree since there a not enough respondents in this category. Also respondents in the category age >65 are not enough represented (4 in total).

In the Netherlands there is no strong connections between age and level of separation whereas when we look at gender the female respondents show a lot more variance and therefore prefer a higher level of separation (see also appendix 3), where the male respondents are normally distributed. Education seems to have influence on the separation level as table 12 below shows.

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Education | Minimum level of segregation at supermarket | 57,792 | 4 | 14,448 | 14,455 | ,000 |
| | Minimum level of segregation during Halal transportation | 28,744 | 4 | 7,186 | 7,028 | ,000 |
| | Minimum level of segregation during Halal storage | 58,317 | 4 | 14,579 | 11,758 | ,000 |
| | Minimum level of segregation during at Sea/Airports | 64,951 | 4 | 16,238 | 13,606 | ,000 |

**Table 12: Minum Separation vs. Education**

The WTP in the Netherlands show that 74% of both male and female are willing to pay extra. All male respondents are divided among 1%-20% extra, whereas females are more divided (higher variance). Education shows no influence, but there are some obvious notifications in the variable age. In the category below 20 years old 40% is not willing to pay extra for their products at all although this is based on small amount of respondents (n=18), in the age category 20-50, 20% is not willing to pay extra. Age shows no significant relationship with amount of percentage (see table below).

| Percentage | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 6,012 | 4 | 1,503 | 1,033 | ,392 |
| Within Groups | 270,732 | 186 | 1,456 | | |
| Total | 276,743 | 190 | | | |

**Table 13: Significance Percentage vs. Age**

## 5.6 Conclusion

In both countries the survey was conducted with a sample around 250 responders. The Malaysian Muslims have more demands according to logistical requirements then the Dutch Muslims. The Malaysian consumers require separate sections for halal during the whole physical distribution chain, whereas the Dutch consumers are content with transportation in separate boxes or on different pallets. Exclusive halal sections are not needed according to the consumers, as long as halal meat can be assured to stay halal and not become haram.

## H6 LOGISTICAL REQUIREMENTS

Logistical requirements are the limitations or adaptations that follow from the measured consumer opinion. As shown in Chapter 5 there are significant differences between The Netherlands and Malaysia, therefore both countries will first be discussed separately and then combined in section 6.3.

### 6.1 Logistical Requirements for Malaysia

Malaysia is from origin a Muslim country as the introduction in chapter 1 already revealed. The results shown in chapter 5 confirm this religiousness and in this chapter the Malaysian logistical requirements will be uncovered. The minimum separation for each of the variables is shown in table 4 below.

| Variable | Minimum Separation |
|---|---|
| Supermarket | Dedicated halal supermarket |
| Transport | Dedicated halal transport |
| Storage/Warehouse | Dedicated halal warehousing |
| Airport | Dedicated halal sea/airport |

**Table 14: Minimum Separation in Malaysia**

In chapter 5 the separation levels were less strict, for the final minimum separation requirements, there is chosen for the dedicated halal separation because of several reasons. First, there is high variance in answering the given question. Second, there is a certain level of acceptance to obtain. The graphs in chapter 5 show that the 'minimum separation level questions', there is a minimum of 27% till 40% of the interviewees that chose the dedicated answer as their minimum. To gain a high level of acceptance this group has to be taken into account as well. The third reason is that the separation levels also have been measured separately. The questions: "Do you prefer a dedicated supermarket (or transport/storage etc.)?" gave significantly high accepted answers with a mean around 6.2 and a low variance. An example of the answers on the variable 'supermarket' is shown in table 7 below.

**Prefer dedicated Supermarket**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 11 | 4,2 | 4,2 | 4,2 |
| | Quite Disagree | 1 | ,4 | ,4 | 4,5 |
| | Slightly Disagree | 4 | 1,5 | 1,5 | 6,0 |
| | Neither | 14 | 5,3 | 5,3 | 11,3 |
| | Slightly Agree | 17 | 6,4 | 6,4 | 17,7 |
| | Quite Agree | 52 | 19,6 | 19,6 | 37,4 |
| | Strongly Agree | 166 | 62,6 | 62,6 | 100,0 |
| | Total | 265 | 100,0 | 100,0 | |

**Table 15: Answers Question 4 for Malaysia**

According to the average consumer, separate halal distribution and storage are necessary. The physical distribution cycle of figure 6 earlier in this report would contain changes that would look like figure 9.
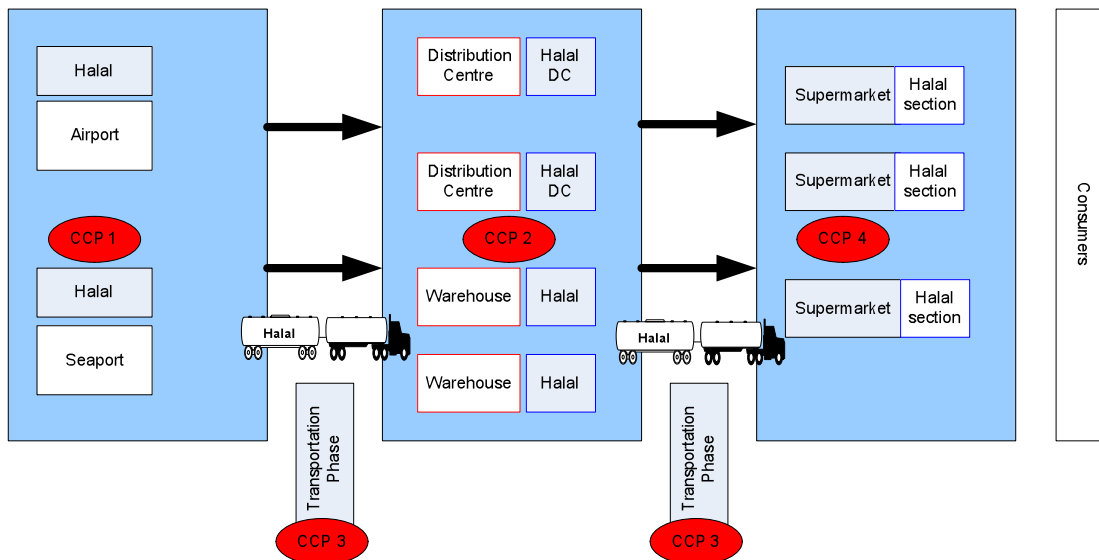


**Figure 8: Halal separation according to Malaysian Muslims**

## 6.2 Logistical Requirements for the Netherlands

The Muslim society in the Netherlands is a minority that purchases their halal meat in their own local 'small halal butcher'. The sale of halal meat in the supermarket is still rather new and is limited by the choice of a view products from 'bigger' brands like 'Mekkafoods'. They do recognise the problems that can occur during logistics and are happy that halal is becoming more and more mainstream. The biased premise of a less conservative outcome could

therefore be expected. The results from chapter are summarized in the table below and show a significant difference with the Malaysian minimum separation levels.

| Variable | Minimum Separation |
|---|---|
| Supermarket | No mixing on the same fridge/rack |
| Transport | No mixing in the same carton box |
| Storage/Warehouse | No mixing in the same carton box |
| Airport | No mixing in the same carton box |

Table 16: Minimum Separation in the Netherlands

The average consumer opinion in table 4 from chapter 5 revealed that the averages lay between 2.09 and 2.14. This could also be accepted as the segmentation level: 'no mixing in the same carton box' (or same shelf within the supermarket) which equals level 2. But there is also a significantly large amount of people (a total of 41, which equals 16.4%) that has chosen the variable; 'no mixing on the same rack'.

