

# ANTECEDENTS OF HALAL COSMETICS SUPPLY CHAIN AGILITY PRACTICES: SCALE DEVELOPMENT AND VALIDATION

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**Abstract:** *Supply chain agility practice plays an important role in the post-Covid-19 era since it enables the assessment and mitigation of supply chain risks particularly in halal industry. Manufacturers are increasingly interested in implementing supply chain agility practices due to the rapid growth of competition in the network. The aim of this study is to develop an instrument and empirically assess the measurement of the antecedents of halal cosmetics supply chain agility practices. The instrument was developed in stages, beginning with identification of antecedents, item generation, questionnaire development, pre-testing, pilot testing, and scale validation. Data were collected from 120 local cosmetics manufacturers across Peninsular Malaysia. Six industrial experts and three academic experts were selected to assess the questionnaire at pre-test phase. The scale was assessed for reliability and validity using Cronbach's Alpha and Exploratory Factor Analysis (EFA). The scale generated was made up of nine antecedents that were modelled as independent variables covering a total of fifty-two items. As a result, a final instrument of halal cosmetics supply chain agility practices was developed and empirically validated before the main survey took place. Manufacturers and future researchers can use this instrument to further investigate the dimension of supply chain agility practices in other selected industry.*

**Keywords:** *Halal cosmetics, Halal supply chain, agility, Scale development, Scale validation*

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## Introduction

According to Kucharska and Erickson (2023), supply chain management is a principle that emphasises the use of efficient cohesive system of supplier, producer, warehouses, retailer, and customer. This ensure that the items are produced and distributed in the right quantities, location, and time to minimize the costs and maximize the service. Supply chain management is important for manufacturers that depend on sources from other suppliers in which the manufacturer interactions may then rely on several additional suppliers to produce the final product. As studied by Maleki Far et al. (2017), supply chain enables a company to respond on client inquiries, track orders, and provide comprehensive after-sales assistance. According to the World Bank (2023), supply chain has become global and complex due to the rapid growth of network and competition. If there are failures at any one point in the chains, it will have the potential to put the completion of a project at risk which can cause reputational risk for the manufacturer. Thus, the entire project will suffer if there are any supply chain disruptions. According to Ibrahim et al. (2023), supply chain interruptions, such as floods and unforeseen catastrophes, have historically serious economic and environmental effects, emphasising the importance of risk mitigation techniques for improving organisational performance. One of the most important characteristics of successful supply networks in the turbulent and fiercely competitive market of today is supply chain agility (Tracey et al., 2021). According to Jindal et al. (2021), by implementing supply chain agility, all resources like customer sensitivity, process integration, network integration, virtual integration must be reconfigured quickly enough to deal with changes and uncertainties. Various interruptions, such as political changes, accidents, natural catastrophes, and supplier failures, can have an impact on the whole supply chain's revenues and expenses. Al Humdan et al. (2020) defined supply chain agility as a supply chain's ability to adjust to changes in a timely manner. Meanwhile, Routroy et al. (2018) discovered that supply chain agility allows organisation to improve its daily operations while also lowering costs, increasing profitability, and gaining competitive advantage. Supply chain agility is considered one of organisations' operating strategies for speed and flexibility, which is the primary goal of supply chain agility to quickly adapt to changes in demand or supply, as well as to efficiently manage external interruptions.

