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Development of an innovative halal logistics concept for the air cargo supply chain

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Co-operation partners: Lufthansa Cargo AG and HALAL CONTROL

Associated partners: Karavan Management Consulting and Fraport AG

Abstract English

The aim of this paper, which is positioned within the research domain of logistics and supply chain management, is to present a holistic perspective on the development of an innovative halal air cargo supply chain.

To the best of our knowledge, a fully integrated halal supply chain "from farm to fork" represents a complete novelty, especially in the context of a non-Muslim-dominant country such as Germany. As a matter of fact, although some major European seaports have been certified according to halal standards (i.e. Rotterdam in 2007, and Zeebrugge and Marseille in 2012), they are still unable to guarantee the integrity of halal products across the entire supply chain.

The seven chapters into which this paper is organised address the various aspects of a halal supply chain. After the introduction (Chapter 1) and the definition of the concept of halal (Chapter 2), we analyse the demand side (Chapter 3) and the supply side (Chapter 4) of the halal market. In the last three chapters, we provide a view of the current halal logistics requirements (Chapter 5), develop a fully compliant halal air cargo process (Chapter 6) and, finally, provide conclusions and empirical suggestions for the implementation of this process (Chapter 7).

In terms of methodologies used, we adopted a multitude of research methods and techniques, depending on the specific research questions included in each chapter. More specifically, the concept of halal and halal logistics (Chapter 2) descended from a critical literature review approach in order to assess the status quo of the phenomenon under analysis – from both a theoretical and an empirical standpoint. Due to the lack of academic or empirical research on halal food in Germany, the analysis of the demand side (Chapter 3) called for exploratory research based on an extensive survey of 772 Muslims. Our analysis of the supply side (Chapter 4), however, was aimed at identifying major trends for halal products in a national and international context, and therefore demanded an approach involving expert interviews conducted among 20 German companies operating in the global food and cosmetics industry. Finally, for our Business Processes Reengineering proposal (Chapter 5 to 7) – and with the support of the Perishable Center at Frankfurt Airport – we adopted an in-depth case study approach aimed at analysing and redesigning all air cargo processes pertaining to halal shipments.

The concept of halal logistics is still in its infant stage and there is even now a significant lack of academic publications, especially empirical implementations of halal logistics principles. Our project ultimately provides detailed guidelines to help air cargo operators that operate in non-Muslim-dominant countries to reengineer their internal processes and, in doing so, to comply with halal logistics and principles.

The outcome of our work has implications for both practitioners and researchers. For practitioners, it offers an immediately applicable implementation plan which is ready to be discussed with all agents involved in the business reengineering process. For researchers, it offers a basis for future halal logistics reengineering projects, both from a theoretical and from an empirical standpoint.

Abstract Deutsch

Das Ziel dieser im Forschungsbereich Logistik und Supply Chain Management angesiedelten Arbeit ist es, einen ganzheitlichen Ansatz für die Entwicklung einer innovativen Halal-Luftfracht-Lieferkette zu entwickeln.

Nach dem Stand aktuellen Forschung ist eine voll integrierte Halal-Lieferkette "From farm to fork" bisher noch nicht implementiert, erst recht nicht in einem nicht-muslimisch geprägten Landes wie Deutschland. Es sind zwar einige große europäische Seehäfen nach Halal-Standards zertifiziert (z.B. Rotterdam 2007, Zeebrugge und Marseille 2012), aber sie sind aber noch nicht in der Lage, die Integrität von Halal-Produkten über die gesamte Lieferkette zu garantieren.

Im Rahmen der sieben Kapitel dieser Arbeit werden die verschiedenen Aspekte einer Halal-Lieferkette vorgestellt. Nach der Einleitung (Kapitel 1) und der Definition des Konzepts von Halal (Kapitel 2) folgt eine Analyse der Nachfrage- (Kapitel 3) und Angebotsseite (Kapitel 4) von Halalprodukten in Deutschland. In den letzten drei Kapiteln geben wir einen Überblick über die aktuellen Halal-Logistikanforderungen (Kapitel 5), entwickeln einen vollständig konformen Halal-Luftfrachtprozess (Kapitel 6) und geben schließlich Empfehlungen für die Umsetzung dieses Prozesses (Kapitel 7).

In der Arbeit haben wir eine Vielzahl von Forschungsmethoden und -techniken angewandt, abhängig von den spezifischen Forschungsfragen, die in den einzelnen Kapiteln adressiert werden. Zur Darstellung des Halal- und Halal-Logistik-Konzepts (Kapitel 2) wurde ein systematischer Literatur-Review-Ansatz durchgeführt. Aufgrund fehlender akademischer oder empirischer Forschung zu Halal-Lebensmitteln in Deutschland wurde für die Analyse der Nachfrageseite (Kapitel 3) eine eigene explorative Forschung durchgeführt, die auf einer Umfrage unter 772 Muslimen in Deutschland basiert. Im Rahmen der Analyse der Angebotsseite (Kapitel 4) sollten wichtige Trends für Halal-Produkte im nationalen und internationalen Kontext identifiziert werden. Dazu wurden 20 Experteninterviews mit Vertretern deutscher Unternehmen der Lebensmittel- und Kosmetikindustrie durchgeführt. Für unseren Vorschlag zum Business Processes Reengineering (Kapitel 5 bis 7) haben wir schließlich - mit Unterstützung des Perishable Centers am Frankfurter Flughafen - einen vertieften Fallstudienansatz gewählt, der alle Luftfrachtprozesse im Zusammenhang mit Halal-Sendungen analysieren und redesignen sollte.

Das Ergebnis unseres Forschungsprojekts liefert detaillierte Richtlinien, die Luftfrachtunternehmen, die in nicht-muslimisch geprägten Ländern operieren, dabei helfen sollen, ihre internen Prozesse umzugestalten und dabei die Halal-Logistik und die zugrundeliegenden Prinzipien einzuhalten.

Für Praktiker bietet es einen sofort anwendbaren Implementierungsplan, der mit allen am Reengineering-Prozess beteiligten Akteuren diskutiert werden kann. Für Forscher bietet es eine Grundlage für zukünftige Halal-Logistik-Reengineering-Projekte, sowohl von einem theoretischen als auch von einem empirischen Standpunkt aus.

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List of Abbreviations

AC	Aircraft
AWB	Airway Bill
BAMF	Bundesamt für Migration und Flüchtlinge
BUP	Built up pallet
DGR	Dangerous Goods
D2D	Door-to-Door
EU	European Union
FBL	Freight Booked List
FFM	Flight Manifest Message
FHL	House Manifest Message
FW	Forwarder
FWB	Waybill Message
GIFR	Global Islamic Finance Report
GSM	Global System for Mobile Communications
HFSC	Halal Food Supply Chain
HR	Human Resources
IATA	International Air Transport Association
ID	Identification
MAWB	Master Airway Bill
MENA	Middle East and North Africa
MOP	Master Operating Procedure
POD	Proof of Delivery
RFS	Road Feeder Service
SGIE	State of the Global Islamic Economy
SC	Supply Chain
SCM	Supply Chain Management
SI	International System of Units
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
ULD	Unit load device
USD	United States Dollar

1. Introduction

1.1 Problem statement

In the last decades, the global demand for halal products has seen a rapid expansion in both Muslim- and non-Muslim-dominant countries. Demographic dynamics, together with other macro- and micro-economic determinants, are expected to further foster the demand for such products in the foreseeable future. In order to exploit this expanding and promising market, the prospective global supply chain must be fully compliant with halal standards.

Indeed, while already requiring a halal certification for the ingredients included in imported products, some Muslim-dominant countries (e.g. Malaysia, Indonesia and the United Arab Emirates) have recently started to ask for the application of the halal standards to the entire supply chain, in accordance with the "farm to fork" model.

As far as halal logistics is concerned, an international standard was issued in 2010, but to date there have been only isolated international implementation attempts. Malaysia is considered a pioneer in the introduction of halal certification for logistics. In this regard, the government is helping the logistics sector to develop halal distribution networks at destination points (HKTDC, 2014). Different European seaports have already been partially or entirely certified according to halal standards, namely Rotterdam in 2007 and Zeebrugge and Marseille in 2012. These certified seaports therefore dominate halal logistics to and from Europe. On the other hand, perishable and high-value groceries are predominantly transported by air cargo. Thus, airports and airlines can play a significant role in the future of a halal supply chain, as long as they extend their skill set in this promising sector. Liège airport has already recognised the commercial importance of this market and is currently exploring a halal certification process.

1.2 Aim of the research project

The target of this research project is to analyse the market potential for halal logistics in the air cargo industry.

To this extent, the following research questions have been formulated:

1. How large is the air cargo import/export market for halal products, especially with reference to perishable groceries? How do importers and exporters value this market segment?
2. Which are the main requirements for a halal-certified supply chain?
3. Are Muslims in Germany interested in consuming products with a halal certification? Would they be willing to pay a premium price for such products?
4. What is the potential for Frankfurt Airport to become the major air cargo hub for halal products in Europe? Which preconditions have to be fulfilled?

Halal logistics is currently still an under-investigated research field. The project will be quite innovative since it will be the first work to be published in Europe regarding a Business Process Reengineering case study on "halal logistics".

1.3　Partners

In this project, the Frankfurt University of Applied Sciences was supported by two companies: HALAL CONTROL GmbH and Lufthansa Cargo AG.

HALAL CONTROL GmbH, based in Rüsselsheim, is the only certification body in Germany approved by the religious authorities of Malaysia, Indonesia, Singapore and Gulf Cooperation Council countries. HALAL CONTROL certifies products, processes, and services for numerous industries (e.g. food, chemical, pharmaceutical, packaging and tank cleaning) and supports the demand of Muslim consumers and authorities for an entirely halal supply chain. HALAL CONTROL has contributed to the research by providing recommendations regarding the structure of a halal logistics product, based on the outlined air cargo processes. They supported the project by utilising their network and, thus, facilitating the online survey and the interviews with industry experts. Also, a concept for the introduction of halal logistics at Frankfurt airport was jointly developed with Mr. Mahmoud Tatari.

Lufthansa Cargo AG, based in Frankfurt, wanted to evaluate the introduction of a halal air cargo product. Therefore, it was necessary to estimate if there was already sufficient demand, and which requirements the processes on the ground and in the air would need to meet for successful certification.

In addition, the research project was supported by two additional affiliated partners, Karavan Management Consulting and Fraport AG.

Karavan Management Consulting has been closely observing recent developments in the Global Islamic Economy and especially in the halal logistics sector. In this context, Karavan Management Consulting cooperates with both the United Arab Emirate government and the International Air Transport Association (IATA). Karavan Management Consulting facilitated expert interviews by establishing contacts with key industry operators.

Fraport AG, the operator of Frankfurt airport, wants to explore the necessary requirements in order to make Frankfurt airport the first halal-certified airport in Europe. Fraport AG supported the project by introducing the project team to the Perishable Center Frankfurt. The Perishable Center is the handling and warehousing agent for perishable products at Frankfurt airport.

1.4　Structure

After the introduction in Chapter 1, the term "halal" is defined in Chapter 2. More specifically, in this chapter we present the concept of halal, the requirements related to halal logistics and the major implications behind the development of a fully halal-certified supply chain.

In Chapter 3, the importance of the market potential of the Islamic food sector is explained and documented with the most recent statistics. The figures are complemented with information obtained from the expert survey conducted among 20 exporters and importers in Germany.

Chapter 4 describes the German halal market. In particular, we provide an estimation of the market size, according to the available statistics. We also present the results of an online survey we performed among 851 Muslims in Germany. With the data from this analysis, we then characterise the main drivers behind the demand for halal products in Germany.

In Chapter 5, we present relevant halal supply chain standards.

In Chapter 6, with the help of our partners, we derive a precise process map and guidelines for implementing a halal-certified air cargo supply chain at Frankfurt Airport. As we will discuss in detail, a number of criticalities clearly emerged from our analysis.

Finally, in Chapter 7, we conclude our research by presenting an overall summary of the entire work, drawing conclusions and stating lessons learned.

2. The concept of "halal"

2.1 Definition of halal according to Islamic law

Halal is an Arabic term which means an act or product that is lawful and permitted. The Quran recommends that Muslims consume only halal food and products. Generally speaking, a certain product therefore needs to fully comply with the Islamic dietary law and fulfil a number of requirements in order to be admissible for the Muslim community. In the academic literature, the term "halal" has often been connected to the overall cleanliness (Bahrudin et al., 2011; Verbeke et al., 2013) and permissibility of the ingredients (Shaari et al., 2013) used in the production process. More generally, the term includes everything which is free from any form of contamination prohibited by the Shariah (Pahim et al., 2012; Al-Qaradawi, 2007). It has been found that the term halal is also perceived by consumers as an assurance of production standards of the highest quality (Riaz and Chaudry, 2003; Hanzaee and Ramezani, 2011).

In recent years, the definition of what should be considered halal has become even broader through the inclusion of other aspects of the production process (e.g. storage, display, preparation, hygiene, sanitation, etc.) as well as sustainability and environmental friendliness. In addition, the product range has also been expanded by including products other than food and ingredients, e.g. cosmetics, personal care products, pharmaceuticals, and nutrition supplements (Dali et al., 2009).

According to the level of permissibility, the Islamic jurisprudence differentiates four distinct categories of food, namely halal (lawful or permitted), haram (unlawful or prohibited), mashbooh and makrooh (Bonne and Verbeke, 2008). Despite not being strictly classified as haram, mashbooh (doubtful or suspicious) and makrooh (hated or frowned upon) products should be avoided by Muslims due to their doubtful or discouraged production processes (Lodhi, 2010). Therefore, only halal products represent a trustworthy source of items suitable for consumption by Muslims.

The Malaysian Standards MS1500:2009, Section 3.5.3 "Processing, handling, distribution and serving", first introduced in 2009, and later partially amended by the new

standards MS1500:2019, Section 4.5.2 "Product manufacturing, handling and serving", prescribes that all processed halal food or ingredients shall meet the following requirements:

a. Food or its ingredients shall not be processed using any components or products of animals that are non-halal or not slaughtered according to Shariah law and fatwa;

b. Food shall not be processed using anything in any quantity that is decreed as najs (i.e. ritually unclean) by Shariah law and fatwa;

c. Processed food or its ingredients shall be safe for consumption, non-poisonous, non-intoxicating or non-hazardous to health;

d. Food shall be prepared, processed or manufactured using equipment and facilities that are free from contamination with najs;

In addition, in the new MS1500:2019, Section 4.7 "Packaging and labelling", Item c), it is stated that "during its preparation, processing, storage or transportation, it shall be physically separated from any other food that does not meet the requirements stated in Item a) or b) or any other things that have been decreed as najs by Shariah law".

2.2　Halal and haram meat

Saheb (2012) has summarised the principles of halal and haram meat. referring to the Fiqh (Islamic law) and extracted from Fiqh books:

- According to the Quran, dead animals, blood, and the flesh of swine (and all products made of pork) are clearly haram to consume.

- Some particular animals, e.g. crocodiles, are haram to consume based on specific explanations.

- Halal meat comes from permitted animals, and is produced and processed (e.g. slaughtering and packaging) in halal ways.

The following Figure 1 illustrates all products based on pig substances.
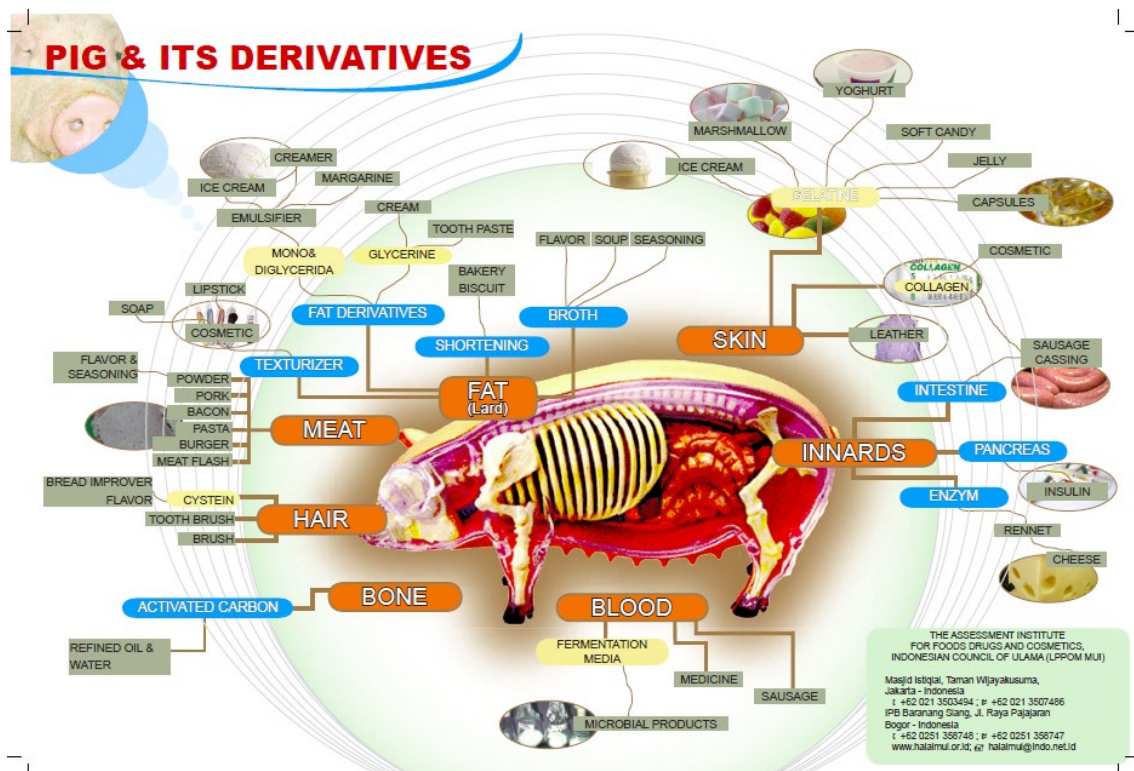
Figure 1: Pig and its derivates
Source: The Assessment Institute for Foods, Drugs and Cosmetics, Indonesian Council of Ulama (n.d.)

2.3 Halal pharmaceuticals and cosmetics

Halal cosmetics and pharmaceuticals shall also not contain ingredients or derivatives of animals origin, which are classified as haram by shariah law (such as from pig). The products should be handled with clean utensils and should be made with materials that are free from najis (e.g. alcohol) and be non-harmful to humans. All product handling processes (e.g. manufacturing, packaging, and distribution) should be referred to Islamic law.

2.4 Halal logistics

Jaafar et al. (2011) explain that halal logistics can be defined as logistic activities that cover procurement, handling, warehousing, transportation, and retailing aspects based on Sharia (Islamic law).

Halal logistics follows strict principles, e.g. segregation of halal and non-halal products in all logistics activities to avoid cross-contamination, to avoid mistakes, and to ensure consistency with Islamic law (Jaafar et al., 2017).

Storage, dissemination, delivery or transportation is part of halal logistics, requiring that the overall supply chain network operates according to halal standards from the origin to final consumption, "from farm to fork" (Talib et al., 2014; Talib et al., 2015). Halal logistics as described by Tieman (2013) must follow conventional approaches, such as managing procurement, movement, storage and handling of material parts, livestock,

semi-finished or finished products, both food and non-food, throughout the supply chain network, while complying with Shariah principles.
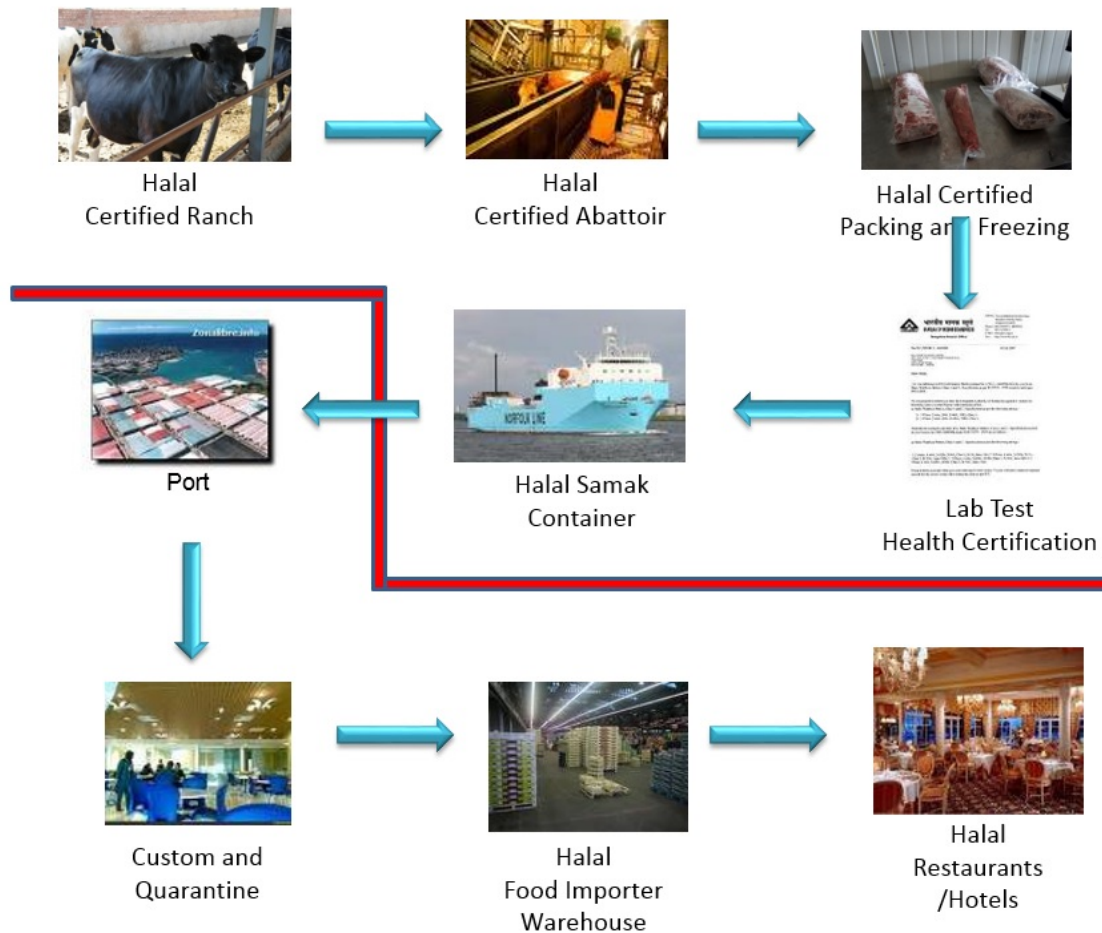
Figure 2:   **From farm to fork principle**
Source: Self-elaboration

Essentially, the halal logistics industry, even in Malaysia, is still in its infant stage. As a consequence, competencies, know-how and publications are quite limited (Zulfakar et al., 2012; Tieman, 2013; Talib et al., 2014).

3.   Analysis of the demand side for halal products

3.1   Islamic economy

According to the State of the Global Islamic Economy (SGIE) Report, Islam is the second largest religion in the world and among the fastest growing religions. Figure 2 illustrates that nations with a Muslim majority are located in Asia, Middle East and Africa (Thomson Reuters, 2013).
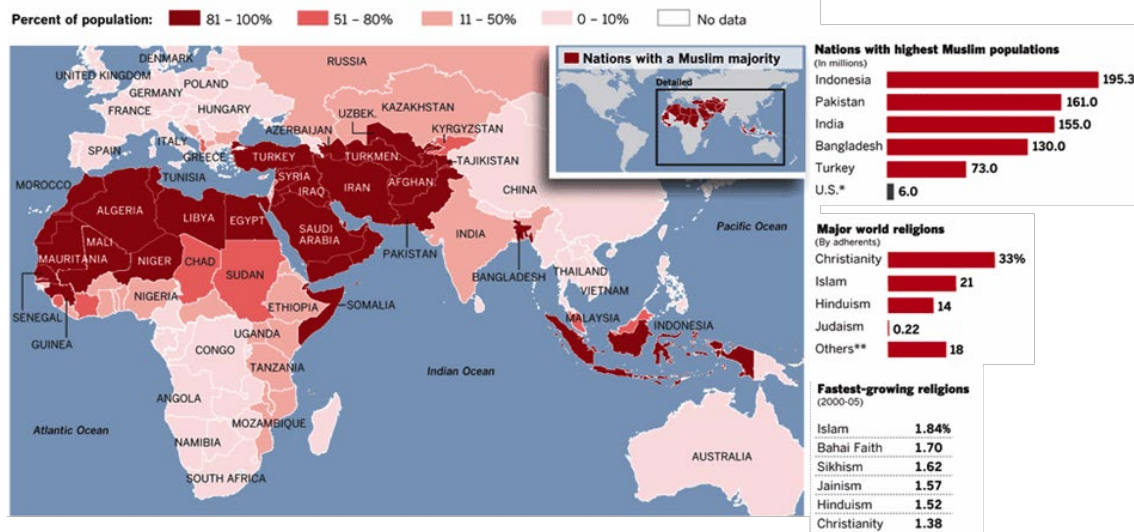
Figure 3:   **Islamic countries**
Source: Thomson Reuters, 2013

According to the Pew Research Center's Forum on Religion & Public Life, the global Muslim population is expected to grow from 1.7 billion in 2014 to 2.2 billion by 2030 (+29.4%) (Pew Research Center, 2021). The growth rate in particular is about twice the rate of the non-Muslim population, with an average annual growth rate of 1.5% for Muslims and 0.7% for non-Muslims.

