

MODELLING THE ADOPTION OF HALAL WAREHOUSING SERVICES AMONG HALAL PHARMACEUTICAL AND COSMETIC MANUFACTURERS

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Abstract: Halal warehousing services were invented by logistics providers in Malaysia to preserve the quality of halal-certified products. Nevertheless, in Malaysia, the acceptance of halal warehousing services has been relatively underwhelming. This research identifies the factors that influence pharmaceutical and cosmetics manufacturers when considering whether to use halal warehousing services. A purposive sampling method was used to collect data from 97 halal manufacturers in Malaysia. Also, structural equation modelling with Smart PLS was applied to investigate the relationship between the latent constructs. The findings show that cost and customer pressure are significant factors that influence the decision of whether to adopt halal warehousing or not. In contrast, supplier availability and organisational readiness are not substantial factors and do not significantly influence the adoption of halal warehousing. The top management attitude moderates the positive relationship between customer pressure and the intention to adopt halal warehousing. The findings provide useful information and give a fuller perspective of the factors that influence the decisions of pharmaceutical and cosmetics companies when deciding whether to use halal warehousing. Furthermore, this study provides recommendations to enhance the adoption of halal logistics by service providers and government.

Keywords: Halal warehousing, halal pharmaceutical, halal cosmetics, TOE framework.

Introduction

Islam is the world's fastest-growing religion, and as a result, consumer's demand for halal cosmetics and pharmaceuticals are on the rise. According to Reuters (2015), Islam, with an average growth rate of 1.5%, will make up 26.4% (8.3 billion) of the world population by 2030. Furthermore, Muslim consumers are now demanding not only high quality but also that products adhere to Islamic law and are halal. Formerly, the term *halal* was commonly associated with food and beverages, but nowadays, it is also used to refer to pharmaceuticals and cosmetics. Halal means that something is allowable or permissible under Islamic law, which, according to Islamic Fiqh, relates to the quality and cleanliness of

products. The concept of halal has also attracted some non-Muslims who are now users of halal products (Ngah *et al.*, 2015). Halal certified products ensure that the production processes and the ingredients are of good quality and are safe to consume. Therefore a proper supply chain which includes halal logistics providers cooperation and contribution in ensuring its integrity (Ali & Suleiman, 2018).

According to market statistics for 2015, the global pharmaceuticals and cosmetics market was worth 334 billion and 13 billion USD respectively. The halal cosmetics market value is expected to grow by around 12% to 52.02 billion USD by 2025 (Grand Review Research, 2017). The halal pharmaceutical industry made approximately 75 billion USD in 2016, and this

is predicted to reach 132 billion by 2021 (News Straits Times, 2017). The increasing demand for halal pharmaceutical and cosmetics has had a snowball effect and led more companies to seek halal certification, primarily cosmetic and pharmaceutical manufacturers. However, although the number of manufacturers is increasing, the adoption of halal warehousing (HW) services among them is still relatively low (Ngah *et al.*, 2017, Ngah & Thurasamy, 2018). Even most Halal certified manufacturers are still unwilling to adopt HW services in their business operation (Ngah *et al.*, 2015). Interviews with three halal transportation providers revealed that only around 10-15% of certified halal manufacturers are using HW services (Ngah *et al.*, 2014a). This situation is perplexing, especially when the products are declared as being halal. Many feel that the product should adhere to halal practices throughout the whole supply chain from the point of origin to the consumption (Tan *et al.*, 2017). However, despite the low usage of HW services, around 85-90% of halal manufacturers still claim that there are no issues regarding whether their products are genuinely halal.

