

Modeling of Halal Warehouse Adoption Using Partial Least Squares (PLS)

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Abstract

Halal warehouse is part of the Halal supply chain services which is offered by Halal logistic providers to meet the demand from Halal industry. However, according to the Halal warehouse service providers, the adoption rate of their service among Halal manufacturers in Malaysia is very low compared to the total number of Halal certified manufacturers. By adopting the Technology, Organization and Environment (TOE) framework, this study investigated what are the determining factors for Halal manufacturers to adopt Halal warehousing services. Data was gathered from 140 participants in the Malaysia International Halal Showcase (MIHAS 2013). Structural Equation Modelling (SEM) approach was used to test the relationship between research model constructs. The findings show that awareness and top management attitude are positively related but complexity and supplier availability was negatively related for adoption decision of Halal warehouse. The findings provided useful information for a better understanding regarding determinants to the adoption of Halal warehouse. Halal providers and government agencies related to the Halal industry should be more aggressive in promoting Halal services to increase the awareness so that it would be adopted by Halal manufacturers in Malaysia. Suggestion for future research are also included.

Keywords: Halal warehouse, determinants, adoption, PLS, TOE framework

1.0 INTRODUCTION

Halal supply chain is defined by Omar and Jaafar (2011) as an integration of business process and activities from the point of origin to point of consumption according to the Islamic law known as Syariah. The main objective of the Halal supply chain is to maintain the Halal integrity of Halal product to ease the doubts of Muslim consumers at the point of consumption. Since it is purely based on Syariah, Halal supply chain is being promoted as the only approach that could confirm the Halal status on the Halal products to their stakeholders. According to Tieman (2011), Halal supply chain is an important approach to confirm the integrity of Halal products at the point of consumption. It is due to all activities involved in the Halal supply chain are already fulfilled and all the requirements needed to certify the Halal status is not in doubt. Activities in the Halal supply chain are warehousing, transportation, sourcing, handling of products, inventory management and other managements.

With the legitimacy of some halal products coming under fire, the industry is now demanding more specialized halal compliant solutions for its supply chain process (Baharuddin et al., 2011). It is affected by the behaviour of Muslim consumers nowadays are not only looking for

Halal products, but also for the Halal processes (Omar & Jaafar, 2011). Hence, to meet the demand from Halal consumers in the industry, logistics service providers come out with a new solution which is known as the Halal supply chain. Halal is based on Islamic value means permissible, allowable or lawful (Zakaria & Abu Talib, 2010) to be consumed. Halal supply chain is a new approach and has been derived from the increase in demand for Halal products not only in Malaysia, but throughout the world. The growth of Muslim population in the world, plus the increasing in their purchasing power, convinced the manufacturers to look after of their Halal requirement. This scenario makes them more cautious on their religious obligation about what kind of products that are allowed to be used. Hence, the purity of the products themselves are important for them. According to Bernama (2011) Halal industry in Malaysia was estimated to reach to RM15 billion with the expectation of 5% steady growth annually. Bahli (2011) reports that, for Halal foods in Malaysia, in 2004, the market value was worth USD6.6billion, but in 2010 it reached to USD9.4 billion, and for the world Halal food market increased from USD587.2 billion to USD641.5 billion for the same period. At present, Halal is not only for foods, but also for other consumer products such as pharmaceutical, cosmetic and other consumer products. According to Illyas et al. (2012), logistics management capabilities such as Halal warehouse play a big role in the success story of the Halal industry by ensuring the integrity of Halal products today. Furthermore, Alam and Sayuti (2011) claim that if foods are not handled or stored accordingly, it would not be considered as Halal.

Bonne and Verbeke (2008) claim that Muslim consumers still lack of information on the supply chain and cannot be reassured that no cross-contamination has taken place during the movement and storage of the product, but according to Daud et al. (2012), Halal concept already started to play their role among Muslim consumers while making a decision what products to be used. Furthermore, even Halal manufacturers in Malaysia are already having a fundamental knowledge and understanding about Halal concept but they are still not ready to commit themselves to a higher level of Halal (Othman et al., 2004). Since, the literature shows that if Halal manufacturers are not adopting Halal supply chain activities, their Halal status would be in doubt. It means that the adoption of Halal warehouse is a must since it is also included in the Halal supply chain activities. That is why it is very skeptical why the majority of Halal manufacturers are still not considering to adopt Halal warehousing activities to confirm their Halal quality.

The market value of Halal products keeps on growing, the number of companies certified as Halal manufacturer also increases. According to the Halal warehouse providers, the adoption rate of their services is not growing as fast as expected. Othman et al. (2006) mentioned that, even compliance with the Halal requirements are no longer a threat, but as a business opportunity, moreover as a source of competitive advantages (Zailani et al., 2011) but majority of Halal manufacturers are still reluctant to adopt halal warehouse to their business operation.