In the context of halal cosmetics, the supply chain agility refers to the capability of the halal supply chain to adjust the process of producing, transporting, and distributing halal cosmetics to merchants and customers. The supply chain begins with requirements and of raw materials, which must adhere to halal requirements, and ends with the distribution of finished items to merchants or customers. The global demand for halal cosmetics among Muslim customers is growing rapidly (Rasi et al., 2017; Sugibayashi et al., 2019). Despite that, Naimat et al. (2024) stated that currently both Muslims and non-Muslims prefer the halal standard. The halal cosmetic industry must fulfil the basic requirement for halal cosmetic product based on Islamic Shariah at every phase of the cosmetics supply chain, including receiving, preparing, processing, storing, packing, labelling, regulating, handling, transporting, and distributing. For that reason, cosmetics companies must properly communicate the function of supply chain management strategy, as it is vital to each company's success. Value chain analysis for business aims to get a competitive advantage in the market by examining the whole supply chain in which each firm operates (Usman et al., 2021). However, COVID-19 has caused severe supply chain disruptions worldwide, particularly in 2020. The halal certified cosmetics businesses in the growing market like India, Indonesia, Malaysia, and others are facing pricing impulsiveness and economic insecurity as a result of the new pandemic. Covid-19 has had a negative influence on manufacturers, resulting in supply chain contacts, performance blockages, and cost

concerns. Previous study has found organisations that experience supply chain disruption are more likely to face continuing financial consequences (Kanike & Robinson, 2023).

While prior research in halal supply chain agility has been studied in detail, there is no relevant study on this context that has provided an empirically tested measurement instrument. Lack of scale for measuring halal supply chain agility practices may create difficulties to understand supply chain agility outcomes. Hence, the objective of this study is to develop measurement instrument and empirically test the scales for measuring the antecedents of halal cosmetics supply chain agility practices.

## Literature Review

Using an extensive review of halal cosmetics supply chain management literature, four major antecedents were identified to measure halal cosmetics supply chain agility practices. Detailed descriptions of the antecedents are explained in the following paragraphs.

### Innovation Capabilities

Innovation capabilities are an important element for the organization to improve their performance which leads to the new product implementation, service and procedure, as a way to deliver business value and securing competitive advantages (Mendoza-Silva, 2020). Despite of that, Weber and Heidenreich (2018) defined innovation capability as the manufacturer's capability to gain along with the adapted novel knowledge and to allocate the knowledge in new products or services. In addition, the knowledge applications and skills surrounded within the routine process of the organization to perform innovations activities are also referred as technical and nontechnical innovations (Ngo & O'Cass, 2013). Based on the discussions in the prior studies, there are eight antecedents of innovation capabilities which are relevant: knowledge management, organizational learning, organizational culture, leaderships, collaborations, creativity, idea management and innovation strategy. However, for the current study, the researchers proposed two antecedents as defined in Table 1.

**Table 1: Innovation Capabilities Antecedents**

Antecedent	Description
Innovation Strategic	Innovation strategic refers to any incremental or radical change embodied in products and processes, including changes in value operations such as services and administrations.
Knowledge Management Practices	Firms that can efficiently manage knowledge resources hope to get benefits such as increased customer service, decreased infrastructure costs, improved decision making, innovation, fostering organisational agility, and speed in establishing new product lines, among others.

### Management Capability

Management capabilities are a key aspect in project success (Iqbal et al., 2015). Despite this, management plays a significant role in organisational since they bear primary accountability and responsibility for managing and designing organisational change (Albrecht, 2002). The development of managerial capabilities includes elements such as halal training and operational flexibility. According to Amil et al. (2020), management capabilities is a set of activities carried out within the organisation to increase the management effectiveness. In fact, management practices have an impact on supply chain processes. Meanwhile, Truong et al. (2017) claimed that management methods help to balance the link between forecasting and supply, hence improving operational performance. This means that management techniques must address all parts of the supply chain to ensure the organization's success. Higher-level management is

responsible to improve organisational effectiveness while also lowering the costs of numerous tasks (Gold & Schleper, 2017). Therefore, management practices also play an important role in the effective implementation of halal cosmetic supply chain agility. For the management capability, it proposes three antecedents as defined in Table 2.

**Table 2: Management Capabilities Antecedents**

Factor	Description
Partner Cooperation	The desire to perform complementary measures to attain common aims.
Conflict Management	Conflict is almost unavoidable in buyer suppliers' partnerships as a result of two partnerships striving to maximise their profits from the commercial connection.
Employee Training	Employee training is a technique for growing individuals within an organisation, and it increases employees' job knowledge and skills.