When more than 15% of the respondents prefer a higher option, a higher option is preferred to generate coverage of at least 85% of the population. This is because there will be extra costs involved, which have to be related to a wide coverage of Muslims. The final choice is based on the level of acceptance. A big advantage is that from the airport till the supermarket the halal meat can stay in the same carton box where the same segregated rules during the cycle can be applied.

## 6.3 Survey results translated to CCPs

The halal food chain as any other food-chain deals with CCPs, the difference is that halal food cannot be exposed to non-halal food. The goal of this research is to measure in what way the Muslim consumer itself would like to see the separation of halal meat and their WTP for possible logistical consequences. Since halal meat is becoming more mainstream, is gaining popularity under non-Muslims and is available in the major supermarkets since a few years, there is chosen to measure the food-cycle from the Airport/Seaport (in case of import) till the supermarket.

The HACCP in the halal meat chain from Bonne and Verbeke (2007) is an outcome resulting from the combination of the Actor Network theory and the Convention theory, which combines socially demanded quality aspects and economical quality coordination. As shown in chapter 2, the CCPs could be within and between every step in the supply chain. The focus should be on to controlling socially demanded quality aspects as indicated by consumer requirements.

The consumer results in chapter 5 show that the separation in the Netherlands is sufficient when halal meat is transported and stored in separate carton boxes and gets a separate shelf or fridge in the supermarket. Simple adaptations are enough to give an extra quality approach on the CCPs of the halal food chain. These operational adaptations are quite easy to implement. Malaysian consumers prefer dedicated halal sections during transportation and storage as well as in the supermarket to guarantee the quality of halal food. An advantage is that Malaysia already uses rather strict rules according to the MS 1500:2004. CCPs are already recognized and this research confirms the strict demands from consumers. Supermarkets already have separate halal sections and transportation is already differentiated. The most important outcome of the survey for Malaysia is therefore, that consumers are willing to pay a significant amount of money extra. Another important outcome is the level of responsibility that is somewhat equally divided among all the stakeholders, which makes the step to collaboration a logical result. Collaboration between all the stakeholders in the development of a halal logistics label is a serious matter to discuss.

When the focus is on the convention theory within the halal food chain, the implementation of a 'track and trace' system during the whole cycle should be helpful as all stakeholders can see where their products come from and go to during transport (M.Tieman, 2009). Within the DC's and warehouses control has to take place to assure that no threat of cross-contamination can be involved.

The supermarkets in the Netherlands can increase their position on the Muslim consumer market by introducing a separate halal shelf or fridge. This is one of the outcomes from the survey and somewhat a logical choice. The availability of halal products becomes automatically more obvious and shows that they are willing to cooperate with Muslim consumers' demands. This can reinforce their position in the market.

## 6.4 Combined Requirements

It would be without any consequence when the Netherlands wants to import halal meat from Malaysia, since Malaysian standards are already in accordance with the requirements stated by the Dutch consumers. The other way around would automatically imply some consequences for the Dutch physical distribution, since strong adaptations will have to be made according to Malaysian standards. This would mean higher qualifications to earn the same level as an accepted halal logistics standard or expectations of consumer requirements. The CCPs would then lay from the transportation of the butcher or storage to the storage at the air- or seaport. With the actual transport overseas, it would be wise to follow the IHI Alliance approach of transportation, as in; No mixing of Halal goods with non-Halal goods in one container/common transportation vehicle in case of bulk shipments. No mixing of Halal unitised shipments with severe najs (like pork meat) in one container/common transportation

storage in case of refrigerated transport. No mixing of Halal and non-Halal goods on one load carrier and the use of tertiary packaging to protect the Halal load, not only during transport but throughout the entire supply chain. Physical segregation of Halal can also be facilitated through containerisation at a lower level. But cleaning procedures will have to be put in place, to ensure a Shariah compliant transportation system (IHIAS '09).·

## 6.5 Conclusion

Section 6.1 till 6.3 showed the limited separation levels from Malaysia and the Netherlands and a possible collaboration between the two countries. In figure 8 a picture of the Malaysian Physical Distribution cycle was drawn. These kinds of radical adaptations are not necessary for the Netherlands. Within the Netherlands shipment, transportation and storage in different carton boxes justifies the consumer opinion, whereas supermarkets are asked to use a separate rack or fridge for their halal meat products.

With the presence of a halal warehouse (Eurofrigo, 2006) in the harbour of Rotterdam the Netherlands is one of the frontiers in Europe when it comes to halal logistics. The outcome of this research however shows that such a dedicated halal warehouse was not necessary according to the Dutch Muslim consumers.

The transportation and storage would become more reliable and qualitatively more sufficient when the actors cooperate and introduce a halal logistical label. The survey revealed that the overall responsibility can be divided between the four measured stakeholders (sea- airport, warehouses, transport, retail), which means that collaboration is desired or even demanded. It is in line with the convention theory to jointly set up a label that can guarantee that halal logistics has been applied. Compensation of costs for the implementation of such a label is possible since 65% of the Dutch Muslim consumers are willing to pay around 9 percent more for their halal logistics guaranteed products. In practise there are not so many costs involved for the establishment of such a label, since it is not much more than a different code that has to be scanned during transportation. On the other hand, there is an advice to make the visual information more noticeable.

Malaysian consumers are already used to the availability of halal products since this is their standard. But the fear for unreliable halal products is large. An indicator for this fear is the amount of interviewees who are willing to pay an increase of more than 30% for their meat if this would be necessary to give a 100% guarantee. Nevertheless is it an obligation of the Muslim 'supplier' to deliver halal goods to Muslim consumers. Collaboration within the

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· No research has been done on transportation overseas, the IHI Alliance Standard is taken as example because it is the only standard that is international applicable and therefore most appropriate with import and export.

supply chain is therefore one of the markers. Responsibility is divided amongst all stakeholders and there is an overall demand for certainty. This research shows that the Malaysian Muslim consumers would prefer dedicated halal distribution and logistics. Logistics is already provided separately, accept for sea and airports, but the research showed that there is a lot of variance on this variable, which makes a halal section with a good control system possibly an acceptable compensation.

## H7 CONCLUSIONS & RECOMMENDATIONS

### 7.1 Conclusions

A logistical system is composed out of a large number of variables which have to be managed properly in order to deliver final products in the right quantities at the desired time and quality at the right place and at a reasonable cost. This puts challenging requirements on the quality of the different logistical processes, especially in view of the specific characteristics of the halal-food chain. This final chapter will answer the problem formulation of chapter 1: *What are the Muslim consumer requirements concerning the distribution of halal meat and how can logistics be arranged accordingly?*

There is not much that has to be changed in the Netherlands or in Malaysia, according to physical distribution to meet the consumer' needs. In Malaysia most of halal distribution and storage is already separated. Most important for Malaysia is that the responsibility is divided amongst all stakeholders and that consumers are willing to pay for halal logistics.
Within the Netherlands it is important that halal meat is in all cases at least separated through different carton boxes and the supermarkets are well advised to implement a halal rack or fridge.

In general the literature says to implement the consumer opinion within the distribution cycle and treat them as a fully respected stakeholder to assure a certain amount of quality and service. The results of this research showed that within the logistical distribution of the halal food chain there is not much that has to be changed.
The fact that the consumer opinion regarding halal logistics has never been measured before made this research interesting. The outcome itself is something new to present to the world and although results may not be surprising on their own, the ability to show that you can take your logistics or distribution decisions with additional support and a measured background can mean a lot for all stakeholders involved.