Tieman (2006) also mentioned that, proper handling and storage activities are a key role in protecting the Halal integrity for Halal products. If Halal manufacturers are not adopting Halal warehouse, are their products really Halal to be consumed? At the same time manufacturers still claim that their products are Halal because the Halal logo that they have on the packaging. Consumers also rely on the Halal logo without concern either the products are stored according to the Halal specification or not. This proposed that more study is necessary to understand what factors are influencing the decision makers to agree on the adoption of Halal warehousing. As the Halal integrity is at stake, the control of Halal food supply chain becomes critical for the future and should be addressed by the Halal industry as well as the academics to provide sustainable

solutions. Hence, four variables from the Technology, Organization and Environment (TOE) framework have been identified as potential variables that could explain the scenario of low adoption of Halal warehousing among Halal manufacturers in Malaysia. The variables are; awareness, complexity for technological factor, top management attitude for organization and supplier availability represent the environmental factor. Indeed, Tieman (2013) makes a clear statement that, academic research is highly needed in this area. Hence, this study contributes something new in this field since most of the previous studies in Halal are focusing on Halal process, Halal status, Halal management and in other area instead of Halal warehousing adoption study. Table 1 below indicates the numbers of Halal manufacturers according to state and firm size in Malaysia, and Table 2, indicate the respondents for this study.

Table 1. Halal Manufacturers in Malaysia According to State and Firm Size

State	Small	Medium	Multi National	Total
Johor	119	181	65	365
Kedah	29	50	11	90
Kelantan	8	4	2	14
Melaka	18	34	10	62
Negeri Sembilan	34	35	11	80
Pahang	13	18	11	42
Penang	86	118	32	236
Perak	21	45	17	83
Perlis	3	3	2	8
Selangor	407	552	144	1103
Terengganu	5	14	4	23
Sabah	5	25	7	37
Sarawak	19	40	8	67
Kuala Lumpur	173	170	70	413
Total	940	1289	394	2623

Source : www.hdcglobal.com/publisher/alias/halaldirectory

Table 2. Respondent According to State and Firm Size

State	Small	Medium	Multi National	Total
Johor	7	3	1	11
Kedah	5	3	1	9
Kelantan	4	0	1	5
Melaka	3	2	2	7
Negeri Sembilan	4	2	0	6
Pahang	5	1	0	6
Pulau Pinang	4	1	1	6
Perak	7	2	0	9
Perlis	1	0	0	1
Selangor	30	7	7	44
Terengganu	3	2	0	5
Sabah	1	2	0	3
Sarawak	2	0	1	3
Kuala Lumpur	9	7	9	25
Total	85	32	23	140

2.0 LITERATURE REVIEW AND RESEARCH MODEL

2.1 Halal Warehouse

As part of the Halal supply chain activities, the separation of Halal products with non-Halal products is a must. Once Halal products enter the warehouse, all tools such as pallets or load carrier that are used to handle the products must be from different set that are used to handle non-Halal products. Also, the Halal products should be placed on a different rack (Tieman, 2007a; Talib et al., 2010). In other words, if the food is not handled or stored accordingly, it would not be considered as Halal (Alam & Sayuti, 2011). Tieman (2007b) also mentioned that Halal integrity could be maintained if the products was handled and stored in a right way, since Halal integrity come from various activities in the supply chain. (Tieman, 2011). Due to the fact that the issue of integrity for the Halal food supply chain has become an increasingly important topic (Tieman, 2007b), it is better now for Halal certified companies not to focus only on their production and ingredients, but extend it to Halal issuefor the entire supply chain in ensuring that their transportation, storage and handling are in compliance with Shariah and meet the requirements of their target Muslim market.

2.2 Awareness

Awareness is very important variable in order to help organization to adopt or reject new innovation. It was commonly used in new innovation adoption studies in various areas. According to Papazafeiropoulou et al. (2002), awareness is considered to be a fundamental element of new technology diffusion. If organizations do not aware of the availability of the new technology in the market, how organizations could consider adopting it or not. Thus, awareness creation and information provision are considered to be very important elements for adoption of an innovation (Papazafeiropoulou et al., 2002). OECD (1998) reports that lack of awareness is one of the most reported barriers to the adoption of electronic commerce as they cannot see the advantages, benefits and business opportunity offered by electronic commerce. Awareness of products in the business environment may have an influence on the adoption of an innovation. (Grover, 1993; Lee, 1998; Thong & Yap, 1995). Due to that matter, for a new innovation, marketing strategies should be designed to inform and educate organizations about the existence and benefits of new technology since awareness can impact on the organization's decision to accept this new technology (Carolyn et al., 2011). In Halal context, awareness level regarding Halal products and services is relatively low among Muslim consumers (Sungkar & Hashim, 2009). In the context of Malaysia, government support is perceived as not playing an important role in e-business adoption due to the lack of awareness among the SMEs concerning the support provided by the government (Marimuthu et.al, 2011). Thus, we propose the following hypothesis:

H1 : Awareness is positively related to the adoption of Halal warehousing.

