

Industrial Revolution 4.0 Halal Supply Chain Management: A Theoretical Framework

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Abstract: Purpose – Halal supply chain management will lead to the customers' satisfaction, which will contribute to the development of halal food industry. The purpose of this study is to explore the theoretical framework for halal supply chain management in industrial revolution 4.0 environment and its importance towards customers' satisfaction.

Design / methodology – Research paper/ journal

Findings – The findings of this study provide evidence that Halal Assurance Services, Halal Service Diversity, Halal Service Procedure, Support of Research Institutes and Universities, Law and Policy Regarding Employment, Improved IT Security and Standards and Information Transparency have significant relationships with the Industrial Revolution 4.0 Halal Supply Chain Management.

Originality / value – This study provides useful information in understanding the importance of halal supply chain management for the halal food industry upon implementation of Industrial Revolution 4.0.

Keywords – Industrial Revolution 4.0, Halal Supply Chain Management, Halal Food Industry, Customers' Satisfaction

Paper type – Conceptual Paper.

I. Introduction

Our nation is progressing gradually towards Industrial Revolution 4.0 (IR 4.0). Therefore, the Malaysian Ministry of International Trade and Industry (MITI) tabled the National Policy for IR 4.0 to help advance the country's businesses and factories. This will ideally help the local industries to increase productivity, efficiency, quality, and to develop new skills and talent with the people. Due to advances in disruptive technologies, it has gained momentum through the Internet of Things (IoT), big data, cloud computing, and cyber-physical (CPS) systems. IR 4.0 has emerged as the promising technology for achieving performance, precision and accuracy. Several researchers have previously suggested the theoretical framework and findings of the IR 4.0 implementation. Such studies have suggested that technology allows data operations, improves efficiency and decreases manufacturing energy wastage (Nascimento et al., 2019).

IR 4.0 was first introduced during the Hannover Messe in year 2011 and officially declared as a German strategic initiative in 2013 to revolutionize the manufacturing industry (Xu et al., 2018). IR 4.0 steers the establishment of smart and dynamic production systems and the mass production of highly customized products (Shrouf et al., 2014). This involves implementing integrated digital elements, which monitor and control the physical devices, sensors, information and communication technologies (ICT) and Internet of Things (IoT) applications (Lasi et al., 2014). Specific aspects may undermine IR 4.0 adoption, especially in manufacturing companies within developing economies, including overall lower technological intensity, restricted investment capital and human resources (Anderl, 2014). Thus, halal supply chain management needs further upgrade before implementation to all levels of the halal food industry in Malaysia.

From a manufacturing process perspective, implementing technologies such as "production remote monitoring and control" and "sensors for the identification and control of product and operating conditions" can enable rapid identification of potential issues that may disturb the original production schedule and negatively impact the pace of production (Sanders et al., 2017; Buer et al., 2018). These such application of ICT within manufacturing processes thus contributes to a quicker problem-solving timeframe as actions move from reactive to preventive (Lasi et al., 2014; Zawadzki and Żywicki, 2016). It was the simplest way of managing and supplying from the plant to the consumers the halal supply chain from farm to fork.

According to Wilson (2012), working knowledge of halal and the ability to establish knowledge sharing and collaboration networks and collaborations are more critical than the wide-ranging and growing halal market. The ‘halal concept’ (especially for foods) is truly from the farm to the table, and requires nutritious items prepared from permissible ingredients in a clean and hygienic manner (Hanzaee & Ramezani, 2011) and compliant with the Islamic laws. From the Islamic point of view, the concept of halal is holistic focusing on both physical attributes and moral sense in the entire supply chain (Hassan, 2013). It is important to Muslim customers in order to choose the halal products. Now, the demand for halal products is continuously growing and the related market is expanding. The global market size of halal food and lifestyle products predicted to reach approximately by USD 2.6 trillion in year 2020. Halal supply chain management defined as “controlling and administering the flow of material, information and capital; through strategic coordination and collaboration of stakeholders, as to create value to improve the performance of the supply chain, in such a way that Halal and *Toyyib* is extended from farm to fork” (Khanetal.,2018a). Product variety, product complexity, overseas supplier, intertwined business relationships, processes among suppliers, manufacturers, distributors, retailers and customers are related to the goal of halal supply chain management.