Many think that by not using an entirely halal supply chain, there is no guarantee that the halal quality is preserved (Ngah *et al.*, 2014b). In fact, in Malaysia, the Department of Malaysian Quarantine and Inspection Service (MAQIS), seized cargo at the port of Tanjung Pelepas and found that Halal and non-Halal products were stored and being shipped in the same containers (Said, 2017). Proper handling includes logistics management, should be based on Islamic requirements that play a vital function in preserving the integrity of the halal products. Without adopting the HW services for the chain of activities, the status of the halal products could be questioned, and they may be deemed unacceptable. Nowadays, more consumers are looking for halal quality products; therefore aligning with halal requirements could provide companies with a competitive advantage (Zailani *et al.* 2011). It is a massive task for academicians to improve the understanding of the halal supply chain or make recommendations

on best practice because research on the subject is still lacking (Tieman *et al.*, 2012). Most studies on halal cosmetics and pharmaceuticals focus on ingredients, certification and consumer behaviour at an individual level (Teng *et al.*, 2013; Halim *et al.*, 2014; Norazmi & Lim, 2015; Putri *et al.*, 2019), whereas this study focuses on consumer behaviour at the organisational level.

Due to lack of study on halal cosmetics and pharmaceuticals, especially on the adoption of halal warehousing, this study investigates the factors that influence the halal pharmaceutical and cosmetics manufacturers in Malaysia to adopt the HW services. It looks at what influences top management decision making by using the technological-organisation-environmental (TOE) framework. This study is highly necessary, since most of the Halal studies only looked into the halal process, status, ingredients or management, but focused very little on the adoption of HW among certified manufacturers in Malaysia. Furthermore, Malaysia is regarded as a leading producer of halal products and many other countries look to Malaysia as an example when seeking guidance regarding standards and practices for food (MS 1500: 2009), pharmaceuticals (MS 2424; 2012), cosmetics (MS 2200; 2012) and logistical services (MS 2400; 2010). Therefore, the findings of this research are useful to various parties like consumers, manufacturers, and logistics providers, both in Malaysia and abroad.

HW is a crucial stage of the halal supply chain. However, it is still considered a relatively new practice to adapt warehousing to meet halal standards, so research on the topic is scarce. Since HW adoption is a new practice, the study considers its adoption in the same way as new technology adoption. The complexity of HW practices means that not all logistics workers can perform them correctly (Syazwan *et al.* 2013) unless they have been trained by halal-certified warehousing providers. Without proper handling, the halal status of the products can be placed in doubt. The Department of Islamic Development Malaysia (JAKIM) formulated quality standards for warehouses to adhere to known as MS 2400-2:2010; *Halalan Toyiyiban*

Assurance Pipeline Part 2: Management System Requirements for Warehousing and Related Activities.

HW providers avoid any chances of cross-contamination, which differentiates them from conventional warehousing providers (Riaz & Chaudary, 2004). Also, the halal goods and non-halal goods are kept separate when they are stored in warehouses (Tieman, 2007; Talib *et al.* 2010). Considering that all halal products go through a warehouse, if they are not handled by a halal warehouse, their integrity may be doubted. Furthermore, many believe that once a product is deemed to be halal, it must adhere to the same principles throughout the supply chain. Tieman (2007) stated that halal products must follow compliance in the warehousing activities because before they reach the point of sale, many products spend more time in the warehouse than anywhere else.

Managing costs is vital for businesses because it has a substantial impact on overall organisational performance. The adoption of new technology usually means that further costs are incurred. According to Premkumar and Roberts (1999), the financial cost is one of the primary elements to consider when adopting new technologies. This opinion is shared by Brown and Rusell (2007), and Hoske (2004) who stated that adopting new technology can be extremely costly for businesses. Tornatzky and Klein (1982) proposed that cost is often the barrier that prevents a company from adopting a service or technology. Also, a lack of knowledge and understanding influences the decision of whether to select a product or service. HW is still new in the warehousing industry, so choosing it will likely result in increased outlay for businesses, especially during the initial transition period. Furthermore, many halal manufacturers do not fully understand the benefits of HW, so it is difficult to convince them to make the change (Omar & Jaafar, 2011).

