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Resilience Attributes of Halal Logistics on the Pharmaceutical Supply Chain

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Abstract
Purpose: The purpose of this study is to model a system that incorporates *Halal* logistics dimensions into the pharmaceutical supply chain framework for enhanced resilience.
Design/methodology/approach: The study involved the use of non-experimental exploratory research design. Three stages were involved in the methodological set up; Preliminary study phase, Modelling phase and Development phase. The Preliminary phase involved an investigation of the *Halal* regulatory set-up and requirements. The Modelling phase involved an evaluation of the existing *Halal* logistics specific requirements, and data in the literature. The Development phase involved an integration of the *Halal* logistics dimensions into the Pharmaceutical supply network.
Findings: The findings of the study reveal the attributes of *Halal* logistics that enhances the capabilities and mitigates the vulnerabilities of the pharmaceutical supply chain. Previous research have revealed that supply capabilities and vulnerabilities are precursors of supply chain resilience
Research implications: There are a number of potential benefits that can be gotten by integrating *Halal* logistics into pharmaceutical supply chain. Resilience is a major one.
Originality/value: As at now, this is the only framework modelled for the Pharmaceutical industry that incorporates the tenets and attributes of *Halal* and *Toyyib* into achieving supply chain resilience

Keywords: Supply chain, logistics, risk, *Halal*, resilience, capabilities, vulnerabilities

Paper Type: Conceptual Paper

Background and Motivation

The turn of the twenty-first century and the reality of globalization has brought about a stiffer competitive business and industrial climate. This has led business firms to search for operational status that impart capabilities into their operations. According to Swinehart and Green (1995), "an enterprise gains sustained competitive advantage over their competitors by applying innovation and quality in targeted areas". The supply chain is one of such targeted areas. Over the years, the sequence of the processes, organizations, people, activities, information, and resources involved in the production and distribution of end products have come under the umbrella of a phenomenon known as "supply chain". The definition of a supply chain is one that is very beneficial to the research on supply chain resilience.

Christopher, (1998) defines a supply chain as "the network of organizations that are involved through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer". According to Lummus and Vokurka, (1999), the goal of managing the supply chain is to "integrate and coordinate all activities and processes across the supply chain through enhanced collaboration and information exchange". However, as the complexity and the length of the supply chain network increases; due largely to contemporary factors such as globalization, market volatility, outsourcing, single point sourcing, and international integration; so too does the supply chain become more susceptible to risks. These risks create disruptions (Christopher and Peck, 2004). Risk occurrence is a factor that must be taken into consideration for continuity, strength and integrity of the chain to be maintained and sustained. As such, the situation warrants the management of such risks. The problem is that the conventional management of risk is dependent on the identification and quantification of such risk events in the supply chain. But a known fact is that even the most carefully designed supply chain is susceptible to both known quantifiable/unquantifiable risk as well as unforeseen/unexpected/uncertain/unquantifiable risks. Hence, there is a need to design a supply chain network in such a way that it has an inherent capacity to adjust itself in the face of unforeseen, unquantifiable and uncertain risk events. This is where supply chain resilience becomes important.

The term "resilience" was defined by Revetria et al. (2000) as the ability to return to the desired state after a major disturbance. Peck (2003), defined supply chain resilience as the ability of a global supply chain to reorganize and deliver its core function continually, despite the impact of external and or internal shocks to the system. Christopher and Peck (2004) defined resilience as the ability of a system to return to its original state or move to a new and more desirable state after being disturbed. From these definitions, it is argued that resilience confers on the supply chain the ability to return to its original or perhaps better supply chain performance under emergency risk environment. As such a correlation between resilience and improved supply chain performance

The literature indicates that in order to pursue a resilient supply chain, an increased level of supply chain capabilities need to be applied in relation to a mitigation of vulnerabilities (Aigbogun, Ghazali & Razali, 2014; Amir, et al, 2013; Pettit 2008).

Aigbogun, Ghazali and Razali (2014) identified the vulnerabilities and the capabilities that exists in the Malaysian pharmaceutical manufacturing supply chain. Via semi-structured interviews with key supply chain personnel in the Malaysian Pharmaceutical industry, four vulnerabilities (Turbulence; External pressure; Sensitivity; and Connectivity) and six capabilities (Flexibility; Reserve capacity; Visibility; Supplier Dispersity; and Collaboration) were identified. The identification of these factors is a first step in proactively building a resilient supply chain that is capable of side stepping supply chain risks and bouncing back from unavoidable supply chain disruptions. Furthermore, the study also discovered that *Halal* logistics imparts on the resilience of the pharmaceutical supply chain.