II. IR 4.0 Halal Supply Chain Management

IR 4.0 is fast transforming how businesses manage their key functions. Digitalization — aided by disruptive new technologies such as IoT, AI, big data & analytics, machine learning, automation and robotics, cloud computing, block chain, 3D printing, etc. and the explosive growth of smart devices — is leaving no segment of the business untouched. Supply chain management, more complex than ever before, stands to benefit tremendously from going digital. Studies suggest that an interconnected, digital supply chain can lower operational costs by more than 30 percent, reduce lost sales opportunities by more than 60 percent, and even reduce inventory requirements by more than 70 percent, all while making companies faster, more agile, granular, accurate, and efficient.

While transitioning to a digitized, automated and fully interconnected supply chain requires significant efforts and long-term investments, the pay-offs are huge. Bringing supply chains online can help enterprises reach the next level of operational effectiveness and realize significant cost reductions.

2.1 Halal Assurance Services

Halal Assurance Services involved in managing of all the functions and activities necessary to determine and achieve halal supply chain management in IR 4.0. Halal Assurance quality practices can be seen through some of the main components, namely control point; product development and verification of flow chart, implementation of control measures, development of corrective care action, document and records management system, process verification, halal guidelines, halal database, and traceability. According to Chaudry et al. (1997) of halal assurance system set up under the “three zero’s” which is zero limit (no use of illegal substances in production), zero defect (no illegal production) and zero risk (no losses). Thus, Othman et al. (2015) study, classification of halal assurance element was made into some key elements, which are halal assurance control, traceability, product recall, laboratory analysis, and critical point.

2.2 Halal Service Diversity

Halal Service Diversity refers the variations in products, logistics services and geographical areas that covered by Supply Chain Management. Service providers are obliged to expand their geographical area coverage, improve their capabilities and broaden their service offerings (Schmoltzi & Wallenburg, 2012). These comprehensive services could lead to the manufacturers’ trust on their halal service providers because of their willingness to service diversity for halal logistics activities. Halal service diversity consists of social care caterers, who are serving up everything from halal meat to dairy-free milk to meet increasingly diverse dietary needs and so that people can eat, what they want and what they require nutritionally. Halal service providers need to pay as much attention to what people want to eat, whether their preference is kosher food or vegetarian meals. Many studies on service quality have been conducted to look into the issues pertaining to service in various sectors such as retail, hotel, banking, hospitals and the food service industry (Ibrahim & Othman, 2014; Henderson, 2016). Halal food service providers should understand the needs and wants of Muslim customers, as well as create a competitive advantage in the delivery of high service quality to this specific market over their competitors.

2.3 *Halal Service Procedure*

Halal has become a universal concept in recent years, covering not only slaughtering practices, social justice and healthcare, but also high-quality products and services to meet the increasing awareness and desires of consumers in a competitive global market.

Latif et al. (2014) claimed that the procedure for halal service is about integrity, trust, obligation and strict enforcement. The halal service procedure is about looking at the subject matter from the lens of Shariah law, which often related to the quality of assurance, safety and reliability. Muslim consumers are heavily dependent on JAKIM, so JAKIM needs to play its role in controlling and tracking the misuse of Halal-related procedures (Ahmad et al., 2013). When halal foods is defined as halal that a Muslim may consume, such expression means that the foods do not contain any part of an animal that is forbidden by Shariah law for a Muslim to eat or that has not been slaughtered according to Shariah standards. Zailani et al. (2017) emphasized that halal service procedures would lead to food manufacturers ' customer trust.

2.4 *Support of Research Institutes and Universities*

In order to ensure a sustainable drive towards IR 4.0 halal supply chain management, it is necessary to provide all industries with adequate support for infrastructure development for research. Collaboration with industries between research institutes and universities will promote knowledge development, training and human resource transfer. Such initiatives will support inter-organizational arrangements to undertake collaborative research and development projects. The transition of university-based intellectual property such as patents to companies also allows for the successful implementation of IR 4.0 halal supply chain management. This cooperation will be useful for the development of social ties through different conferences, meetings and social networks. Through the assistance of research institutes and universities, knowledge transfer to suppliers in multiple levels within the business is possible. The transition of knowledge and awareness will reduce the risks and chances of a failure of IR 4.0 in the supply chain network (Guimón, 2013; Sung, 2018).