2.3 Complexity

According to Rogers (2003) and Seymour et al. (2007), technological complexity denotes the difficulties associated with the understanding, implementing and using the innovation. Complexity is the extent to which new innovation is assumed as relatively difficult to understand

and use (Corrocher, 2003). Since complexity usually negatively associated with the adoption, it could be a means that complexity is inhibited for adoption of new innovation (Tornatzky & Fleischer, 1982; Premkumar et al., 1994; Premkumar & Roberts, 1999). According to Rogers (2003), even though complexity may not be as important as the relative advantage, it potentially represents as a barrier to technology adoption. Complexity arises due to the technology is still new in the market. Halal supply chain services is a new approach and that is the reason why the adoption rate is still low. According to the Ngai et al. (2007) consumer may not have confidence in RFID system since it is still relatively new to them.

Since Halal is Islamic terms, and usually related to the Muslim people, it may be complex to be understood by the non-Muslim since not all of Halal manufacturers are Muslims. As a matter of fact, in Malaysia, most of the big companies who got certified as Halal manufacturers are non-Muslim (Tieman, 2011). Most of the non-Muslims believe that as long their products do not mix with pigs, it is already Halal. So, understanding the concept of Halal itself is already a problem, to understand what is Halal supply chain services also should be a problem for them. Siti Sarah et al. (2011) mentioned that the complexities of the Halal supply chain extend much further than the usual concerns regarding unbroken cool chains and the efficient delivery of fresh food produce. Therefore, we hypothesize:

H2 : Complexity is negatively related to the adoption of Halal warehousing.

2.4 Suppliers

A system and implementation of the service provider should be competent and knowledgeable; there is good cooperation between the provider and adopting company. Barriers are connected to the system provider's restricted resources and its inability to guarantee adequate consulting and training services (Piotr, 2011) and evidence has been found that supplier power (brand image and volume of transactions) may influence business customers in their adoption (Wang & Archer, 2004). Schmelz et al. (2001) claims that it is already proven that suppliers play a critical role in the adoption process. Wozniak (1987), Gatignon and Robertson (1989) found that supplier incentives were positively related to the adoption of new technology.

This study defines supplier as a Halal warehouse service providers who are certified as a Halal service provider. Since the numbers of Halal warehouse service providers who are certified by JAKIM are very small, this study expanded the coverage of Halal service providers to any logistic operators who are approved by HDC and other international agencies who are approved by JAKIM. This study also investigated either the small numbers of Halal service providers are a barrier or not for Halal manufacturers to adopt their services. Therefore, following hypothesis is tested:

H3 : Supplier availability is positively related to the adoption of Halal warehousing.

2.5 Top Management Attitudes

The top management attitude has been widely used as a variable in adoption studies (e.g. Brown & Russell, 2008; Wang et al., 2010). It is well-known that top management plays a vital role in the acquisition and diffusion of innovation (Orlikowski, 1993) in whatever technology that

they are involved in. Top management support is critical for creating a supportive climate (Ab Hamid, 2012) and for providing adequate resources for the adoption of new technologies (Lin & Lee, 2005; Wang et al., 2010). Furthermore, top management support is critical for creating a supportive climate and for providing adequate resources for the adoption of new technologies (Lin & Lee, 2005; Wang et al., 2010). Besides encouraging the changes for the benefits of the organization, top management also could stimulate the changes to adopt new technology in their business operation. According to Thong (1999), they could also do that by communicating and reinforcing the adoption of new methods through articulating vision for the organization. As the complexity and sophistication of technologies increase, top management can provide a vision and commitment to create a positive environment for innovation (Lee & Kim, 2007; Pyke, 2009). Some empirical studies have indicated that there is a positive relationship between top management support and adoption of new technology (e.g. Iacovou et al., 1995; Premkumar & Roberts, 1999; Grandon & Pearson, 2004; Al-Qirim, 2007; Ramdani et al., 2009). Hence, the hypothesis is:

H4 : Top management attitude is positively related to the adoption of Halal warehousing.

The following figure is the conceptual model that shows all the relationships based on the hypotheses that have been developed.