The concept of halal logistics was introduced to identify a global market, sharing similar features and requirements regarding production, handling and distribution policies. As a consequence of the increasing interest in this industry, Malaysia, the most advanced country in terms of regulations for halal-certified products, issued the first halal Food Standard.

The growing importance of the halal market has also been influenced by i) the extension of the halal principles to non-food sectors (e.g. pharmaceuticals, cosmetics, etc.) and ii) the increasing number of affluent Muslims requesting a new halal-compliant lifestyle offering (e.g. travel services, modest fashion, etc.) (Elasrag, 2016).

Nowadays, the importance of this market is undeniable. The Global Islamic Finance Report (GIFR) has estimated that the global Muslim market had a total value of USD 2,006 billion in 2016, accounting for 12% of global expenditure (GIFR, 2017).

The biggest markets for halal products are Middle East and North Africa (MENA), South Asia, and Gulf countries, while, interestingly, the biggest producers of halal food products are non-Muslim countries such as Brazil, Australia, New Zealand, France and Germany.

3.2 Segments of the global halal market

3.2.1 Overview of the market segments

According to the SGIE report 2019/2020, in 2018, food, pharmaceuticals and cosmetics accounted for 69% of total Muslim spending. The halal market is estimated to grow by approximately 40% until 2024 and account for USD 3,186 billion. The following Table 1 provides details about the different halal market segments; however, the spending for Islamic financing is not considered in these statistics (DinarStandard, 2019).

Segments of the halal market			
(in billion USD)	**2018**	**%**	**2024**
Food	1,369	62%	1,972
Modest Fashion	283	13%	402
Media & Recreation	220	10%	309
Travel	189	8%	274
Pharmaceuticals	92	4%	134
Cosmetics	64	3%	95
Total	**2,217**	**100,0%**	**3,186**

Table 1:　　　Segments of the halal market
Source: SGIE report 2019/2020 (DinarStandard, 2019)

The global expenditure of Muslim consumers on food and lifestyle sectors grew by 9.5% from the previous year's estimates to USD 2 trillion in 2013, and is expected to reach USD 3,700 billion by 2019 at a compound annual growth rate of 10.8%. This forms the potential core market for halal food and lifestyle sectors (SGIE Report 2014).

3.2.2 Food

In 2010, the halal food market already represented 20% of the global food market, with a total value of USD 668 billion and an expected growth of 70% by 2050.

Market analysts maintain that this evolution will be mainly due to four drivers, namely

1. The growth rate of Islam,
2. The demand from non-Muslim consumers,
3. The growth rate of the disposable income for the Muslim population, and
4. The increase in consumer awareness toward halal products.

In addition, distribution channels will also play a key role in fostering the development of this market segment. Indeed, while in the previous decades halal food products were offered in specialised shops and butchers, nowadays they are also available in common supermarkets and hypermarket chains (GIFR, 2013).

The following table provides a breakdown of the halal food segment by selected geographical regions. The estimated figures, in particular, have been obtained by combining data from different sources with proprietary interpolations and assumptions.

Value of halal food market				
(in billion USD)	**2009A**	**2010A**	**2030E***	**2050E**
Asia	400,0	418,1	564,4	710,8
Middle East and Africa	150,6	155,9	210,5	265,0
Europe	66,6	69,3	93,6	117,8
North America	8,6	15,3	20,7	26,0
Central & South America	7,5	8,2	11,1	13,9
Australia	1,2	1,6	2,2	2,7
Total	**634,5**	**668,4**	**902,3**	**1136,3**
* Figures obtained by interpolation of 2010A and 2050E				

Table 2: **Value of the halal food market per region**
Source: Thomas Reuters, 2013

Global Muslim spending on food and beverages (F&B) increased by 10.8% to reach USD 1,292 billion in 2013. This takes the potential core market for halal food to 17.7% of the global expenditure in 2013, compared to 16.6% the year before. By 2019, this expenditure was expected to grow to a market worth USD 2,537 billion and to account for 21.2% of the global expenditure. Based on the data from 2013, the top countries for food consumption by Muslim consumers are Indonesia (USD 190 billion), Turkey (USD 168 billion), Pakistan (USD 108 billion) and Iran (USD 97 billion).

Meanwhile, Malaysia, the UAE and Australia lead the Halal Food Indicator, which focusses on the health of the halal food ecosystem of a country relative to its size. A special focus report on halal food logistics estimated the logistic costs for the potential global halal food market to reach USD 151 billion in 2013 (SGIE Report 2014).

3.2.3 Pharmaceuticals

Pharmaceutical products (e.g. generic medical, wellness and healthcare products) may contain haram elements such as animal-based gelatines and are, therefore, forbidden for consumption by the *Shariah* law[1]. Since quality control and halal integrity are an issue for this market segment, Malaysia issued a standard, the MS2424:2012 "Halal Pharmaceuticals – General Guidelines", which is focused on the supply chain management of medicines and health supplements, from processing to handling, packaging, labelling, distribution, storage and display (Ghazali *et al.*, 2019).

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[1] However in case of danger for the human life the Shariah also allows the consumption of haram products.

In the following Table 3, we estimated the development of the global halal pharmaceutical segment until 2030 and 2050, respectively, by combining the data included in the previous tables 1 (Segments of the halal market) and 2 (Value of the halal food market per region) and assuming a growth in the demand of pharmaceutical products similar to that of the food segment.

Value of halal pharmaceutical market				
(in billion USD)	**2009A**	**2010A**	**2030E***	**2050E**
Asia	170,5	178,2	240,6	303,0
Middle East and Africa	64,2	66,4	89,7	113,0
Europe	28,4	29,5	39,9	50,2
North America	3,7	6,5	8,8	11,1
Central & South America	3,2	3,5	4,7	5,9
Australia	0,5	0,7	0,9	1,2
Total	**270,4**	**284,9**	**384,6**	**484,3**

Table 3:   **Value of the halal pharmaceutical market per region**
Source: Self-elaboration on Thomson Reuters data (Thomson Reuters, 2013)

Global Muslim consumer spending on pharmaceuticals increased by 2.1% to reach USD 72 billion in 2013. This means that the Muslim pharmaceuticals market accounted for 6.6% of global expenditure that year, with it being expected to reach USD 103 billion by 2019. In 2013, the countries with the largest share of consumers of Muslim pharmaceuticals were Turkey (USD 8.9 billion), Saudi Arabia (USD 5.9 billion), Indonesia (USD 4.9 billion), and Iran (USD 3.7 billion) (SGIE Report 2014).

3.2.4   Cosmetics

As shown in Table 1, the cosmetics sector in 2010 constituted 11% of the overall halal market or approximately USD 120.5 million. Over the next years, the growth rate of this market segment is expected to be in line with the halal food segment, being fostered by both Muslim and non-Muslim consumers who are willing to pay a premium price for organic cosmetics products. Multinational cosmetic companies, however, will continue to dominate the global cosmetics market in the near future and, thus, contamination from non-halal-compliant products or ingredients will continue to constitute a crucial issue. Similar to what we presented above about the food and pharmaceutical market segments, the following Table 4 provides the geographical split of the halal cosmetics market. As it is possible to infer, the largest halal cosmetics markets are Asia and the Middle East.

Value of halal cosmetics market				
(in billion USD)	**2009A**	**2010A**	**2030E***	**2050E**
Asia	72,1	75,4	101,8	128,2
Middle East and Africa	27,2	28,1	38,0	47,8
Europe	12,0	12,5	16,9	21,2
North America	1,6	2,8	3,7	4,7
Central & South America	1,3	1,5	2,0	2,5
Australia	0,2	0,3	0,4	0,5
Total	**114,4**	**120,5**	**162,7**	**204,9**

Table 4: **Value of the halal cosmetics market per region**
Source: Self-elaboration on Thomson Reuters data (Thomson Reuters, 2013)

Global Muslim spending on cosmetics increased by 1% to reach USD 46 billion in 2013. This spending represents 6.78% of the global sector expenditure and was expected to reach USD 73 billion by 2019. Based on the estimates in 2013, the top countries with Muslim consumers of cosmetics are the United Arab Emirates (USD 4.9 billion), Turkey (USD 4.4 billion), India (USD 3.5 billion), and Russia (USD 3.4 billion).

Malaysia, Egypt and Singapore are the leading countries for a combined Halal Pharmaceuticals and Cosmetics Indicator that focusses on the health of the halal pharmaceutical and cosmetics ecosystem of a country relative to its size (SGIE Report 2014).

3.3   Europe as a market for halal products

European countries have a significant role in the global Islamic economy, either as producers or consumers. In 2014, the European halal market generated USD 30 billion in sales (HalalFocus.net, 2014).

Of course, the Muslim population represents the single most important driver when estimating the demand for halal-certified products and services. Since 1990, the share of the total Muslim population in Europe has been steadily increasing by about 2 percentage points per decade and reached 25.8 million in 2016, equalling 4.9% of the entire population of the European Union (EU) (Pew Research Center, 2017a).

Muslims make up 4.9% of Europe's population in 2016

Estimated % of Muslims among total population in each country

Finland **2.7**

Rus.

Nor. **5.7**

Sweden **8.1**

Est. **0.2**

Lat. **0.2**

Lith. **0.1**

Baltic Sea

Bel.

Denmark **5.4**

Netherlands **7.1**

Belgium **7.6**

Ireland **1.4**

UK **6.3**

Poland **< 0.1**

Ukr.

% of population that is Muslim

- ■ > 18.0%
- ■ 12.0-17.9
- ■ 6.0-11.9
- ■ 3.0-5.9
- ■ < 3.0

Germany **6.1**

Czech R. **0.2**

Slvk. **0.1**

Lux. **3.2**

France **8.8**

Switz. **6.1**

Austria **6.9**

Hungary **0.4**

Romania **0.4**

Slovenia **3.8**

Bos./Herz.

Serb.

Bul. **11.1**

Croatia **1.6**

Italy **4.8**

Mac.

Alb.

Portugal **0.4**

Spain **2.6**

Greece **5.7**

Mediterranean Sea

■ Cyprus **25.4**

Malta **2.6** →
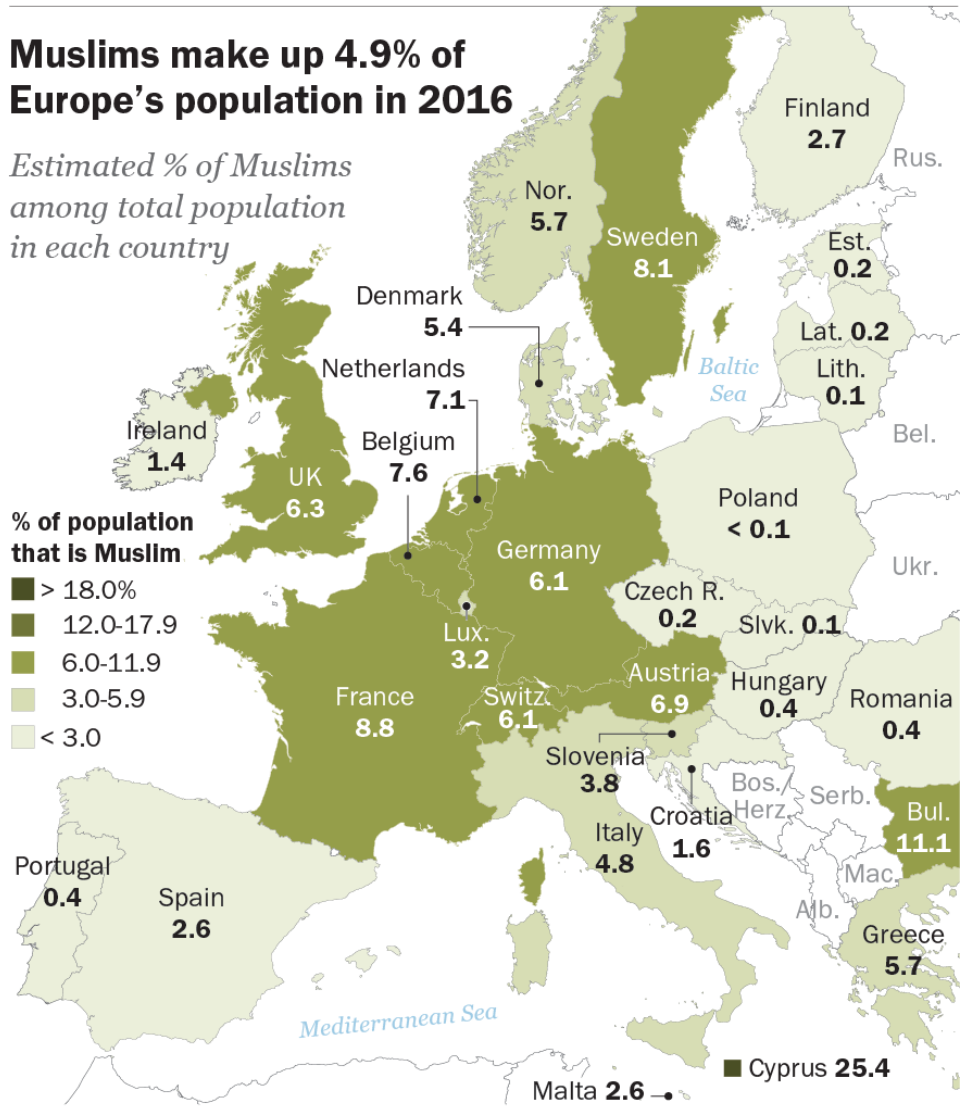
Estimated size of Muslim population in 2016			% of population that is Muslim
REGION	25,770,000		4.9%
France	5,720,000		8.8
Germany	4,950,000		6.1
United Kingdom	4,130,000		6.3
Italy	2,870,000		4.8
Netherlands	1,210,000		7.1
Spain	1,180,000		2.6

Figure 4: **Estimated size of Muslim population in Europe in 2016**
Source: Pew Research Center, 2017

From Figure 4, we can infer that, among the European Union member countries, France and Germany are the two countries with the largest Muslim population in absolute numbers. Indeed, the Pew Research Center estimated that, in 2016, there were 5.7 million Muslims living in France (8.8% of the country's population) and 5.0 million Muslims living in Germany (6.1% of the country's population) (Pew Research Center, 2017a).

In the same study, the Pew Research Center estimated that, in a medium growth scenario, the Muslim population would reach 58 million by 2050, accounting for approximately 11% of the European population. These figures are slightly higher than the projections from 2010 due to the influx of Muslim refugees between 2015 and 2016.

3.4   The German halal market

3.4.1   Muslim consumers

According to a report by the Federal Agency of Migration and Refugees (Bundesamt für Migration und Flüchtlinge, BAMF) published in 2015, the Muslim population in Germany ranged between 4,401,024 and 4,662,526 people as of 31 December 2015 (Stichs, 2016). These figures include both Muslim migrants residing in Germany in the year 2011 (ranging between 3,174,547 and 3,415,544) and Muslim refugees entering Germany during the period of 2011-2015 (ranging between 1,226,478 and 1,246,982).

A recent publication from the Pew Research Center, "The Growth of Germany's Muslim Population" (Pew Research Center, 2017b) estimated that there were 4,950,000 Muslims living in Germany in 2016, which seems to be in line with the BAMF figures. Their estimate of Muslim refugees entering Germany in the period between mid-2010 and mid-2016, however, is slightly lower than that of the BAMF: about 1.35 million migrants, with:

- approximately 670,000 refugees (86% of whom are Muslim);
- approximately 680,000 "regular" migrants (e.g. for economic, family or other reasons), (40% of whom are Muslim).

Thus, Germany received a total of around 850,000 Muslims during the aforementioned time window.

For the future, Pew foresees a further growth of the Muslim population. Even assuming a "low" migration scenario in which migration stopped after mid-2016, they see an increase in Muslim presence in Germany from 5 million in 2016 to 6 million in 2050. The reason is the younger median age and a higher number of children compared to the non-Muslim population.

For 2050, the Pew Forum (Pew Research Center, 2017b) also forecasts two additional scenarios:

- a "medium" migration scenario, in which regular migration continues but refugee migration stops as of mid-2016. Then, the Muslim population will equal 8.5 million (11% of Germany's population) in 2050;

- a "high" migration scenario, in which both regular migration and refugee migration from the Middle East continues indefinitely. Here, the Muslim population will equal 17.5 million (20% of Germany's population).

The following Table 5 combines and exemplifies all relevant information discussed and constitutes the central pillar for the estimation of the overall demand of halal-certified products.

			2050		
	2010	**2016**	**zero migration**	**medium migration**	**high migration**
Number of Muslims in Germany (in millions)	4.1	5.0*	6.0	8.5	17.5
Number of Muslims in Europe (in millions)	19.5*	25.8*	35.8*	57.9*	75.6*
Muslim share of total European population	3.8%*	6.0%*	7.4%*	11.2%*	14.0%*

Table 5: **Projection size of Muslim population in Germany and Europe**
Source: *The Pew Forum, 2017

3.4.2 Demand estimation of halal market in Germany

In order to assess the market potential for halal products in Germany, two aspects need to be considered, namely:

1. the *domestic market*, which also drives the flow of halal import goods from abroad directed to the Muslim community in Germany
2. the export market, determining the flow of halal goods from Germany to Muslim countries.

The European halal market in 2014 has been estimated at approximately USD 30 billion. The proportion of Muslims in the total population of Europe is expected to increase from 6% in 2010 to 8% in 2030. In 2016, the Muslim community in Germany consisted of 5 million individuals, representing almost 6% of the population and, as a consequence, an even bigger market for halal products in Germany. Finally, the 2009 BAMF survey "Muslimisches Leben in Deutschland" (*Muslim Life in Germany*) found that 36% of the surveyed Muslim sample population considered themselves "very religious", while 50% described themselves as "quite religious". Among the women, a significantly higher proportion of 41% considered themselves "very religious", while among the men, it was only 32% (Haug *et al.*, 2009).

However, 82% of the surveyed Muslims stated that they observed the religious guidelines during mealtimes (Haug *et al.*, 2009). This means that the potential customer base for halal products is a total of 4.1 million consumers (4.95 million (cf. Pew Research

Center figures from 2016) * 82% = 4.1 million potential consumers). This figure does not include potential non-Muslim consumers.

According to the BAMF survey, the average household size for Muslims in Germany in 2009 was 3.6, while the average household size of a non-Muslim family in Germany was 2.1 (Haug *et al.*, 2009). Consequently, based on the assumption that 4.1 million Muslims are interested in halal products, this would mean that 1,127,500 Muslim *households* are interested in halal products.

According to a 2013 Statista survey, the average household spending for groceries (excl. alcohol and tobacco) in Germany is EUR 257 per month (Statista, 2013). Thus, the total potential spending of Muslim households interested in halal products in Germany per year is EUR 3.5 billion per year (EUR 257 * 12 months * 1,127,500 households).

3.4.3 Future demand trends

Over the last decades, Muslim consumers have been faced with a broad selection of products and services offered by thousands of companies worldwide. However, their preferred choices are still halal products and services. Therefore, the mass demand for halal products and services is irrefutably linked to socio-economic trends, e.g. the rise of Muslim social classes, social groups, trade unions, customers' organisations, business companies, international governments, and transnational organisations.

Besides this, non-Muslims are becoming more aware of halal products and services that stand for hygiene, safety and environmental friendliness (Aziz and Chok, 2013; Gayatri and Chew, 2013; Marzuki *et al.*, 2012). Currently, thousands of products and services produced at the global level have initiated a "halalisation" process by using symbols, e.g a halal logo and halal certificates from countries such as Malaysia, Australia, the United Arab Emirates (UAE), Singapore, Indonesia and China (Adams, 2011). In the near future, the global halal food market will continue to grow as a result of the increase in the Muslim population, which is expect to rise from roughly 1.3 billion in the year 2000 to 2.2 billion in the year 2030 (Pew Research Center, 2011). Therefore, the halal market's potential is a very promising opportunity for halal producers to disseminate their products internationally.

As stated in the introduction, the purpose of this section of the study is to determine whether Muslims residing in Germany are interested in consuming halal-certified products as well as their degree of willingness to pay a premium price. In the following paragraphs, we will present the methodology and the results we obtained from our survey.

3.4.3.1 Methodology

Given the lack of academic or empirical research on halal food in Germany, this work can be validly described as exploratory research. Our sample included 772 respondents, with respondents being mainly Muslim (97% of the sample) and over 18 years old (97% of the sample)

Our questionnaire included 26 close-ended questions divided into different clusters depending upon the type of answer to be provided:

- *Binary choices*: Questions designed to provide general descriptive statistics (i.e. "Are you Muslim?", "Are you a practicing Muslim?", etc.).

- *Multiple choices*: Questions aimed at defining the degree of awareness of definitions and at assessing personal buying habits or desires (i.e. "What do you mean by halal?", "Which halal products are you looking for?", etc.).

- *Lickert scale questions*: Questions aimed at measuring respondents' opinions with a deeper insight regarding a certain topic (i.e. "In general, how important are the following factors when buying halal foods?").

The demographic profiles of the respondents are as follows:

a) 30% male and 70% female;
b) 58% were between 18 and 29 years of age, 28% were between 30 and 39 years old, and 14% were 49 and over;
c) 63% had an (after-tax) annual income up to EUR 20,000, 28% between EUR 20,000 and EUR 50,000, and 9% had an income exceeding EUR 50,000;
d) 98% lived in West Germany (and more precisely, 45% lived in Hessen);
e) 86% had completed either their A-levels, an apprenticeship, a university degree or a combination of these three.

At first glance, points a), b) and c) from the aforementioned demographics may be viewed as a potential source of bias for the results we will present in the following chapters. However, they actually represent strong points of this work by further corroborating the accuracy and reliability of the results obtained. Indeed, regarding the 70% female proportion in our sample (point a), it is important to point out that food habits within families are normally driven by women. Thus, in our sample, this will translate into a more accurate representation of the phenomenon under analysis. As for the average age, since 86% of the sample are 40 years or younger (point b), the research is "forward-looking", in the sense that, besides describing the "As-Is" scenario, it also investigates the trends and tendencies that the next generation of customers are likely to exhibit. Finally, the last point pertains to the average (after-tax) annual income (point c); approximately 63% of the sample declared an annual income equal to or lower than EUR 20,000. In this regard, anticipating one of the major conclusions of the survey, the major driving force behind halal-certified products is religion, and thus budget allocation is independent from the wealth level of the respondent.

3.4.4   Results

3.4.4.1   Religious practice

In line with the research questions to be addressed and the descending research design, almost all participants in the survey stated that they were Muslim (97%). Moreover, when asked the question "Are you observant?", 96% of respondents described their religious observance as "Regular practicing" (76%), or, to a smaller degree, "Irregular practicing" (19%), as shown in the following Figure 5.

Figure 5:   **Religious practice**

3.4.4.2   Definition of the term "halal"

As expected, the subjective perception of the term "halal" was generally linked to the Muslim spiritual framework, being explained as either i) equal to Islam law (84% of the sample), or ii) allowed for religious reasons (71% of the sample). Only a relative minority (39%) associated the term "halal" with healthy eating habits.