2.5 *Law and Policy Regarding Employment*

By creating a halal supply chain demonstrate, this demonstrate ought to begin with of all guarantee the right intention (Alserhan, 2010). In this manner, halal needs commitment at beat management level through a halal approach (Office of Guidelines Malaysia, 2010a, b), which acts as premise for the association of the supply chain. Among others, a halal policy addresses: the obligation of an association in securing the halal judgment along the supply chain; scope of halal certification of the association; the affirmation to the consumer or client (the guarantee); and strategy of confirmation (control mechanism; covering perspectives like halal committee, halal compliance officer and assessments). In line with the indispensably request and supply chain demonstrate (van Amstel & van Goor, 2001) and the system for chain/ network advancement for nourishment supply chains (van der Vorst & Beulens, 2002).

To measure the execution of halal supply chains, it is first vital to measure the adequacy viewpoint of a supply chain. It would address two key aspects that would be specific prepare quality (Andersen, 1994; Bonne & Verbeke, 2008) and waste (Abdul-Matin, 2010). Handle quality addresses the strength/trust of a brand, the credibility of a halal certificate and the buyer complaints gotten with respect to the halal status of a product. In truth, Malaysia is additionally the worldwide pioneer in halal certification framework. JAKIM is additionally common recognized as the driving specialist on things relating to improvement of halal approaches, halal certification forms and examining benchmarks with collaboration of Office of Guidelines Malaysia (JAKIM, 2012).

2.6 *Improved IT Security and Standards*

Through the business of the specialized approaches of IR 4.0 the supply chain becomes more adaptable and more straightforward. In expansion, conceivable outcomes for clients to form utilize of (personalized) functionalities are expanding permitted by customized mass-production that works in an economically profitable way (Baum, 2013). Bulgurcu (2010) inspected the antecedents of representative compliance with the organizational data security policy and the effect of data security mindfulness (ISA) on an employee's state of mind to comply with the data security approach. According to Guo (2011), observationally examined the components affecting the states of mind and behavior of end-users toward organizational data security. They created and tried a non-malicious security infringement show by analyzing the information accumulated from end-users at work environment.

2.7 *Information Transparency*

For the successful implementation of IR 4.0 in halal industry, knowledge transparency and good communication between consumers and suppliers in the supply chain network are important to meet the objective. In this light, transparency is defined as “visibility and accessibility of information especially regarding business practices” (Merriam-Webster Online Dictionary, 2010; Bhaduri & Ha-Brookshire, 2011, p. 136). Information transparency is thought to have several dimensions to be effective: information access, comprehensiveness, relevance, quality, accuracy, factuality, timeliness and reliability of information (Vishwanath & Kaufmann, 2001; Hofstede, 2003). Therefore it can be considered those dimensions to be effective. Human beings turn to external sources of information in the event of inadequate internal information.

III. Conceptual Framework

From the literature, the following conceptual framework has been developed for the purpose of this study.