Based on the information detailed in this study, the following hypothesis is proposed:

H1: Cost has a negative influence on HW adoption

Organizational readiness could influence the decision to adopt HW. According to Asif & Mandviwalla (2005), organisational readiness is a vital factor that influences the adoption of technology. Organisational readiness is related to how willing and capable the people in an organisation are to achieve the company's goals, or how financially capable the company is to achieve its goals. This research focuses on the financial and HR readiness of halal pharmaceutical and cosmetics manufacturers to adopt HW services. Even though the organisational readiness varies according to the nature of the business, Tsai and Tang (2012) claimed that it still influences an organisation's decision to adopt new technology. Previous studies found that organizational readiness has a positive relationship with the intention to adopt new technology (Alam & Sayuti, 2011; Gangwar *et al.*, 2015). Hence, the second hypothesis is as follows:

H2: Organisational readiness has a positive effect on HW adoption.

Customer pressure is crucial in shaping the business activities of manufacturers, and their survival relies on customers' acceptance of their products or services. Businesses must be sensitive to their clients' needs to ensure continued support from them. This study defines customer pressure as consumer pressure that forces the halal pharmaceutical and cosmetics makers to adopt HW services. Several studies claimed that customer pressure has a positive relationship with the decision to adopt the service (Grandon & Pearson, 2004; Al-Qirim, 2005; Sophonthummapharn, 2009). Therefore, the next hypothesis is as follows:

H3: Customer pressure has a positive effect on the HW adoption decision.

Suppliers are essential in the introduction of new products or innovations because they are responsible for introducing, promoting the product or service to consumers, and for offering backup services. Resultingly, businesses are more inclined to introduce new technology if they feel that it is easy to find reliable and flexible suppliers (Lutra *et al.*, 2017). Previous studies

found that the decision to adopt new technology is positively influenced by supplier availability. Cool *et al.* (2008), supported this idea and concluded that the adoption of new technology was positively related to supply-related factors. The supplier has a direct effect on the intention to purchase the internet connection (Cool *et al.*, 2008). Furthermore, Al-Qirim (2007) stated that the supplier has a positive relationship with the intention to adopt new technology. Therefore, this study hypothesised the following:

H4: Supplier availability is positively related to the adoption of HW.

Top management attitude (TMA) has frequently been employed as an independent variable in adoption studies. Nevertheless, this study used TMA as the moderating factor for the relationship between customer pressure and the intention to adopt HW. The moderating factors are introduced if there is an inconsistent pattern in the literature. Previous studies claimed that customer pressure positively relates to the adoption decision (Grandon & Pearson, 2004; Al-Qirim, 2005; Sophonthummapharn, 2009). However, Askool and Nakata (2012) found that customer pressure was not a significant factor in the espousal of social customer relationship management. Due to this inconsistency, it was decided that TMA would be a moderator in the supply chain study (Raganath *et al.* 2004). Hence, the final hypothesis is as follows:

H5: The positive relationship between customer pressure and intention to adopt will be stronger when the TMA is low.

All the hypotheses are summarised in the research framework in Figure 1.

Methodology

The unit of analysis of this study was in the organisation. The respondents were the top management from halal pharmaceutical and halal cosmetics manufacturers who had an expo stall at the Malaysian International Halal Showcase (MIHAS) that was held at the Kuala Lumpur Convention Centre (KLCC) from April 3rd to 6th. Also, the halal festival (Halfest) held at the Mines Exhibition Centre, Seri Kembangan Selangor from October 2nd to 6th. At both events, there were many halal manufacturers in attendance. Because the study focuses on the cosmetics and pharmaceuticals industries, a purposive sampling method was used. The purposive sampling method is used to ensure the validity of the sample and is applicable due to the characteristics of the respondents (Rowley, 2014).

Furthermore, according to (Hulland, Baumgartner, & Smith, 2017), a non-probability sampling method is suitable for studies that test theoretical effects based on the research framework. 110 questionnaires were distributed, and 102 of them were answered.