In line with these outcomes, the following Figure 6 exemplifies the main drivers responsible for halal product consumption. Again, the religious aspect prevailed, driving the Muslim participants' buying habits.
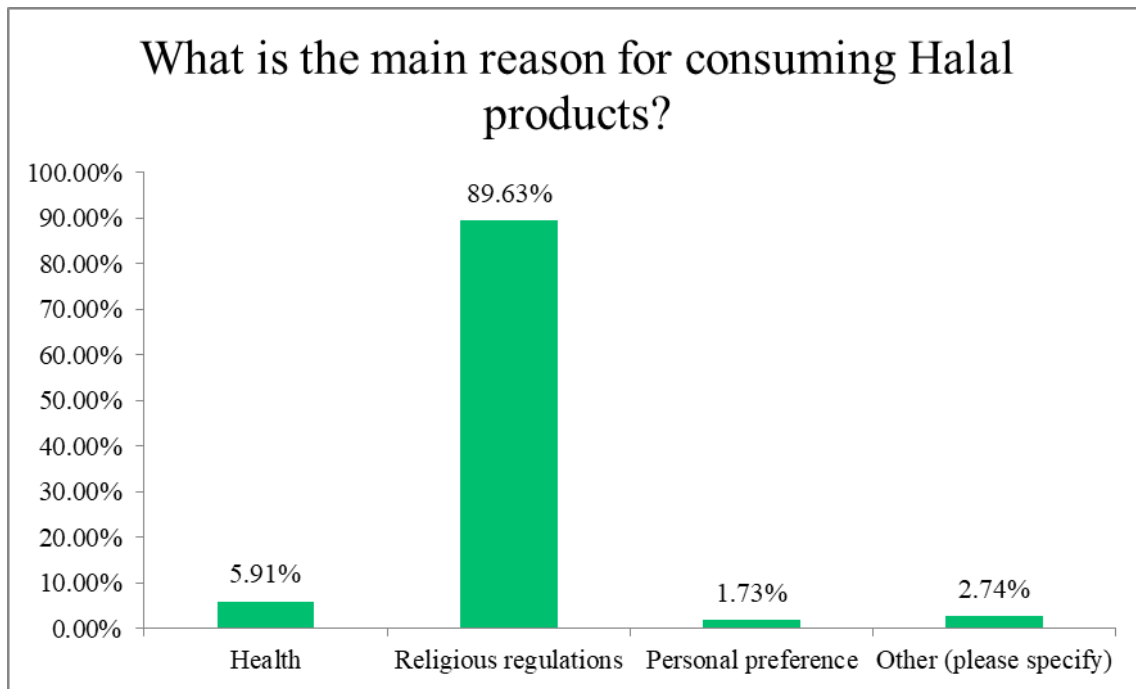
Figure 6:   Reasons for the consumption of halal products

3.4.4.3 Importance of halal consumption

As shown in the following Figure 7, the importance of consuming halal products was strongly associated with spiritual and religious aspects; almost the entire sample (96%) believed that it was either "Very important" (88%) or, to a lesser extent, "Moderately important" (9%) to consume products which preserve halal integrity.
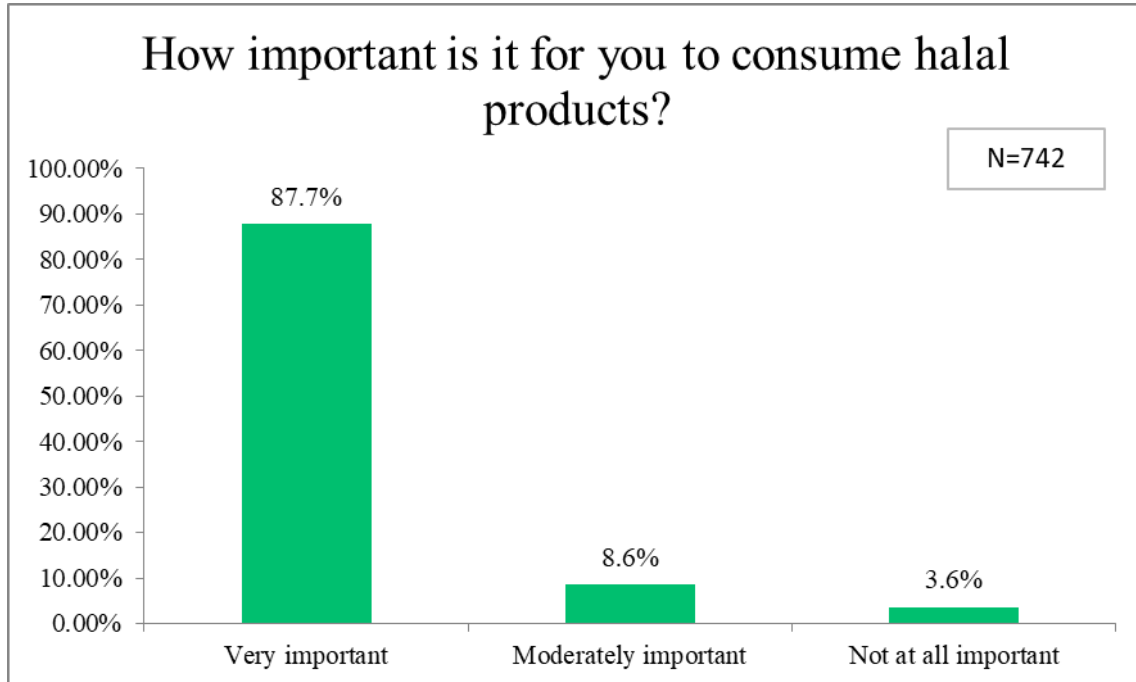
Figure 7:   **Importance of the consumption of halal products**

3.4.4.4   Propensity to pay for halal products

Even more impressive was the willingness to pay a premium for such products. Indeed, the question "Would you prefer to consume halal products, regardless of price?" was answered affirmatively by the vast majority of the sample (94%). Asked directly, "Are you prepared to pay a premium for halal products compared to non-halal products?", 59% of the interviewees acknowledged their willingness to pay a premium price for halal products, while 32% agreed to only pay more for fresh halal products.

The respondents who stated that they were willing to pay a price premium were asked a follow-up question: "How much more would you be willing to pay for halal products compared to non-halal products?". The results are summarised in the following Figure 8.
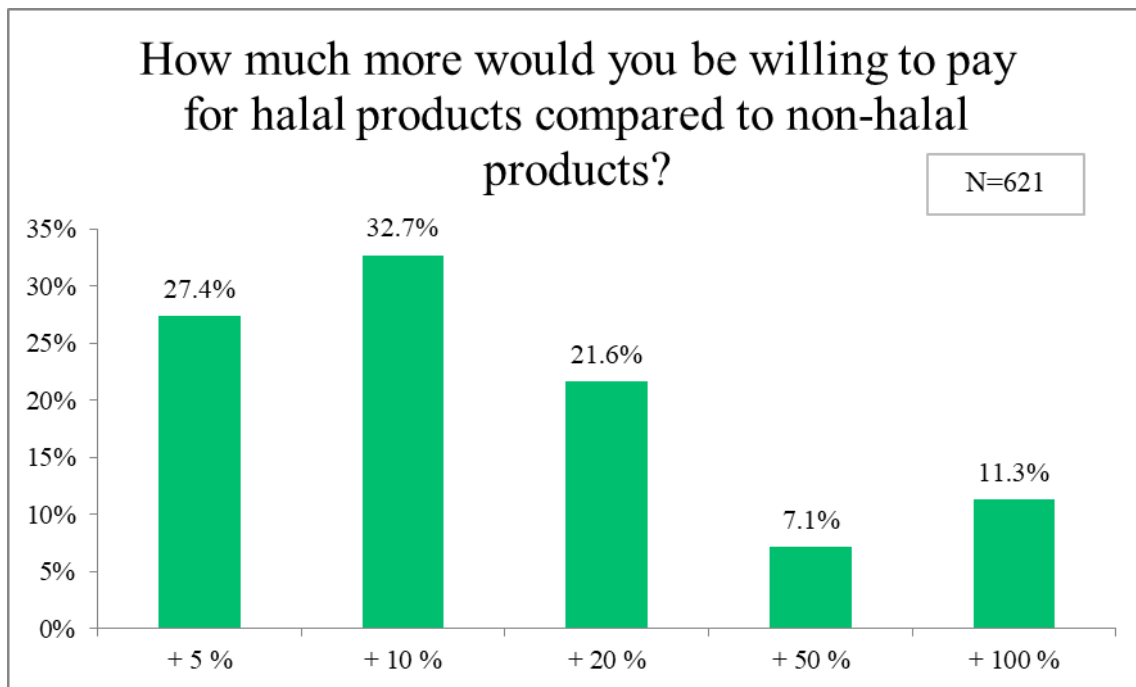
Figure 8:   **Willingness to pay a price premium for halal products**

3.4.4.5 Halal product demand

The following Figure 9 describes the demand for specific halal products: sweets (87%), flavourings/gelatine (86%) and meat (84%) are the most popular halal products.
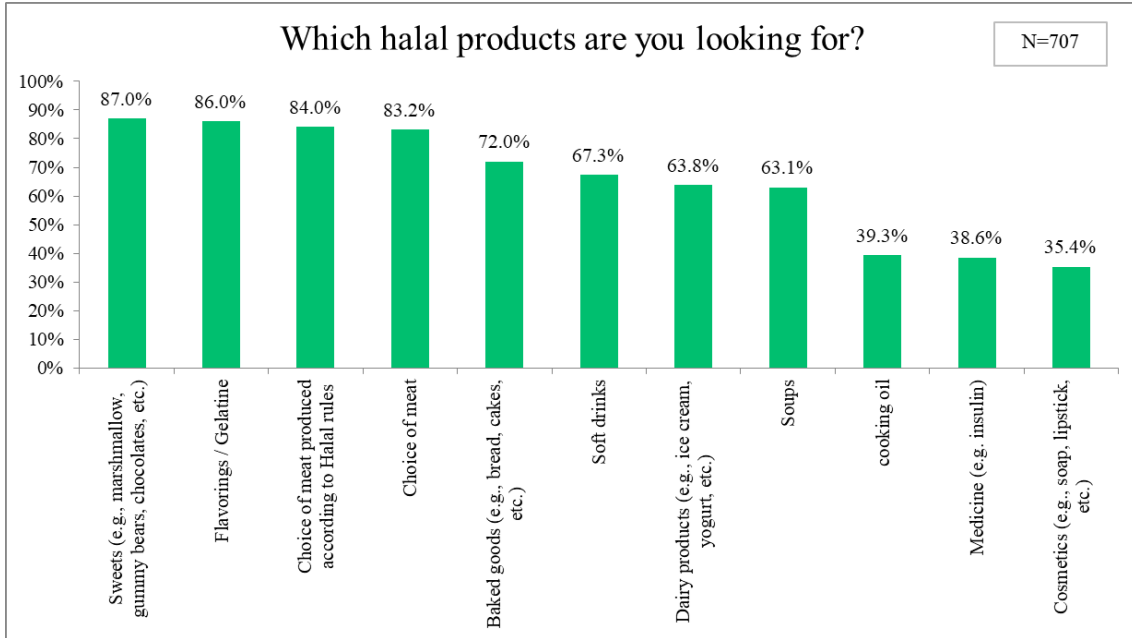
Figure 9: **Type of demanded halal products**

The sample seemed to be very careful about the quality of the products, since 87% of respondents declared that they always checked the labels and other distinctive signs to ascertain that the product really was halal-certified.

3.4.4.6 Halal product distribution outlets

Regarding the availability of halal products in Germany, 40% of the sample found it easy to source them, while the remaining 60% believed that this aspect could be largely improved.

In this regard, it is very useful to assess where consumers procure halal products; as shown in the following Figure 10, discounters and halal shops take the lead, while online stores range at the end with only a marginal market share.
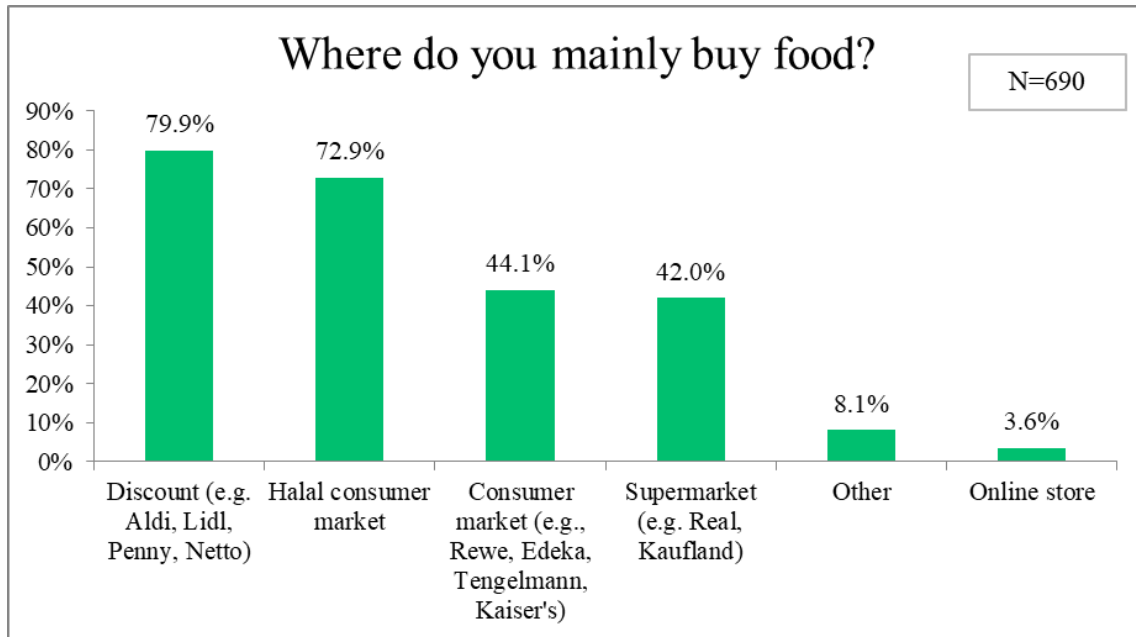
Figure 10:   Usual grocery shops for halal products

However, 74% of the respondents also stated that they would be willing to buy halal products online if such a service were provided in Germany.

3.4.4.7   Perception of the integrity of halal products

The following Figure 11 displays the consumers' perception of the integrity of their halal products; generally, the majority of the respondents was not sure about the halal compliance of a procured product.
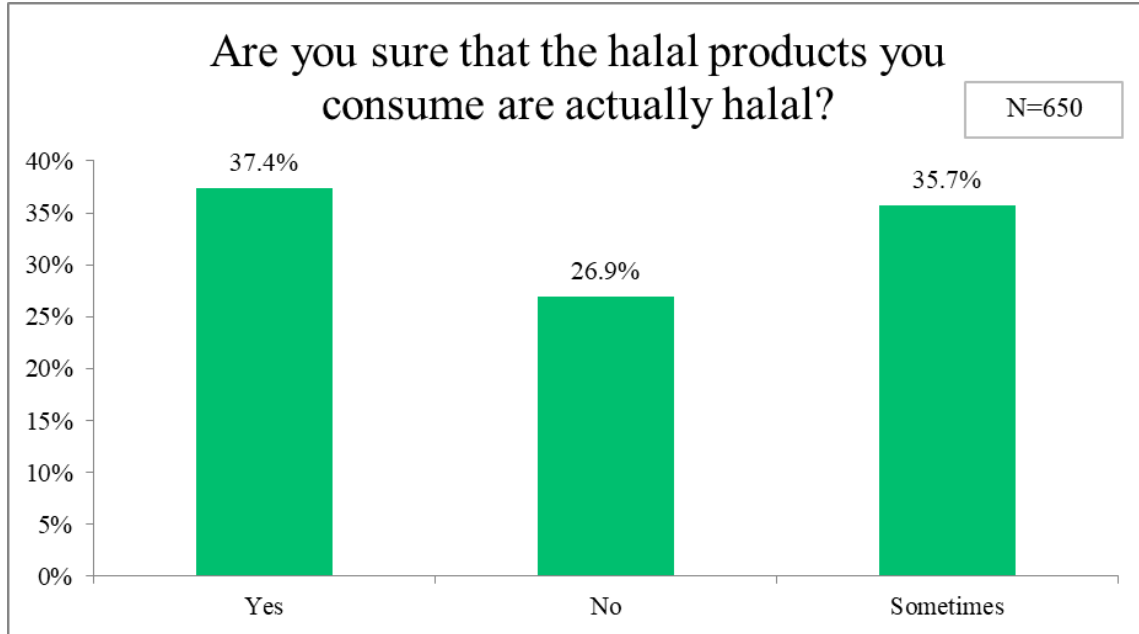
Figure 11:   Perception of the integrity of halal products

In this regard (see Figure 12), the majority of the interviewees reported that they mainly use halal certificates (75%) and halal references of the company (44%) to assess the halal conformity of the product.
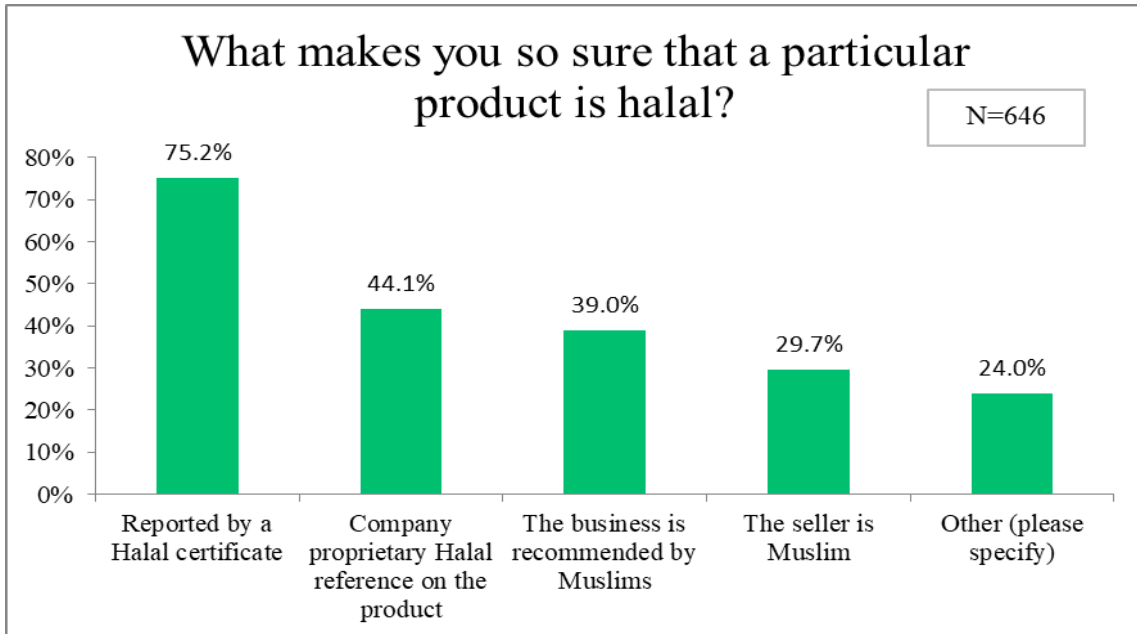
Figure 12: **Indication for the integrity of halal products**

3.4.4.8 Influence on the purchase decision

A halal certificate is the most appreciated feature the consumer would like to find on the packaging. Interestingly, the average customer clearly prefers a halal label certificate issued by a German authority or institution, as the following Figure 13 shows. The halal label and the label issued by the country of origin, while still important, do not trigger customer consumption to the same degree.
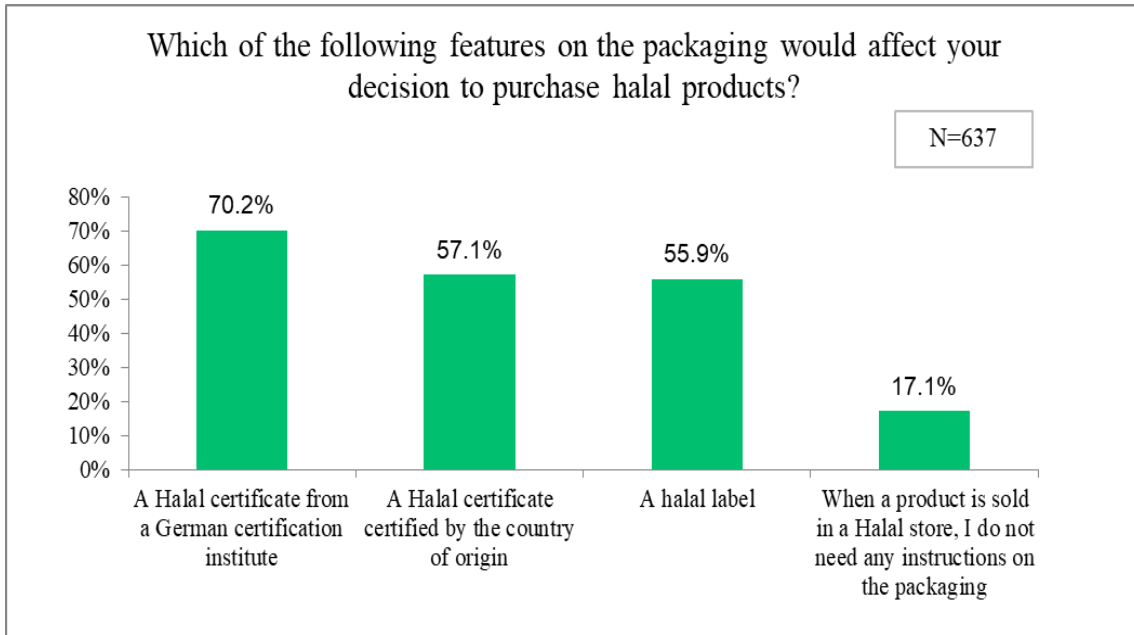
Figure 13: **Influences on the purchase decision**

The survey also confirmed that potential customers pay particular attention not only to the integrity of the product itself, but also to the entire supply chain, i.e. the question whether the halal rules have also been applied to storage and transportation processes. Indeed, for the question "How important are halal rules in the supply chain from production to storage to transport and distribution?", the most widespread answer (78%) confirmed that the average customer buys only products which comply with Islam law across the entire supply chain.

The following Figure 14 summarises the four main drivers behind buying habits on the basis of a Lickert scale.
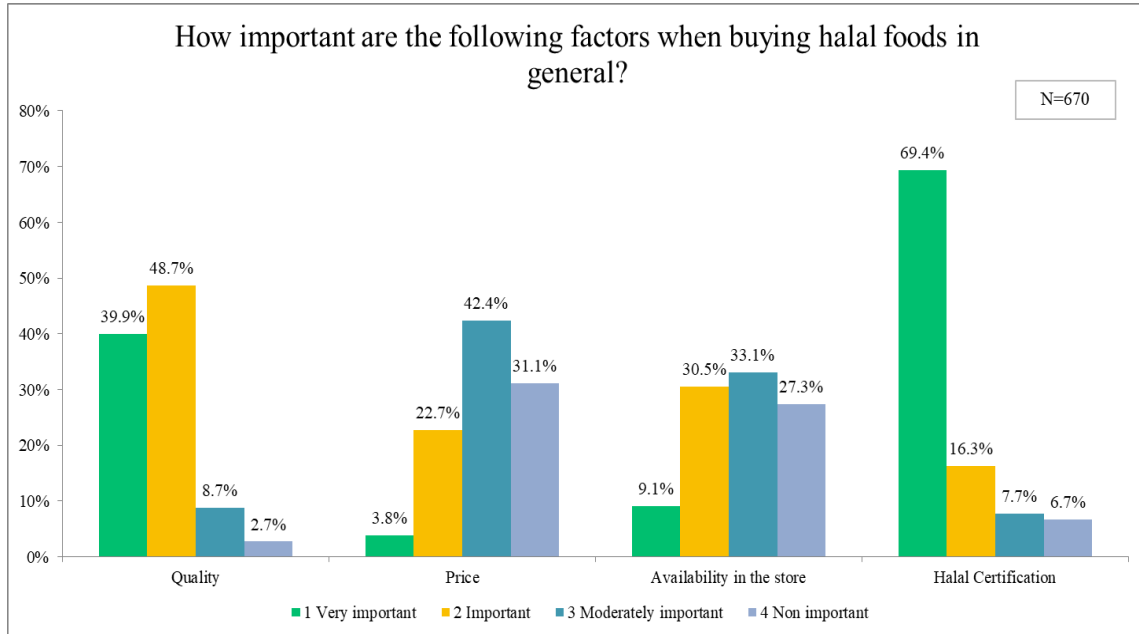
Figure 14: **Factors influencing purchase decisions of halal products**

From the previous, we can infer that:

1. *Halal certification* is extremely important;
2. *Quality* is important/very important;
3. *Price* is moderately important/not important;
4. *Availability* is (for the most part) moderately important/not important.

3.4.5 Discussion

The drivers behind a halal purchase intention have been explored extensively from a theoretical standpoint. Nevertheless, only a limited amount of research has been carried out from an empirical standpoint in the last decade. A number of academic efforts, however, are worth mentioning in order to assess similarities with, and differences to, the results we presented in the previous section.

Aziz and Chok (2013) studied the significance of halal awareness, halal certification, and marketing-related components (e.g. food quality, promotion and branding) for the purchase intention toward halal products among the non-Muslim community in Malaysia. By applying a structural equation model on a sample of 226 non-Muslim consumers, they showed that each driver included in the analysis was positively associated with purchase intention.

Mukhtar and Butt (2012) used a regression model on a sample of 180 consumers to assess consumer attitude toward halal products, specifically taking into account the degree of inter- and intrapersonal religiosity. The study confirmed that the Theory of

Reasoned Action (TRA) (Azjen, 1980; Fishbein and Ajzen, 1975) represents a solid methodological framework for modelling halal purchase intention. In addition, it also emerged that subjective norms and intrapersonal religiosity positively influenced attitudes towards halal products, with subjective norms being the most important predictor.

A number of scholars, though, seem to agree on the fact that the Theory of Planned Behaviour (TPB) (Ajzen, 1991), better suits the specificities of halal buying habits (Alam and Sayuti, 2011; Bonne *et al.*, 2007; Bonne and Verbeke, 2008). More specifically, the framework was developed to assess intention-performance paradigms and purchasing intentions in a multitude of contexts.

Stemming from the TPB theory, Alam and Sayuti (2011) hypothesised a significant and positive relationship between three independent variables:

1. *Attitude*: "the degree to which performance of the behaviour is positively or negatively valued" (e.g. buying the halal product);
2. *Subjective norms*: social norms and pressure toward or against the performance of any behaviour (e.g. family, friend, relatives, peer or other significant groups);
3. *Perceived behavioural control*: ability of the individual to engage in a given behaviour (e.g. purchase of the halal product).

In the same vein, Khan and Azam (2016) investigated the drivers influencing the consumption of halal products in the Indian market. They designed a survey based on the aforementioned TPB, with the addition of a fourth variable, "religiosity", in order to evaluate the impact, if any, of religion on the purchase intention of halal products. In contrast with the results presented by Mukhtar and Butt (2012), they found that "attitude" and "perceived behavioural control" were the most significant drivers, while "religiosity" and "subjective norms" were insignificant predictors. The lack of impact of the religiosity factor may be related to the specific geographical and social context in which the analysis was performed. However, the authors maintain that "halal is largely related to meat and except for pork and alcohol, everything is deemed to be halal" (Khan and Azam, 2016).

Yusoff *et al.* (2015) investigated the important topic of the influence of the consumers' knowledge about the halal supply chain on the purchasing intention toward halal products. The study took into account the entire halal value chain process, such as feed, slaughtering, handling and storage, packaging, logistics, and retail. The survey addressed Muslim and non-Muslim consumers in the Malaysian market. In line with previous academic efforts on the same topic (e.g. Shaari and Mohd Arifin, 2009), the work concluded that a positive correlation did indeed exist between knowledge of halal supply chain and purchasing behaviour. Moreover, the authors also found that consumers' awareness about specific processes of i) slaughtering, ii) storage, and iii) packaging, were the most important predictors for halal purchasing habits. Packaging, in particular, was found to be a crucial component in the marketing mix, and, consistently with other studies on the topic (Awan *et al.*, 2015), the presence of a halal certification label or logo on the packaging enhanced the willingness of the potential consumer to purchase halal products. However, unlike previous efforts on the topic (e.g.