### **Government Support**

According to Yusoff et al. (2021), government support is divided into two categories: financial and non-financial support. To date, government has given supports to micro, small and medium enterprises (MSMEs) sector in a variety of ways, including taxes break, loans, social support, and financial assistance (Alkahtani et al., 2020). In terms of financial assistances, government has provided many financial incentives which allow MSMEs to extend their operational activities, hence improving their performances (Jayeola et al., 2022). Meanwhile, non-financial assistance refers to non-monetary supports available for venture growth, promotion, and survival, such as government regulations that regularly promote new and established enterprises (Songling et al., 2018). For the current study, the researcher identified two antecedents to assess government support as presented in Table 3.

**Table 3: Government Support Antecedents**

Antecedent	Description
Financial Support	Organization can receive multiplicity of government help, including taxes, loans, information technology, subsidies, social support, productivity aids, exemptions, and financial capitals.
Technical Support	Government provides many support services for MSMEs' survival, including quality support, technical, financial incentives, immediate, management skill enhancement, cutting administration costs, provision for targeted business services, building ties with external bodies, financial assistance, foreign market entry, and legal framework reinforcement.

### **Supplier Capabilities**

Supplier capabilities are crucial in supply chain management since it helps to minimise costs, deliver products on time, improve the organization's competitiveness, and assess different suppliers according to different standards. Referring to Lopez and Rodriguez-Lopez (2021), supplier capability is one of the critical decision-making factors in supply chain management. A poor decision can result losses in the supply chain, which will have a direct impact on the company's performances. Meanwhile, Abdul Zubar and Parthiban (2014) noted that the supplier capabilities process is critical in any supply chain. A supply chain is effective or efficient when the correct number and quality of the finished product is supplied at the correct location and time. Supplier capabilities will be evaluated using four criteria: supplier's quality, performance

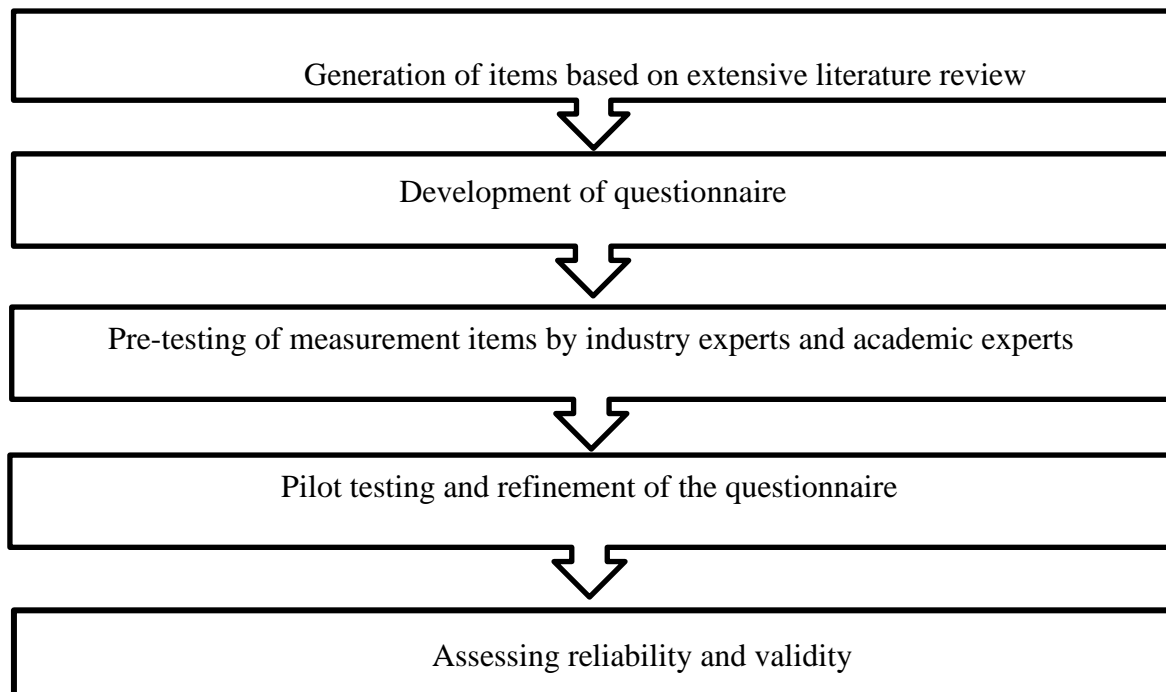
delivery, supply services, and cost (Vijayakumar et al., 2019). Moon and Tikoo (2015) stated that manufacturers look for two fundamentals of capability from suppliers: the supplier's ability to provide the product or services in accordance with the organization's specifications, and the supplier's ability to assist them in improving their current services and developing new products. Supplier selection is critical in the halal cosmetic industry today since every stage of the supply chain must adhere to halal requirements. Thus, supplier flexibility and supplier responsiveness are identified as antecedents for the current study as depicted in Table 4.