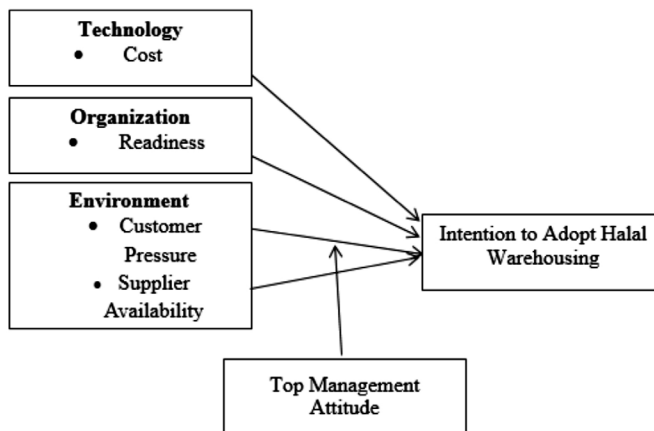


Figure 1: Research framework

Eight respondents were unwilling to respond because of time constraints at the event. From the 102 returned questionnaires, only 97 could be employed for data analysis.

According to a list obtained from the Halal Development Corporation, there are a total of 175 halal pharmaceutical and 73 halal cosmetics manufacturers that possess a halal certification. Ninety-seven from the 248 halal manufacturers were involved in this study. This study uses structural equation modelling with Smart PLS version 3.2.7 to test the hypotheses. According to Hair *et al.* (2017), the sample size should be based on the power of analysis, which is the minimum number of samples based on the model complexity. Based on Green (1991) table, six predictors from the research framework have a medium effect size. Also, it is suggested by Gefen *et al.* (2011) that the minimum sample size should be 97. Therefore, the 97 respondents of this study fulfil the minimum sample size to test the research model. Table 1 shows the categorisation of the respondents according to category. Halal pharmaceutical companies are higher in number in Malaysia than cosmetics companies, but there were less of them in attendance at the two events. Hence, 57 % of the respondents belong to the halal cosmetics industry.

Measurement of Variables

All items used to measure the constructs in the theoretical framework were adopted and adapted from various pieces of seminal technology adoption literature. Elements for cost, readiness, supplier, and customer pressure were adapted from Sophonthummapharn (2009), the item to measure TMA from Khemtong and Roberts (2006), and the item for the intention to adopt

halal transportation was adapted from Chen *et al.*, (2011).

Data Analysis and Findings

The data were analysed using Smart PLS version 3.2.7, which is software developed by Ringle *et al.*, (2015) that is a variance of structural equation modelling (SEM). It is a worthy alternative instead of covariance-based SEM because this work predicts the relationship between the variables in the research model rather than reproducing the covariance matrix to achieve a model fit (Hair *et al.*, 2017). Furthermore, Smart PLS is also suitable for the data that do not meet the normality requirements. As suggested by Hair *et al.* (2017), the study tests the multivariate normality by looking at the skewness and kurtosis using the available software: https://webpower.psychstat.org/models/kurtosis/results.php?url=df6c03b42059738095a7c13f68dce510_

Results showed the data were multivariate and not normal as follows: Mardia's multivariate skewness with $\beta = 5.391$ and $p < 0.01$; and 2) Mardia's multivariate kurtosis with $\beta = 51.810$ and $p < 0.01$. Hence, Smart PLS was chosen as it is a nonparametric analysis software. This survey employed a two-stage approach. The first stage was the measurement model, which was concerned with relations between the items and the construct (Anderson & Gerbing, 1988). Second, the structural model was used to test the hypotheses by using bootstrapping procedures with 500 resampling subsamples. With bootstrapping, the number of subsamples must be higher than the number of respondents for the study, which was the case in this study (Hair *et al.*, 2017).