At this stage, the question is *"What are the attributes of Halal logistics that improves the capabilities and mitigates the vulnerabilities in the Pharmaceutical supply chain?"* The objective could be met by finding the answers to this question. Hence the objective of this study is to identify the attributes and aspects of *Halal* logistics that improves the resilience of the Pharmaceutical supply chain.

In achieving this objective, a study was conducted on the existing *Halal*an-*Toyyiban* regulatory set up and guidelines proscribed by the Malaysian standards (2010); as well as the *Halal*

Pharmaceutical Standards 2424 2012. Furthermore, an exploratory study was conducted on the existing literature on *Halal* logistics and supply chain resilience. This was necessary to obtain relevant secondary data. Consequently, the necessary data gotten, were studied and applied in conceptualising a Pharmaceutical Supply Chain Resilience Framework (*see figure 1*). The next section, is an overview of the *Halal*an-*Toyyiban* Assurance Pipeline .

***Halal*a-*Toyyiban* Assurance**

(Source: Malaysia Standard, 2010)

*Halal*an-*toyyiban* assurance pipeline is a value supply chain management system that conforms to the *Halal*an-toyyiban principles

According to the Department of Islamic Standards Malaysia (2010), *Halal*/*Halal*an are things or actions which are permitted or lawful in Islam. It conveys basic meaning and defines the standard of acceptability in accordance to Shariah requirements. *Toyyib/toyyiban* Complements and perfects the essence (spirit) of the basic standard or minimum threshold (*Halal*), i.e. on hygiene, safety, sanitation, cleanliness, nutrition, risk exposure, environmental, social and other related aspects in accordance with situational or application needs; wholesomeness.

*Halal*an-*Toyyiban* assures and guarantee that both aspects of *Halal*an and *toyyiban* are integrated into holistic and balanced requirements that fulfill the condition, situation or application needs. This guarantees/assures third party process verification throughout the supply/value chain.

The *Halal*an-*Toyyiban* Assurance Pipeline is translated into a set of Management System Requirements Standards which comprise the following (Malaysia Standard, 2010):

- Transportation of goods and/or cargo chain services
- Warehousing and related activities
- Retailing

The implementation of these standards should be consistent with the principles of the following standards:

- MS 2300: Value based Management System: consists of certifiable requirements which prescribe the framework for an organisation to establish a management system based on Islamic values. The integrity of the organisation is important as the integrity of the *Halal*an-*Toyyiban* Assurance Pipeline depends on them.
- MS 1900: Defines the quality management system requirements from the Islamic perspectives, whereby the standard can be used by organisations to inculcate Shariah requirements into their quality management practice with the emphasis on value-based management.
- MS 1500: Provides practical guidance for handling of *Halal* product. Compliance to this standard ensures that products produced are *Halal*, clean, safe and hygienic.

With these important points noted, a summary of the secondary data gathered from the literature is presented in the next section.

Literature

According to Tierman & Maznah (2013), it is important to ensure that *Halal* integrity is secured from source to the point of consumer purchase. It is in this light that the *Halal* standard for

pharmaceuticals becomes important. It is important to apply strict standards so as to assure the integrity of the raw materials and products in the chain connecting the individual suppliers to the ultimate consumer; a process that requires *Halal* logistics. Therefore, judging by the efforts and significant research that has gone into finding a coherent solution to improving the resilience of the supply chain, it is important to delve more deeply into the surrounding variables essential to its understanding. This acts as a fulcrum in assessing the implications of applying *Halal* logistics into pharmaceutical supply chains in order to enhance supply chain capabilities and mitigate supply chain vulnerabilities.

A naturally *Halal* certified product can be vulnerable and hence the integrity of the product compromised if *Halal* delivery and transportation procedures are not included in the logistics planning and activities (Tieman, Jack & Ghazali, 2012). Pettit, Fiksel and Croxton (2008) defined vulnerabilities as "Fundamental factors that make an enterprise susceptible to disruptions". By addressing the vulnerability of a supply chain, risks are mitigated (Blos et al, 2009; Wagner & Bode, 2006; Svensson, 2002). Whilst the continued search for efficiency improvements is essential in a fiercely competitive marketplace, the challenge is to find ways in which vulnerability can be contained and managed. The findings of Tieman, Jack & Ghazali (2012), show that *Halal* control and assurance activities are put in place to reduce supply chain vulnerabilities. Hence, *Halal* supply chain management is a new approach and academic research is highly needed in this area (Tieman & Maznah, 2013; Jafaar et al 2011).