**Table 4: Supplier Capability Antecedents**

Antecedent	Description
Supplier Flexibility	The abilities to work at various productions levels efficiently and successfully.
Supplier Responsiveness	The rate at which actions are conducted in response to intelligence generated and distributed.

### Methodology

Scale development and validation processes were defined in previous research. Prior research has extensively employed the guidelines for scale development and validation as suggested by many scholars such as Churchill (1979) and Hensley (1999). For this research, the development of the scale was done in stages which cover factor identification, item generation, pre-testing, pilot testing, and scale validation as depicted in Figure 1 (Punniyamoorthy et al., 2013; Shahbaz, RM Rasi, & Ahmad, 2019).



**Figure 1: Research Process of Scale Development**

#### Generation of Items

A list of 52 items representing the antecedents of halal cosmetics supply chain agility practices was initially produced after a comprehensive literature review. The items were adopted and adapted from previous studies with validated instruments. Details are depicted in Table 5. A 7-



point Likert scale was used in this investigation. According to Diefenbach et al. (1993), the 7-point item scale emerged as the best overall, with respondents reporting it to be the most accurate and easiest to use. The scale is based on assertions, with the order of strongly disagree (1) to strongly agree (7).

**Table 5: Number of Items Used to Measure Antecedents**

Antecedents	No of Items	Source
Knowledge Management Practices	5	Bahar et al. (2021)
Innovation Strategic	7	Sundram et al. (2018); Wan Omar (2017)
Partner Cooperation	5	Sayuti (2013)
Conflict Management	5	Sayuti (2013)
Employee Training	5	Wan Omar (2017)
Supplier Flexibility	7	Üstündağ & Urgan (2020)
Supplier Responsiveness	7	Squire et al. (2009); Rajab & Muchelule (2016)
Technical Support	6	Chen (2013)
Financial Support	5	Omar (2015); Nguyen et al. (2018)

### Pre-testing

The rationale of pre-test is to strengthen the content validity of the survey instrument by investigating the degree of relevance of each variable item and confirming the proposed items in the survey through the expert opinions of industry representatives and academics. Six industrial experts from halal cosmetics manufacturers and three academic experts were selected for the pre-test phase. The organizations selected for this pre-test were located in Kelantan, Johor and Selangor. Selangor and Johor are the states that have the largest number of cosmetics manufacturers in Malaysia. The experts were selected from a group of people in management, for example, top management, managers, and supervisors. They were chosen based on their vast experiences in the cosmetics industry. The participated organizations have operated more than five years and have more experience in halal cosmetics industry. Meanwhile, the selected academic experts have wide knowledge in the supply chain management and halal studies. Therefore, these group of people were considered qualified to be experts assessors for this study's instrument. The feedback from the experts was used to guide the items to be re-written for clarity. Seven items were required to be modified as a result of the experts' feedback.