To arrange halal logistics accordingly in the future, is by using this research with the development of a halal standard that can be applied in a Muslim country and the development of a standard that can be applied in a non-Muslim country. The IHI standard is the first standard that is trying to make a global standard and therefore inserted a 'should' as a preferred standard and a 'shall' section in case of non-dedicated options. This research has set the boundaries for the 'shall' section in non-Muslim countries and can be used as a first step for standardisation.

One of the results out of the survey showed that Muslim consumers in the Netherlands would like to see a separate halal rack or fridge within the supermarket. Supermarkets are already

investing in the halal market, so why don't they make it more obvious and try to make more profit out of it? This is quite easy to establish and logical as well. It makes the availability of halal products more visible and tangible and therefore more attractive, instead of putting it in a fridge next to the pizza boxes. It is also a logical decision, to a need for visual information to the consumers. In order to arrange logistics accordingly to consumer requirements changes in the supermarkets would be wisely to implement.

## 7.2 Reflections

In this section I would like to look back on the process and results of my thesis. The objective of the research was to measure the consumers' perception on halal logistics. A major part of the research was the development of a consumer survey including a thorough literature review and testing, which cost a lot of time and effort. The survey resulted in the answers needed, which makes me pleased with the results. Although you hope to find something exclusive and surprising, the result itself is the most important measurement, since this is the first time that the consumer opinion on the physical distribution of halal is measured and it can therefore mean a lot for the stakeholders involved. The results are useful for everybody who is involved in the storage and transportation of halal meat including supermarkets. Especially for non-Muslim countries this research can be used for the upcoming standardisation of halal transport.

I would do a few things differently when I look back at the process of my thesis. First of all, I would finish my theoretical framework and methodology before I actually would step on the plane to Malaysia. Although my supervisor changed simply a day before I stepped on the plane, and we only made a decent plan when I was already in Malaysia, it was still my responsibility to have a solid framework. Second, I had a lack of knowledge on making a consumer survey (which is more a behavioural science subject) and not enough knowledge of logistics. This took me a bit too much time, although my work in Malaysia was perfectly on schedule. On the other hand, two rather new subjects on the topic of halal were quit challenging as well.

Theory on the topic of halal logistics is almost not available at all. The most useful theory came from articles of M. Tieman (which are commercial articles and not scientific) and from Verbeke. This is why articles on food management came more in front during the progress of my thesis. The theory was more than useful for the development of the survey and helped a lot during this process.

## 7.3 Recommendations

One of the biggest problems within the implementation of halal logistics is the hundreds of halal certifiers who all claim to have the ability of providing a halal certificate, but apply different sets of rules and regulations. A lot of these certifiers are not even officially recognised or accepted by the halal authorities. Bribery and lack of control are some of the biggest threats, but according to the WHF '09 this is a worldwide problem. One of the recommendations would therefore be to follow Malaysia in setting up a Dutch halal standard which can be used as a guideline and a minimum set of rules that have to be applied. As stated in the conclusions it is important to give more attention to the visual information. This is mainly applicable to the supermarkets, since this is the display to the consumers.

## 7.4 Further Research

This research could because of a lack of funds only be conducted in Malaysia and the Netherlands, but to really establish a worldwide view regarding halal logistics and physical distribution, it could be valuable to conduct the same research in other countries as well. All the differences within the Muslim world would make it even more necessary. It is interesting to see how for example the Arabic countries look at halal logistics.

A lot of Muslims that I've spoken came with examples of small trucks that deliver in impure conditions or even with unsealed pork hanging within the same truck. So the major problems within the Netherlands at the moment occur during transportation to the small halal butchers, which sell the most halal meat at the moment. Research in the lack of control and delivery to small butchers or food markets could be rather challenging and necessary as well.

I have had no insight in the structures of the current physical distribution of halal meat in the Netherlands, since I've only investigated the consumer opinion. In order to really be able to make a design for the physical distribution in the Netherlands it is necessary to research what the chances and possible problems could be during the implementation of such a structure.

At last I would like to advice to conduct the survey in such a way, that there is more variance in respondents, during the study on socio demo-graphic statistics some groups were in a minority, particularly the elderly and higher educated Muslims.

# References

- Ajzen, I. (2006) "Constructing a TpB Questionnaire: Conceptual and Methodological Considerations."

- Bonne, K. and Verbeke, W., (2007) "Religious values informing halal meat production and the control and delivery of halal credence quality." *Agriculure and Human Values* (2008), 25, 35-47

- Bonne, K. and Verbeke, W., (2007) "Muslim consumer trust in halal meat status and control in belgium." *Meat Science* 79 (2008), 113-123

- Botonaki, A., Polymeros, K., Tsakiridou, E. and Mattas K (2006), "The role of food quality certification on consumers' food choices." *British food Journal, 108 (2)*: 77-90

- Bowersox, D.J., Closs, D.J., Cooper, B.M. (2002), Supply Chain Logistic Management, McGraw-Hill, ISBN: 0-07-235100-4 (p32)

- Cristopher, M., (1998), "Logistics and Supply Chain Management: Strategies for reducing costs and improving service." Prentice hall, 2$^{nd}$ edition, ISBN: 0-273-63049-0 (p.80)

- Babbie, E. (1990) "Survey Research Methods". Wadsworth Publishing Company, ISBN: 0534126723.

- Diamantopoulos, A., Schlegelmilch, B.B., Sinkovics, R.R., Bohlenc, G.M., (2003) "Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation." *Journal of Business Research, 56 (2003),* 465 – 480

- Fam, Kim Shyan, Waller, David S, Erdogan, and B. Zafer., (2004) "The influence of religion on attitudes towards the advertising of controversial products." *European journal of Marketing*, 2004, *vol. 38 issue 5/6* p-537-555

- Fink, A and Kosecoff, J., (1985), "How to Conduct Surveys: A step by step guide." Sage Publications. ISBN: 0761914099

- Fink, A and Kosecoff, J., (1982), "Evaluation Basics: A practitioner's Manual." Sage Publications. ISBN: 0803918976

- Fishbein, M and Ajzen, I., (1975), "Belief, Attitude, Intention and Behaviour: An introduction to Theory and research." Addison-Wesley

- Francis, J.J., Eccles, M.P., Johnston, M. Walker, A., Grimshaw, J. Foy, R., Kaner, E.F.S., Smith, L. Bonetti, D., (2004) "Constructing Questionnaires based on the Theory of Planned Behaviour."*Quality of life and management of living resources* ISBN:09540161-5-7

- Friesen, M.E and Johson, J.A., (1995) "*The success paradigm: creating organizational effectiveness through quality and strategy"*, ISBN: 0-89930-836-8

- Grunert, KG, Bech-Larsen, T. and Bredahl, L. (2000). "Three issues in consumer quality perception and acceptance of diary product." *International Diary Journal*, *10*, 575-584

- Grunert, KG, Fjord, TA, and Brunso, K (2002), "Consumers' food choice and quality perception." Aarhud School of business, working paper.

- Han, J.H. and Wes.Harrison, R. (2006). "Consumer Valuation of the Second Generation of Generatically Modified (GM) Foods with Benefits disclosure." *Dept. of Agricultural Economicss and Agribusiness*, Louisiana State University.