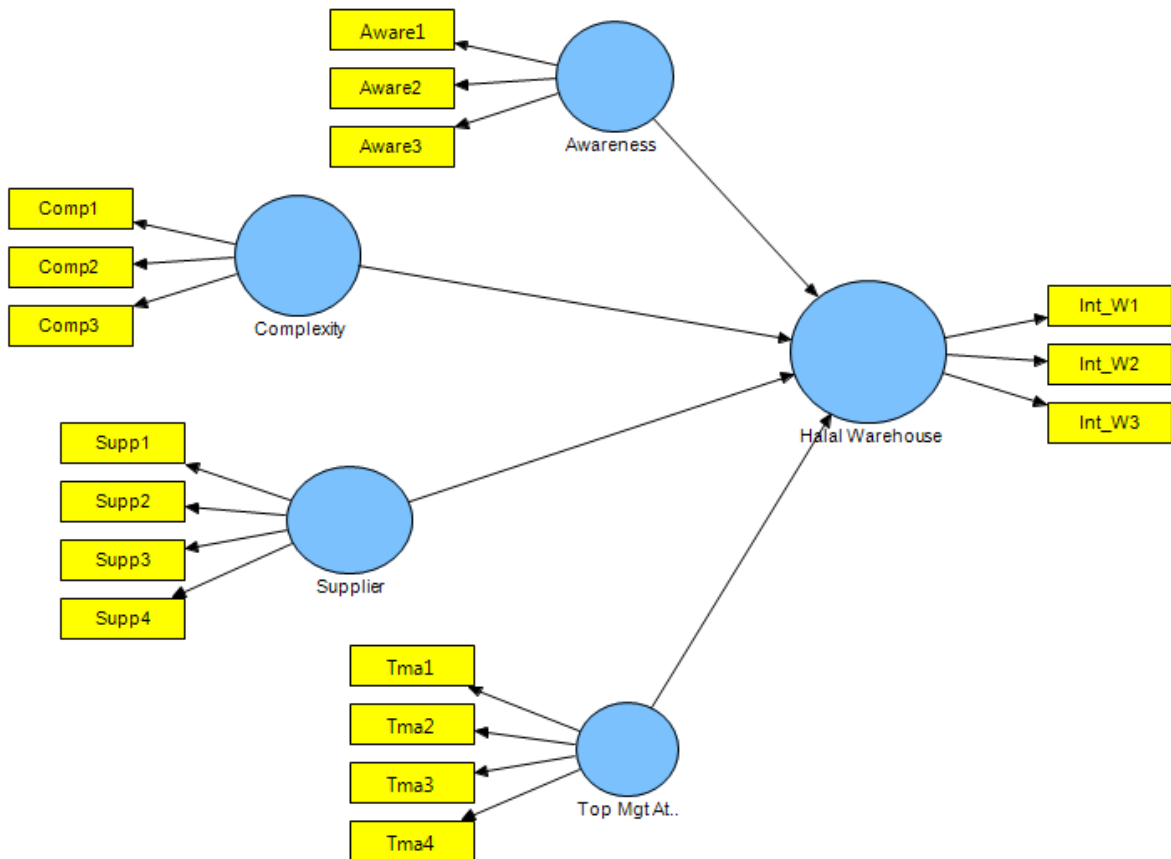


Figure 1. Research Model

3.0 RESEARCH METHODOLOGY

The unit of analysis for this study is at the organizational level. Respondents of this study are Halal manufacturers who are attending the Malaysian International Halal Showcase (MIHAS 2013) at Kuala Lumpur City Centre (KLCC), Kuala Lumpur on 3rd - 6th April 2013. The aim of this study is to gain information about adoption factors in the Halal industry in three sectors which are Food, Pharmaceuticals and Cosmetic. Since we have a list of exhibitors, systematic sampling method was used in this study. Due to the number of potential respondents being unequal based on the industries, respondents were divided based on the industry. The person who can be the respondents must be at the top level management.

3.1 Data Collection

The questionnaire was distributed among 200 selected Halal manufacturers. The exhibitors are from all around the world and also from every state in Malaysia. Since this study only focuses on companies which are operating in Malaysia only, all international participants are excluded from the survey. Majority of them are from the food industry, therefore the majority of respondents being selected are from this industry. The process of distribution and collection of questionnaires was carried out in 4 days, from the first day of exhibition until the last day of the event. Out of 200 questionnaires, 189 of them were responding, but due to poor quality of data, only 140 can be used for data analysis purpose.

3.2 Measures and Assessment of Goodness of Measures

Five-point Likert scale was used to gather data regarding independent variables, and seven-point Likert scale was used to measure item in dependent variable. This is an approach in order to avoid common method variance before data analysis as suggested by Podsakoff and Organ, (1986). Since there is lacking of literature in the Halal supply chain, most of the instruments were adapted from the other technology adoption study and were modified to fit with current study. Items measuring the awareness were newly developed based on Al-Qirim (2005) and Sophonthummapharm, (2009), Complexity from Frederic et al. (2011), Halal warehouse from Chen et al. (2011), Supplier was newly developed based on Sophonthummapharm (2009), and items for Top management attitude from Khemtong and Roberts (2006). Table 3 shows all the constructs along with their definition, sources and the number of items used in this study.