Tieman *et al.*, 2012), halal retail and halal logistics were deemed to have only a minor influence on buying patterns. In other words, consumers were not willing to pay for the high segregation standards required by the Malaysian Standards in logistics and retail.

Another study by Fathi *et al.* (2016) explored the factors influencing the willingness to pay for halal logistics in the Malaysian market. The study hypothesised a positive correlation between a dependent variable (willingness to pay) and three independent variables, namely i) individual characteristics (perceptions of usefulness of halal logistics, concern for halal), ii) environmental characteristics (media influence), and iii) logistics providers' characteristics (service capability, image).

Our survey confirmed what was previously found in the extant literature on this topic, namely that the dominant driver behind consumers' willingness to pay for halal products is religion. Nevertheless, our results innovate the academic literature on this topic on different levels.

First, we discovered that the demand for halal products (and for halal logistics in general) is basically inelastic to price. This means that the demand shows a modest inverse correlation to the price.

Second, quality, perceived as integrity of the halal products, plays a very important role in purchasing decisions, and halal certification, especially when awarded by a German authority, is a central driver in influencing halal purchase intentions.

4.   Analysis of the supply side

4.1   Export

4.1.1   Export of halal products from Germany

Islamic countries are mainly located in Asia, the Middle East and Africa. Currently, 80% of the food imports to Islamic countries come from non-Islamic countries (Thomson Reuters, 2014). In 2015, Muslims' grocery expenses reached USD 1.173 billion worldwide and were expected to grow to USD 1.914 billion by 2021 (Thomson Reuters, 2016). At this moment, Germany already ranks among the top five meat exporters to Islamic countries (Thomson Reuters, 2013), as can be seen in Figure 15 below.
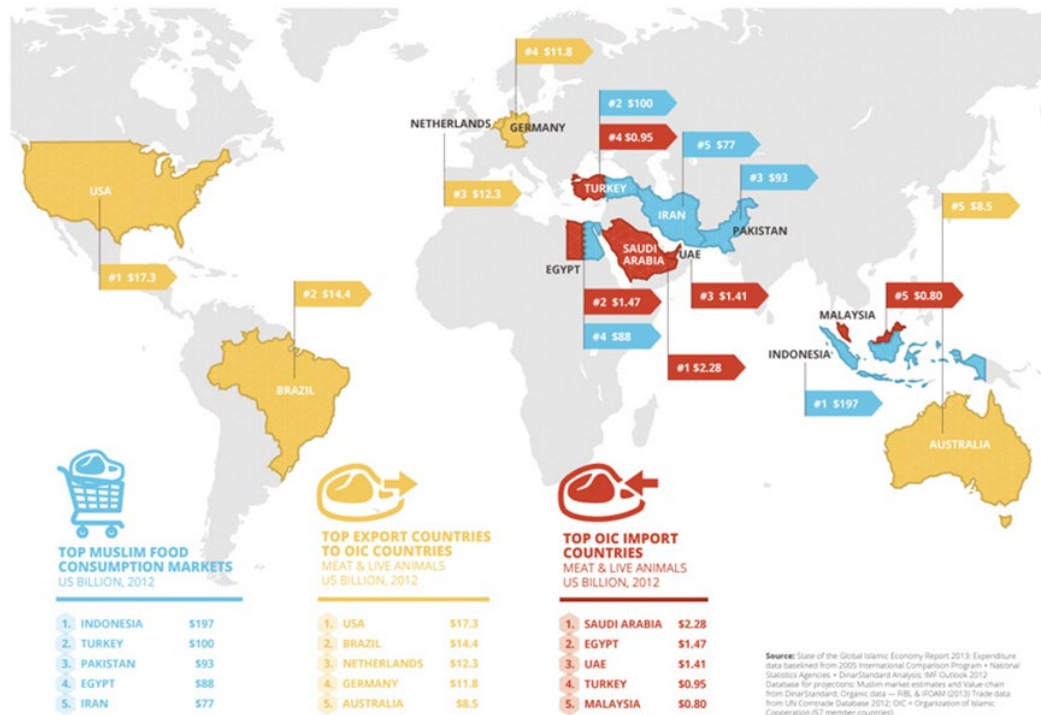
Figure 15:   Food importers and exporters
Source: SGIE report, 2013

Germany is one of Europe's largest meat producers, including beef, pork, and poultry. The country also produces halal beef marketed in Germany and exported to other countries (German Meat GmbH, 2021).

However, in order to fully exploit the market growth, German companies, as anticipated above, must observe the halal standards across the entire supply chain.

4.1.1.1   Export of halal products from Germany via air cargo

Unfortunately, Eurostat does not collect information on halal products exported or imported via air or sea. At present, products are not explicitly declared as halal cargo shipments. Therefore, the volume of export (and import) air cargo shipments can only

be estimated. For the purpose of this report, we assumed that all meat exports to Muslim countries from Germany have to have been produced according to halal standards. Thus, according to Eurostat (Lufthansa Cargo Internal Data, 2016), in 2015 39,410 tons of meat and innards (beef, sheep, goat, poultry, fish, horse) – fresh, frozen, cooled, dried and smoked – were transported from Germany via air to the top ten countries with a Muslim population. These countries were Indonesia, Pakistan, India, Malaysia, Saudi Arabia, the UAE and Qatar. The transported value was EUR 3.05 billion.

4.2   Outlook on the global halal food market from the perspective of German producers

4.2.1   Research objective

This chapter presents the results of the empirical survey among German companies producing and exporting mainly food products, but also some cosmetics products for the global halal market.

The research objective was to collect information on the national and international market for halal products and to identify trends.

4.2.2   Methodology

In order to provide an outlook on the halal food market from the specific perspective of German producers, we adopted the *expert interview methodology*.

Expert interview is an empirical qualitative method well-investigated in the academic literature, especially in social science research (Meuser and Nagel, 1991; Kaiser, 2014). Though "expert interviews" may entail a multitude of different methods and approaches, this method basically consists in qualitative interviews revolving around the specific knowledge of the expert in a certain field in order to develop a better understanding of the phenomenon under analysis. The importance of the expert interview methodology becomes apparent when certain research avenues require empirical approaches beyond conventional methodologies which are based on technical data and facts. By adopting the interpretative lenses of these expert interviews, the researcher aims to shed light on the implicit dimension of expert knowledge which could not be captured otherwise. In literature, three types of expert interviews have been identified (Bogner *et al.*, 2009), namely, i) the exploratory expert interview, ii) the systematising expert interview, and iii) the theory-generating expert interview. While the first type helps to formulate initial hypotheses, and the second aims at structuring the extant expert knowledge, the theory-generating expert interview allows for the development of theoretical approaches by outlining the empirical interrelations in the field. For the purpose of this work, the approach followed is the exploratory expert interview, since the global outlook for halal food still represents an under-investigated, albeit very promising, research avenue.

Regarding the strategy for data collection, 20 experts from German companies exporting their products to Europe and worldwide were surveyed using a qualitative, standardised questionnaire with 16 open questions. The sample included both companies devoted

exclusively to halal products and companies with a mix of halal and non-halal products. The survey was conducted by e-mail and by telephone. For the detailed questionnaire, please refer to Annex 1.

Finally, as for the specific data analysis technique used, the raw inputs were organised and analysed according to the qualitative content analysis approach, where a combination of inductive and deductive elements are applied to evaluate theory-supported semi-structured interviews (Mayring, 2015). An essential feature of qualitative content analysis is the use of categories, which are often derived from theoretical models, i.e. deductively. In contrast to other approaches, the fundamental goal of qualitative content analysis is the summary of the material.

4.2.3   Results

The sample was composed of 18 companies operating in the food industry (in particular, dairy (9), biotech (3), raw ingredients (3), dried fruits (2), breadcrumbs (1), fats (1), and sugar-based products (1)), and 2 companies operating in the cosmetics industry.

In addition, 18 companies were classed as manufacturers while the remaining two were classed as distributors for halal products.

In terms of revenue breakdown, we can report the following:

- Eight companies relied entirely upon halal products (approx. 40% of the sample)

- Six companies achieved 50-90% of their turnover selling halal products (approx. 30% of the sample)

- Six companies relied only marginally upon the turnover generated from halal products (approx. 30% of the sample)

Before presenting the main insights on the global outlook for halal food derived from the expert interviews, we want to present some common themes shared across the panel:

1. *Halal standards*: Fifteen companies complied with halal standards due to customer expectations and market requirements. In terms of requirements, specifically, an increasing number of Islamic countries are enforcing halal standards to imports and exports of goods along the entire supply chain. In this regard, in 2014 Indonesia adopted a particularly restrictive law requiring that all products in circulation had to be certified and labelled as "halal" or "non-halal" by 2019. The law implementation, however, was postponed (Thomson Reuters, 2019).

2. *Certification*: Eighteen companies had all their products halal-certified while the remaining two certified the majority of their products. It seemed to be common among their customers to ask for halal certificates, sometimes from a specific certification body. In addition, the end customer also seemed to be influenced by the "halalness" of the production process. Finally, halal labels and product specifications on the packaging also influenced the purchase behaviour of their customers. There is an urgent need for harmonisation of the halal requirements of the different countries, though it must be said that such efforts are not feasible in the short to medium term. The multiplication of halal guidelines and standards has, indeed, led to uncertainty among manufacturers. The role of the halal certification authorities is therefore perceived as very valuable by manufacturers since they could monitor and advise on major changes in regulations. Halal certification is on average perceived as a liability because it contributes to increased costs and efforts. In Muslim-dominant countries, this constitutes only a marginal problem, because halal-compliant products are the norm. For this reason, the experts surveyed agreed that halal certification is becoming increasingly important, and with it the demands on certifiers. The experts would prefer the certifiers to allow pragmatic solutions for certification rather than insisting on requirements here that apparently cannot be realised without great expense. There is a need for uniform, global certification standards and certifiers who mutually acknowledge each other.

3. *Product/Market diversification:* All 20 companies produced halal products because they wanted to exploit the opportunities of the increasing halal food/products market. The companies included in the sample have had their production processes certified and tended to use this certification as a differentiating factor against competitors. Finally, they perceived halal products as an interesting market niche and expected an increase in customer demand.

4. *Halal supply chain*: A supply chain is a network of suppliers, manufacturers, distributors, retailers and customers. At an operational level, this means that, when it comes to halal-compliant handling, both the physical product flow from the supplier to the customer and the return flow for product returns, maintenance and recycling must be considered. All companies stated that halal standards were strictly followed during production. They also said that, in principle, the standards also applied to the entire supply chain, but they did not know if rules for halal transportation were met: "*In our factory, yes, we follow halal standards. From the moment of loading the goods, it is no longer our responsibility*", "*Goods should be halal, whether the container is halal, we do not know*", "*We only check that halal products are definitely not mixed with non-halal goods*", "*If we transport goods loosely, then the freight forwarders should not have transported any pork or alcohol products during the last two deliveries*", "*The finished product is properly packed. So there is no risk of contaminating the goods*". From these comments, one could argue that, while the inputs for the production process (i.e. raw materials) are halal-certified, the integrity of the final product will largely depend upon the compliance of the entire supply chain to halal standards.

5. **Air cargo:** Eighteen companies transported halal goods by road and sea, while seven also used air cargo, albeit as emergency transportation due to time pressures for the shipment or the perishable nature of the products. Air cargo of course implies higher shipping costs and is only used when absolutely necessary or inevitable.
6. **Halal officer:** Eleven companies had a dedicated in-house halal officer, who was accountable for halal logistics, distribution and warehousing, or had established a halal management system in their company. When the risk of cross-contamination is low, e.g. production is 100% halal, certification bodies do not require in-house officers.
7. **Willing to pay a price premium:** Twelve of the interviewed experts stated that the majority of end customers were not willing to pay a price premium for halal products because, in their opinion, the customers viewed the halal certification as a standard requirement. However, some experts believed that, if the markup applied was modest and the halal integrity could be proven, then the average customer might be willing to pay a premium. One company said it could apply a one-percent surcharge only in the food industry. In the consumer goods industry, this would be not possible due to price pressure. One company charged about 13% more with a minimum order quantity of three tons due to the increased production costs.
8. **German market:** Ten companies operated in the German market, while six stated that there was no demand for halal products in Germany, and that the German market was smaller than the Asian markets.

On the future outlook of the halal food and products industry, the experts believed that the market will steadily expand due to the following main reasons:

1. *Globalisation effect:* In order to be exported worldwide, the products will need to be such that they are accepted by other countries and all end consumers, regardless of religious orientation.
2. *National legislation/requirements*: As of 2019, and as one of several countries, Indonesia's more restrictive legislation will put pressure on the international market to produce more halal-certified goods.
3. *European and German market*: Due to the increasing Muslim share of the population and the wave of refugees, the demand for halal products in Europe and Germany will continue to rise.
4. *Consumer awareness*: Whether "organic", "regional", "gluten-free" or "lactose-free" – "halal" is one of several markets that has its specific requirements and where transparency in production is demanded. Customers wants to know what they are eating in order to be able to decide whether the product meets their requirements.

Globalisation. Customers from Arab or Islamic countries expect imported goods to also meet the requirements of Islam. On the other hand, the demand for halal-compliant products is steadily increasing among customers in the European market. More people

are eating more consciously and paying attention to the safety of the products they consume. Manufacturers of food products must address halal requirements in order to supply their customers with high-quality products. This is only possible through cooperation with reputable certification bodies that are experts in this field.

National legislation/requirements. The new legislation in Indonesia, the demand originating from the surrounding countries such as Thailand, China, Korea, and Malaysia, and increasingly also from Europe, necessitate products that are halal-compliant. If the new legislation in Indonesia is successfully applied, other countries with a large Muslim population such as Malaysia etc. will follow Indonesia's example. The pressure on raw material suppliers and producers of consumer products to produce sufficiently certified products will increase. However, this also means that the certifiers must allow pragmatic solutions for certification and not insist on requirements that apparently cannot be realised without great expense.

European and German market. The European market for halal products is still considered an untapped market with significant growth potential, with France, Italy and Germany being the most attractive domestic markets. From the experts surveyed, we derived the following observations about the halal market outlook:

- Due to the multicultural society in Germany and throughout Europe, the demand for halal products has increased significantly. The area of halal-certified products is becoming increasingly important. It is no longer enough for products to be halal, they must now be halal-certified, in some cases even by a specified organisation. Transparency in the production process, not only for halal products, is becoming more important.

- Due to Muslim migration to Germany and the increasing Muslim population worldwide, halal-certified raw materials and finished food products will become increasingly important in the foreseeable future.

- Companies are interested in a global halal certification standard such as promoted by the OIC/SMIIC (https://www.smiic.org/en/standards).

- It is important to educate Muslim consumers and to build a relationship of trust. For Muslim consumers, trust and confidence in the ownership of the company is very important beside compliance matters.

Consumer awareness. Whether "organic", "regional", "gluten-free" or "lactose-free" – "halal" is one of several markets that has its specific requirements. Companies wanting to sell their products in this market must face these requirements and comply with them. And – in terms of potential buyers (number of people) – the halal market is a relatively large market with a relatively large demand. Through globalisation, the supply will adjust to this and grow and become commercialised accordingly.

Finally, the experts interviewed indicated that the harmonisation of the halal requirements on a global scale would represent a necessary step toward a fully-compliant halal supply chain "from farm to fork". Most of the experts maintained that the current state of the certification process does cause uncertainty among manufacturers about the production process, and represents a potential source of competitive disadvantage (compared to producers located in Muslim countries). Therefore, their appeal to the halal certifiers was to act not only as monitoring institutions, but rather, in future, as advisors who must immediately inform manufacturers about significant changes in the legislation.

5. Halal logistics requirements

5.1 Halal Supply Chain Management

Van der Vorst (2000) defines Supply Chain Management (SCM) as "the integrated planning, co-ordination and control of all logistical business processes and activities in the Supply Chain (SC) to deliver superior consumer value at less cost to the SC as a whole whilst satisfying requirements of other stakeholders in the SC". SCM may enhance various internal processes (e.g. quality control, a firm's networks, etc.) as well as customer satisfaction; however, a proper Halal Food Supply Chain (HFSC) requires plugging halal requirements into conventional SCM models.

In this regard, since the food production and distribution chain has become progressively longer, especially in the last decades, food integrity represents a major point of concern for the Muslim community (Bonne and Verbeke, 2008; Tieman, 2015). Contaminations, therefore, represent a central argument for halal scholars and an important selling point for food manufacturers as well (Amin *et al.*, 2009; Tieman *et al.*, 2012).

According to Omar *et al.* (2013), HFSC pertains to all economic activities which start at the point of origin and end at the point of consumption (e.g. sourcing, warehousing, handling, etc.). In order to ensure their integrity, all these transactions need to comply with *Shariah* law. In a globalised economy, where different partners and contractors may reside in non-Muslim countries, this could constitute a potential obstacle, as the higher the number of handling points the higher the probability of contamination. Moreover, according to modern air cargo paradigm, where economies of scale and cost optimisation play a major role, large quantities of haram products may be placed beside halal products, thus increasing the probability of cross-contamination.

In recent years, a number of studies have supported a unified HFSC model. Tieman *et al.* (2012) introduced a halal-optimised supply chain model and demonstrated a positive correlation between specific product features (bulk versus unitised, ambient versus cool chain) or market requirements (Muslim or non-Muslim country), and the probability of contamination. Wan Omar (2017), on the other hand, proposed a conceptual model derived from direct interviews with poultry industry stakeholders in Malaysia, with the aim of isolating the factors that lead to an effective HFSC; ultimately, their results seem

to suggest that i) animal feed, ii) proper slaughtering and iii) proper segregation represent the most important areas to consider when designing an efficient and effective HFSC. Finally, Zulfakar *et al.* (2014) investigated the halal meat supply chain in a non-Muslim-majority country, namely Australia. They demonstrated that successful halal operations in that specific context were strongly correlated with two major factors, i) segregation and ii) people.

However, despite the great efforts aimed at regulating the production and distribution of halal products, the customer does not have any tool to assess if a certain product is still halal-compliant at the time of consumption or has actually suffered some form of contamination along the supply chain. In the next section, therefore, we will adhere to the classification by Wan Omar (2017) to characterise a halal supply chain which complies with *Shariah* law.

The International Halal Integrity Alliance (IHIA) had previously established an international halal logistics standard. However, nowadays this standard has become irrelevant. The only relevant standard for halal insurance is the halal logistics standard issued by the Malaysian government (HDC, n.d.). In 2015, the Malaysian Standards also influenced the Gulf Standardization Organization (GSO Standard) for the countries of the Gulf Corporation (Saudi Arabia, UAE, Kuwait, Oman, Qatar, and Bahrain).

5.2   A holistic approach to HSCM

The aforementioned model is based on eleven dimensions, namely:

1. Physical segregation
2. Training and personnel
3. Storage and transport
4. Ethical practices
5. Packaging and labelling
6. Material handling
7. Islamic dietary law
8. Resource availability
9. Innovative capability
10. Cleanliness
11. Safety

Physical segregation. When discussing "Product manufacturing, handling and serving" (Malaysian Standards MS1500:2019, Section 4.5.2) in Paragraph 2.1, we concluded that physical segregation implies that halal products must be kept separate from haram products in order to preserve their halal status (Tieman, 2013). As stressed by Zulfakar *et al.* (2012), proper segregation constitutes one of the most common critical control points along the halal food supply chain. In order to make physical segregation feasible, Lodhi (2010) suggested the use of dedicated infrastructures along the entire supply chain (e.g. transport, warehousing, storage facilities, handling tools, etc.).

Training and personnel. The Malaysian Standards MS1500:2019, Section 4 "Requirements", Subsection 4.1 "Management responsibility", provides specific guidelines about Human Resource (HR) management practices in a halal logistics context (Department of Standards Malaysia, 2019). With specific reference to HR management, the more general responsibilities of the management include:

- Appointing a Muslim person who is responsible for ensuring the effectiveness of the implementation of the internal halal control system;

- Providing regular training to relevant personnel on halal principles and their application;

- Ensuring that sufficient resources (i.e. manpower, facility, financial and infrastructure) are provided in order to implement the halal control system;

- Allowing Muslim personnel to fulfil the obligations of their religious practice.

The academic literature on the specific topic still needs further development, as it is mainly confirmative of what is already included in the aforementioned Malaysian standards. Tieman *et al.* (2012), for example, concluded that HR management represents a central pillar within the halal supply chain, especially in terms of training practices. Pahim *et al.* (2012) found that professionals involved in halal logistics need to be aware of Shariah's special requirements and act accordingly in order to preserve halal integrity along the value chain. Other major academic efforts have been aimed at investigating the effectiveness of the traceability systems in place (Samsi *et al.*, 2012; Shafii and Khadijah, 2012). As mentioned before, the halal HR management research avenue needs to be enriched by more exploratory studies.

Storage and transport. The MS 1500:2019, Section 4.6 "Storage, transportation, display, sale and servings of halal food", recommends that:

- All halal food that is stored, transported, displayed, sold and/or served shall be categorised and labelled as halal;

- Transportation vehicles shall be dedicated and appropriate to the respective type of halal food, as well as satisfying hygiene and sanitation requirements.

For the purpose of a properly designed halal air cargo logistics model, transportation and warehousing at each distribution node are key factors for preserving the halal status throughout the entire value chain (Riaz and Chaudry, 2003). In terms of storage, Tieman *et al.* (2012) reiterate the importance of dedicated storage areas or shelves to avoid cross-contamination. The literature on halal transportation suggests that mixing of halal and haram products shall be avoided by segregating the halal products in dedicated shipping storage units (Zailani *et al.*, 2017).

Ethical practices. In terms of ethical behaviour, while the Malaysian Standards don't require any specific halal process, Al-Qaradawi (2007) has suggested that the general concept of permissibility shall also be extended to all human actions and behaviours.

Packaging and labelling. The MS 1500:2019 devotes its entire Section 3.7 to "Packaging and labelling" of halal products. More specifically, "Packaging materials shall be halal in nature and must comply with the following requirements:

a) The packaging materials shall not be made from any raw materials that are decreed as najs by Shariah law;
b) The halal product shall not be prepared, processed or manufactured using equipment that is contaminated by things that are najs as decreed by Shariah law;
c) During preparation, processing, storage or transportation, the halal product shall be physically separated from any other food that does not meet the requirements stated in items a) or b) or any other things that have been decreed as najs by Shariah law;
d) The packaging materials shall not have any toxic effect on the halal food; and
e) Packaging design, sign, symbol, logo, name and picture shall not be misleading and/or contravening the principles of Shariah law."

In addition, Section 4.7.5 provides the following, specific recommendations for labelling purposes:

"Each packaging shall be marked legibly and indelibly, or a label shall be attached to the packaging, with the following information:

a) Name of the product;
b) Net content expressed in metric system (SI units)[2];
c) Name and address of the manufacturer, importer and/or distributor and trademark;
d) List of ingredients;
e) Code number identifying date and/or batch number of manufacture and expiry date; and
f) Country of origin".

Finally, for meat products the label should also include the date of slaughter and the date of processing (MS1500:2019, Section 4.7.6).

As for the academic contribution on the topic, in their conceptual paper, Ab Talib and Mohd Johan (2012) found that one of the most critical issues in halal cross-contamination is the packaging material. Soong (2007) agreed by suggesting that, if the packaging is made from raw material of animal origin, it should require proper halal certification in order to preserve halal integrity.

Material handling. In terms of devices, utensils, machines, processing aids and equipment, the MS 1500:2019, Section 4.3, prescribes that they "shall be designed and constructed to facilitate cleaning and shall not be made of or contain any materials that are decreed as *najs* by *Shariah* law, and shall be used only for halal food".

If any form of contamination arises, Annex A of MS1500:2019, determines that a cleansing ritual is required in accordance with Shariah law. The same ritual needs to be performed when converting a contaminated production line into halal production facilities. Afterwards, the cleansed tools/machines shall be dedicated to halal products

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[2] The International System of Units (SI, abbreviated from the French Système International (d'unités))

only, and converting back to haram production is not permitted. Jaafar *et al.* (2011) confirmed that halal food products require different procedures for handling, storage and product management compared to a usual value chain.

Islamic dietary laws. As previously presented in Chapter 3 when discussing the results from our survey, religion accounts for most of the food habits of the Muslim community. As a matter of fact, Islam could also be considered a collection of rules and guidelines that prescribe, within a more comprehensive and general Muslim lifestyle, a specific code of conduct for dietary habits (Bonne and Verbeke, 2008; Riaz and Chaudry, 2003). In this regard, van der Spiegel *et al.* (2012) summarised the extant research by maintaining that "…basically, all food products are permitted except those that are explicitly forbidden according to Islamic dietary laws, including alcohol, pork, blood, meat from cadavers, and meat of animals that have not been slaughtered according to Islamic rules" (van der Spiegel *et al.*, 2012).