Table 1: Respondents according to the industry

Data \ Industry	Pharmaceuticals	Cosmetics	Total
MIHAS	21	30	51
HALFEST	21	25	46
Total Respondent	42	55	97

Testing for Common Method Variance (CMV)

Since data were compiled from a single source, method bias could have been an issue. For the procedural approach, this study employed different scales to measure the predictors and criterion variables (Podsakoff *et al.*, (2003). Harman's single factor test was used for statistical testing and showed that the first criterion only explained 27.64% of the 71.35% variance. A CMV is a problem if the first factor results in more than 40% of the total variance (Babin *et al.*, 2016). Bagozzi *et al.* (1991) mentioned that method bias is a problem when the correlations are 0.90. This study obtained the correlation of less than 0.90, which indicates that CMV was not a severe problem.

Measurement Model

The first test is convergent validity, which reflects whether a particular item measures a latent variable that it is said to measure (Urbach & Ahlemann, 2010). Hair *et al.* (2017) proposed that the loading and average variance explain (AVE) must exceed 0.5, and the composite reliability (CR) must reach 0.7 to ensure that convergent validity is established in the model. The analysis confirmed that convergent validity was adequate with loading, AVE and CR values surpassing the recommended values (ranging from 0.617 to 0.934, for loading, 0.602 to 0.825 for the AVE, and 0.855 to 0.935 for CR. Thus, it can be confirmed that the measurement model showed evidence of convergent validity. Table 2 and Figure 2 illustrate the result of the measurement model of the study.

The second test is a test for discriminant validity, which ensures all the constructs are unique and captures phenomenon not mapped by other constructs in the model (Hair *et al.*, 2017). Henseler *et al.* (2015) proposed the use of HTMT ratio at this stage. An HTMT value higher than 0.85 indicates there is a severe issue of discriminant validity (Henseler *et al.*, 2015). Table 3 shows that discriminant validity is established because all the HTMT values were lower than the most conservative value set out by Henseler *et al.* (2015).

Once a measurement model is confirmed, the lateral collinearity test (VIF) was tested to ensure that there is no collinearity issue in the model before proceeding to the structural model. Diamantopoulos and Siguaw (2006) remarked that if the VIF value is higher than 3.3, it has a potential collinearity issue. Table 4 shows that all VIF values are lower than 3.3, confirming that the lateral multicollinearity is not a concern for this study.

Structural Model

In evaluating the structural model, Hair *et al.* (2017) proposed to look at the standard beta, t-values with a bootstrapping procedure using a resample with more respondents, confidence intervals, Q^2 ; which regarding the predictive relevance, and the f^2 ; which looking at effect sizes. The results reveal that two hypotheses were supported (H1 and H2) and another two hypotheses were not supported (H3 and H4). Cost ($\beta = -0.453$, $t = 3.787$: LL = - 0.648, UL = - 0.271, $p < 0.001$) and customer pressure ($\beta = 0.299$, $t = 2.326$: LL = 0.076, UL 0.500, $p < 0.01$). Regarding organizational readiness ($\beta = 0.087$, $t = 0.919$: LL = -0.144, UL = 0.194, $p < 0.179$) and supplier ($\beta = -0.244$, $t = 2.293$: LL = -0.392, UL = -0.075, $p < 0.011$), they were also unsupported. For H4, the values show that it should be supported since the hypothesis generated was positive, however, the findings found that it was negatively related so H4 is unsupported.

Table 6 presents the report of the coefficient of determination (R^2), the effect size (f^2), and the predictive relevance (Q^2) of exogenous variables on the endogenous variable. The R^2 value is 0.488, suggesting that cost, customer pressure, organizational readiness, supplier, and TMA made up 48.8% of the variance in the intention to adopt HW. The Q^2 for intention is 0.358, which is higher than 0 (Hair *et al.*, 2017), indicating that all exogenous variables have a predictive ability on the intention to adopt HW. Among the endogenous variables, the cost has a medium effect, and customer pressure has a small effect on the intention to adopt HW.