- Hill, C. A. and Scudder, G.D. (2002), "The use of electronic data interchange for supply chain coordination in the food industry." *Journal of Operations Management 20 (2002)* 375–387

- Kennedy, D. (1998). "Humans in the chemical decision chain.", in Carter, H.O, Nuckton, C.F (Eds), Chemicals in the Human Food Chain: *Sources, Options and Public Policy, Agricultural Issues*

*Center,* University of California, Davis, CA.

- Overby, J.W, Woodruff, R.B. and Gardial, S. F, (2005) "The influence of culture upon consumers' desired value perceptions." *A research agenda, 2005*; 5; 139 Marketing Theory

- Matell, MS & Jacoby, J (1972). "Is there an optimal number of alternatives for Likert scale items? Effects of testing time and scale properties." *Journal of Applied Psychology*, *56 (6),* 506-509.

- Muhammad, R., (2009), " Standardisation: A Solution for Achieving Economic Growth in the Muslim World", *The Halal Journal* Jan/Feb 2009

- Richardson, N., MacFie, H.J.H. and Sheperd, R. (1994). "Consumer attitudes to meat eating." *Meat Science*, *36,* 57-65

- Robson, C (2002), *Real world Research,* 2nd edition, Oxford: Blackwell

- Roe, B., Teisl M. F., Levy A. and M. Russell (2001), "US consumers' willingness to pay for green electricity." *Energy Policy, 29*(11): 917-925

- Sudman, S. (1983). "Applied Sampling." In *Handbook of Survey research*, ed. Peter Rossi, james Wright, and Andy Anderson, pp. 145-194, New York: Academic Press

- Regenstein, J.M., Chaudry, M.M., Regenstein, C.E. (2003), "The Kosher and Halal Food Laws." *Comprehensive Reviews in Food Science and Food Safety. Institute of Food Technologies*, vol. 2, p. 126

- Roininen, K. Tuorila, H., Zandstra, E. H., de Graaf, C. and Vehkalahti, K. (2001). "Differences in health and taste attitudes and reported behaviour among Finnish, Dutch, and British consumers: A cross-national validation of the Health and Taste Attitude Scales (HTAS)". *Appetite, 35*(1), 33-45

- Sage, C. (2003), "Social embeddedness and relations of regard: alternative 'good food' networks in south-west Ireland." *Journal of Rural Studies, 19,* 47–60

- Singer, E, (1984) "Public Reactions to Some Ethical Issues of Social Research: Attitudes and Behavior." *The Journal of Consumer Research*, *Vol. 11, No. 1*, pp. 501-509

- Snijders, JMA and van Knapen, F. (2002), "Prevention of human diseases by an integrated quality control system*", Livestock Production Science 76*, 203–206

- Shoemaker T. (2006), "Growing  Muslim population in Europe spurs Markets for halal food products ." http://www.halalcontrol.de/102006QFFINTL_Ted_Shoemaker.pdf

- Shumate S.R. Surles J. Johnson, R. L. and Penny, J., (2007) "The Effects of the Number of Scale. Points and Non-Normality on the Generalizability Coefficient: A Monte Carlo Study.*" Applied Measurement in education*, *20(4*), 357–376

- Tieman, M (2008), "HALAL STORAGE – A critical success factor of your Halal Supply Chain", *Halal Journal*, 11

- Tieman, M (2009), "HALAL TRANSPORTATION - The building blocks of a Halal transportation system", *Halal Journal*, 1

- Tieman, M (2009), "HALAL COMPLIANT TERMINAL: Facilitating imports and exports", *Halal Journal*, 3

- Verbeke, W. (2004), "Consumer acceptance of functional foods: socio-demographic, cognitive and attitudinal determinants". *Food Quality and preference, 16* (2005), 45-57

- Verbeke, W. (2005), "Functional foods: Consumer Willingness to compromise on taste for health?" *Food Quality and preference, 17* (2006), 126-131

- Vorst, van der, J.G.A.J., A.J.M. Beulens and P. van Beek (2005), Ïnnovations in logistics and ICT in food supply chain networks", *Innovation in Agri-Food Systems,* (Eds) W.M.F. Jongen & M.T.G. Meulenberg, Wageningen Academic Publishers, Wageningen, Chapter 10, p. 245-292

- Vorst, van der, J. G. A. J. (2000), "Effective food supply chains; generating, modeling and evaluating supply chain scenarios." PhD Thesis, Wageningen University, The Netherlands.

## Background Information:

- Malaysian Standard 1500:2004, Halal Food- production, preparation, handling and storage-general guidelines (first revision), Department of Standards Malaysia, 2004
- Draft version: International Halal Integrity Alliance Standard (IHIAS) on Halal Logistics, 13-4-2009
- Chaudry M.M. & Riaz M.N., Halal Food Production, CRS Press, 2004
- Presentations World Halal Forum 2009, Kuala Lumpur, 4-5 May 2009
- Naresh K. Malhhotra, Marketing Research, an applied orientation, 2004, ISBN: 0-13-033716-1
- Abd Rahim Md Nor. (2009) "Statistical Methods in Research." Prentice Hall, Pearson education, ISBN: 978-983-3927-95-1

## Internet:

- http://www.halaljournal.com (used from April '09 till August '09)
- http://www.halalfocus.com (used from April '09 till August '09)
- http://www.islamicpopulation.com (used in December '09)
- http://www.halalaudit.nl (used in December '09, article Food Management 26-03-'99)
- http://www.german-info.com/press_shownews.php?pid=1826 Halal food market on the rise in Europe, (used in January 2010)
- http://www.islamonline.net/english/index.shtml (used in January 2010)
- http://www.eurofrigo.nl/nl/certificaten/ (Halal storage harbor Rotterdam used in January 2010)
- https://www.cia.gov/library/publications/the-world-factbook/geos/my.html (Socio-demographic figures Malaysia, used in November '09)
- http://en.logisticsplatform.com.ua/?module=static&id=16 (used in section 2.6, November '09)

## Glossary

- *Halal*: This Arabic word means "*permissible*", in a large sense of the word: Things or actions, that are permissible or lawful under *Shariah*.

- *Haram*: Things or actions that are not classified as halal according to this standard, and things or actions that is forbidden or unlawful under *Shariah*.

- *Shariah*: Concerns all forms of practical actions by a Muslim manifesting his faith and belief.
    *Shariah*: being the practical aspects of a Muslim's daily life has two parts
    - *Ibadat*: concerns the practicalities of his worship to Allah.
    - *Muamalat:* Concerns the practicalities of his routine (wordly) daily life.

-*Najs*: *Najs* according to *Shariah* are:
a) Things that are themselves not permissible such as pig and all its derivatives, blood and carrion;
b) halal goods that are contaminated with the things that are non-halal
c) halal goods that comes into direct contact with things that are non-halal'
d) any liquid and objects discharged from the orifices of human beings or animals such as urine, excrement, blood, vomit, pus, sperm and ova of pigs and dogs except from sperm and ova of other animals;
e) carrion or halal animals that are not slaughtered according to *Shariah*; and
f) halal goods that have become spoilt such as; expired or exposed to air, and subsequently become toxic, hazardous or unfit for consumption.

There are two types of *najs* relevant to the logistics industry.
- <u>*Severe najs*</u>: this is considered as *Mughallazah*, namely pig and dog and its liquid, objects discharged from their orifices, descendants and derivatives.
- <u>*Medium najs*</u>, which is considered as *Mutawassitah*, namely alcoholic drinks, carrion, or halal animals that are not slaughtered according to the S*hariah*, and blood used for non-medical purposes.