Resource availability. In terms of resource availability, MS1500:2019, Section 4.1.4, prescribes that "The management shall ensure that sufficient resources (i.e. manpower, facility, financial and infrastructure) are provided in order to implement the halal control system". In addition, the Malaysian Standards MS1900:2014, devoted to Shariah-based quality management systems, provide further guidance on the infrastructure needed to achieve halal compliance. In Section 6.3 in particular, we can read that "The organisation shall determine, provide and maintain the infrastructure needed to achieve conformity to product requirements. The term *infrastructure* includes, as applicable:

a) Buildings, workspaces, prayer rooms (Musolla), ablution facilities and other associated utilities for Muslims to fulfil their religious obligations in line with Shariah requirements;
b) Process equipment (both hardware and software);
c) Supporting services (such as transport, communication or information systems);
d) Eateries within the premise of the organisation, which shall provide halal foods and beverages. Non-halal foods and beverages (if any) shall be segregated accordingly to avoid any cross-contamination.".

Innovative capability. While not explicitly mentioned in the Standards, innovative capability should represent a central area of interest for management in achieving, protecting and fostering the competitive advantage of the firm. In the specific halal-industry context, innovation may involve innovative tracking and production technologies (Zailani *et al.*, 2010) and complex systems which implement an innovative combination of barcodes, Global System for Mobile Communications (GSM) and internet technologies to enhance halal transparency (Yang and Bao, 2010).

Cleanliness. Finally, as for the concept of cleanliness, the ICCI-IHI Alliance Halal Standard (2010) concurs with the Malaysian Standards in requiring that the organisation ensure that the appropriated cleansing ritual be performed according to the respective degree of contamination.

6. Development of an air cargo halal process

6.1 An application of the Malaysian Standards on Halal Logistics to IATA's Master Operating Plan (MOP)

In this section we present a use case implementation of the Malaysian Standards in a non-dominant Muslim market like Germany. More specifically, for this use case we adopted the IATA Master Operating Procedures, a well-established international air cargo process map, as the basis for our analysis. By comparing the extant air cargo best practices to the Malaysian requirements, we were indeed able to shed light on the possible criticalities arising from implementing a fully-compliant halal air cargo supply chain in the context of a non-dominant Muslim market.

As stated, our structure reflects IATA's MOP and is articulated in the following sections and processes:

- Section I – Processes 1-6 (Origin Activities Forwarder)

- Section II – Processes 7-8 (Origin Activities Carrier)

- Section III – Processes 9-13 (Transport Activities Carrier)

- Section IV – Processes 14-15 (Destination Activities Carrier)

- Section V – Processes 16-19 (Transport Activities Forwarder)

In the following sub-paragraphs, we discuss each section separately and identify all the requirements that need to be addressed to set up and maintain a fully-compliant halal supply chain.

6.1.1 Origin Activities (Forwarder) – Processes 1-6
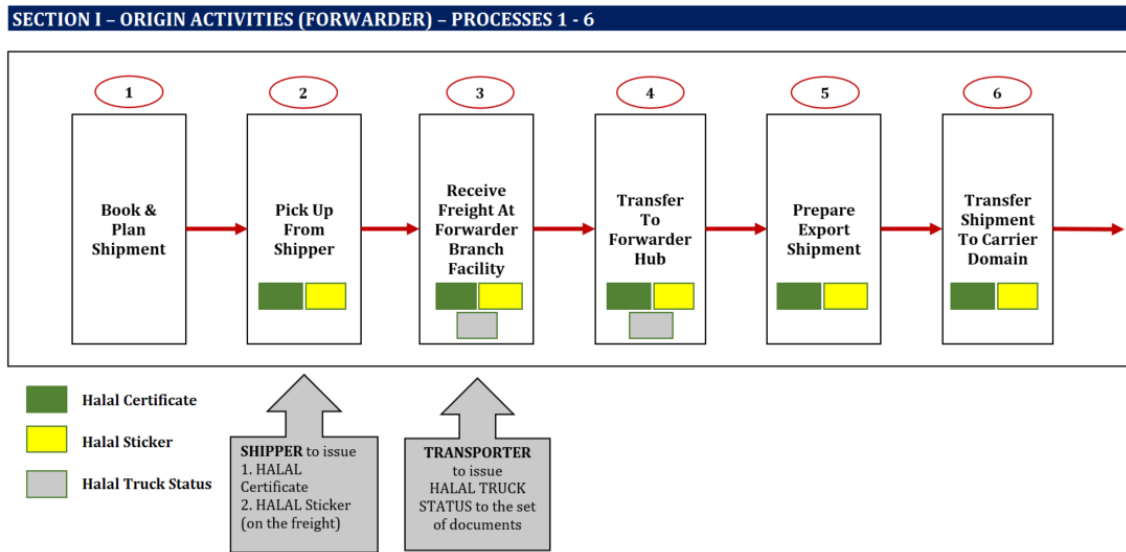
Figure 16:   Processes 1-6
Self-elaboration

Section I consists of six major processes, P01 through P06. The section deals with the origin activities of forwarders, which are:

- P01 Book & Plan Shipment

- P02 Pick Up From Shipper

- P03 Receive Freight At Forwarder Branch Facility

- P04 Transfer To Forwarder Hub

- P05 Prepare Export Shipment

- P06 Transfer Shipment To Carrier Domain

6.1.1.1 Process P1: Book & Plan Shipment
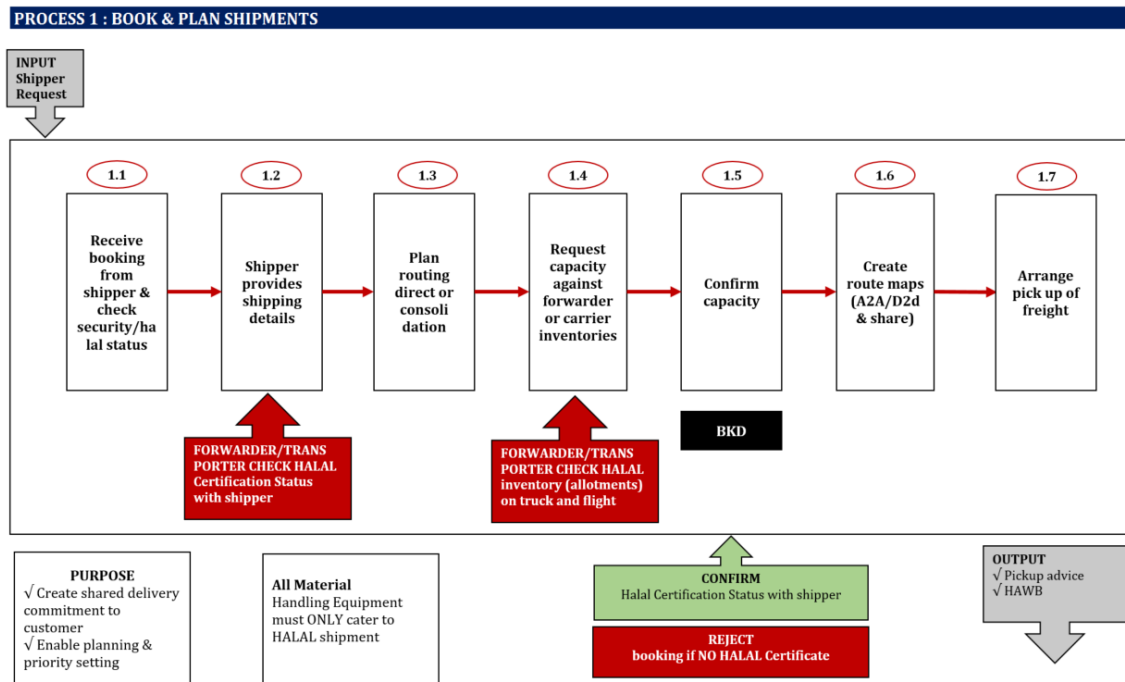
Figure 17: **Process 1**
Self-elaboration

Process P1 begins with process *P1.1 Receive booking from shipper & check security status*. The booking request creates a shared delivery commitment to the customer and enables the planning and priority setting for the shipment. The booking of the shipment should be done using a special IATA code for the halal product ("HAL"), which does not exist at present. The shipper must carefully select a forwarder with a halal certificate. In order to assure the integrity of the halal supply chain, several measures are suggested by the research team:

1. Confirm halal certificate of shipper/forwarder
2. Confirm that the shipment's documentation also includes a halal certificate
3. Visualise the halal status in the form of a halal sticker, provided as an official halal label by IATA
4. Check the halal status of the truck. In addition, whenever a truck is used for transportation, the cleanliness of all transport equipment has to be checked before loading the shipment

For process *P1.2 Shipper provides shipping details*, the Malaysian Standards prescribe that the forwarder or transporter check the halal certification status of the shipper. This implies that each shipper needs to be halal-certified in order to book a halal-certified shipment. At this stage, the minimum documentation required is:

1. Shipment invoice
2. Packing list
3. Shipment markings
4. DGR declaration (e.g. in case of halal pharma or chemical products)
5. Halal certificate

Processes 1.3 and 1.4 address *Plan routing direct or halal-specific consolidation* and *Create route maps (A2A/D2D) & share*, respectively.

In process *P1.5 Confirm capacity*, the halal transportation status is confirmed by the airline and, if the shipment does not carry the halal certificate, it will not be accepted for transportation.

Finally, the capacity is confirmed (*P1.6*) with the creation of a Booked (BKD) file (consignment booked on a specific flight) and a pickup of freight is arranged with a dedicated/ segregated halal truck (*P1.7*) once a pickup advice is generated and the house air waybill (HAWB) is available.

6.1.1.2 Process P2: Pickup from the shipper
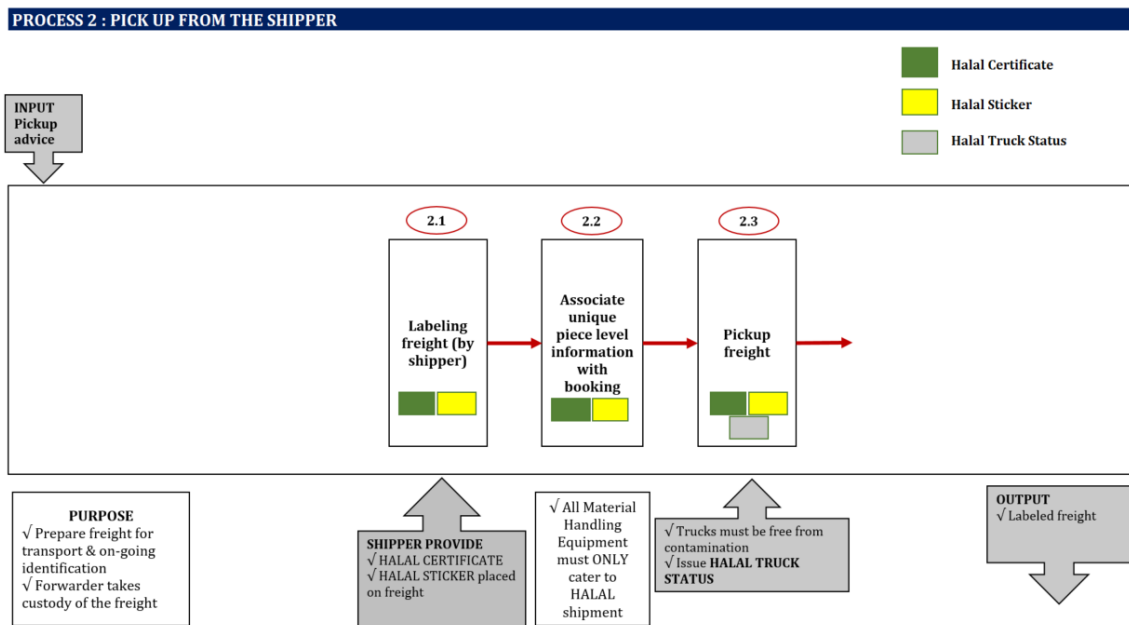
Figure 18:   Process 2
Self-elaboration

Process P2 pertains to the actual pickup from the shipper. The process aims at preparing the freight for transportation and on-going transport. Ultimately, the forwarder will take custody of the freight. In process *P2.1 Labelling freight*, the shipper generates and physically places the necessary documentation – including a halal certificate and a halal sticker – on the freight.

At this stage, the Malaysian Standards prescribe that

1. All material handling equipment must be dedicated exclusively to halal shipments;
2. The trucks used for the shipment must be free from any form of contamination;
3. All trucks must be dedicated exclusively to halal products and should carry the "halal truck status" (corresponding to the grey sticker in our exemplification)

This process ends with the complete halal labelling of the freight (*P2.2*) and the transfer of the goods from the shipper to the forwarder (*P2.3*).

6.1.1.3 Process P3: Receive freight at forwarder branch facility
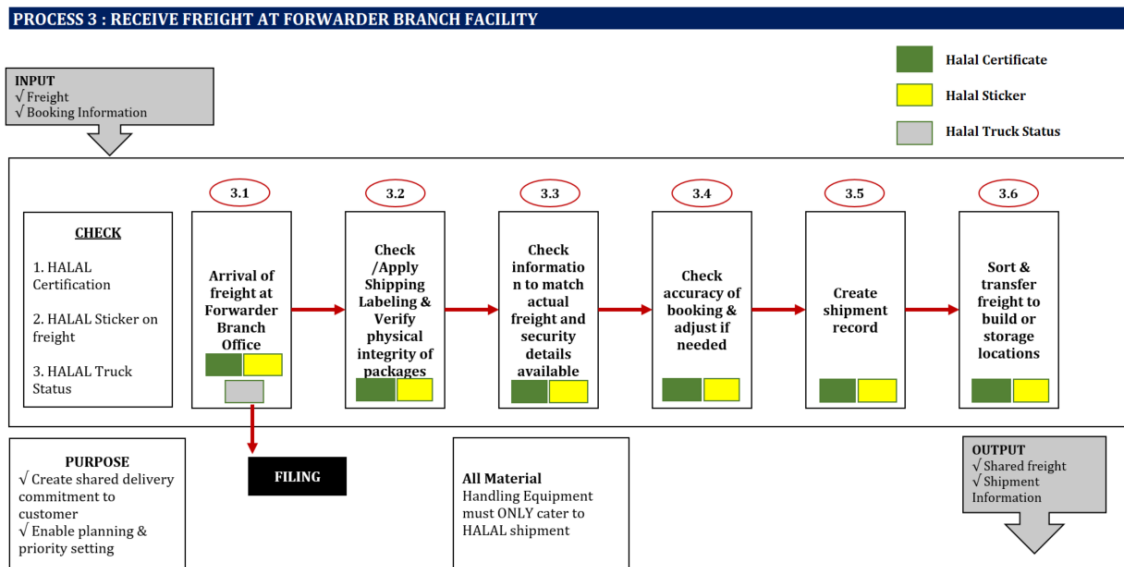
Figure 19:   **Process 3**
Self-elaboration

Process P3 includes all processes related to the handling of the freight at the forwarder branch facility. When the freight arrives at the forwarder branch facility (*P3.1*), three basic requirements need to be fulfilled:

1. Segregated halal entrance and storage area
2. Entry of halal truck status into Forwarder IT system
3. Documentation of halal status on certificate

In addition, a number of preliminary checks need to be performed at the forwarder´s branch office, namely:

- Check Shipping Labelling & verify physical integrity of packages (*P3.2*)

- Check information to match actual freight and security details available (*P3.3*)

- Check accuracy of booking & adjust if needed (*P3.4*)

If every check is passed, then a shipment record is created (*P3.5*) and the freight is sorted and transferred to build or storage locations (*P3.6*). Handling equipment, unit load devices (ULD) and storage facilities need to be compliant with the halal standards.

6.1.1.4 Process P4: Transfer to forwarding hub
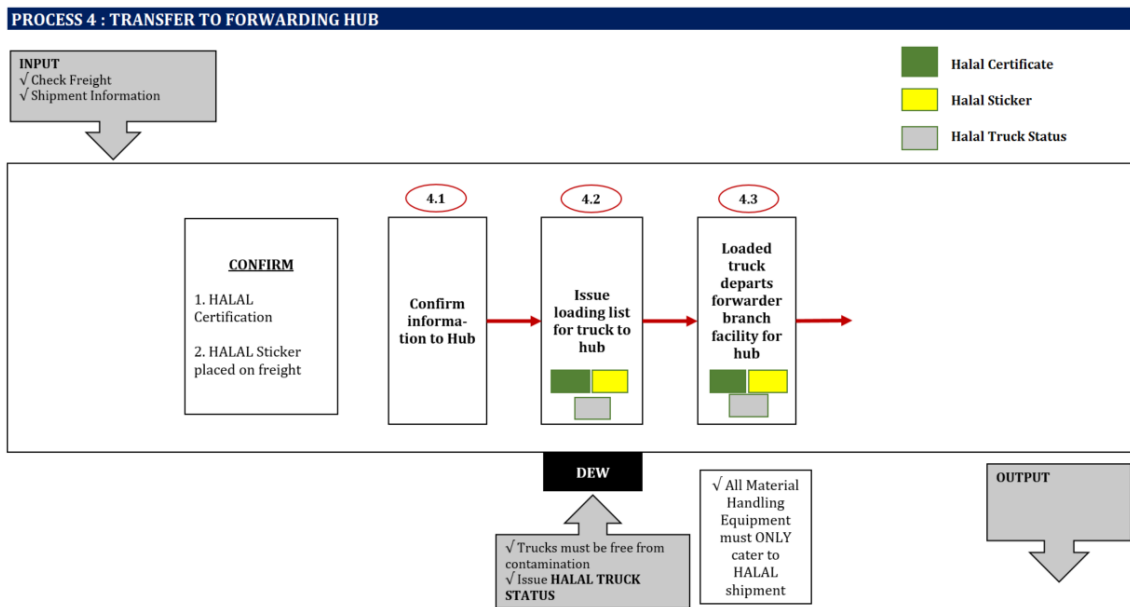
Figure 20: **Process 4**
Self-elaboration

Process P4 involves the actual transfer of freight to the forwarding hub. In process *P4.2 Issue loading list for truck to hub*, the halal truck status is reintroduced, and the requirements described above (i.e. trucks and handling tools dedicated to halal shipments) still apply. During these cross-docking operations, integrity should not be compromised, and all ULDs/handling equipment must only cater to halal shipments and use of halal-compliant trucks. The process ends with the issue of the loading list for truck to hub (*P4.2*) and then the loaded halal truck departs from the forwarder branch facility to the forwarder hub (*P4.3*).

6.1.1.5 Process P5: Prepare export shipment

PROCESS 5 : PREPARE EXPORT SHIPMENTS

INPUT
√ Check Shipment

Halal Certificate
Halal Sticker
Halal Truck Status

CHECK
STATUS of truck free from Contamination

5.1 Arrival of truck at forwarder hub

5.2 Check /Verify physical integrity of truckload

5.3 Check security status of shipment

5.4 Create MAWB shipment record and consolidation maniest

5.5 Send freight picking instructions to warehouse

5.6 Prepare shipment for export

PURPOSE
√ Prepare shipment for delivery to carrier

FILING

All Material Handling Equipment must ONLY cater to HALAL shipment

OUTPUT
√ Control Manifest √ Picking Instructions

Figure 21:   Process 5
Self-elaboration

The output of process P5 is the creation of a customs export declaration. In particular, when the truck arrives at the forwarder hub (*P5.1*), similarly to process *P3.1 Arrival of freight at Forwarder Branch Office*, a number of requirements need to be fulfilled, namely:

1. Segregated halal entrance and storage area
2. Entry of halal truck status into forwarder IT system
3. Documentation of halal status on certificate

Then a check of the physical integrity of the truckload must be performed (*P5.2*) as well as a check of the security status of the shipment (*P5.3*). The Master Airway Bill (MAWB), shipment record and consolidation manifest are created (*P5.4*) and freight pickup instructions are sent to the warehouse (*P5.5*). Finally, the shipment is prepared for export (*P5.6*) with the creation of two messages: FHL (Transfer of Electronic Manifest) and FWB (Transfer of Electronic MAWB).

6.1.1.6   Process P6: Transfer shipment to the carrier domain

PROCESS 6 : TRANSFER SHIPMENT TO THE CARRIER DOMAIN

INPUT
√ Sorted Shipment

- Halal Certificate
- Halal Sticker
- Halal Truck Status

| 6.1 | 6.2 | 6.3 (FHL) | 6.4 (FHB) |
| Issue loading list for truck to carrier / load freight | Depart truck from forwarder hub to carrier domain | Transmit forwarder information to carrier | Arrival of truck at carrier domain |

1. AWB Nr.
2. # pallets, dimensions, weight of shipment
3. Time&date of delivery
4. Flight nr. and departure time
5. Halal handling information
6. Security status of shipment
7. ULD-type 8. active/passive cooling device

Figure 22:   Process 6
Self-elaboration

The last process of Section I addresses the transfer of the shipment to the carrier domain. First, a loading list for the truck is issued to the carrier (*P6.1*); again, the truck used for transferring the freight, as well as the handling tools, must be free from contaminations. The truck, which carries the halal truck status, departs from the forwarder hub (*P6.2*) and the forwarder transmits FHL/FWB messages to the carrier (*P6.3*). The minimum information required is:

- AWB number

- Number of pallets, dimensions, weight of shipment

- Time and date of delivery

- Flight number and departure time

- Halal handling information

- Security status of shipment

- ULD-type

- Active/passive cooling device

Finally, the truck arrives at the departure airport and into the carrier domain (*P6.4*).

6.1.2 Origin Activities (Carrier) – Processes 7-8
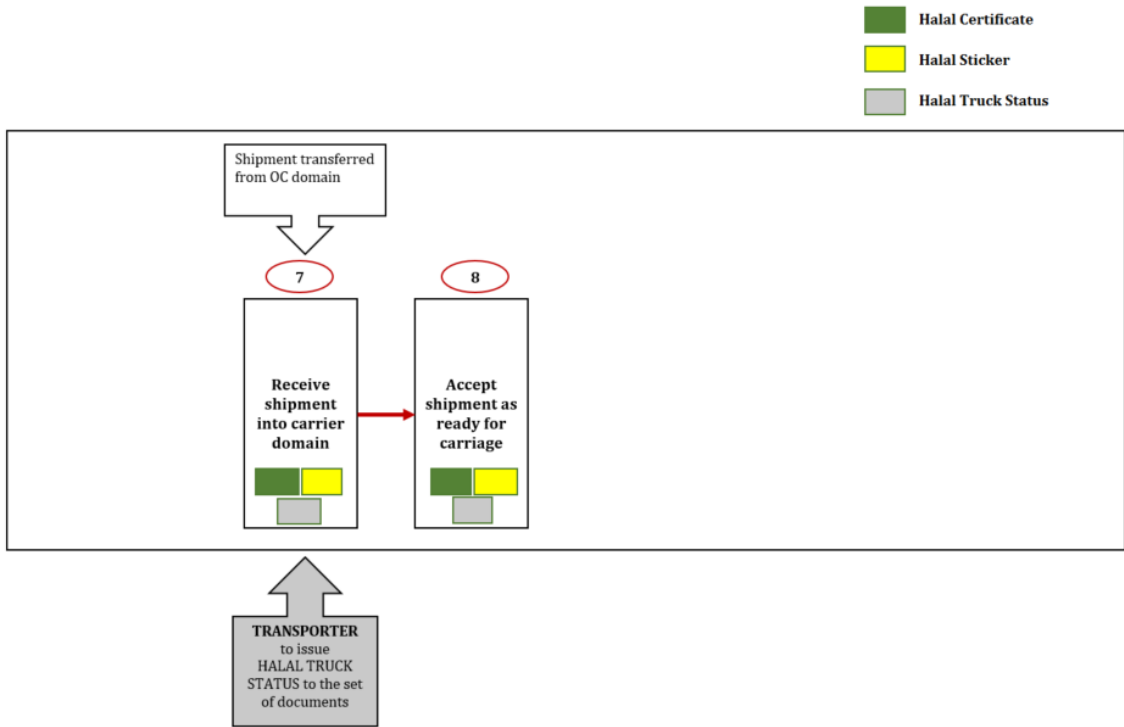
Figure 23: **Processes 7-8**
Self-elaboration

Section II deals with the origin activities from the carrier perspective and describes two processes, P7 and P8.