Table 2: Measurement Model

Construct	Loading	CR	AVE
<i>Cost</i>			
Additional costs will be incurred to apply halal supply chain services	0.860	0.935	0.783
Halal supply chain services adoption cost is higher than the benefit.	0.902		
The amount of money and time to be invested in the adoption of halal supply chain services are high	0.895		
The cost of halal supply chain services is quite high for our company.	0.882		
<i>Customer Pressure</i>			
Our customers are pressuring us to adopt halal supply chain services.	0.918	0.928	0.812
Customers' requirements indicate that our company need to adopt halal supply chain services.	0.902		
Customers' behaviours indicate that our company need to adopt halal supply chain services.	0.883		
<i>Intention to Adopt Halal Warehouse</i>			
Our organization has an intention to adopt halal warehousing services in our operation near future.	0.934	0.934	0.825
Our organization will try to adopt halal warehousing services in our operation near future.	0.926		
Our organization has the plan to adopt halal warehousing services in our operation near future	0.864		
<i>Readiness</i>			
Our organization gave its staff a formal explanation regarding halal supply chain services.	0.794	0.855	0.602
The budget was an important factor that our organization had to deal with before adopting halal supply chain services.	0.924		
Our organization has the financial resources to adopt halal supply chain services.	0.617		
Our organization has knowledgeable staff to adopt halal supply chain services.	0.736		
<i>Supplier</i>			
Halal supply chain service providers are available in my area.	0.879	0.899	0.691
Halal supply chain service providers promote their services to our organization	0.848		
Our organization has contact with some halal supply chain service providers	0.772		
We believe that our current supply chain activities could match the services offered by halal supply chain service providers.	0.823		
<i>Top Management Attitude (TMA)</i>			
Top management considers the halal supply chain services as important.	0.852	0.917	0.787
Top management support the adoption of halal supply chain services	0.921		
Top management will allocate resources for the adoption of halal supply chain services.	0.888		

Note: CR = Composite Reliability, AVE = Average Variance Explain, TMA4 has been deleted due to low loading

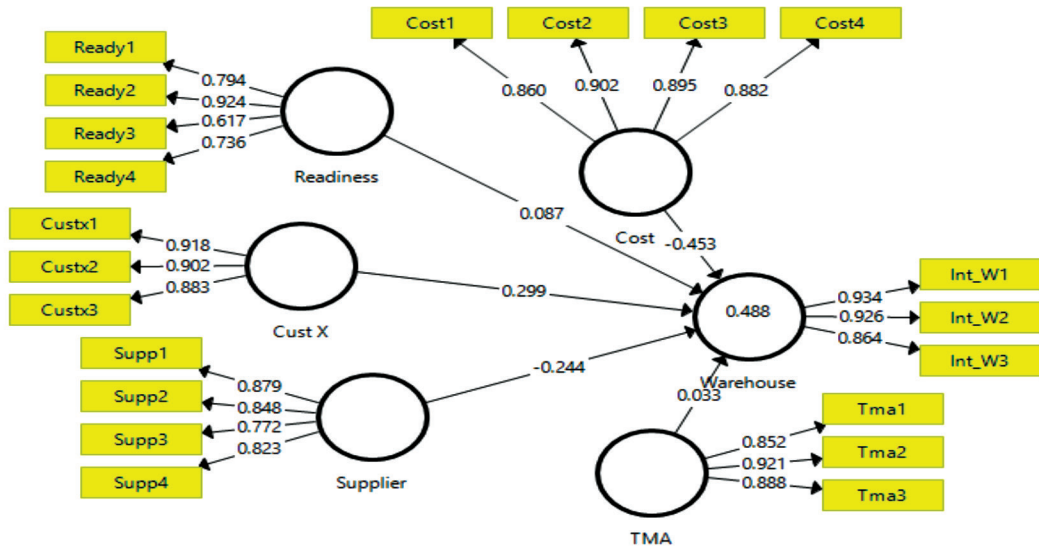


Figure 2: Measurement model

Table 3: Discriminant Validity, Heterotrait-Monotrait Ratio (HTMT)

	Cost	Cust X	Readiness	Supplier	TMA	Warehouse
Cost						
Cust X	0.569					
Readiness	0.068	0.208				
Supplier	0.089	0.064	0.123			
TMA	0.241	0.124	0.135	0.441		
Warehouse	0.642	0.621	0.140	0.210	0.208	