-*Makrooh*: Means disliked, hated or detested. It is used in reference to actions and deeds that are referred to negatively in the Quran.

- IHI: International Halal Integrity

- IHIAS: International Halal Integrity Alliance Standard

- CCP: Critical Control Point

## Appendices:

Number __                                                    Date _____

**Appendix 1: Consumer opinion survey (Version 2.8)**

As you might know, the logistics of Halal meat is very important for the integrity of Halal products. The core of Halal Logistics is that Halal Products are segregated from non‑Halal products.

*Your opinion* is important in developing a better logistics system for Halal that meets consumer' needs.

With **Logistics** we mean the transportation, storage and handling of the meat from the farm to the supermarket.

This worldwide survey will be used in behalf of a PhD research on Halal logistics and is completely anonymous.

*Please answer each of the following questions by circling the number that best describes your opinion.*

**1. Who is in your opinion <u>responsible</u> for Halal logistics?**

a. Government through regulations

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

b. Halal Authority

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

c. Manufacturer of Halal Products

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

d. Supermarket

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

**2. Where does Halal stand for in your opinion?**

a. Food Quality

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

b. Health

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

c. Animal Welfare

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

d. Food Safety

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

**3. When there is no high quality Halal meat available,**

a. I will buy low quality Halal meat (that might not be very hygienic)

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

b. I will buy high quality Kosher meat

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

c. I will buy any high quality product that does not contain Haram ingredients

Strongly Disagree        Strongly Agree

1  2  3  4  5  6  7

**The following questions are about the level of segregation during the logistics of Halal meat. Some of the questions may appear to be similar, but they do address somewhat different issues. Please read each question carefully.**

*Please answer each of the following questions by circling the number that best describes your opinion.*

**4. The segregation at the Supermarket**

a. Does not matter, as long as the Halal meat is vacuum packed

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

b. No mixing of Halal and Non-Halal meat in the same (shelf) section

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

c. No mixing of Halal and Non-Halal meat in the same fridge or rack

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

d. No mixing of Halal and Non-Halal meat in the same zone of the supermarket

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

e. I would prefer a dedicated Halal Supermarket

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

**5. What is the <u>minimum</u> segregation required at the supermarket? (Tick only one)**

O      Does not matter, as long as the Halal meat is vacuum packed

O      No mixing of Halal and Non-Halal meat in the same (shelf) section

O      No mixing of Halal and Non-Halal meat in the same fridge or rack

O      No mixing of Halal and Non-Halal meat in the same zone of the supermarket

O      A dedicated Halal supermarket

**6. The segregation during Halal Transport**

a. Does not matter, as long as the Halal meat is vacuum packed

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

b. No mixing of Halal and Non-Halal meat in the same carton box

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

c. No mixing of Halal and Non-Halal meat on the same load carrier or pallet

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

d. No mixing of Halal and Non-Halal meat in the same container or vehicle

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

e. I would prefer dedicated container/transport for Halal meat

Strongly Disagree          Strongly Agree

1 ┊ 2 ┊ 3 ┊ 4 ┊ 5 ┊ 6 ┊ 7

**7. What is the <u>minimum</u> segregation required during Halal Transport? (Tick only one)**

O      Does not matter, as long as the Halal meat is vacuum packed

O      No mixing of Halal and Non-Halal meat in the same carton box

O      No mixing of Halal and Non-Halal meat on the same load carrier or pallet

O      No mixing of Halal and Non-Halal meat in the same container or vehicle

O      A dedicated container/transport for Halal meat

**8. The segregation level in the Halal Storage**

| | |
|---|---|
| a. Does not matter, as long as the Halal meat is vacuum packed | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |
| b. No mixing of Halal and Non-Halal meat in the same carton box | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |
| c. No mixing of Halal and Non-Halal meat on the same load carrier or pallet | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |
| d. No mixing of Halal and Non-Halal meat in the same warehouse section | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |
| e. I would prefer a dedicated Halal warehouse for storage | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |

**9. What is the <u>minimum</u> segregation required in Halal storage? (Tick only one)**
O     Does not matter, as long as the Halal meat is vacuum packed
O     No mixing of Halal and Non-Halal meat in the same carton box
O     No mixing of Halal and Non-Halal meat on the same load carrier or pallet
O     No mixing of Halal and Non-Halal meat in the same warehouse section
O     A dedicated Halal warehouse for storage

**10. The segregation required at Sea & Airports**

| | |
|---|---|
| a. Does not matter, as long as the Halal meat is vacuum packed | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |
| b. No mixing of Halal and Non-Halal meat in the same carton box | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |
| c. No mixing of Halal and Non-Halal meat on the same load carrier or pallet | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |
| d. No mixing of Halal and Non-Halal meat in the same section | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |
| e. I would prefer a dedicated Halal Sea/Airport complex for Halal meat | Strongly Disagree         Strongly Agree<br>1 2 3 4 5 6 7 |

**11. What is the <u>minimum</u> segregation required at Sea & Airports? (Tick only one)**
O     Does not matter, as long as the Halal meat is vacuum packed
O     No mixing of Halal and Non-Halal meat in the same carton box
O     No mixing of Halal and Non-Halal meat on the same load carrier or pallet
O     No mixing of Halal and Non-Halal meat in the same section
O     A dedicated Halal Sea/Airport complex for Halal meat

**12. Are you willing to <u>pay more</u> for Halal meat that uses a Halal Logistics system? (Tick only one)**
O     No
O     Yes

**If yes, by how many percent (Tick only one):**
O      0% - 5%
O      5% - 10%
O      10% - 15%
O      15% - 20%
O      20% - 25%
O      25% - 30%
O      >30%

**13. Demographic Data**

| | | | | | |
|---|---|---|---|---|---|
| **Gender** | O Male | | O Female | | |
| **Religion** | O Muslim | | O Non-Muslim | | |
| **Country** | | | | | |
| **Highest Education** | O Primary | O Secondary | O Diploma | O Bachelor | O Master | O PhD |
| **Age** | O  <20 | O 20-35 | O 36-50 | O 51-65 | O >65 |

## Appendix 2: Consumer opinion Test Survey.

Number __                                          Date _____

**Consumer opinion survey.**


Your opinion is important in developing a better logistics system for Halal that meets consumer' needs.

As you might know, the logistics of Halal meat is very important for the integrity of Halal products. The core of Halal Logistics is that Halal Products are segregated from non-Halal products.

We would like to know what the consumer' opinion is, about the minimum level of segregation required.

With **Logistics** we mean the transportation, storage and handling of the meat from the farm to the supermarket.

This survey will be used in behalf of a PhD research about Halal logistics and is completely anonymous.

**1. Who is in your opinion responsible for the logistics of Halal meat?**
O    Government trough regulations
O    Halal Authority
O    Manufacturer of Halal Product
O    Supermarket

**2. Where does Halal stand for in your opinion?**
a.    Food Quality
Not at All                                                   Very Much
        1   2   3   4   5   6   7
b.    Health
Not at All                                                   Very Much
        1   2   3   4   5   6   7
c.    Animal Welfare
Not at All     1   2   3   4   5   6   7     Very Much

d.    Food Safety
Not at All                                                   Very Much
        1   2   3   4   5   6   7

**3. When there is no high quality Halal meat available,**
a.    I will buy low quality Halal meat (that might not be very hygienic)
Not at All                                     Very Important
        1   2   3   4   5   6   7
b.    I will buy high quality Kosjer meat
Not at All     1   2   3   4   5   6   7     Very Important

c.    I will buy any high quality product that does not contain Haram ingredients
Not at All     1   2   3   4   5   6   7     Very Important


The following questions are about the level of segregation during the logistics of Halal meat.