6.1.2.1 Process P7: Transfer shipment to the carrier domain
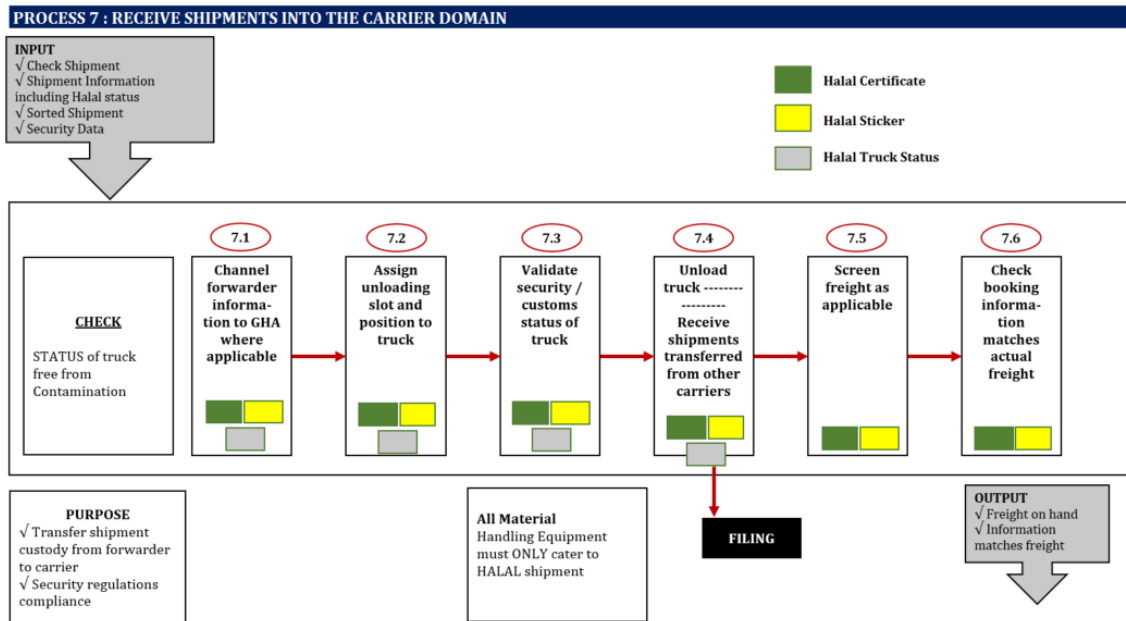
Figure 24: **Process 7**
Self-elaboration

Process P7 describes all the operations related to the reception of the shipment at the carrier domain. As seen above, if there is an active container/BUP in process *P2 "Pick up from Shipper"*, then process P7 starts by channelling the forwarder information to the applicable parties (*P7.1*). The unloading slot and position are assigned to the truck (*P7.2*) and driver identification (ID) and Road Feeder Service (RFS) number plate are checked (*P7.2b*). The unloading process, in particular, requires compliance with the following guidelines:

1. Segregated halal entrance and storage area
2. Entry of halal truck status into carrier IT system
3. Documentation of halal status on certificate

Then, there is a further validation step related to the security/customs status of the truck (*P7.3*), in which the physical data must match the accompanying documents: If discrepancies in the documents are found, they must be adjusted. Basic checks include i) weight, ii) dimensions, iii) pieces, iv) dangerous goods (DGR), v) documents. Process P7.3 also includes three additional checks specific for the halal use case scenario:

- Check if AWB is complete and halal IATA code is clearly stated (*P7.3b*)

- Check if etiquette corresponds with AWB info (*P7.3c*)

- Check if damages are visible -> inform forwarder/shipper (*P7.3d*)

Then the truck is unloaded/shipments transferred from other carriers are received (*P7.4*) and the driver receives a receipt with name, date and time (*P7.4b*). P7 ends with

the screening of the freight (as applicable) with a dedicated x-ray machine (*P7.5*) and with a check to ensure the booking information matches the actual freight (*P7.6*).

6.1.2.2   Process P8: Accept shipments as ready for carriage
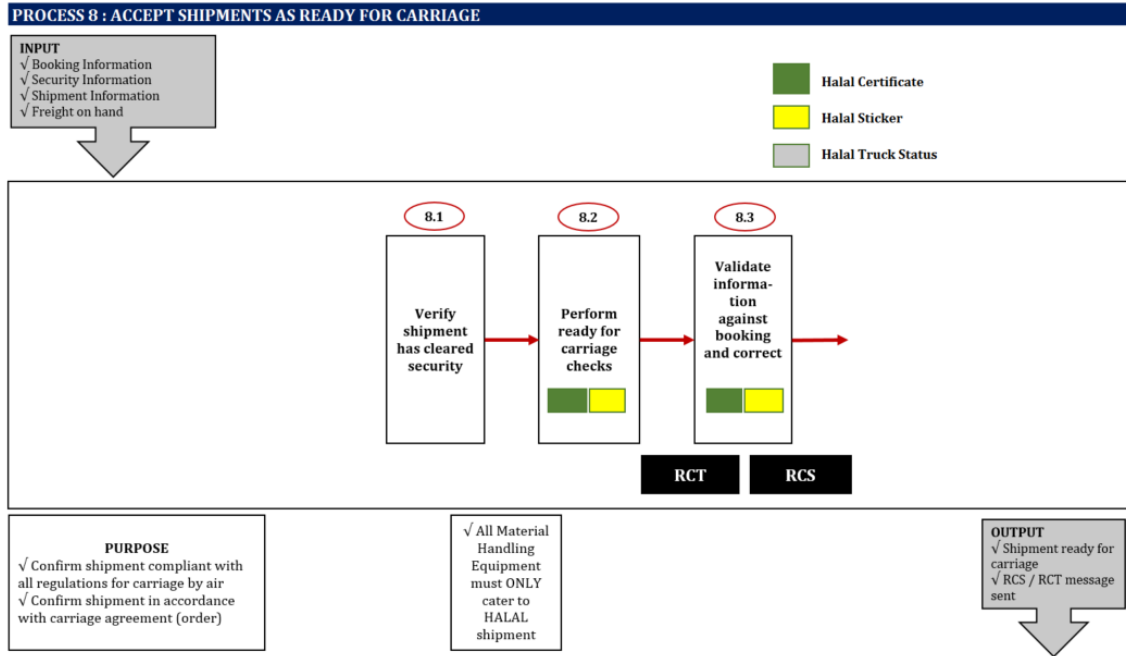
Figure 25:   Process 8
Self-elaboration

The purpose of process P8 is twofold. Firstly, it constitutes a formal validation of the compliance of the shipment to halal air carriage regulations and, secondly, it constitutes a confirmation that the shipment is in accordance with carriage agreement (e.g. the order). In particular, P8 includes verifying if the shipment has cleared security (*P8.1*), performing ready for carriage checks (*P8.2*), and validating the information against booking and correcting it if discrepancies emerge (*P8.3*). At this stage, the shipment is considered as accepted by the carrier and its corresponding FWB (Transfer of Electronic MAWB) message cannot be amended.

At the end of Section II, therefore, the shipment will be ready for carriage.

6.1.3 Transport Activities (Carrier) – Processes 9-13
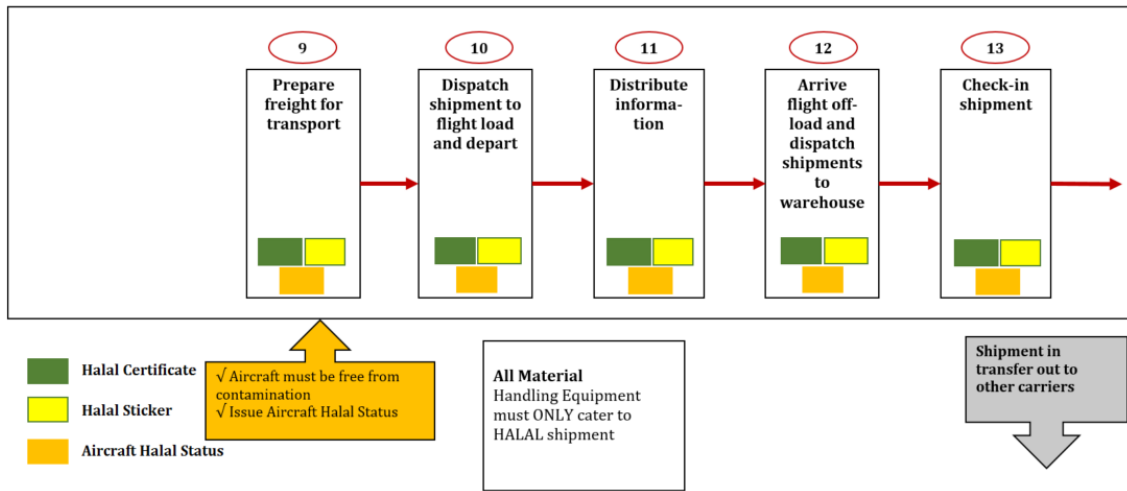
Figure 26: Processes 9-13
Self-elaboration

This section pertains to the material transportation of the shipment by the carrier and includes five processes, P9 through P13. In order to ensure a fully-compliant halal supply chain, the aircraft, too, must be free from any form of contamination during the transport activities of the carrier, and indeed, an Aircraft Halal Status should be issued (i.e. orange label in our exemplification above).

6.1.3.1 Process P9: Prepare cargo for transport
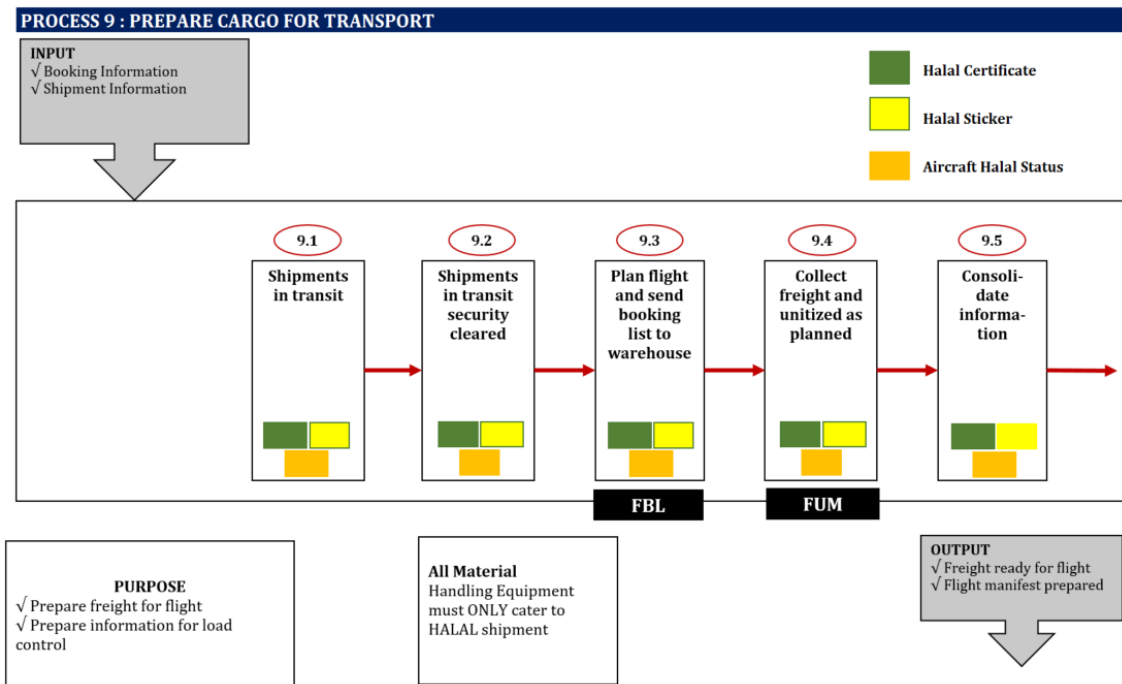
Figure 27: **Process 9**
Self-elaboration

The main purpose of P9 is to prepare the freight for the departure, including all information for load control.

All ULD/handling equipment must only cater to halal shipments (*P9.1*). Then, the necessary security checks are performed on the shipment (*P9.2*) and it is put in cold storage according to temperature range requirements (*P9.2b*). The next steps involve customs clearance of the shipment (*P9.2c*), planning of the flight and sending the booking list to the warehouse (*P9.3*) with the issue of the FBL message (Freight Booked List). After that, the freight is collected and, according to customer instructions, stored in a segregated halal build-up and storage area (which does not yet exist) (*P9.4*), with preconditioning of active/passive ULDs (*P9.4b*). Finally, the information is consolidated, and the following checks are performed (*P9.5*):

- Check if shipment is complete
- Check if shipment is not damaged
- Check if AWB label is available
- Check conformity
- Check security

6.1.3.2   Process P10: Send shipment to the flight
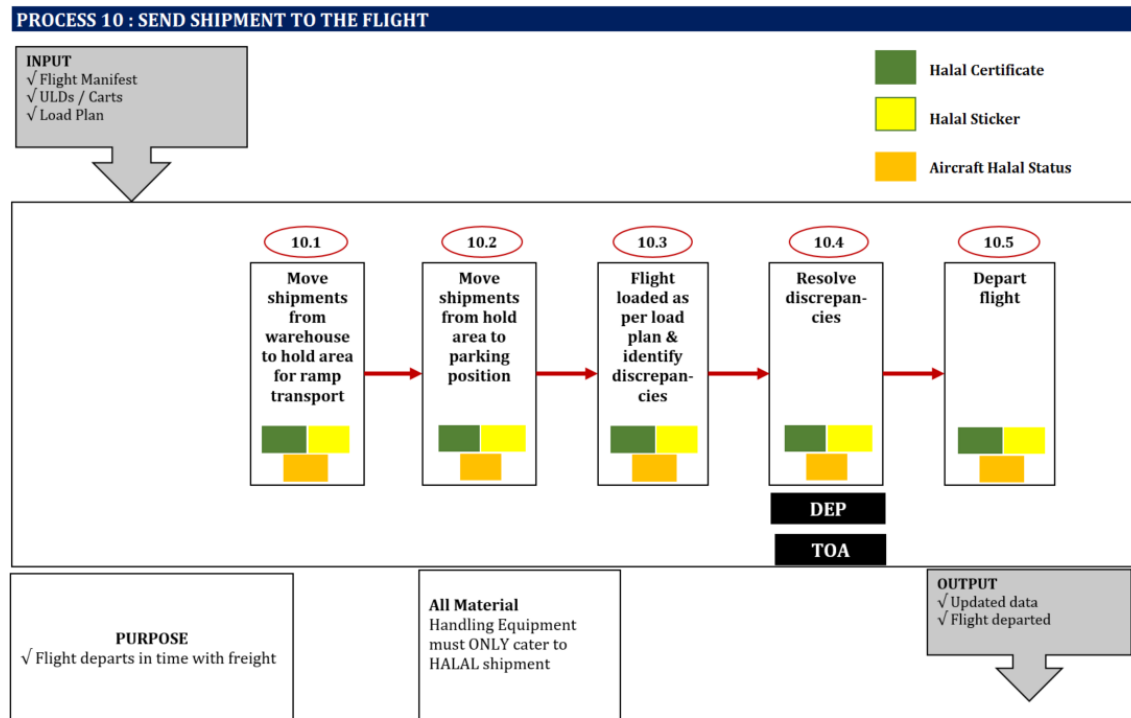
Figure 28:   Process 10
Self-elaboration

Process P10 starts with moving shipments from the warehouse to the hold area for ramp transport (*P10.1*) using ULD/handling equipment dedicated to halal shipments. The cargo is then protected against bad weather conditions (rain, snow) with thermal blankets/plastic foils (*P10.1b*) and moved from the holding area to the parking position (*P10.2*). In this regard, the shipment has to be placed next to the aircraft 4-6 hours before departure (tarmac times Frankfurt airport). Finally, a number of final checks and documentation flows are performed (*P10.2b*):

- Agreement of hand-over time with ramp agent

- Documentation of hand-over and archive

- Measurement of surface temperature at hand-over (if a certain temperature is required)

The shipment is then loaded into the aircraft according to the load sheet (*P10.3*). Possible discrepancies are identified and resolved (*P10.4*) and, finally, the flight departs on time with the freight (*P10.5*).

6.1.3.3 Process P11: Distribute information

PROCESS 11 : DISTRIBUTE INFORMATION

INPUT
√ Flight Information
√ Shipment Information

■ Halal Certificate
■ Halal Sticker
■ Aircraft Halal Status

11.1

Transit flight & shipment information down line stations & authorities

FBL   FMM   FWB

PURPOSE
√ Ensure shipments are expected
√ Ensure that all legal & regulatory requirements are met

All Material
Handling Equipment must ONLY cater to HALAL shipment

OUTPUT
√ Transmission of information at flight & shipment level

Figure 29:   Process 11
Self-elaboration

Flight and shipment information is transmitted to downline stations and authorities, including a halal avis (*P11.1*). A number of messages accompany this sub-process, namely FHL (House Manifest Message), FFM (Flight Manifest Message) and FWB (Waybill Message).

6.1.3.4   Process P12: Unload and dispatch shipment to warehouse
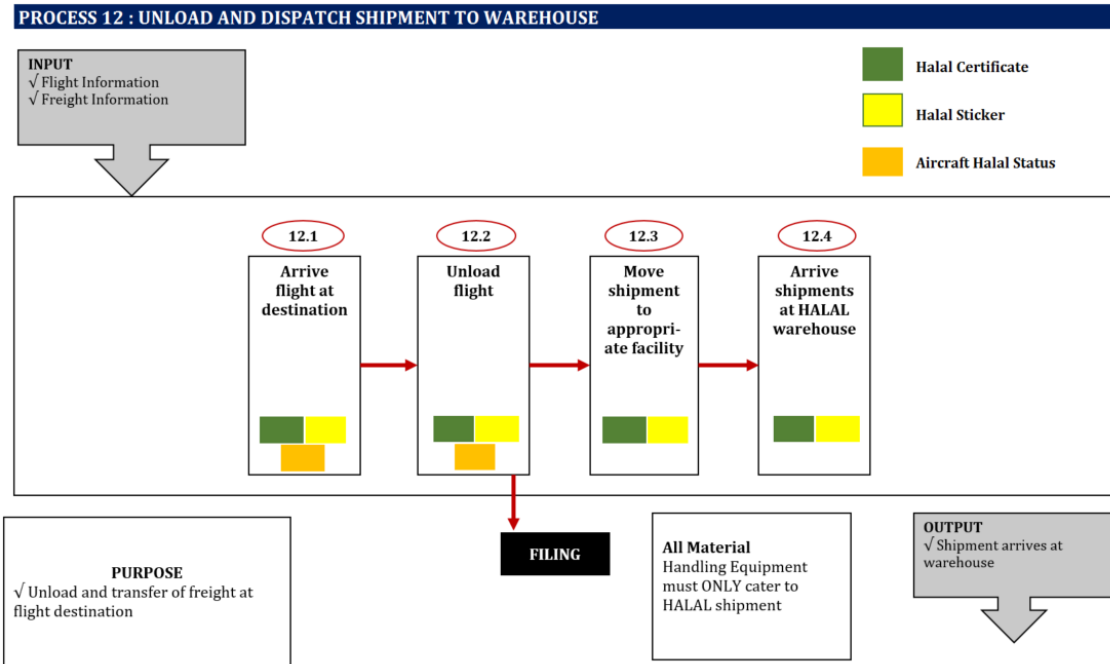
Figure 30:   Process 12
Self-elaboration

Process P12 pertains to the unloading and transferring of the shipment at the destination warehouse. The process is very straightforward: the flight arrives at its destination (*P12.1*) and is unloaded (*P12.2*). The shipment is first moved to the appropriate facility (*P12.3*) and finally arrives at a dedicated halal warehouse (*P12.4*). As soon as the flight is unloaded, the Aircraft Halal Status is filed including all critical details.

In addition, upon arrival at the warehouse, the following checks are performed:

Document checks:

- Halal cargo
- Check if customs check was done
- Check if customs stamp was done
- Check differences

Cargo checks:

- Certified halal shipper
- Origin of shipment
- Product type
- Halal label
- Halal certificate number

- Lot number

- Package intact

6.1.3.5   Process P13: Check-in shipment
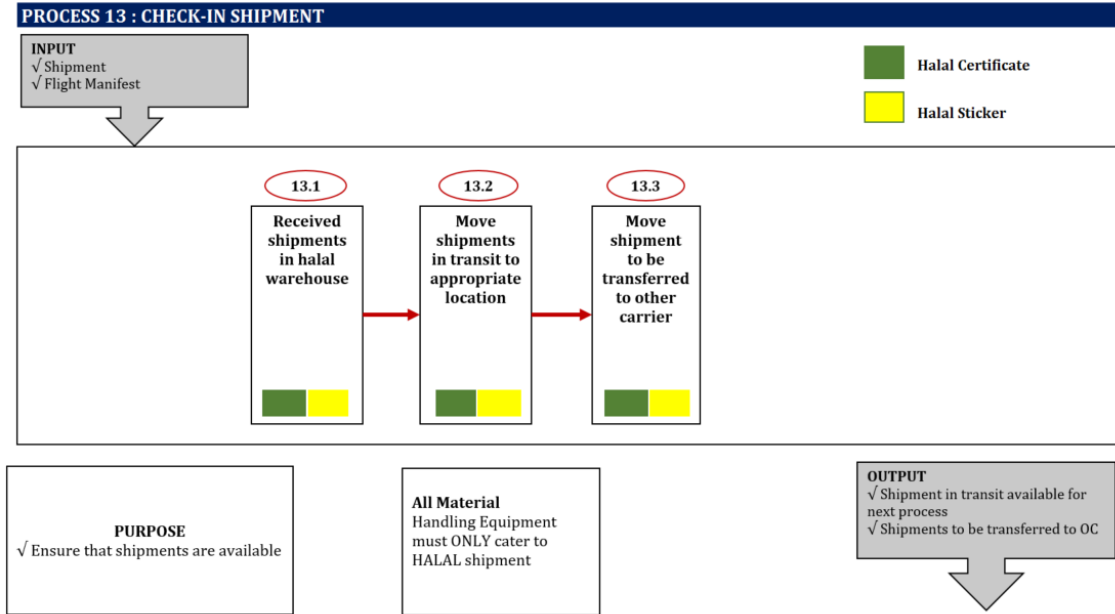
Figure 31:   Process 13
Self-elaboration

The shipment in transit received from process P12.4 (*P13.1*) will be moved to an appropriate halal storage location (*P13.2*) and/or moved to be transferred to other carriers (*P13.3*) with a halal cargo product. Similar to what we previously discussed (e.g. *P6.4 Arrival of truck at carrier domain*), segregated breakdown areas are mandatory at this stage.

6.1.4 Destination Activities (Carrier)
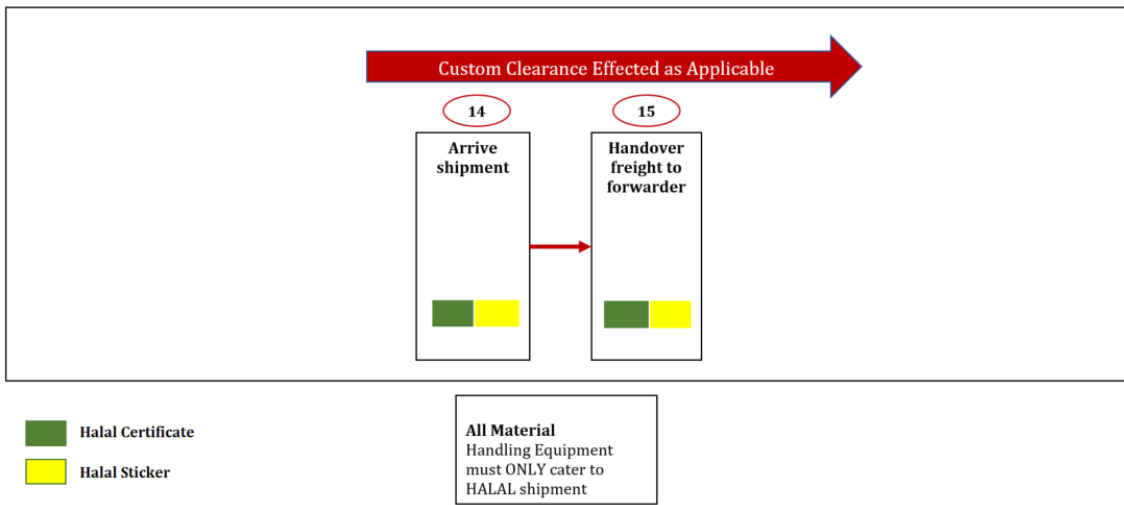
Figure 32: **Processes 14-15**
Self-elaboration

This section includes two processes, namely *P14 Arrive shipment* (at warehouse destination) and *P15 Handover freight to forwarder*.

6.1.4.1 Process P14: Arrive shipment
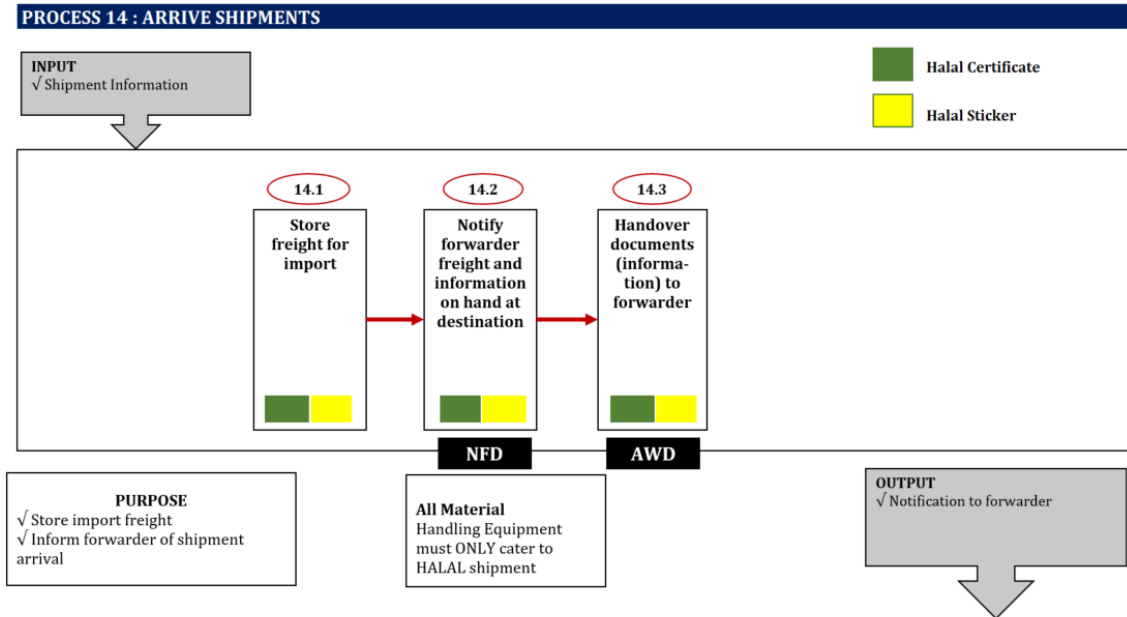
Figure 33: **Process 14**
Self-elaboration

After the arrival of the shipment, the freight will be stored for import (*P14.1*) according to the following rules:

1. Fish and vegetables are stored in special but non-halal specific areas, as fish and vegetables are halal products in any case
2. Halal meat is stored in the halal-dedicated meat section (marking on the floor); this section is located on the right hand side before the European meat and the international meat section of Fraport Perishable Center
3. Halal meat products have to go on dedicated halal wood pallets

A notification will be sent to the forwarder (NFD: Freight & Docs ready for Forwarder Pick Up) (*P14.2*), in which it is stated that the cargo and the documents are ready for pickup at the airline (handler). The information is then transferred to the forwarder (AWD: Documents Delivery to Forwarder) (*P14.3*).