As defined by Pettit, Fiksel and Croxton (2008), capabilities are "attributes that enable an enterprise to anticipate and overcome disruptions". Melatu, Tasnim & Ibrahim (2011) suggested that for supply chain integrity to be achieved and preserved, full participation of all the stakeholders in the *Halal* supply chain is required. This singular act, achieves the collaborative capability of the supply chain (Talib, Rubin, & Zhengyi, 2013; Kamaruddin, Iberahim, & Shabudin, 2012) and thus imparts resilience (Bakshi, 2008; Pettit, 2008; Sheffi & James, 2005).

Very little literature exists on the management of *Halal* in the supply chain in terms of logistics. However, a few number of definitions have been put forward. For instance Tieman, Jack & Ghazali (2012), in their research on "Principles in *Halal* supply chain management" described *Halal* logistics as procedures that ensure product quality in the procurement and supply chain management of commodities, according to *Halal* prescribed standards. The Malaysia Institute of Transport (2012), defined *Halal* logistics as "the process of managing the procurement, movement, storage and handling of materials, parts livestock and (semi) finished inventory both food and non-food (and related information & documentation flows) through the organization and the supply chain in compliance with the general principles of Shariah Law". A major theme in these definitions is the assurance of quality throughout the length of the supply chain, a property known to confer resilience to the supply chain (Andersson, 2007). In the case of the Malaysian Pharmaceutical industry, the *Halal* compliance and regulatory body (JAKIM) is a body wholly responsible for determining *Halal* Pharmaceutical standards and for monitoring the quality assurance process starting from the supplier of the raw materials through the logistics process until the end product, including the principles of Good Manufacturing Practice (GMP).

Having the regulatory body to assure quality throughout the supply chain, strengthens the collaboration and partnership of suppliers and manufacturers to secure continuity of supply (Tieman & Maznah, 2013). Furthermore, this role can also impart the supply chain in terms of flexibility in sourcing of raw materials according to specifications both by the companies and the regulatory authority (who have the capacity to source and advice on alternative suppliers that meet

with the quality standards in terms of supply disruptions). Furthermore, this also assures the quality of the reserve capacity. These properties (flexibility, quality management of reserve capacity) have proven to add capability to the supply chain (Aigbogun, Ghazali & Razali, 2014). In addition, according to Tieman and Maznah (2013), conventional commodity categories in certain industries can be allocated different for *Halal* certified products and services, resulting in possible different product and supplier strategies. This capability thus show that *Halal* logistics has an impact on the purchasing process; as well as its tactical and operational purchasing activities using the purchasing portfolio matrix of Kraljic and the purchasing process model of van Weele (Tieman, and Maznah, 2013).

The extension of the *Halal* quality assurance and control to the reserve capacities and the redundant inventories in the logistics of *Halal* pharmaceuticals can assure quality in the reserve capacity and redundant inventory (Aigbogun, Ghazali & Razali, 2014).

This can be achieved by means of providing necessary facilities and resources for *Halal* compliance such as the availability of appropriate qualified and trained personnel, adequate premises, space and services, correct materials, containers and labels. Also necessary are approved procedures and instructions and dedicated equipment, storage and transport (Noriah, Faqihah, S., & Saiful, 2012). These act as key enablers of the supply chain in the achieving resilience in the pharmaceutical industry.

Pharmaceutical Supply Chain Resilience Framework (PSCRF)

See Figure 1 (Source: Original)

——▻ = Process flow

◅- - - -▻ = Interconnection

↑ = Enhance

↓ = Mitigate

■ = Capability

■ = Vulnerability

♦ = Regulatory requirements (MS2300, MS1900, MS1500 and MS2424

PE = Personnel (Supply chain key enabler)

PR = Process (Supply chain key enabler)

IT = Technology (Supply chain key enabler)

RA = Regulatory Authority (Supply chain key enabler) – NPCB, DCA, JAKIM

NPCB: National Pharmaceutical Control Board

DCA: Drug Control Agency

JAKIM: Department of Islamic Development Malaysia

MS2400-1-2010 – 3.2.1.2d = Review the results of the risk management activities at defined intervals to ensure

contnuing suitability and effectiveness of the risk management process (Malaysia Standard, 2010)