Please answer each of the following questions by circling the number that best describes your opinion.  Some of the questions may appear to be similar, but they do address somewhat different issues. Please read each question carefully.


**4. The physical segregation at the Supermarket**
a.    Does not matter, as long as the Halal meat is vacuum packed.
Strongly agree                                     Strongly disagree
        1   2   3   4   5   6   7
b.    No mixing of Halal and Non-Halal meat on the same shelf section or pallet
Strongly agree                                     Strongly disagree
        1   2   3   4   5   6   7
c.    No mixing of Halal and Non-Halal meat on the same rack
Strongly agree                                     Strongly disagree
        1   2   3   4   5   6   7

---

d.      No mixing of Halal and Non-Halal meat in the same zone within the supermarket

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

e.      I would prefer a dedicated Halal supermarket

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

## 5. What is the minimum physical segregation required at the supermarket?

O      Does not matter, as long as the Halal meat is vacuum packed
O      No mixing of Halal and Non-Halal meat on the same shelf section or pallet
O      No mixing of Halal and Non-Halal meat on the same rack
O      No mixing of Halal and Non-Halal meat in the same zone of the supermarket
O      I would prefer a dedicated Halal supermarket

## 6. The segregation during Halal Transport

a.      Does not matter, as long as the Halal meat is vacuum packed.

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

b.      No mixing of Halal and Non-Halal meat in the same carton box

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

c.      No mixing of Halal and Non-Halal meat on the same load carrier or pallet

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

d.      No mixing of Halal and Non-Halal meat in the same container or vehicle

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

e.      I would prefer a dedicated container/transport for Halal meat

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

## 7. What is the minimum physical segregation required during Halal Transport?

O      Does not matter, as long as the Halal meat is vacuum packed
O      No mixing of Halal and Non-Halal meat on the same carton box
O      No mixing of Halal and Non-Halal meat on the same load carrier or pallet
O      No mixing of Halal and Non-Halal meat in the same container or vehicle
O      I would prefer a dedicated container/transport for Halal meat

## 8. The segregation level in the Halal Storage,

a.      Does not matter, as long as the Halal meat is vacuum packed.

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

b.      No mixing of Halal and Non-Halal meat in the same carton box

Strongly agree      1   2   3   4   5   6   7      Strongly disagree

c.      No mixing of Halal and Non-Halal meat on the same load carrier or pallet

1   2   3   4   5   6   7

Strongly agree Strongly disagree

d.     No mixing of Halal and Non-Halal meat in the same warehouse section

Strongly agree     1   2   3   4   5   6   7     Strongly disagree

e.     I would prefer a dedicated Halal warehouse for storage

Strongly agree     1   2   3   4   5   6   7     Strongly disagree

## 9. What is the minimum physical segregation required in Halal storage?

O    Does not matter, as long as the Halal meat is vacuum packed

O    No mixing of Halal and Non-Halal meat on the same carton box

O    No mixing of Halal and Non-Halal meat on the same load carrier or pallet

O    No mixing of Halal and Non-Halal meat in the same warehouse section

O    I would prefer a dedicated Halal warehouse for storage.

## 10.  The segregation required for Sea & Airports

a.     Does not matter, as long as the Halal meat is vacuum packed.

Strongly agree     1   2   3   4   5   6   7     Strongly disagree

b.     No mixing of Halal and Non-Halal meat in the same carton box

Strongly agree     1   2   3   4   5   6   7     Strongly disagree

c.     No mixing of Halal and Non-Halal meat on the same load carrier or pallet

Strongly agree     1   2   3   4   5   6   7     Strongly disagree

d.     No mixing of Halal and Non-Halal meat in the same section

Strongly agree     1   2   3   4   5   6   7     Strongly disagree

e.     I would prefer a dedicated Halal Sea/Airport complex for Halal meat

Strongly agree     1   2   3   4   5   6   7     Strongly disagree

## 11. What is the minimum physical segregation required for Sea & Airports?

O    Does not matter, as long as the Halal meat is vacuum packed

O    No mixing of Halal and Non-Halal meat on the same carton box

O    No mixing of Halal and Non-Halal meat on the same load carrier or pallet

O    No mixing of Halal and Non-Halal meat in the same section

O    I would prefer a dedicated Halal Sea/Airport complex for Halal meat

## 12. I am willing to pay more for Halal meat that uses a Halal Logistics system.

O No, I am not.            O 11 < 20%

O < 5%                   O 21 < 30%

O 6 < 10%              O  > 31%

**Demografic Data**

| | | | | | |
|---|---|---|---|---|---|
| **Gender** | O Male | | O Female | | |
| **Religion** | O Muslim | | O Non-Muslim | | |
| **Country** | ................................... | | | | |
| **Highest Education** | O Primary | O Secondary | O Diploma | O Bachelor | OMaster | O PHD |
| **Age** | O 0 <20 | O 20-35 | O 36-50 | O 51-65 | O >65 |

**Appendix 3. SPSS Tests according to Abd Rahim Md Nor**

*Chi-square:* is used to determine whether there is an association between two variables measured at nominal (categorical) scale. Chi-square is a non-parametric statistical method, which does not need stringent requirements. This means that the test can also be run when the data shows no normal distribution.

*One-way ANOVA:* (analysis of variance) is a statistical method for comparing means of three or more groups of cases or respondents. It can be also be used to analyse the mean difference for two groups. This technique is an extension of the independent-sample *t*-test. The data must show normal distribution since ANOVA is a parametric test. This procedure produces a one-way analysis of variance for a quantitative dependent variable by a single factor (independent) variable.

*Two-way ANOVA*: conducts analyses of variance for one dependent variable and two exploratory variables. Hereby can the null hypotheses be tested about the effects of other variables on the means of various groupings of a single dependent variable.

*Multiple Regression:* is basically a technique of predicting. It is a multivariate statistical method of predicting one dependent variable using a set of several independent variables. The purpose is to examine whether the set of independent variables of any influence on the dependent variables.

## Appendix 4. SPSS tables

**Comparison responsibility between Malaysia and the Netherlands.**

**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| Government through regulations | Malaysia | 262 | 6,19 | 1,105 | ,068 | 6,06 | 6,33 | 2 | 8 |
| | The Netherlands | 259 | 4,46 | 1,805 | ,112 | 4,24 | 4,68 | 1 | 7 |
| | Total | 521 | 5,33 | 1,726 | ,076 | 5,18 | 5,48 | 1 | 8 |
| Halal Authority | Malaysia | 262 | 6,39 | ,979 | ,060 | 6,27 | 6,51 | 3 | 7 |
| | The Netherlands | 259 | 5,94 | 1,008 | ,063 | 5,82 | 6,07 | 2 | 7 |
| | Total | 521 | 6,17 | 1,018 | ,045 | 6,08 | 6,25 | 2 | 7 |
| Manufacturer of Halal Products | Malaysia | 262 | 6,34 | 1,033 | ,064 | 6,21 | 6,46 | 2 | 7 |
| | The Netherlands | 259 | 5,76 | 1,199 | ,075 | 5,61 | 5,91 | 1 | 7 |
| | Total | 521 | 6,05 | 1,154 | ,051 | 5,95 | 6,15 | 1 | 7 |
| Supermarket | Malaysia | 262 | 5,24 | 1,642 | ,101 | 5,04 | 5,44 | 1 | 7 |
| | The Netherlands | 259 | 4,78 | 1,551 | ,096 | 4,59 | 4,97 | 1 | 7 |
| | Total | 521 | 5,01 | 1,613 | ,071 | 4,87 | 5,15 | 1 | 7 |