6.1.4.2   Process P15: Handover freight to the forwarder

PROCESS 15 : HANDOVER FREIGHT TO THE FORWARDER

INPUT
√ Customs Release Form

Halal Certificate

Halal Sticker

15.1 — Check customs release status

15.2 — Prepare freight for handover

15.3 — Handover freight to forwarder

DLV

PURPOSE
√ Transfer custody of shipment to forwarder

All Material
Handling Equipment must ONLY cater to HALAL shipment

OUTPUT
√ Freight collected
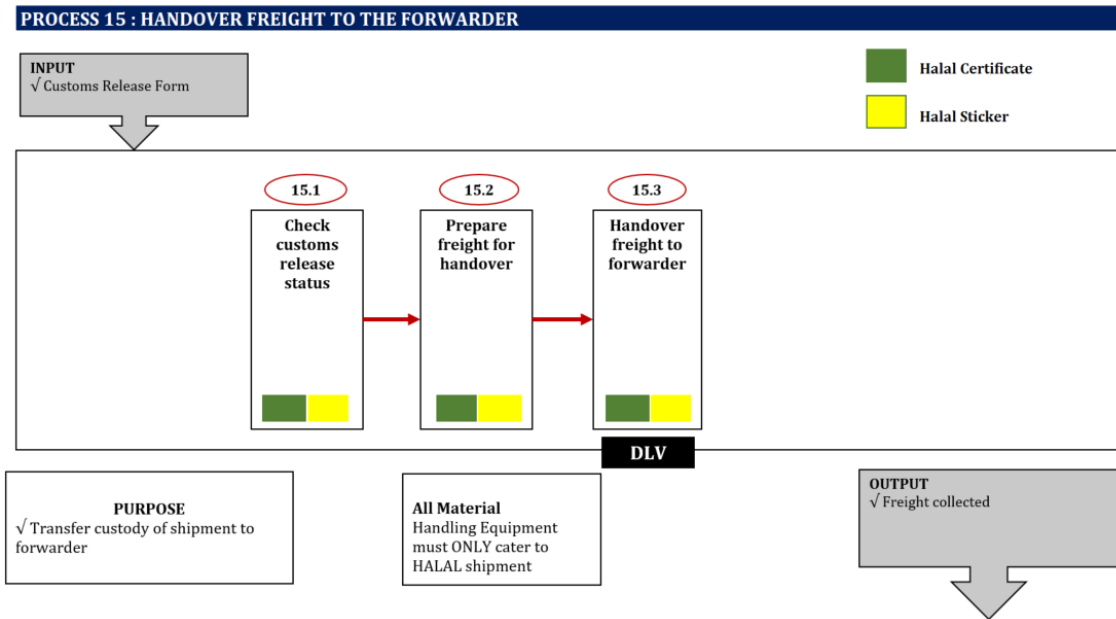
Figure 34:   Process 15
Self-elaboration

Process P15 includes *Check customs release status* (*P15.1*), *Prepare the freight for hand-over* (*P15.2*) and *Handover of freight to forwarder* with the issuance of DLV statement (*P15.3*).

6.1.5 Transport Activities (Carrier)
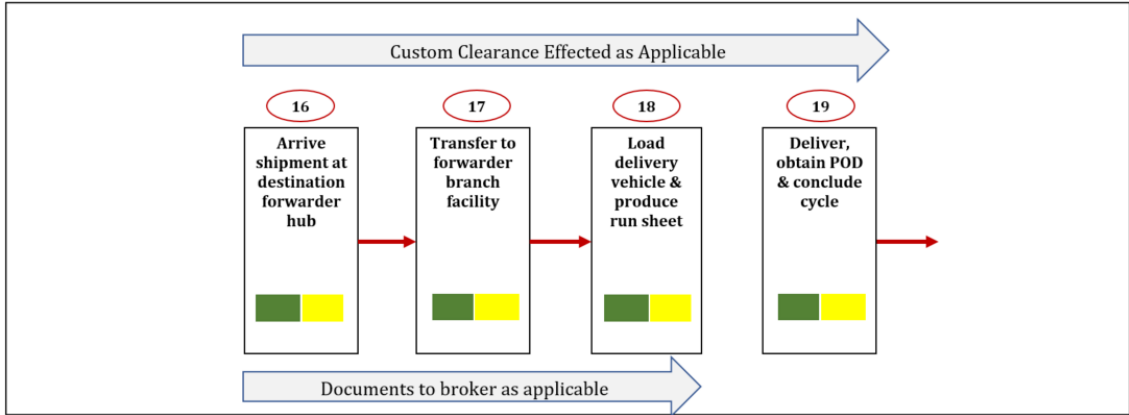
Figure 35: Processes 16-19
Self-elaboration

This last section includes the following four processes:

- P16: Arrive shipment at destination forwarder hub

- P17: Transfer to forwarder branch facility

- P18: Load delivery vehicle & produce run sheet

- P19: Deliver, obtain POD & conclude cycle

6.1.5.1 Process P16: Arrive shipment at forwarder hub
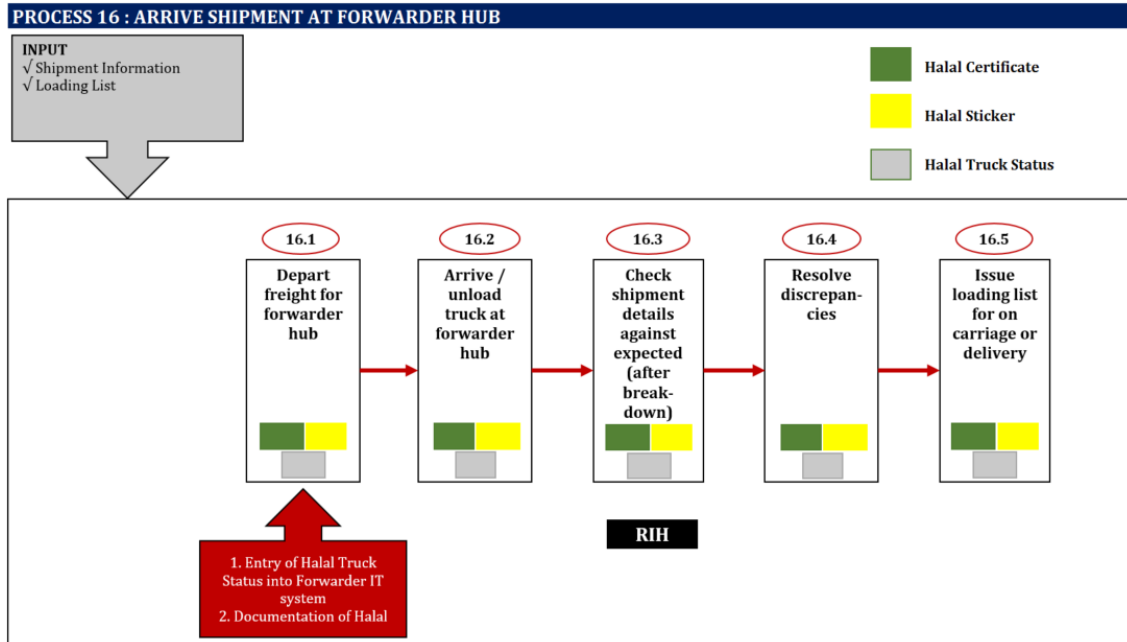
Figure 36: Process 16
Self-elaboration

The purpose of process P16 is to prepare the shipment for delivery or transfer to the forwarder branch facility. First, the freight departs for the forwarder hub (*P16.1*) with the following requirements:

- Entry of halal truck status into forwarder IT system

- Documentation of halal status on certificate

Then, the truck arrives at the forwarder hub and is unloaded using only halal-compliant tools (*P16.2*). After breakdown, the details of the shipment are checked against the expected details (*P16.3*), discrepancies are resolved (*P16.4*), and the loading list for on carriage or delivery is issued (*P16.5*). As it is apparent from the colours of the representation, and as already discussed above, the halal certificate and sticker as well as the halal truck status follow the shipment.

6.1.5.2 Process P17: Transfer shipment to forwarder branch facility

PROCESS 17 : TRANSFER SHIPMENT TO FORWARDER BRANCH FACILITY

INPUT
√ Shipment Information
√ Loading List

Halal Certificate

Halal Sticker

Halal Truck Status

17.1 Depart truck to forwarder branch facility

17.2 Arrive / unload truck at forwarder branch facility

17.3 Check / verify physical integrity of truckload

17.4 Resolve discrepancies

PURPOSE
√ Prepare shipment for delivery

All Material
Handling Equipment must ONLY cater to

FILING

OUTPUT

Figure 37:   Process 17
Self-elaboration

Process P17 involves all processes related to the transfer of the shipment to a specific facility into the forwarder domain. It mimics the previous process P16, in particular: *P17.1 Depart truck to forwarder branch facility, P17.2 Arrive/unload truck at forwarder branch facility, P17.3 Check/verify physical integrity of truckload,* and *P17.4 Resolve possible discrepancies.*

6.1.5.3 Process P18: Load truck and produce run sheet

PROCESS 18 : LOAD TRUCK AND PRODUCE RUN SHEET

INPUT
√ Shipment Information
√ Customer Information

Halal Certificate
Halal Sticker
Halal Truck Status

| 18.1 | 18.2 | 18.3 | 18.4 |
| Contact customer for handover instructions | Pick up freight by customer | Issue Loading List for truck to consignee / load truck | Depart truck from forwarder branch to consignee |

FORWARDER BRANCH FACILITY – DESIGNATED HALAL WAREHOUSE

PURPOSE
√ Prepare shipment for collection at the forwarder branch facility for final

All Material
Handling Equipment
must ONLY cater to

OUTPUT
√ Loading List
√ Freight ready for delivery

Figure 38:   Process 18
Self-elaboration

Process P18 is aimed at preparing the shipment for collection at the forwarder branch facility for final delivery to the consignee. More specifically, the customer is contacted for the handover instructions (*P18.1*), then the freight is picked up by the customer (*P18.2*) and, as a consequence, a loading list is issued for the halal truck to the consignee and the halal truck is loaded (*P18.3*). Finally, the halal truck departs from forwarder branch to consignee (*P18.4*).

6.1.5.4   Process P19: Load truck and produce run sheet
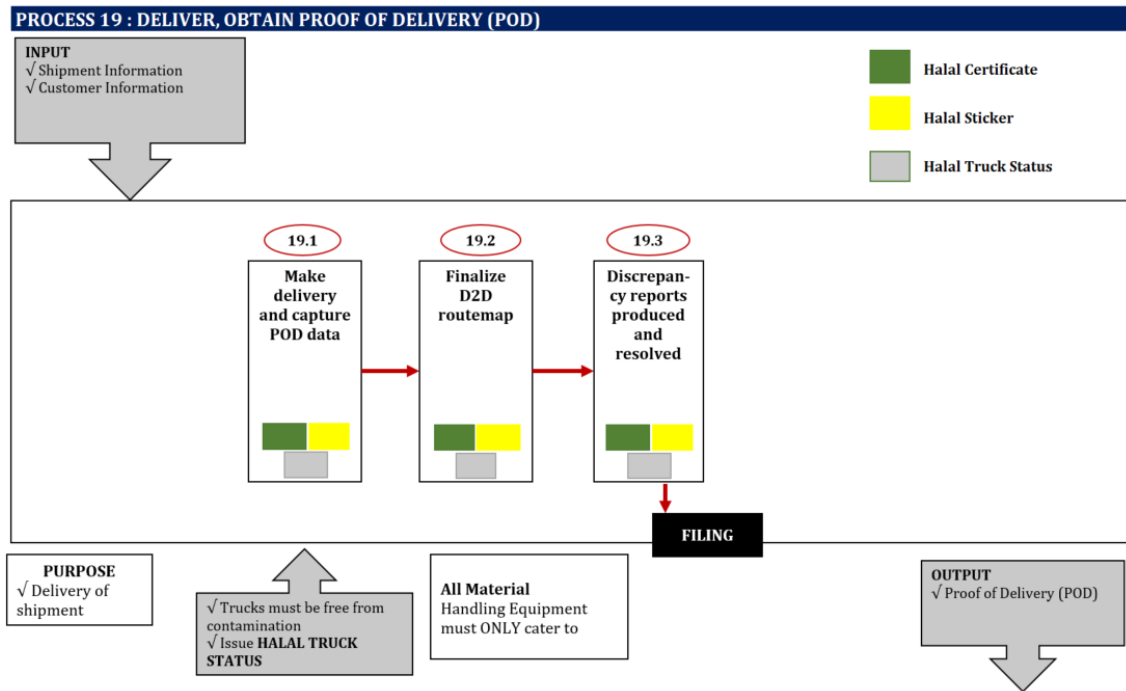
Figure 39:   Process 19
Self-elaboration

P19 starts with delivering the shipment and capturing the POD data (*P19.1*), then the Door-to-Door (D2D) route map is finalised (*P19.2*) and a final check of integrity of the shipment is performed, documentation of the halal status is produced and, where necessary, resolved (*P19.3*).

6.2   Potential issues and suggested implementation plan for the halal air cargo supply chain

The last section of this work is devoted to the implementation plan of an air cargo supply chain at Frankfurt Airport which is compliant – to different degrees – to the Malaysian Standards.

The following table provides a summary of

1. Column 1: The critical processes identified (IATA codification);
2. Column 2: Full compliance with the Malaysian Standards;
3. Column 3: Obstacles in implementing the Malaysian Standards in a non-Muslim country;
4. Column 4: A solution proposal with two levels, and an increasing level of complexity in the execution process.

	Process	Malaysian requirements	Potential issue	Level 1	Level 2
1	P1.1 Receive booking from shipper & check security status	The forwarder (or transporter) books the shipment with a special IATA code (HAL)	Code does not yet exist	Put halal specification in the comment box within the booking process (to be checked)	Update IATA code system including the dedicated HAL code for halal air cargo shipments
2	- P1.2 Shipper provides shipping details - P1.5 Confirm capacity - P2.1 Labelling freight	The forwarder (or transporter) checks the halal certification status of the shipper and the freight in order to accept the shipment	The majority of shippers in a non-Muslim Country do not hold a halal certification	Shipper has to check halal certificate of forwarder, truck company and airline, e.g. via internet.	Shipper can refer to a central halal data base, e.g. IATA capability data base.
3	- P2.3 Pickup freight; - P3.6 Sort & transfer freight to build or storage locations - P4.3 Loaded truck departs forwarder branch facility for hub - P7.4 Unload truck/Receive shipments transferred from other carriers - P10 Shipment to flight, load & depart - P12.2 Unload flight - 16.2 Arrive / unload truck at forwarder hub (destination)	All material handling equipment and tools must be dedicated exclusively to halal shipments	The average operator (shipper/forwarder/carrier/customer) does not have different handling equipment and tools for different purposes	Handling equipment and pallets are in principle used for all cargo; in case of visible contamination by non-halal goods, a cleansing ritual, Samak, has to be performed	Dedicated tools and equipment
4	- P3.6 Sort & transfer freight to build or storage locations - P12.4 Arrive shipments at warehouse - 16.2 Arrive / unload truck at forwarder hub (destination)	Build/storage area needs to be dedicated to halal products	Forwarders/warehouses outside Muslim Countries do not have dedicated areas for building or storage of halal products.	Dedicated, clearly marked and segregated storage areas in joint buildings.	Dedicated storage areas in separate buildings.

	Process	Malaysian requirements	Potential issue	Level 1	Level 2
5	- P2.3 Pickup freight - P6.2 Depart truck from forwarder hub to carrier domain - P7.4 Unload truck (Carrier domain) - P16.1 Depart freight for forwarder hub (destination) - P18.2 Pickup freight by Customer	The trucks used for the shipment must be dedicated exclusively to halal products	Forwarders (or transporters) use the same truck for different purposes or goods	Segregated trucks with physical separation and proper halal packaging	Dedicated trucks
6	- P3.1 Arrival of freight at forwarder branch facility; - P4.2 Issue loading list for truck to hub - P5.1 Arrival of truck at forwarder hub - P6.1 Issue loading list for truck to carrier / load freight - P7.4 Unload truck/Receive shipments transferred from other carriers (Carrier filing)	Forwarders and carriers need to file all the details about the truck's loading and unloading operations in their IT system	Forwarders and carriers need to create a dedicated information management system for the handling of halal products (similar to Bio or Pharma)	Update forwarders/carriers' internal information management system with specific halal handling workflow	Update forwarders/carriers' internal information management system with specific halal handling workflow
7	Section III – Transport Activities (Carrier) - Chapters 9 - 13	The aircraft used for shipment must be dedicated to halal products -> Aircraft Halal Status	Carriers outside Muslim countries do not have dedicated halal aircrafts	Halal products and pork-based products should not be mixed on one pallet or in one container	Dedicated halal pallet or container only inside the aircraft

6.2.1 Booking process

The first process to be considered for innovation is the booking process (*P1.1 Receive booking from shipper &check security status*). Indeed, the forwarder (or transporter) must book the shipment with a special IATA code (tentatively: "HAL") which does not yet exist. This process innovation would require approximately one year to be implemented. Therefore, we suggest an implementation plan consisting of the following:

- Level 1: Put halal specification in the comment box within the booking process; this option would make it possible to recognise the special halal shipment with all the procedural peculiarities related to it, but would not enable the forwarder to run analytics and statistics on the halal shipments;

- Level 2: Update IATA code system including the dedicated HAL code for halal air cargo shipments. Once implemented, all data manipulation would be possible, similarly to "Bio" or "Pharma" shipments.

6.2.2 Halal certification status

As for the halal certification status, for processes *P1.2 Shipper provides shipping details* and *P1.5 Confirm capacity*, the Malaysian Standards prescribe that the forwarder (or transporter) has to check the halal certification status of the shipper, otherwise the shipment cannot be accepted. Our assumption is that all shippers interested in an air cargo service that is fully compliant with halal requirements are operators that have already received certification from a halal certification body in the country of shipment (e.g. Germany). If this condition does not yet hold (e.g. the shipper produces halal products but has not yet applied for, or is in the process of obtaining certification), we suggest to overcome this issue by allowing the shipper to assume full responsibility for declaring the shipment halal-compliant. A validation system has to be put in place, however, at a certain step in the supply chain.

6.2.3 Handling equipment and tools

In many roles and functions discussed in the previous two sections, we encountered handling equipment and tools. A synthesis is provided in the table above. We found that, according to the Malaysian Standards, all material-handling equipment and tools must be dedicated exclusively to halal shipments. Potential issues arise when we consider that the average operator (shipper/forwarder/carrier/customer) does not have different handling equipment and tools for different purposes. Therefore, our proposal is:

- Level 1: As halal shipments have packaging as protection, generic tools and handling equipment could be used without any harm to the integrity of the shipment; dedicated halal pallets would be created and used for handling halal shipments. Moreover, in order to facilitate the handling procedures and decrease cross-contamination risks, the individual unit could also be protected through specific mitigation tools (e.g. a carton box

over the whole unit). In case of visible contamination by non-halal goods, a cleansing ritual, Samak, would have to be performed;

- Level 2: All ULD/handling equipment and tools must only cater to halal shipments.

6.2.4   Build and storage areas

As discussed in the previous sections, many processes pertaining to the for-warder/carrier/warehouse include the use of build and/or storage areas (e.g. *P3.6 Sort & transfer freight to build or storage locations*, *P12.4 Arrive shipments at warehouse*, *P16.2 Arrive/unload truck at forwarder hub (destination)*). As we saw in the section of this work dedicated to halal requirements, the Malaysian Standards require that all build/storage areas need to be dedicated to halal products. Of course, the initial dimension of the halal market in Germany does not allow the use of dedicated storage areas, as discussed with Mr. Koldevitz of the Perishable Center in Frankfurt Main Airport. Therefore, we suggest the following development plan, articulated in two levels:

- Level 1: As a starting point, we suggest the creation of properly segregated build and storage areas. In particular, we have identified the current European meat storage area as the designated area to handle all halal-related products;

- Level 2: Creation of dedicated build/storage areas at the forwarder/carrier/warehouse sites if needed.

6.2.5   Transportation: Trucks and planes

As for transportation, in this work we took into account both trucks (forwarder/warehouse/customer) and airplanes (carrier). In both cases, according to the Malaysian standards, trucks and airplanes should be dedicated to the transportation of only halal products and they would carry the labels "halal truck" and "halal plane", respectively. Once again, the application of the standards without any adjustments is not feasible, at least not in the introductory phase. Therefore, we propose the following two-level development plan to overcome these issues in a non-Muslim-dominant country:

Truck transport:

- Level 1: We suggest a properly segregated truck in which a physical separation (e.g. separating wall inside the truck) would exist between halal-certified products and allowed products (i.e. products which haven't been certified yet, but possess the declaration of the shipper). Obviously, mixing halal and non-halal products could never be allowed;

- Level 2: Only dedicated trucks used for transportation of halal products.

Air transport:

- Level 1: As suggested above for the build/storage areas, we suggest devoting a specific section inside the airplane to halal products; the units (i.e. pallets) and the mitigation tools (i.e. halal package) would reduce the probability of cross contamination inside the airplane to a minimum;

- Level 2: Only dedicated planes are used for transportation of halal products; however, this solution does not seem sustainable in a non-Muslim country unless justified by internal demand.

6.2.6   IT system

Since a fully-compliant halal supply chain represents a breakthrough and a challenge to the status quo in the air cargo industry, all the operators involved, namely shippers, forwarders, carriers, and customers, will need to adapt their internal IT systems to accommodate the information flow and data exchange related to the halal products. Since technological infrastructure is a prerequisite for the proper handling of a halal supply chain, the information systems of the operators involved need to be updated at Level 1 of the introduction plan, similar to what has been done for the Bio or Pharma products.

6.3 Specific requirements for the individual agents in the halal air cargo supply chain

6.3.1 Shipper

We assume that the shipper, being halal-certified (or awaiting certification), will observe the halal guidelines in each and every step of the production, handling and packaging & labelling process.

6.3.2 Carrier (both at origin and destination)

	Malaysian requirements	Potential issue	Level 1	Level 2
1	The trucks used for the shipment must be dedicated exclusively to halal products	Forwarders (or transporters) use the same truck for different purposes or goods	Segregated trucks with physical separation and proper halal packaging	Dedicated trucks
2	All material handling equipment and tools must be dedicated exclusively to halal shipments	The average operator (shipper/ forwarder / carrier / customer) does not have different handling equipment and tools for different purposes	Handling equipment and pallets are in principle used for all cargo; in case of visible contamination by non-halal goods, a cleansing ritual, Samak, has to be performed	Dedicated tools and equipment
3	Forwarders and carriers need to file all the details about the truck´s loading and unloading operations in their IT system	Forwarders and carriers need to create a dedicated information management system for the handling of halal products (similar to Bio or Pharma)	Update forwarders/carriers' internal information management system with specific halal-handling workflow	Update forward-ers/carriers' internal information management sys-tem with specific halal-handling workflow

6.3.3 Warehouse

	Malaysian requirements	Potential issue	Level 1	Level 2
1	All material handling equipment and tools must be dedicated exclusively to halal shipments	The average operator (shipper/forwarder/carrier/customer) does not have different handling equipment and tools for different purposes	Generic tools and handling equipment, halal pallets; in case of visible contamination by non-halal goods, a cleansing ritual, Samak, has to be performed	Dedicated tools and equipment
2	Build/storage area needs to be dedicated to halal products	Forwarders/warehouses outside Muslim countries do not have dedicated areas for building or storage	Properly segregated build/storage areas	Dedicated build/storage areas
3	Warehouses need to file all the details about the truck´s loading and unloading operations in their IT system	Forwarders and carriers need to create a dedicated information management system for the handling of halal products (similar to Bio or Pharma)	Update forwarders/carriers' internal information management system with specific halal-handling workflow	

6.3.4 Forwarder (Airline)

	Malaysian requirements	Potential issue	Level 1	Level 2
1	The airline books the shipment with a special IATA code (HAL)	Code does not yet exist	Put halal specification in the comment box within the booking process (to be checked)	Update IATA code system including the dedicated HAL code for halal air cargo shipments
2	All material handling equipment and tools must be dedicated exclusively to halal shipments	The average operator (shipper/forwarder/carrier/customer) does not have different handling equipment and tools for different purposes	Generic tools and handling equipment, halal pallets; in case of visible contamination by non-halal goods, a cleansing ritual, Samak, has to be performed	Dedicated tools and equipment
3	Airlines need to file all the details about the truck´s loading and unloading operations in their IT system	Airlines need to create a dedicated information management system for the handling of halal products (similar to Bio or Pharma)	Update forwarders/carriers' internal information management system with specific halal-handling workflow	
4	The aircraft used for shipment must be dedicated to halal products -> Aircraft Halal Status	Carriers outside Muslim countries do not have dedicated halal aircrafts	Segregated halal section inside the aircraft	Aircraft for halal only products

7.   Conclusions

Especially in the last decade, the global demand for halal products has seen a rapid expansion in both Muslim and non-Muslim dominant countries. To exploit this promising market, global supply chains must comply with specific halal standards in order to ensure the "farm to fork" principle. Besides the halal certification for the ingredients of imported products, Muslim-dominant countries (e.g. Malaysia, Indonesia, and the United Arab Emirates) are now requiring the application of the halal standards to the entire supply chain management. In this regard, Malaysia acted as the first mover by introducing halal certification in the context of logistics management.