Sensitivity: Importance of carefully controlled conditions for product and process integrity
Connectivity: Degree of interdependence and reliance on outside entities
Flexibility: Ability to quickly change inputs or the mode of receiving inputs
Capacity: Availability of assets to enable required production levels
Visibility: Knowledge of the status of operating assets and the environment
Collaboration: Ability to work effectively with other entities for mutual benefit

Elaboration

This Framework is a holistic system that was designed by incorporating the mediating role of *Halal* pharmaceutical logistics into the framework for Supply chain resilience. The role of *Halal* in the Pharmaceutical logistics is made possible by the *Halal*an-*Toyyiban* Assurance Pipeline which is a value supply chain management system of the Malaysian Department of standards. It conforms to the standards of hygiene, safety, sanitation, cleanliness, nutrition, risk exposure, environmental, social and other related aspects in accordance with the Shariah requirements

It is an established fact in the field of supply chain management that supply chain resilience can be measured in terms of two constructs – capabilities and vulnerabilities (Amir et al, 2013; Pettit, 2008). We designed the framework in such a way that from one node in the supply chain network to the other, there is a system that guides the interfacing of activities in order maintain a smooth flow and protect the integrity of the product and process. At each node, the framework was designed with a system to either enhance the supply chain capability, and/or mitigate the supply chain vulnerability. The particular guideline and system, strategic to achieving the resilient flow by enhancing the capability and mitigating the vulnerability to be faced at each point is indicated in the system design.

Contemporary research in *Halal* logistics has explored the applications of *Halal* quality with a product perspective in mind. The process perspective as well as the impact this process has on the resilience of a supply chain has not been previously explored. This is where our resilience framework becomes important.

Furthermore, the incorporation of *Halal* logistics for the achievement of supply chain resilience is still left unexplored and this framework can be adapted suitably. The primary effect of guaranteeing safety, efficacy, and quality of the product and process, make the Halan-Toyyiban assurance more suitable in relation to other quality management philosophies.

In addition, the literature has shown that *Halal* logistics reduces supply chain vulnerabilities, but the actual attributes of *Halal* logistics that are implicated in this activity have previously not be isolated. This framework, has isolated the *Halal* logistics attributes and inserted it into the nodes of the supply chain network. This creates a platform for policy makers to evaluate existing policies, draw out new policies, and ensure adequate implementation.