### Pilot Test

Pilot test was conducted to identify and estimate the inter-item internal consistency and reliability of the measured items. Responding to the experts' comments at the pre-test stage, the questionnaire was revised and modified. The questionnaire was distributed to the respondents who were randomly selected from the list of local cosmetics manufacturers registered under National Pharmaceutical Regulatory Agency (NPRA). They were approached online, and the online survey was shared through email and WhatsApp application. A total of 120 questionnaires were collected from the identified respondents who were willing to participate in the survey. According to Malhotra (2008), 100 samples for pilot study is considered adequate. Reliability test was employed to assess the internal inconsistency of the measurement items. The details are explained in the findings section.

### Data Analysis and Data Screening

According to Hill (1998), 10 to 30 participants are acceptable sample size to conduct a pilot test. Therefore, the current study's sample size of 120 is considered acceptable. The data were

filtered to check whether it was correctly entered and had no missing values. The survey results are displayed in Tables 6, 7, and 8. Most respondents (38.3%) were from the production department, followed by logistic (24.2%) and operation department (15.0%). For the position of the respondents, 45.7 percent were managers and 30.8 percent were executive officers. Finally, regarding the experiences of the respondent with cosmetics manufacture company, 70.8 percent of the respondents had 5 years' experience or less and 25.0 percent of the respondents had experiences between 6 to 10 years.

**Table 6: Distribution of Respondent by Department**

Department	Respondents	Percentage
Operation	18	15.0
Logistic	29	24.2
Production	46	38.3
Halal	7	5.8
R&D	4	3.3
Others	16	13.3

**Table 7: Distribution of Respondents by Position**

Position	Respondents	Percentage
Manager	56	46.7
Supervisor	22	18.3
Executive officer	37	30.8
Assistant supervisor	5	4.2

**Table 8: Distribution of Respondents by Years of Experience**

Years of Experience	Respondents	Percentage
5 years or less	85	70.8
6 – 10 years	30	25.0
16 – 20 years	5	4.2

## Research Findings

The scale was assessed for reliability and validity using the Cronbach's Alpha ( $\alpha$ ) and Exploratory Factor Analysis (EFA) respectively.

### Assessment of Reliability

Cronbach's alpha ( $\alpha$ ) is the most common method used to assess reliability, including the reliability of a measurement scale or internal reliability (Nunnally & Bernstein, 1994; Sekaran & Bougie, 2016). As presented in Table 9, all factors except financial performance variable have a Cronbach's  $\alpha$ -value greater than 0.7 which indicates that the variables are internally consistent and suitable measures for the study. However, the Cronbach's value of 0.600 for financial performance variable is still considered acceptable. Pallant (2001) and Nunnally and Bernstein (1994) stated that Cronbach's alpha value of above 0.6 is considered reliable and acceptable. The constructs are considered internally consistent.

**Table 9: Reliability Analysis**

Constructs	Cronbach's Alpha	N of Items
Operational Performance	0.989	5
Financial Performance	0.600	6
Halal Integrity	0.780	6
Halal Cosmetics SCAP	0.747	6
Knowledge Management Practices	0.743	5
Innovation Strategic	0.755	7
Partner Cooperation	0.979	5
Conflict Management	0.905	5
Employee Training	0.705	5
Supplier Flexibility	0.715	6
Supplier Responsiveness	0.770	7
Technical Support	0.942	6
Financial Support	0.956	5