Table 3. Properties of the Measurement Items

Construct	Definition	Source	No. of item
Awareness	Organization awareness regarding Halal warehousing	Newly developed items based on Al-Qirim, 2005 and Sophonthummapharm, 2009.	3
Complexity	Complexity in adopting Halal warehousing	Frederic et al., 2011.	3
Halal Warehouse	Intention to adopt Halal warehousing	Chen et al., 2011.	3
Supplier	Suppliers availability in adopting Halal warehousing	Newly developed based on Sophonthummapharm, 2009.	4
Top Management Attitude	Attitude of decision maker towards adopting Halal warehousing	Khemtong & Roberts, 2006.	4

3.3 Construct Validity

Construct validity is done by looking at the respective loadings and cross-loadings to evaluate if there are problems with any particular items. Hair et al. (2010) suggested the cutoff value for loading at minimum 0.50 as significant. The cross-loading is a significant problem if any items which has a loading of higher than 0.50 on two or more factors. From Table 4 , it is clearly shown that all the items measuring a particular construct loaded highly on that construct and loaded lower on the other constructs thus confirming construct validity.

Table 4. Loadings and Cross-loadings

	Awareness	Complexity	Halal Warehouse	Supplier	Top Management Attitude
Aware1	0.895	-0.120	0.695	-0.421	0.589
Aware2	0.906	-0.166	0.706	-0.418	0.623
Aware3	0.891	-0.130	0.714	-0.380	0.607
Comp1	-0.166	0.902	-0.285	0.066	-0.064
Comp2	-0.104	0.894	-0.263	0.049	-0.083
Comp3	-0.147	0.910	-0.290	0.077	-0.062
Int_W1	0.736	-0.256	0.912	-0.449	0.740
Int_W2	0.709	-0.379	0.915	-0.420	0.620
Int_W3	0.702	-0.213	0.908	-0.396	0.709
Supp1	-0.448	0.043	-0.431	0.916	-0.294
Supp2	-0.364	0.125	-0.383	0.856	-0.265
Supp3	-0.413	0.083	-0.429	0.901	-0.318
Supp4	-0.365	0.001	-0.386	0.852	-0.312
Tma1	0.582	-0.073	0.635	-0.293	0.833
Tma2	0.552	-0.098	0.664	-0.274	0.875
Tma3	0.580	-0.057	0.637	-0.292	0.846
Tma4	0.573	-0.029	0.625	-0.282	0.827

Bold values are loadings for items which are above the recommended value 0.50.

3.4 Convergent Validity

Convergent validity is the test to measure the degree to which multiple items to measure the same concept are in agreement. Hair et al. (2010) suggested that to assess convergent validity, we need to use the factor loadings, composite reliability (CR) and the average variance extracted (AVE). The cutoff value for loading should exceed 0.50, and the CR is greater than 0.70 (Hair et al., 2010). The cutoff value for AVE is also 0.50 (Barclay et al., 1995). As shown in the Table 4, the loadings for all items were in the range of 0.827- 0.916 and all of them are above the recommended value. CR values as shown in Table 4, depict the degree to which the construct indicators indicate the latent construct ranging from 0.909 - 0.937 which higher than the recommended value of 0.70. The last measurement is AVE which measures the variance captured by the indicators relative to measurement error, and it should exceed 0.50 to justify using a construct (Barclay et al., 1995). Table 5 shows all value for loadings, CR and AVEs which are above the cutoff values in order to conclude that the measurement model to have adequate convergent validity.

Table 5. Results of Measurement Model

Model Construct	Measurement Item	Loading	CR	AVE ^b
Awareness	Aware1	0.895	0.925	0.805
	Aware2	0.906		
	Aware3	0.891		
Complexity	Comp1	0.902	0.929	0.813
	Comp2	0.894		
	Comp3	0.910		
Halal Warehouse	Int_W1	0.912	0.937	0.831
	Int_W2	0.915		
	Int_W3	0.908		
Supplier	Supp1	0.916	0.933	0.777
	Supp2	0.856		
	Supp3	0.901		
	Supp4	0.852		
Top Management Attitude	Tma1	0.833	0.909	0.715
	Tma2	0.875		
	Tma3	0.846		
	Tma4	0.827		

(a) Composite reliability (CR) = (square of the summation of the factor loadings) / {(square of the summation of the factor loadings) + (square of the summation of the error variances)}.

(b) Average variance extracted (AVE) = (summation of the square of the factor loadings) / {(summation of the square of the factor loadings) + (summation of the error variances)}.