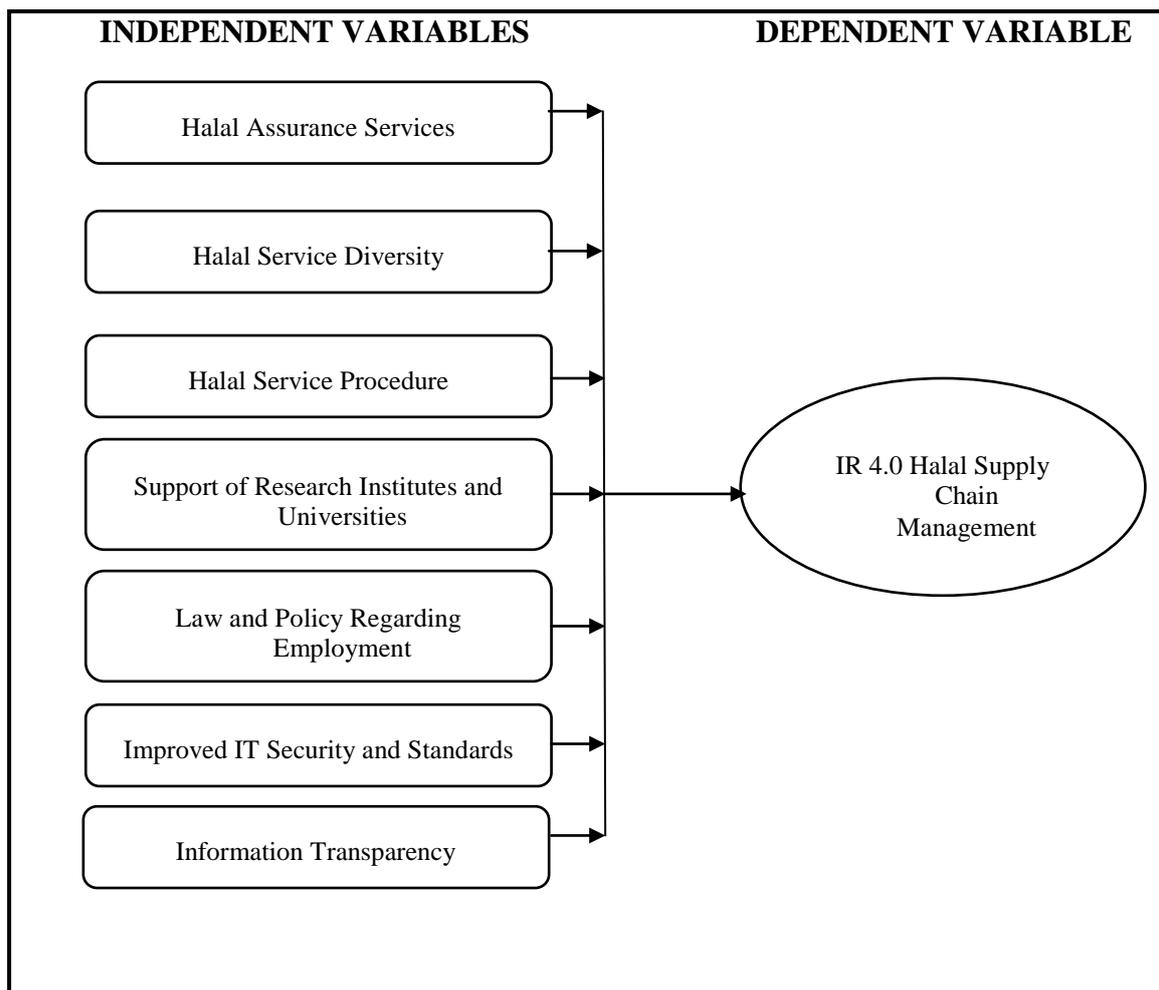


Figure 1.0 Conceptual Framework

3.1 *Hypotheses*

There are seven hypotheses suggested for the purpose of this study which as follows:

- H1 Halal Assurance Services will positively influence IR 4.0 Halal Supply Chain Management
- H2 Halal Service Diversity will positively influence IR 4.0 Halal Supply Chain Management
- H3 Halal Service Procedure will positively influence IR 4.0 Halal Supply Chain Management
- H4 Support of Research Institutes and Universities will positively influence IR 4.0 Halal Supply Chain Management
- H5 Law and Policies Regarding Employment will positively influence IR 4.0 Halal Supply Chain Management
- H6 Improved IT Security and Standards will positively influence IR 4.0 Halal Supply Chain Management
- H7 Information Transparency will positively influence IR 4.0 Halal Supply Chain Management

IV. Methodology

This study is developed by using secondary data mainly from previous scholars' extensive review of literature reviews of research papers, journals, and documents. No further test is required to confirm the hypotheses, as this is a conceptual study.

V. Conclusion

In order to ensure a sustainable drive towards IR4.0 halal supply chain management, it is necessary to provide all industries with adequate support for infrastructure development for research. Collaboration with industries between research institutes and universities also would promote the production of expertise in halal supply chain management. It is a new phenomenon driven by the halal industry, from the perceptions of manufacturers and consumers, to expand halal product and service diversity beside to consider the determinants of halal logistics services for manufacturers' satisfaction. This study leads to a theoretical understanding of the factors promoting the quality of halal logistics service, the confidence of manufacturers and their satisfaction in Malaysia towards the supply of chain management in halal industry. Analysis of the Halal Assurance Service, Halal Service Diversity and Halal Service procedure influencing the satisfaction of customers are crucial to the development of the Halal Market.

Furthermore, intelligent thinking supply chains upon implementation IR 4.0 should learn to identify risks and adjust the parameters of their supply chain to minimize any risks appears. Hence, constantly evolving and learning to manage several cases without any human involvement, except for any unexpected risks where human intervention is required to decide the next course of action. Advanced supply chain solutions combine manufacturer, service provider, etc. data into a "supply chain cloud," ensuring that all stakeholders make the same fact-based decisions. Such end-to-end, real-time visibility would allow companies to respond more quickly to real-time disruptions and minimize risk. Obviously, in IR 4.0 businesses have much to benefit from enhancing their supply chain management, and those who are unwilling to do so are at risk of becoming uncompetitive.

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