**Assessment of Validity – Exploratory Factor Analysis (EFA)**

Exploratory factor analysis (EFA) was conducted in this study to structure the measurement of constructs, e.g., how many factors the study should have, and which factors are loaded on which constructs (Ferguson & Cox, 1993). Furthermore, EFA is also used to describe and summarise the data by grouping together the variables that are correlated and to determine the sub-factors that underline a set of items measuring each theoretical construct and dimensions of a nomological network suited to the research context (Kline, 2010). EFA was performed using principal axis factoring as the extraction method and varimax with Kaiser normalisation as the rotation method to determine the underlying factors. The pilot test data were used to perform the analysis. To check the suitability of the data for factor analysis, the results are based on the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of sphericity (BTOS). A KMO value of above 0.60 (Kaiser, 1974) and a Bartlett's test of sphericity with p-value less than 0.05 (Bartlett, 1950) were used as indicators. The EFA yielded 0.607 for the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, indicating that the factor analysis was suitable. The Chi-square was about 618.017 and df of 36 with p-value < 0.01 for the Bartlett's test of sphericity, indicating no difficulties with inter-matrix correlations (Hair et al., 2019). The results showed an 8th factor solution with eigenvalues greater than 1.0. Due to low factor loadings, 5 of the 52 items were eliminated, leaving a total of 47 items and 8 factors for the halal cosmetics supply chain agility practices measuring model. Table 11 shows the factor loadings which are above 0.5.

**Table 10: KMO & Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.607
Bartlett's Test of Sphericity	Approx. Chi-Square	618.017
	df	36
	Sig.	0.000



**Table 11: Results of Exploratory Factor Analysis**

Items	FS	SR	TS	PCO	ET	KMP	SF	IS
FS1	0.944							
FS2	0.903							
FS3	0.888							
FS4	0.865							
FS5	0.751							
FS6	0.742							
FS7	0.733							
FS8	0.733							
SR1		0.877						
SR2		0.876						
SR3		0.858						
SR4		0.79						
SR5		0.756						
SR6		0.75						
SR7		0.732						
SR8		0.721						
SR9		0.647						
SR10		0.601						
SR11		0.585						
TS1			0.909					
TS2			0.895					
TS3			0.893					
TS4			0.877					
TS5			0.806					
TS6			0.667					
PCO1				0.962				
PCO2				0.945				
PCO3				0.937				
PCO4				0.929				
PCO5				0.894				
PCO6				0.824				
PCO7				0.66				
ET1					0.884			
ET2					0.752			
ET3					0.743			
ET4					0.609			
ET5					0.531			
ET6					0.881			
KMP1						0.626		
KMP2						0.769		
KMP3						0.578		
SF1							0.899	
SF2							0.718	
SF3							0.622	

IS1	0.685
IS2	0.666
IS3	0.650

### Conclusion and Implication

This study proposed to develop and validate the measurement instrument based on a multi-stage process covering factor identification, item generation, pre-test, pilot test and scale validation. Extensive systematic review was conducted to identify the antecedents for halal cosmetics supply chain agility practices. Data were collected from 120 leading local halal cosmetics manufacturers in Kelantan, Selangor, and Johor. The instrument was pre-tested by six industrial experts and three academic experts. The scale was assessed for reliability and validity using Cronbach's Alpha and Exploratory Factor Analysis (EFA). All the scales were found to be reliable, and the scale generated 8 antecedents that are modelled as constructs covering a total of 47 items.

This study has some drawbacks that should be addressed in future research. First, the number of respondents is limited to one industry only. Further studies are recommended to cover other industries. Secondly, the measurement scale was developed and empirically validated in the context of Malaysian cosmetic industry. Lastly, the cross-sectional survey data collected for this study were restricted to a single point of time. Further research employing longitudinal data would provide more comprehensive analysis of the measurement scale.

The results show that the instruments are valid and reliable; thus, it can be used as a tool to conduct further studies on halal cosmetics supply chain agility practices. This measurement scale can also be used by the manufacturer to strategize their supply chain process in the selected industry. For future researcher, this validated measurement items can become the foundation for further investigation of the halal supply chain agility practices in another research domain.

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