**Minimum Segregation comparison Malaysia and the Netherlands.**

**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| Minimum level of segregation at supermarket | Malaysia | 258 | 3,66 | 1,196 | ,074 | 3,52 | 3,81 | 1 | 5 |
| | The Netherlands | 259 | 2,08 | 1,183 | ,074 | 1,94 | 2,23 | 1 | 5 |
| | Total | 517 | 2,87 | 1,428 | ,063 | 2,75 | 2,99 | 1 | 5 |
| Minimum level of segregation during Halal transportation | Malaysia | 260 | 3,68 | 1,396 | ,087 | 3,51 | 3,85 | 1 | 5 |
| | The Netherlands | 257 | 2,13 | 1,214 | ,076 | 1,98 | 2,28 | 1 | 5 |
| | Total | 517 | 2,91 | 1,519 | ,067 | 2,78 | 3,04 | 1 | 5 |
| Minimum level of segregation during Halal storage | Malaysia | 262 | 3,74 | 1,345 | ,083 | 3,58 | 3,91 | 1 | 5 |
| | The Netherlands | 258 | 2,13 | 1,284 | ,080 | 1,97 | 2,29 | 1 | 5 |
| | Total | 520 | 2,94 | 1,542 | ,068 | 2,81 | 3,08 | 1 | 5 |
| Minimum level of segregation during at Sea/Airports | Malaysia | 261 | 3,53 | 1,279 | ,079 | 3,37 | 3,68 | 1 | 5 |
| | The Netherlands | 259 | 2,05 | 1,222 | ,076 | 1,90 | 2,20 | 1 | 5 |
| | Total | 520 | 2,79 | 1,451 | ,064 | 2,67 | 2,92 | 1 | 5 |

**Willingness to pay and percentage comparison Malaysia and the Netherlands.**

**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| Willingness to Pay | Malaysia | 262 | ,95 | ,687 | ,042 | ,86 | 1,03 | 0 | 11 |
| | The Netherlands | 259 | ,69 | ,497 | ,031 | ,63 | ,75 | 0 | 2 |
| | Total | 521 | ,82 | ,613 | ,027 | ,76 | ,87 | 0 | 11 |
| Percentage | Malaysia | 262 | 3,77 | 2,800 | ,173 | 3,43 | 4,12 | 1 | 9 |
| | The Netherlands | 197 | 2,15 | 1,633 | ,116 | 1,92 | 2,38 | 1 | 9 |
| | Total | 459 | 3,08 | 2,502 | ,117 | 2,85 | 3,31 | 1 | 9 |

## Socio Demographic Statistics

**Gender**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Male | 305 | 58,2 | 58,2 | 58,2 |
| | Female | 219 | 41,8 | 41,8 | 100,0 |
| | Total | 524 | 100,0 | 100,0 | |

**Highest Education**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Primary | 9 | 1,7 | 1,8 | 1,8 |
| | Secondary | 96 | 18,3 | 18,9 | 20,6 |
| | Diploma | 179 | 34,2 | 35,2 | 55,8 |
| | Bachelor | 200 | 38,2 | 39,3 | 95,1 |
| | Master | 25 | 4,8 | 4,9 | 100,0 |
| | Total | 509 | 97,1 | 100,0 | |
| Missing | 9 | 15 | 2,9 | | |
| Total | | 524 | 100,0 | | |

**Age**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | <20 | 72 | 13,7 | 13,8 | 13,8 |
| | 20-35 | 287 | 54,8 | 54,9 | 68,6 |
| | 36-50 | 137 | 26,1 | 26,2 | 94,8 |
| | 51-65 | 23 | 4,4 | 4,4 | 99,2 |
| | >65 | 4 | ,8 | ,8 | 100,0 |
| | Total | 523 | 99,8 | 100,0 | |
| Missing | 9 | 1 | ,2 | | |
| Total | | 524 | 100,0 | | |

## Socio-Demographic comparison Malaysia and the Netherlands

**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| Gender | Malaysia | 263 | 1,55 | ,498 | ,031 | 1,49 | 1,61 | 1 | 2 |
| | The Netherlands | 259 | 1,29 | ,453 | ,028 | 1,23 | 1,34 | 1 | 2 |
| | Total | 522 | 1,42 | ,494 | ,022 | 1,38 | 1,46 | 1 | 2 |
| Highest Education | Malaysia | 263 | 3,75 | ,646 | ,040 | 3,67 | 3,83 | 1 | 5 |
| | The Netherlands | 244 | 2,74 | ,803 | ,051 | 2,64 | 2,84 | 1 | 5 |
| | Total | 507 | 3,26 | ,883 | ,039 | 3,19 | 3,34 | 1 | 5 |
| Age | Malaysia | 262 | 2,03 | ,719 | ,044 | 1,94 | 2,11 | 1 | 4 |
| | The Netherlands | 259 | 2,44 | ,762 | ,047 | 2,35 | 2,54 | 1 | 5 |
| | Total | 521 | 2,23 | ,769 | ,034 | 2,17 | 2,30 | 1 | 5 |

## Malaysia: Responsibility

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Government through regulations | ,410 | 1 | ,410 | ,402 | ,527 |
| | Halal Authority | ,946 | 1 | ,946 | 1,011 | ,316 |
| | Manufacturer of Halal Products | ,191 | 1 | ,191 | ,200 | ,655 |
| | Supermarket | ,263 | 1 | ,263 | ,102 | ,750 |
| Education | Government through regulations | 4,492 | 4 | 1,123 | 1,101 | ,357 |
| | Halal Authority | ,489 | 4 | ,122 | ,131 | ,971 |
| | Manufacturer of Halal Products | 3,206 | 4 | ,801 | ,838 | ,502 |
| | Supermarket | 6,353 | 4 | 1,588 | ,615 | ,653 |
| Age | Government through regulations | ,844 | 3 | ,281 | ,276 | ,843 |
| | Halal Authority | ,821 | 3 | ,274 | ,293 | ,831 |
| | Manufacturer of Halal Products | 4,284 | 3 | 1,428 | 1,493 | ,217 |
| | Supermarket | 17,945 | 3 | 5,982 | 2,314 | ,077 |

## Malaysia: Integrity

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Food Quality | ,028 | 1 | ,028 | ,030 | ,862 |
| | Health | ,051 | 1 | ,051 | ,062 | ,803 |
| | Animal Welfare | 1,209 | 1 | 1,209 | ,683 | ,409 |
| | Food Safety | ,056 | 1 | ,056 | ,090 | ,764 |
| Education | Food Quality | 2,857 | 4 | ,714 | ,770 | ,546 |
| | Health | 2,538 | 4 | ,634 | ,781 | ,539 |
| | Animal Welfare | 8,577 | 4 | 2,144 | 1,211 | ,307 |
| | Food Safety | 5,396 | 4 | 1,349 | 2,174 | ,073 |
| Age | Food Quality | 3,122 | 3 | 1,041 | 1,122 | ,341 |
| | Health | 2,831 | 3 | ,944 | 1,161 | ,325 |
| | Animal Welfare | 1,376 | 3 | ,459 | ,259 | ,855 |
| | Food Safety | 1,641 | 3 | ,547 | ,882 | ,451 |