Table 5 summarizes the results of the measurement model. The results indicate that all the five constructs viz awareness, complexity, Halal warehouse, supplier and top management attitude are all valid measures of their respective constructs according to their parameter estimates

and statistical significance (Chow & Chan, 2008). Since the study is using a single source data, there was a potential for common method variance. Thus, the Harman single factor test was conducted to determine the extent of this bias. Podsakoff and Organ (1986) mentioned that common method bias is problematic if a single latent factor would carry the majority of the explained variance. The unrotated factor analysis indicated that the first factor carried for 39.19% of total 64.57% variance, and thus the common method bias was not serious in this study.

Table 6. Summary Results of the Model Construct

Model Construct	Measurement Item	Standardized Estimate	T-Value
Awareness	Aware1	0.013	27.306
	Aware2	0.014	25.975
	Aware3	0.014	26.992
Complexity	Comp1	0.054	6.931
	Comp2	0.047	7.469
	Comp3	0.047	8.151
Halal Warehouse	Int_W1	0.012	31.793
	Int_W2	0.010	37.482
	Int_W3	0.010	36.772
Supplier	Supp1	0.024	12.433
	Supp2	0.033	8.091
	Supp3	0.026	11.346
	Supp4	0.029	9.261
Top Management Attitude	Tma1	0.016	18.128
	Tma2	0.016	18.629
	Tma3	0.020	14.505
	Tma4	0.022	13.340

3.5 Discriminant Validity

The discriminant validity can be assessed by examining the correlations between the measures of potential overlapping constructs. Items should load higher on their own constructs in the model. The average variance shared between each construct and its measures should be greater than the variance shared between the construct and other construct (Compeau et al., 1999). Similarly, the square correlations for each construct should be lower than the average variance extracted (AVE) by the construct and this give support to an adequate discriminant validity. As a whole, the measurement model demonstrated adequate convergent validity and discriminant validity.

Table 7. Discriminant Validity of the Constructs

	Awareness	Complexity	Halal Warehouse	Supplier	Top Mgt. Attitude
Awareness	0.897				
Complexity	-0.155	0.902			
Halal Warehouse	0.786	-0.310	0.912		
Supplier	-0.453	0.071	-0.463	0.881	
Top Mgt. Attitude	0.676	-0.077	0.758	-0.337	0.845

Note : Diagonals (in bold) represent the square root of the AVE and the off diagonals represent the correlations.

3.6 Hypothesis Testing

For hypothesis testing, the results of the modelling was used to test the four hypotheses generated from the research model. Figure 2 and Table 8 showed the results. The R² for main model was 0.764, meaning that 76.4% of the variance in the halal warehousing variable can be explained by awareness, complexity, supplier and top management attitude. Results shown in Table 8 clearly indicate that all relationships were significant at $p < 0.01$.