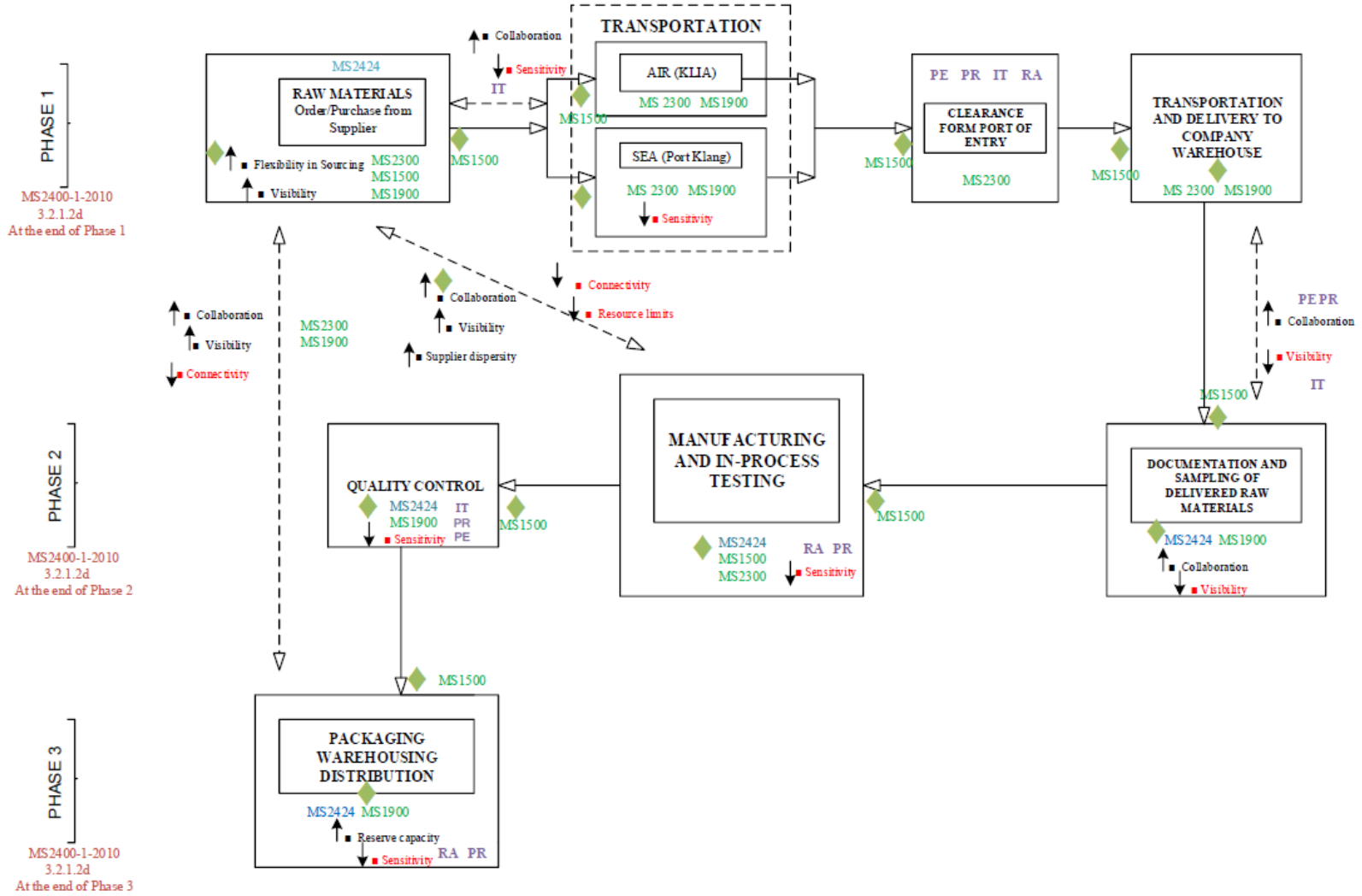

Figure 1: Pharmaceutical Supply Chain Resilience Framework (PSCRF)

Conclusion

The objective of this study was to identify the attributes and aspects of *Halal* logistics that improves the resilience of the Pharmaceutical supply chain.

The findings of Tieman, Jack and Ghazali (2012), show that *Halal* control and assurance activities are put in place to reduce supply chain vulnerabilities. But the aspects of the *Halal* activities that impact positively to mitigating these vulnerabilities in respect to supply chain resilience have previously been left unexplored. Secondly, Tieman and Maznah, (2013) has seen the need to develop logistics management in the *Halal* supply chain because unlike the conventional management of the supply chain, the *Halal* supply chain requires a *Halal* policy and specific design parameters for supply chain objectives, logistics control, supply chain network structure, supply chain business processes, supply chain resources and supply chain performance metrics

By isolating the actual attributes of the *Halal* logistics parameters that mitigates the vulnerabilities and enhance the capabilities of the pharmaceutical supply chain, policies beneficial to achieving a resilient supply chain can be drawn. The framework design characterized from the study findings, implicates the exact nodes in the supply chain network and the attending outcomes, especially as it relates to achieving and enhancing resilience of the supply chain. Contemporary research on *Halal* logistics have concentrated on the applications of *Halal* quality with a product perspective in mind, but the impact this has on the resilience of a supply chain has not been previously explored. Therefore, the findings of this research provide a framework for the application of *Halal* logistics techniques in enhancing supply chain resilience.

This study has some limitations. These include; single-source bias, as the collection of information was from a single regulatory source due to its ease of access and convenience. Also the study is devoid of post data assessment thereby making interpretations of the study findings more judgmental. This is largely due to the unavailability of an appropriate assessment tool to measure the causal effect of the parameters of *Halal* logistics on supply chain resilience

As a follow up to the findings of this study, two areas are suggested to future researchers. Firstly, it is important to address current Good Manufacturing Practice (cGMP) in the Pharmaceutical industry in relation to *Halal* compliance. Therefore, it is suggested that researchers come up with a system to integrate cGMP and *Halal* compliance into a holistic framework for the pharmaceutical industry. Secondly, seeing that the attributes of *Halal* logistics that confer resilience on the Pharmaceutical supply chain have been identified and characterised, it is suggested to future researchers to develop an assessment tool as an instrument for measuring the resilience impact of the attributes of *Halal* logistics on the phamaceutical supply chain

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