## Malaysia: Compromise

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Low quality Halal food | 12,883 | 1 | 12,883 | 4,247 | ,041 |
| | High quality Kosher food | ,722 | 1 | ,722 | ,204 | ,652 |
| | High quality that doesn't contain Haram | 18,862 | 1 | 18,862 | 6,538 | ,011 |
| Education | Low quality Halal food | 18,013 | 4 | 4,503 | 1,484 | ,208 |
| | High quality Kosher food | 18,729 | 4 | 4,682 | 1,324 | ,262 |
| | High quality that doesn't contain Haram | 17,027 | 4 | 4,257 | 1,475 | ,211 |
| Age | Low quality Halal food | 14,184 | 3 | 4,728 | 1,558 | ,200 |
| | High quality Kosher food | 2,253 | 3 | ,751 | ,212 | ,888 |
| | High quality that doesn't contain Haram | 3,742 | 3 | 1,247 | ,432 | ,730 |

## Malaysia: Level of Separation halal variables

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Minimum level of segregation at supermarket | 5,593 | 1 | 5,593 | 4,822 | ,029 |
| | Minimum level of segregation during Halal transportation | 5,328 | 1 | 5,328 | 3,051 | ,082 |
| | Minimum level of segregation during Halal storage | 4,977 | 1 | 4,977 | 3,180 | ,076 |
| | Minimum level of segregation during at Sea/Airports | 3,673 | 1 | 3,673 | 2,409 | ,122 |
| Education | Minimum level of segregation at supermarket | 2,422 | 4 | ,605 | ,522 | ,720 |
| | Minimum level of segregation during Halal transportation | 5,035 | 4 | 1,259 | ,721 | ,579 |
| | Minimum level of segregation during Halal storage | 2,968 | 4 | ,742 | ,474 | ,755 |
| | Minimum level of segregation during at Sea/Airports | 4,225 | 4 | 1,056 | ,693 | ,598 |
| Age | Minimum level of segregation at supermarket | 6,712 | 3 | 2,237 | 1,929 | ,126 |
| | Minimum level of segregation during Halal transportation | 9,007 | 3 | 3,002 | 1,719 | ,164 |
| | Minimum level of segregation during Halal storage | 7,644 | 3 | 2,548 | 1,628 | ,184 |
| | Minimum level of segregation during at Sea/Airports | 2,724 | 3 | ,908 | ,595 | ,619 |

## The Netherlands: Responsibility

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Government through regulations | 17,813 | 1 | 17,813 | 6,881 | ,009 |
| | Halal Authority | ,002 | 1 | ,002 | ,003 | ,956 |
| | Manufacturer of Halal Products | ,118 | 1 | ,118 | ,089 | ,765 |
| | Supermarket | 4,931 | 1 | 4,931 | 2,620 | ,107 |
| Education | Government through regulations | 30,190 | 4 | 7,548 | 2,916 | ,022 |
| | Halal Authority | 16,007 | 4 | 4,002 | 4,920 | ,001 |
| | Manufacturer of Halal Products | 13,454 | 4 | 3,363 | 2,542 | ,041 |
| | Supermarket | 19,666 | 4 | 4,916 | 2,612 | ,036 |
| Age | Government through regulations | 27,510 | 4 | 6,878 | 2,657 | ,034 |
| | Halal Authority | 3,703 | 4 | ,926 | 1,138 | ,340 |
| | Manufacturer of Halal Products | 13,627 | 4 | 3,407 | 2,575 | ,039 |
| | Supermarket | 34,059 | 4 | 8,515 | 4,524 | ,002 |

## The Netherlands: Integrity

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Food Quality | ,065 | 1 | ,065 | ,056 | ,814 |
| | Health | ,043 | 1 | ,043 | ,042 | ,837 |
| | Animal Welfare | ,377 | 1 | ,377 | ,352 | ,554 |
| | Food Safety | 3,405 | 1 | 3,405 | 3,491 | ,063 |
| Education | Food Quality | 20,896 | 4 | 5,224 | 4,483 | ,002 |
| | Health | 5,434 | 4 | 1,359 | 1,330 | ,260 |
| | Animal Welfare | 25,593 | 4 | 6,398 | 5,976 | ,000 |
| | Food Safety | 7,925 | 4 | 1,981 | 2,031 | ,091 |
| Age | Food Quality | 24,974 | 4 | 6,243 | 5,358 | ,000 |
| | Health | 33,958 | 4 | 8,490 | 8,312 | ,000 |
| | Animal Welfare | 9,584 | 4 | 2,396 | 2,238 | ,066 |
| | Food Safety | 14,536 | 4 | 3,634 | 3,726 | ,006 |

## The Netherlands: Compromise

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Low quality Halal food | 42,615 | 1 | 42,615 | 14,305 | ,000 |
| | High quality Kosher food | 4,884 | 1 | 4,884 | 3,437 | ,065 |
| | High quality that doesn't contain Haram | 1,714 | 1 | 1,714 | 1,032 | ,311 |
| Education | Low quality Halal food | 65,040 | 4 | 16,260 | 5,458 | ,000 |
| | High quality Kosher food | 108,589 | 4 | 27,147 | 19,107 | ,000 |
| | High quality that doesn't contain Haram | 40,832 | 4 | 10,208 | 6,146 | ,000 |
| Age | Low quality Halal food | 24,797 | 4 | 6,199 | 2,081 | ,085 |
| | High quality Kosher food | 18,360 | 4 | 4,590 | 3,231 | ,013 |
| | High quality that doesn't contain Haram | 6,257 | 4 | 1,564 | ,942 | ,441 |

## The Netherlands: Level of separation variables

**Tests of Between-Subjects Effects**

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Gender | Minimum level of segregation at supermarket | 14,112 | 1 | 14,112 | 14,119 | ,000 |
| | Minimum level of segregation during Halal transportation | ,000 | 1 | ,000 | ,000 | ,990 |
| | Minimum level of segregation during Halal storage | ,791 | 1 | ,791 | ,638 | ,425 |
| | Minimum level of segregation during at Sea/Airports | ,759 | 1 | ,759 | ,636 | ,426 |
| Education | Minimum level of segregation at supermarket | 57,792 | 4 | 14,448 | 14,455 | ,000 |
| | Minimum level of segregation during Halal transportation | 28,744 | 4 | 7,186 | 7,028 | ,000 |
| | Minimum level of segregation during Halal storage | 58,317 | 4 | 14,579 | 11,758 | ,000 |
| | Minimum level of segregation during at Sea/Airports | 64,951 | 4 | 16,238 | 13,606 | ,000 |
| Age | Minimum level of segregation at supermarket | 12,879 | 4 | 3,220 | 3,221 | ,014 |
| | Minimum level of segregation during Halal transportation | 18,244 | 4 | 4,561 | 4,461 | ,002 |
| | Minimum level of segregation during Halal storage | 16,900 | 4 | 4,225 | 3,407 | ,010 |
| | Minimum level of segregation during at Sea/Airports | 9,622 | 4 | 2,405 | 2,016 | ,093 |

## The Netherlands: Variance among female choice

**Crosstab**

| Count | | Gender | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| Minimum level of segregation during Halal storage | does not matter as long as vacuum packed | 65 | 20 | 85 |
| | no mixing in same carton box | 87 | 24 | 111 |
| | no mixing on same load carrier or pallet | 4 | 2 | 6 |
| | no mixing in same warehouse section | 5 | 14 | 19 |
| | dedicated warehouse for storage | 18 | 10 | 28 |
| | Total | 179 | 70 | 249 |