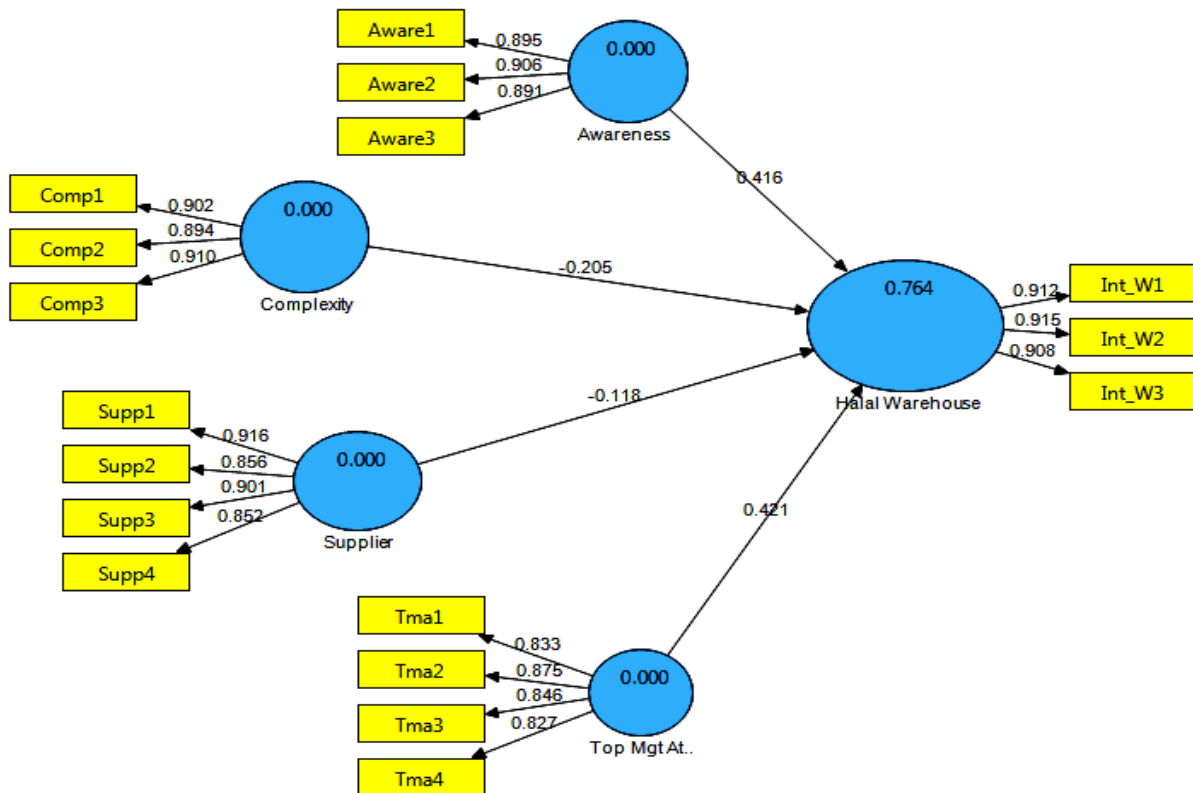


Figure 2. Structural Model Result

Table 8. Path Coefficient and Hypothesis Testing

Hypothesis	Relationship	Beta	Standard Error	T-Value	Decision
H1	Awareness → Halal Warehouse	0.416	0.068	6.121**	Supported
H2	Complexity → Halal Warehouse	-0.205	0.041	4.994**	Supported
H3	Supplier → Halal Warehouse	-0.118	0.056	2.107**	Not Supported
H4	Top Mgt Attitude → Halal Warehouse	0.421	0.067	6.318**	Supported

The reason for adopting PLS to analyze the data is because the study is looking for a prediction. Predictive relevance (Q^2) was tested by using blindfolding procedure. According to Hair et al (2010), Q^2 represents a measure of how well the observed values are reconstructed by the model and its parameter estimates. Fornell and Cha (1994) mentioned that if $Q^2 > 0$, means that the model has predictive relevance. Due to the Q^2 value of this model is 0.618 which is higher than the cutoff value set by Hair et al. (2010), cross-validated redundancy measures show that the structural model for this study has predictive relevance.

Table 9. Effect Size

Construct	R ²	f ²	Decision
Full model	0.764		
Construct Excluded			
Awareness	0.682	0.35	Large
Complexity	0.724	0.17	Medium
Supplier	0.753	0.05	Small
Top Management Attitude	0.688	0.32	Medium

f² 0.02, small, 0.15 medium, 0.35 large

Effect size analysis (f^2) is a method to measure the changes in R^2 to see either the impact of a particular independent latent variable to a dependent latent variable has a substantive impact or not. Cohen (1998) has set up the range value of the impact of f^2 as 0.02 as a small effect, 0.15 as a medium and 0.35 as a large effect at the structural level. Table 9 indicates that awareness has a large effect, complexity and top management attitude have medium effect and supplier has a small effect on the adoption of Halal warehousing among Halal manufacturers in Malaysia.

4.0 FINDINGS AND DISCUSSIONS

Overall, the purpose of this study is to identify determinants to the adoption of Halal warehouse adoption among Halal manufacturers in Malaysia. From four hypothesis tested, only three relationships were supported viz the effect of awareness, complexity and top management attitude on Halal warehousing and another relationship viz the effect of supplier availability on Halal warehousing was not supported even the t-value shown it was significant. It is because the hypothesis is positively related, but since the beta value shown was negative, it means that supplier availability was negatively related to the adoption of Halal warehousing.

For technological context, results show that both relationships of awareness and complexity on Halal warehouse adoption were supported, but in the different direction relationship. Awareness is positively related and complexity was negatively related to the intention of adopting Halal warehousing activities. It means that, the higher the awareness would lead to the higher adoption among Halal manufacturers. Troshani and Doolin (2007) claimed that factors of low adoption of XBRL in Australia are low awareness. This finding is supported by study regarding XBRL adoption which Steenkamp and Nel (2012) found that slow adoption of XBRL was due to lack of awareness among potential users. It shows that, the lower the awareness, the barrier will be higher. This study found that awareness will lead to a higher in adoption decision. As a matter of fact, this study provided meaningful information for many parties involved in this area such as Halal warehouse providers, the Halal Development Corporation and other government agencies involved in promoting Halal services that should be more aggressive in promoting this service. The respondents for this study are among the non-adopters of Halal warehouse services. From the conversation during the data collection process, a few of them are not aware of the availability of this kind of services. But the main reason why they are still not adopting Halal warehouse services for their products is because they are not aware who are the providers, and do not know where they can get the services. Most of them indicated that they are willing to adopt it if the service are not complex to be adopted.