Table 4: Multicollinearity

Construct	VIF
Cost	1.469
Cust X	1.437
Readiness	1.071
Supplier	1.225
TMA	1.246

Table 7 elucidates the moderating effect of the TMA on the relationship between customer pressure and the intention to adopt HW ($\beta = -0.258, t = 3.338; LL = -0.377, UL = -0.140, p < 0.001$). It was found that the TMA moderates

the relationship between customer pressure and the intention to adopt HW. Dawson’s (2013) plot, as presented in Figure 3, illustrates that the postulated relationship is stronger when low top management attitude. As such, H7 is supported.

Table 5: Path Coefficient Assessment

Hypothesis	Relationship	Beta	SE	T Value	P Values	LL	UL	Decision
H1	Cost -> Warehouse	-0.453	0.120	3.787	0.001	-0.648	-0.271	Supported
H2	Cust X -> Warehouse	0.299	0.128	2.326	0.010	0.076	0.500	Supported
H3	Readiness -> Warehouse	0.087	0.095	0.919	0.179	-0.144	0.194	Unsupported
H4	Supplier -> Warehouse	-0.244	0.106	2.293	0.011	-0.392	-0.075	Unsupported

Table 6: Coefficient of determination (R²), effect size (f²) and predictive relevance (Q²)

Construct	R Square	Q Square	f Square	Decision
Warehouse	0.488	0.358		
Cost			0.273	Medium
Cust X			0.121	Small

Table 7: Moderating effect of TMA

Relationship	Beta	SE	T Value	P Value	LL	UL	Decision
Cust X * TMA -> Warehouse	-0.258	0.077	3.338	0.001	-0.377	-0.140	Supported

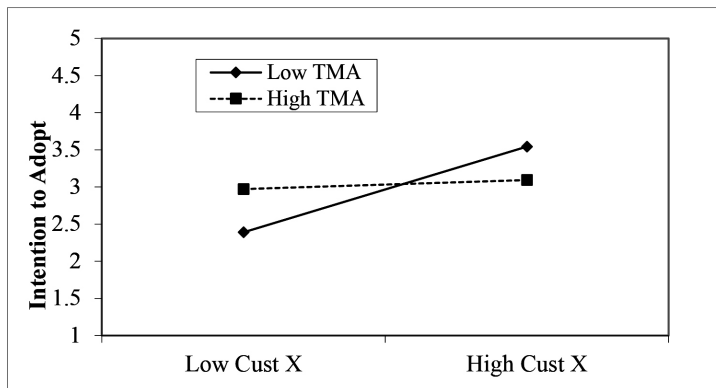


Figure 3: Moderation effect of TMA

Discussion

This survey aims to find out the components that lead to the adoption of HW among pharmaceutical and cosmetics manufacturers in Malaysia. By employing the TOE Framework, this study investigates the critical determinants

that affect the decision to adopt HW services. This study confirms that the hypotheses for cost and customer pressure are supported. Also, the moderating effect of the TMA on the relationship between customer pressure and the intention to adopt WH services is supported. However,

organisational readiness and suppliers were found to be unsupported. In general, the study revealed that the TOE Framework is useful in explaining the factors that influence the decision to adopt HW among the halal pharmaceutical and cosmetics manufacturers in Malaysia.

The cost was negative relationship with the adoption. It shows that higher costs result in a lower intention to adopt. This finding was supported by Premkumar and Roberts (1999), Hoske (2004), and Brown and Rusell (2007). The HW service providers should take some action as this study shows that cost serves as a barrier for many companies. Therefore, service providers should lower prices to increase the adoption rate, especially among the halal pharmaceutical and cosmetics manufacturers. They should consider the long-term profits and growth potential rather than focusing on short term costs. Once the halal manufacturers start to understand the importance and the benefits of adopting the services, there will be more business as the numbers of halal manufacturers is increasing rapidly.