In Europe, compliance with halal logistics standards is far from being fully accomplished. Nevertheless, some European seaports (e.g. Rotterdam in 2007, and Zeebrugge and Marseille in 2012) have already been partially or entirely certified and thus dominate halal logistics to and from Europe.

Perishable and high-value groceries, however, still need to be shipped by air cargo and this may create interesting business opportunities for airports and airlines keen to extend their skill set to halal logistics.

Halal logistics is currently still an under-investigated research field, especially in the specific context of the air cargo industry. To the best of our knowledge, the case study developed in Chapter 6 is the first empirical investigation into business process reengineering in halal logistics to be published in Europe.

More specifically, this research project has analysed the market potential for halal logistics in the air cargo industry from various perspectives and research questions, namely:

- ***Market demand:*** Are Muslims in Germany interested in consuming products with a halal certification? Would they be willing to pay a premium price for such products?

- ***Market supply***: How large is the air cargo import/export market for halal products, especially with reference to perishable groceries? How do importers and exporters value this market segment?

- ***Market requirements:*** Which are the main requirements for a halal-certified supply chain?

- ***Implementation plan and possible pitfalls***

As mentioned in the introduction, in order to accomplish the research goals, the Frankfurt University of Applied Sciences was supported by HALAL CONTROL GmbH, Lufthansa Cargo AG and Fraport AG.

7.1   Market demand

Our survey among 772 Muslims living in Germany produced a number of insightful observations, discussed in depth in Chapter 3 of this work. The following is a synthesis of our observations in form of bullet points:

- The demand for halal products is mainly driven by religious motives

- For the observant Muslim, consuming halal products is very important

- Almost all respondents stated they were willing to pay a premium for fully-compliant halal products

- Approximately 80% of the sample stated they were willing to pay a premium between +5% and +20% for halal products, while the remaining 20% of the sample declared +50% or more

- The most in-demand products (in descending order) were sweets, flavourings, meat, baked goods, soft drinks, dairy products and soup

- Regarding availability, 60% of the sample believed that physical distribution could be largely improved

- Discount supermarkets (e.g. Aldi, Lidl, etc.) and specialised halal consumer markets are the preferred physical shops for the sourcing of halal products

- Only 37% of respondents were sure of the integrity of the halal products they buy

- In order to assess the integrity of the halal product, the average customer normally relies upon the halal certificate of the producer and the halal label on the package

- Interestingly, the average customer had more trust in a halal certificate issued by a German certification body than a halal certificate released by the country of origin

7.2 Market supply

In order to provide the perspective of the producers of halal products, in Chapter 4 we conducted 20 expert interviews covering various subsectors in the food and cosmetics industry. The outlook the experts provided on the European halal market was particularly interesting. The following is a synthesis of the main insights in form of bullet points:

- Twelve of the experts interviewed perceived that the majority of end customers were not willing to pay a price premium for halal products

- Some experts believed that, if the markup applied were modest and the halal integrity could be proven, then the average customer might be willing to pay a premium

- The experts maintained that halal standards should also apply to the entire supply chain, but they did not know for sure whether those rules were really followed or enforced

- The experts believed that, in the near future, we will see a steady expansion of the halal market mainly due to the following four factors:

  o *Globalisation effect:* In order to be exported worldwide, the products will need to be such that they are accepted by other countries and all end consumers, regardless of religious orientation.

  o *National legislation/requirements:* As of 2019, and as one of several countries, Indonesia's more restrictive legislation will put pressure on the international market to produce more halal-certified goods.

- *European and German market:* Due to the increasing Muslim share of the population and the wave of refugees, the demand for halal products in Europe and Germany will continue to rise.

- *Consumer awareness:* Whether "organic", "regional", "gluten-free" or "lactose-free" – "halal" is one of several markets that has its specific requirements and where transparency in production is demanded. Customers want to know what they are eating in order to be able to decide whether the product meets their requirements.

7.3   Market requirements

In Chapter 5, we discussed the minimum set of features needed to characterise a halal supply chain as compliant with Shariah law. Stemming from the extant literature, our holistic approach to HSCM (Halal Supply Chain Management) revolved around 11 dimensions. The main implications for each one are as follows:

1. *Physical segregation:* Halal products must be kept properly separated from haram products in order to preserve their halal status
2. *HR management:* The company's management should appoint a Muslim representative responsible for operations and provide training about halal principles and best practices
3. *Storage and transport:* Transportation and warehousing at each distribution node are key factors for the preservation of halal integrity throughout the entire value chain. To this extent, dedicated storage areas or shelves should be used to avoid cross-contamination. In addition, halal products should be shipped in dedicated shipping storage units.
4. *Ethical practices:* The general concept of permissibility shall also be extended to all human actions and behaviours.
5. *Packaging and labelling*: One of the most critical issues in halal cross-contamination is the packaging material. In order to preserve halal integrity, if the packaging is made from raw materials of animal origin, it requires proper halal certification.
6. *Material handling*: Devices, utensils, machines, processing aids and equipment shall not be made of or contain any haram materials and shall be used only for halal food
7. *Islamic dietary law:* Religion accounts for most of the food habits of the Muslim community and only permitted food shall be consumed
8. *Resource availability:* The company's management should ensure sufficient resources for the halal control system
9. *Innovative capability:* In the specific halal industry context, innovation may involve pioneering tracking and production technologies and complex systems which implement an innovative combination of barcodes, Global System for Mobile Communications (GSM) and internet technologies to enhance halal transparency
10. *Cleanliness:* The organisation shall ensure that the appropriate cleansing ritual is performed according to the respective degree of contamination.
11. *Safety*

7.4 Implementation plan and possible pitfalls

Chapter 6 was devoted to the empirical application of the aforementioned principles to the business case of Frankfurt Airport. Being the most critical and important part of this report, we ask the reader to refer to Chapter 6 for the details of said application. In this final section, we will summarise the main insights from the analysis, underlining the potential pitfalls that may arise during the real-life implementation of such a business process reengineering exercise.

7.4.1 Booking process

- *Potential issue*: The forwarder (or transporter) must book the shipment with a special IATA code (tentatively: "HAL") which doesn't yet exist.

- *Level 1 solution:* Put halal specification in the comment box within the booking process so the special halal shipment will be recognised.

- *Level 2 solution:* Update IATA code system including the dedicated HAL code for halal air cargo shipments.

7.4.2 Halal certification status

- *Potential issue*: The forwarder (or transporter) has to check the halal certification status of the shipper, otherwise the shipment cannot be accepted.

- *Level 1 solution:* The shipper has to check halal certificate of forwarder, truck company and airline, e.g. via the internet.

- *Level 2 solution:* The shipper can refer to a central halal data base, e.g. IATA capability data base.

7.4.3 Halal equipment and tools

- *Potential issue*: All material-handling equipment and tools must be dedicated exclusively to halal shipments. The average operator (shipper/forwarder/carrier/customer), however, does not have different handling equipment and tools for different purposes.

- *Level 1 solution:* Generic tools and handling equipment could be used without any harm to the integrity of the shipment, as long as dedicated halal pallets are created and used for handling halal shipments. The individual unit could also be protected through specific mitigation tools (e.g. a carton box over the whole unit).

- *Level 2 solution:* All ULD/handling equipment and tools must only be used for halal shipments.

7.4.4 Build and storage areas

- *Potential issue*: Many processes pertaining to the forwarder/carrier/warehouse include the use of build and/or storage areas; however, the Malaysian Standards prescribe that all build/storage areas need to be dedicated to halal products.

- *Level 1 solution:* Creation of properly segregated build and storage areas (e.g. the current European meat storage area at Fraport Perishable Center).

- *Level 2 solution:* Creation of dedicated build/storage areas at the forwarder/carrier/warehouse sites if needed.

7.4.5 Transportation: Tracks and Plane

- *Potential issue*: Trucks and airplanes should be dedicated to the transportation of only halal products and they would carry the labels "halal truck" and "halal plane", respectively.

- *Level 1 solution (Truck):* Properly segregated truck in which a physical separation (e.g. separating wall inside the truck) would exist between halal-certified products and allowed products (i.e. products which have not yet been certified, but possess the declaration of the shipper).

- *Level 2 solution (Truck):* Only dedicated trucks used for transportation of halal products.

- *Level 1 solution (Plane):* A specific section inside the airplane could be devoted to halal products. The units (i.e. pallets) and the mitigation tools (i.e. halal package) would reduce the probability of cross contamination inside the airplane to a minimum.

- *Level 2 solution (Plane):* Only dedicated planes could be used for transportation of halal products; however, this solution does not seem sustainable in a non-Muslim country unless justified by internal demand.

7.4.6 IT system

- *Potential issue*: Shippers, forwarders, carriers, and customers need to adapt their internal IT systems to accommodate the information flow and data exchange related to halal products.

- *Level 1 solution:* Since technological infrastructure is a prerequisite for the proper handling of a halal supply chain, the information systems of the operators involved need to be updated at Level 1 of the introduction plan, similar to what has been done for Bio or Pharma products.

8.   Annex: Questionnaire for the expert interviews

1. Welche   Produkte/Dienstleistungen   verkaufen   Sie?
   Which products/services are you selling?

2. Sind   Sie   mit   dem   Halal-Konzept   vertraut?
   Are you acquainted with the halal concept?

3. Verkaufen/Produzieren   Sie   Halal-Produkte?
   Are you selling/producing halal products?

4. Welche Ihrer Produkte sind halal? Wie viel Prozent des Volumens sind halal?
   Which of your products are halal? How much of your volume/capacity is dedicated to halal products?

5. Wie viel Prozent Ihres Jahresumsatzes und Ihres Volumens erwirtschaften Sie durch Halal-Produkte?
   Which percentage of your annual turnover is achieved by selling halal products?

6. Warum vertreiben Sie Halal-Produkte? Wie sind Sie auf die Idee gekommen?
   Why are you distributing halal products? How did you come up with that idea?

7. Ist Ihre Ware halal-zertifiziert? Wer stellt das Zertifikat aus? Was sind die Kriterien für   eine   Zertifizierung?
   Are your goods halal-certified? Who issues the certificate? What are the criteria for certification?

8. Achten Sie bei der Transport-/Produktions-/Lager- /Vertriebskette auf halal?
   Do you follow halal standards with respect to your transport/production/ warehouse and distribution chain?

9. Welche Verkehrsträger nutzen Ihre Produkte (Luft, Wasser, Schiene, Straße)?
   Which carriers do you use for the transportation of your products (air, water, rail, roads)?

10. Existiert bei Ihnen eine Abteilung/ein Verantwortlicher/eine Verantwortliche, der/die sich für die Halal-Logistik, -Vertrieb, -Lagerung verantwortlich zeigt?
    Do you have a division / a person in charge who is accountable for halal logistics, distribution and warehousing?

11. Worauf achten Ihre Kunden bei Halal-Produkten? Welche Erfahrungen haben Sie mit Ihren Kunden gemacht? Welche Schwerpunkte setzen diese, um ein Produkt als halal zu identifizieren?
What do your customers pay attention to when buying halal products? What are your experiences with your customers? How do they identify a halal product?

12. Welche Preisbereitschaft erkennen Sie bei Ihren Kunden bezüglich Halal-Qualität? Sind Ihre Kunden bereit, einen Preisaufschlag im Vergleich zu Nicht-Halal-Produkten zu zahlen und wenn ja welchen (prozentual)?
How do you consider your customer's willingness to pay for a quality halal product? Are your customers willing to pay a premium price for a halal product in comparison to a non-halal product and if yes, which one (in percent)?

13. Was ist aus Ihrer Sicht der Hauptgrund für Ihre Kunden beim Kauf von Halal-Produkten?
From your point of view, what is the main reason your customers purchase halal products?

14. Ist es für Sie einfach, in Deutschland Kunden für Halal-Produkte zu finden?
Is it easy for you to find customers for halal products in Germany?

15. Wo vertreiben Sie Ihre Produkte? Vertreiben Sie Ihre Halal-Produkte online?
Where are you selling your products? Are you distributing your halal products online?

16. Wie sehen Sie die Entwicklung des Halal-Marktes? Wie sehen Sie die Entwicklung der Kundenbedürfnisse bei Halal-Produkten und was halten Sie für wichtig?
How do you view the development of the halal market? How do you see the development of customer requirements regarding halal products, and what do you consider to be important?

9.   References

Ab Talib, M.S. and Mohd Johan (2012), "Issues in halal packaging: a conceptual paper", *International Business and Management*, Vol. 5 No. 2, pp. 94–98.

Adams, I.A. (2011), "Globalization: Explaining the dynamics and challenges of the ḥalāl food surge", *Intellectual Discourse*, Vol. 19 No. 1.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational behavior and human decision processes*, Vol. 50 No. 2, pp. 179–211.

Alam, S.S. and Sayuti, N.M. (2011), "Applying the Theory of Planned Behavior (TPB) in halal food purchasing", *International journal of Commerce and Management*.

Al-Qaradawi, S.Y. (2007), *The Halal and Haram in the Private Life of a Muslim. The Lawful and Prohibited in Islam*, Lahore, Pakistan: Al-Falah Foundation.

Amin, H., Lada, S. and Tanakinjal, G. (2009), "Predicting intention to choose halal products using theory of reasoned action", *International Journal of Islamic and Middle Eastern Finance and Management*, Vol. 2, pp. 66–76.

Awan, H.M., Siddiquei, A.N. and Haider, Z. (2015), "Factors affecting Halal purchase intention–evidence from Pakistan's Halal food sector", *Management Research Review*.

Aziz, Y.A. and Chok, N.V. (2013), "The role of Halal awareness, Halal certification, and marketing components in determining Halal purchase intention among non-Muslims in Malaysia: A structural equation modeling approach", *Journal of International Food & Agribusiness Marketing*, Vol. 25 No. 1, pp. 1–23.

Azjen, I. (1980), "Understanding attitudes and predicting social behavior", *Englewood Cliffs*.

Bahrudin, S.S.M., Illyas, M.I. and Desa, M.I. (Eds.) (2011), *Tracking and tracing technology for halal product integrity over the supply chain*, IEEE.

Bogner, A., Littig, B. and Menz, W. (2009), *Interviewing experts*, Springer.

Bonne, K. and Verbeke, W. (2008), "Muslim consumer trust in halal meat status and control in Belgium", *Meat science*, Vol. 79 No. 1, pp. 113–123.

Bonne, K., Vermeir, I., Bergeaud-Blackler, F. and Verbeke, W. (2007), "Determinants of halal meat consumption in France", *British Food Journal*.

Dali, N., Nooh, M.N.B., Nawai, N.B., Mohammad, H.B., Nilai, B.B. and Sembilan, N. (2009), "İs halal products are more expensive as perceived by the consumers? Muslimprenuers challenges and opportunities in establishing a blue ocean playing field", *Journal of Management & Muamalah*, Vol. 2, pp. 39–62.

Department of Standards Malaysia (2019), *Malaysian Standard MS 1500:2019: Halal food - General requirements,* Third revision.

DinarStandard (2019), "State of the Global Islamic Economy 2019/20 Report", available at: https://www.salaamgateway.com/specialcoverage/SGIE19-20 (accessed 11 February 2021).

Elasrag, H. (2016), *Halal industry: Key challenges and opportunities*, Hussein Elasrag.

Fathi, E., Zailani, S., Iranmanesh, M. and Kanapathy, K. (2016), "Drivers of consumers' willingness to pay for halal logistics", *British Food Journal*.

Fishbein, M. and Ajzen, I. (1975), "Belief", *Attitude, Intention and Behavior: An Introduction to Theory and Research*, Vol. 578.

Gayatri, G. and Chew, J. (2013), "How do Muslim consumers perceive service quality?", *Asia Pacific Journal of Marketing and Logistics*.

German Meat GmbH (2021), "Fleisch aus Detuschland", available at: https://german-meat.org/ (accessed 22 March 2021).

Ghazali, E.M., Mutum, D.S., Rashid, M. and Ahmed, J.U. (2019), "Management of shari'ah compliant businesses", *Switzerland: Springer*, pp. 144–145.

GIFR (2013), *Global Islamic Finance Report 2013* (accessed 11 February 2021).

GIFR (2017), *Global Islamic Finance Report 2017* (accessed 11 February 2021).

HalalFocus.net (2014), "European halal market worth an estimated $30bn - HalalFocus.net - Daily Halal Market News", available at: https://halalfocus.net/european-halal-market-worth-an-estimated-30bn-2/ (accessed 11 February 2021).

Hanzaee, K.H. and Ramezani, M.R. (2011), "Intention to halal products in the world markets", *Interdisciplinary Journal of Research in Business*, Vol. 1 No. 5, pp. 1–7.

Haug, S., Müssig, S. and Stichs, A. (2009), *Muslimisches Leben in Deutschland: Im Auftrag der Deutschen Islam Konferenz*, DEU.

HKTDC (2014), "Halal in Malaysia: beyond food and drink sector | Hong Kong Means Business", available at: https://hkmb.hktdc.com/en/1X09Y7JW/hktdc-research/Halal-in-Malaysia-beyond-food-and-drink-sector (accessed 11 February 2021).

Jaafar, H.S., Endut, I.R., Faisol, N. and Omar, E.N. (2011), "Innovation in logistics services–halal logistics".

Jaafar, H.S., Faisol, N., Rahman, F.A. and Muhammad, A. (2017), "Halal logistics vs Halal supply chain: A preliminary insight", *Contemporary Issues and Development in the Global Halal Industry, Springer, Singapore*, pp. 579–588.

Kaiser, R. (2014), *Qualitative Experteninterviews: Konzeptionelle Grundlagen und praktische Durchführung*, Springer-Verlag.

Khan, A. and Azam, M.K. (2016), "Factors influencing halal products purchase intention in India: preliminary investigation", *IUP Journal of Marketing Management*, Vol. 15 No. 1, p. 20.

Lodhi, A. (2010), "Understanding Halal Food Supply Chain (second)", *HFRC UK Ltd, London*.

Marzuki, S.Z.S., Hall, C.M. and Ballantine, P.W. (2012), "Restaurant managers' perspectives on halal certification", *Journal of Islamic Marketing*.

Mayring, P. (2015), "Qualitative content analysis: Theoretical background and procedures", in *Approaches to qualitative research in mathematics education*, Springer, pp. 365–380.

Meuser, M. and Nagel, U. (1991), "ExpertInneninterviews—vielfach erprobt, wenig bedacht", in *Qualitativ-empirische sozialforschung*, Springer, pp. 441–471.

Mukhtar, A. and Butt, M.M. (2012), "Intention to choose Halal products: the role of religiosity", *Journal of Islamic Marketing*.

Omar, E.N., Jaafar, H.S., Osman, M.R. and Nasruddin, F. (2013), "Halalan Toyyiban supply chain the new insights in sustainable supply chain management".

Pahim, K.M.B., Jemali, S. and Mohamad, S. J. A. N. S. (2012), "An empirical research on relationship between demand, people and awareness towards training needs: A case study in Malaysia Halal logistics industry", *In 2012 IEEE Business, Engineering & Industrial Applications Colloquium (BEIAC)*, pp. 246-251.

Pew Research Center (2011), "The future of the global muslim population", 27 January, available at: https://www.pewforum.org/2011/01/27/the-future-of-the-global-muslim-population/.

Pew Research Center (2017a), "Europe's Growing Muslim Population", 2017, available at: https://www.pewforum.org/2017/11/29/europes-growing-muslim-population/ (accessed 11 February 2021).

Pew Research Center (2017b), "The Growth of Germany's Muslim Population", 29 November, available at: https://www.pewforum.org/essay/the-growth-of-germanys-muslim-population/ (accessed 11 February 2021).

Pew Research Center (2021), "Religion & Public Life Project - Global Religious Futures", 2021, available at: http://globalreligiousfutures.org/explorer#/?subtopic=15&chartType=bar&year=2030&data_type=number&religious_affiliation=all&destination=to&countries=Worldwide&age_group=all&gender=all&pdfMode=false (accessed 11 February 2021).

Riaz, M.N. and Chaudry, M.M. (2003), *Halal food production*, CRC press.

Saheb, M.E.D. (2012), "The Laws of Halal and Haram Animals", available at: http://askimam.org/public/question_detail/22647 (accessed 6 January 2021).

Samsi, S.Z.M., Ibrahim, O. and Tasnim, R. (2012), "Review on knowledge management as a tool for effective traceability system in Halal food industry supply chain", *Journal of Research and Innovation in Information Systems*, Vol. 1, pp. 78–85.

Shaari, J., Ottot, H. and Kermin, M.F. (Eds.) (2013), *Halal; organic; and preservative: marketing concept for bread industry*.

Shaari, J.A.N. and Mohd Arifin, N.S. (2009), "Dimension of halal purchase intention: A preliminary study".

Shafii, Z. and Khadijah, W.W.S.N. (2012), "Halal traceability framework for halal food production", *World Applied Sciences Journal*, Vol. 17 No. 12, pp. 1–5.

Soong, S.F.V. (2007), "Managing halal quality in food service industry".

Statista (2013), "Monthly household consumer spend by segment Germany", available at: https://www.statista.com/statistics/519465/monthly-household-consumer-spend-by-segment-germany/ (accessed 11 February 2021).

Stichs, A. (2016), "Wie viele Muslime leben in Deutschland? Eine Hochrechnung über die Anzahl der Muslime in Deutschland zum Stand 31. Dezember 2015; im Auftrag der Deutschen Islam Konferenz", *1865-4967*.

Talib, M., Hamid, A.B., Zulfakar, M. and Jeeva, A. (2014), "Halal logistics PEST analysis: the Malaysia perspectives", *Asian Social Science*, Vol. 10 No. 14, pp. 119–131.

Talib, M.S.A., Hamid, A.B.A., Zulfakar, M.H. and Chin, T.A. (2015), "Barriers to Halal logistics operation: views from Malaysian logistics experts", *International Journal of Logistics Systems and Management*, Vol. 22 No. 2, pp. 193–209.

Thomson Reuters (2013), "State of the Global Islamic Economy (SGIE) Report 2013", 2013, available at: http://www.eat-halal.com/thomson-reuters-state-global-islamic-economy-report-2013/ (accessed 18 November 2020).

Thomson Reuters (2019), "Indonesia to postpone halal label deadline amid industry concerns", available at: https://www.reuters.com/article/us-indonesia-economy-halal-idUSKCN1Q40MZ (accessed 22 March 2021).

Tieman, M. (2013), "Establishing the principles in halal logistics", *Journal of Emerging Economies and Islamic Research*, Vol. 1 No. 1, pp. 19–31.

Tieman, M. (2015), "Halal clusters", *Journal of Islamic Marketing*.

Tieman, M., Van der Vorst, Jack GAJ and Ghazali, M.C. (2012), "Principles in halal supply chain management", *Journal of Islamic Marketing*.

van der Spiegel, M., van der Fels-Klerx, H.J., Sterrenburg, P., van Ruth, S.M., Scholtens-Toma, I.M.J. and Kok, E.J. (2012), "Halal assurance in food supply chains: Verification of halal certificates using audits and laboratory analysis", *Trends in Food Science & Technology*, Vol. 27 No. 2, pp. 109–119.

Van der Vorst, J. G. (2000), "Effective food supply chains: generating, modelling and evaluating supply chain scenarios".

Verbeke, W., Rutsaert, P., Bonne, K. and Vermeir, I. (2013), "Credence quality coordination and consumers' willingness-to-pay for certified halal labelled meat", *Meat science*, Vol. 95 No. 4, pp. 790–797.

Wan Omar, W. (2017), "Developing a model for halal food supply chain implementation".

Yang, Y. and Bao, W. (2010), "The design and implementation of halal beef wholly quality traceability system", International Conference on Computer and Computing Technologies in Agriculture, pp. 464–472.

Yusoff, F.A.M., Yusof, R.N.R. and Hussin, S.R. (2015), "Halal Food Supply Chain Knowledge and Purchase Intention", *International Journal of Economics & Management*, Vol. 9.

Zailani, S., Arrifin, Z., Abd Wahid, N., Othman, R. and Fernando, Y. (2010), "Halal traceability and halal tracking systems in strengthening halal food supply chain for food industry in Malaysia (a review)", *Journal of food Technology*, Vol. 8 No. 3, pp. 74–81.

Zailani, S., Iranmanesh, M., Aziz, A.A. and Kanapathy, K. (2017), "Halal logistics opportunities and challenges", *Journal of Islamic Marketing*.

Zulfakar, M.H., Chan, C. and Jie, F. (2014), "Factors Influencing the Operations of the Halal Meat Supply Chain in Australia", *Proceedings of the19th ISL International Symposium on Logistics, University of Nottingham, Nottingham (pp. 1-8)*.

Zulfakar, M.H., Jie, F. and Chan, C. (2012), "Halal food supply chain integrity: from a literature review to a conceptual framework", *10th ANZAM Operations, Supply Chain and Services Management Symposium*, Vol. 61.

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