Complexity was found to be negatively related to the intention of the adoption of Halal warehouse. This finding is consistent with the other findings in different area of studies. Huy et al. (2012) studied regarding E-commerce and Wang et al. (2010) on RFID adoption, all of them found that complexity was negatively related to the adoption decision. Rogers (2003) defined complexity is the degree of innovation that is assumed to be difficult to understand and being used. The higher the complexities of new technology will lead to higher resistance for the potential organization to adopt it. Complexity could appear in many ways. The newer the technology, the smaller the information about it available in the market. Firms have a low confidence to adopt cloud computing system because it is relatively new to them (Buyya, 2009) and very limited source of information explaining about it. Tieman (2007a) also claims that the Halal supply chain is a new approach in logistic industry, and due to that matter, it is logical and sensible if the complexity is a barrier for Halal manufacturers to adopt it in the current situation. Furthermore, Halal is an Arabic word and it is only used by the Muslim, but at the same time, the majority of Halal manufacturers in Malaysia nowadays is non-Muslim (Tieman, 2011). To understand the Halal concept itself also a problem for them. It is unfair if Muslim consumers expect them to have a deep understanding about Halal warehouse concept.

This study used top management support as a variable representing the organizational context. The finding for this variable are consistent with Lertwongsatien and Wongpinunwatana (2003) and Low et al. (2011), who found that top management attitude positively influencing the adoption of new technology. Either SME or not, top management support play a vital role in the adoption process as they will decide what is the best for the organization. Even the workers found that Halal warehousing activities are good for the organization, but, if the top management did not support their views, the intention will remain as intention. It will be different if the top management think it is good for the organization, but the lower level management feels that it is not important, the adoption of Halal warehousing in their supply chain activity still will be executed since the top management will instruct and allocate some budget to realize it. Without

top management support, organizations are less likely to adopt new innovations (Lertwongsatien & Wongpinunwatana, 2003).

Interestingly, for environmental context, the Supplier availability was found to be negatively related to the adoption of Halal warehousing. This finding contradicted to the study Cool et al. (1997) who concluded that supplier related factors likely to accelerate the acceptance of an innovation. Their study showed that supplier availability will have an effect to the intention to adopt new technology, but in this study supplier availability is a barrier to the adoption. Probably, Halal manufacturers who are operating their business in Selangor and Kuala Lumpur, would not face any problems with the availability of the suppliers for Halal warehouse compared to the other areas. Currently, only six service providers are certified by JAKIM as Halal warehouse service providers and all of them are running their business in Selangor and Kuala Lumpur since the majority of Halal manufacturers are in Selangor (1103 firms) and Kuala Lumpur (399 firms). Halal warehousing is a new approach, that is why the number of service providers who are certified as Halal service providers are still very small. For Halal manufacturers who are operating their business outside Selangor and Kuala Lumpur, there is no Halal warehouse supplier available in their region except one in the Penang Port. But for Halal warehouse in Penang Port, it is provided for the export purposes, not for the local market. For this study, about 50.7% of the respondents come from outside Selangor and Kuala Lumpur and there is no certified Halal warehouse supplier in their regions. This is because we cannot expect Halal manufacturers to have a chance adopting it while there is no suppliers are available around them. Even most of the study found that supplier availability would enhance the adoption, but in this study with the current scenario, lacking of supplier availability was a barrier for them to adopt Halal warehousing services that leads the result for this study for supplier availability which was negatively related to the adoption of Halal warehousing services.

5.0 CONCLUSIONS

Halal supply chain is a process which must be Halal at the point of origin of the supply chain until it reaches the customers' destination (Omar & Jaafar, 2011). The process of Halal warehouse also must be included since most of the manufacturers are manufacturing the product to the market not only to their district, but also to the whole state or entire Malaysia.

This study is an early attempt to explore and develop Halal warehouse adoption model that was theoretically grounded in the TOE framework. By adopting the TOE framework this study has shown that all three contexts in the framework which are Technology, Organization and Environment context have a significant relationship to the adoption of Halal warehousing. Although, not all variables that commonly used in other studies were applied to this study and it contributes to the body of knowledge especially on the adoption study. This study found that awareness and top management attitude was positively related to the adoption of Halal warehouse, but the complexity and supplier availability was negatively related.

Despite only four variables which are investigated, these findings also have important implications and great value to the Halal service providers, government agencies and also for academicians. Halal service providers can take the results of this study especially on the awareness since the awareness has the largest impact on this study. Suppliers or Halal service providers and government agencies who are responsible in promoting Halal in Malaysia should be

more aggressive since the low level of awareness among Halal manufacturers regarding their services availability in the market. The supplier also should note that they are not the only groups who would benefit of higher adoption rate for their services, but also Muslim consumers would be very happy if Halal products are really Halal to be consumed at the point of consumption. For academics, they could take this study as a stepping stone to continue this area of study since there is a very small number of literature regarding the adoption of Halal supply chain services. Future research could focus on examining the Halal supply chain in another area of the Halal supply chain such as transportation and purification services. Since, this study focused on the non-adopter, it is suggested that future study may focus on the adopters of halal warehousing concept.

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