Customer pressure was found to possess a positive relationship with the intention to adopt HW among pharmaceutical and cosmetics manufacturers in Malaysia. The finding is in line with previous literature that claims that customer pressure has a positive relationship with the intention to adopt a novel technology (Al-Qirim, 2005; Sophonthummapharn, 2009). The environmental factor could also be a factor that influences the decision to adopt the service among business organisations. Hence, Muslim consumers should start to play their role in pressuring halal manufacturers to adopt HW services. When customers begin to pressure halal pharmaceutical and cosmetics manufacturers to use HW, the companies are more likely to do it because they fear to lose their customers to competitors. Even though not all of the products in these categories are halal certified, Muslim consumers still have a wide choice of competitors from whom they can buy their products.

Another two hypotheses have a direct relationship, but they were found as unsupported. Organisational readiness was not a significant factor in terms of HW adoption. This finding is like research carried out on the adoption of e-market in Australian SMEs (Duan *et al.*, 2012). Organisational readiness also proved not to be a significant factor in influencing businesses to adopt HW services. This result is because adhering to halal procedures throughout the whole process is something that is done voluntarily, and as long as companies have a halal stamp, they are satisfied. Furthermore, the halal stamp is more than enough to convince people to choose their products over non-halal products. Although the halal manufacturers in Malaysia have an indispensable knowledge of halal, they are unfortunately still unwilling to dedicate themselves to the issue at a higher level (Othman *et al.*, 2004).

Supplier availability is another non-significant factor in the adoption of HW. Although the literature on technology adoption claimed that the supplier has a positive relationship with the adoption decision, this study obtained a contradictory result. Even though the *t* value, lower level (LL), and upper level (UL) from the table 5, were in the area of supporting the hypothesis, the hypothesis was developed to test the positive side. The beta value showed a negative sign, which showed that it is not supported. The negative result was because the majority of the HW providers are in the centre of the country in Selangor and Kuala Lumpur. The respondents of this study are from the different states in Malaysia. So, perhaps halal pharmaceutical and cosmetics manufacturers are not adopting the services due to the limitations of suppliers in other parts of the country. If there were suppliers of HW services in their area, the findings of this study might be more like those in the previous literature.

For the moderating factor, this study found that the positive relationship between customer pressure and the intention to adopt WH is stronger when the TMA is lower. The top management attitude has an important impact on strategic and

operational decisions. Most of the halal-certified manufacturers in Malaysia are non-Muslims, and it is possible that their understanding of the importance of halal is not as extensive as Muslim owners, which is reflected in their operational decision making. For the top management, there is no need to change their warehouse to HW if their products have a halal stamp. However, if top management has less power, the intention to adopt HW is higher. Even though the bulk of top management is non-Muslims, halal is a part of everyday life for Muslims, so it makes sense to let Muslims decide on the best practices to reach Muslim consumers. If the customers are happy and satisfied that the products are halal throughout the whole supply chain, the chance of them continuing to consume the products is relatively high.

Conclusion

This study introduces the capability of the TOE Framework with the TMA as the moderator in the research model to enrich the theoretical explanation of the intention of Malaysian halal pharmaceutical and cosmetics manufacturers to adopt HW activities. The study was limited to four variables, and other variables could explain the intention to adopt HW in more depth. On top of that, the term *halal* also includes other areas such as halal transportation and shipping, which have a significant role in the halal industry. Future studies should include more halal manufacturers to provide a more comprehensive view of the subject. Other variables that could give further insight are government enforcement and regulations in the halal industry, as well as the availability and characteristics of suppliers. Warehousing is crucial to preserve the halal quality, and it is another area of the supply chain that still requires further attention from researchers. Halal transportation and other halal activities should be explored to provide enough knowledge to the business and community. This study identified the factors influencing the adoption decision, future research could focus on the financial and operational impact of HW on businesses that have already adopted it. If there

is empirical research that shows the benefits of adoption, it may enhance the adoption rates of halal services, not only in Malaysia but also in the rest of the world.

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