Assessing the Supply Chain Risk in Indonesian Cosmetic Industry

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Abstract

The trend of using cosmetic products in Indonesia is not only exclusively for women but also has expanded for men and children. Until 2019, the Indonesian government recorded 797 domestic cosmetic companies from small, medium, and large scale, which increased compared to 760 companies in the previous year. The cosmetics industry's performance also grew by 5.59% in 2020 and contributed to foreign exchange for export with USD 317 million, increasing 15.2% compared to the previous year. Supply chain flow in business activities is undoubtedly a complicated issue to discuss because the activities, connections, and interrelationships between elements from upstream to downstream are full of risks and uncertainties. This study aims to conceptualize a supply chain risk model in the Indonesian cosmetics industry to ensure the development of appropriate risk mitigation strategy. This research used qualitative data in a questionnaire assessment by experts, processed using a Content Validity Index (CVI) approach. A total of 20 sub-indicators have been successfully validated from 36 sub-indicators by five experts in the cosmetics industry with an average I-CVI value of 0.91.

Keywords
Content Validity, Cosmetic Industry, Risk Design, Supply Chain Risk

1. Introduction

People use cosmetics to beautify themselves or change their appearance. Products from the cosmetics industry are not only mascara, lipstick, and powder but also refer to products used to clean the body, such as shampoo, toothpaste, soap, deodorant, as well as products for health purposes such as acne creams, whitening creams, and more (Sahota 2014). Until 2019, the Indonesian government recorded 797 domestic cosmetic companies from small, medium, and large scale, which increased from the level of in the previous year (Ministry of Industry of the Republic of Indonesia 2020). In addition, the Ministry of Industry revealed that the government continues to support the growth of the domestic cosmetics industry. The industry's performance grew by 5.59% in 2020 and contributed to the country's foreign exchange with an export value of USD 317 million, or an increase of 15.2% compared to the previous year. There are three things that are potential in stimulating the growth of the cosmetics industry in the country. First, Indonesia has a more than 150 million female population with an average age of 28 years old. Second, domestic economic growth can be pretty good even though the pandemic hit it. Third, social media involvement contributes to the marketing of cosmetic products (Sofia 2021).

Cosmetics are one of the Fast Moving Consumer Goods (FMCG) product. FMCG is a product sold in large quantities with a relatively low-profit margin. In addition, the character of this product is that if it is not available, it can be quickly replaced by competing products (Elzakker et al. 2014). Generally, products produced by FMCG companies have a shorter shelf life or can expire and have the potential to decrease quality over time, so they must be given special care (Golestani et al. 2021).

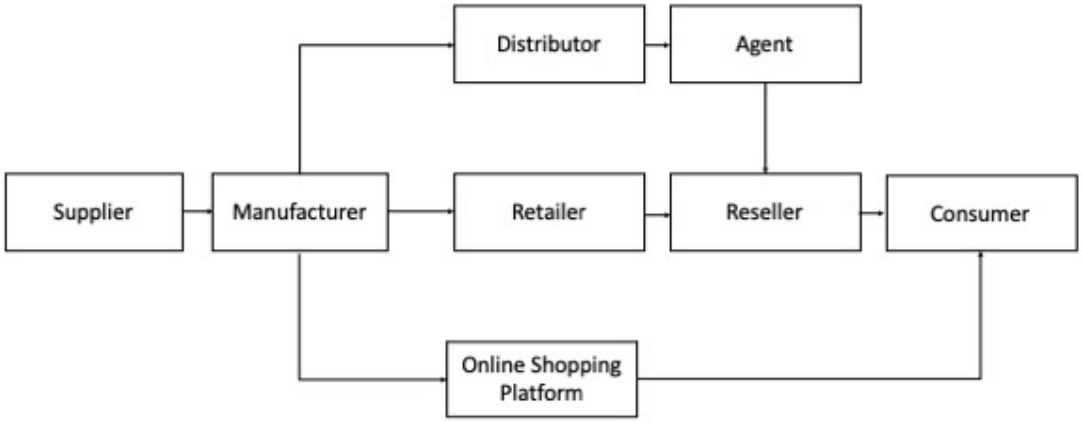

Figure 1. Cosmetic Industry Supply Chain Flow in Indonesia
(Source: Interview with cosmetic industry business actors in Indonesia)

Figure 1 shows the sequence of the supply chain of cosmetic industry in Indonesia based on the results of interviews with business players in the industry. The supply chain flow requires the support of operators, suppliers, manufacturers, and leaders who have sufficient knowledge to run the production flow from upstream to downstream so that it remains balanced to meet consumer needs (APICS 2017). The large population of Indonesian people, where the average is women with the age of 28 years, adds to the opportunity for the cosmetics industry to continue to grow in this country. The tight competition and the many choices of various products that consumers face make the cosmetics industry players have to find ways to continue to compete with their competitors. To meet consumer needs, the cosmetics industry faces various challenges in its supply chain flow activities (Abbasi et al. 2021). Supply chain flow in business activities is a complicated thing to discuss. The reason is that the activities, connections, and interrelationships between upstream to downstream are full of risks and uncertainties. This situation full of risks and uncertainties poses a greater challenge for investors and policymakers to analyze the risks and implement mitigation measures. This study aims to design a supply chain risk model in the Indonesian cosmetics industry to ensure the development of appropriate risk mitigation strategy. This research hopes to provide good insight for the cosmetics industry in managing risks that can hinder efforts to reach company targets and goals and encourage management to be more critical, act proactively and prioritize the precautionary principle to minimize the risks that arise.

2. Literature Review

This section will explain how risk management in the supply chain can affect the sustainability of the cosmetic industry in Indonesia.

2.1 Supply Chain Risk Management

Many organizations have used supply chain management to achieve a competitive advantage. However, supply chain management is not easy due to market uncertainty in balancing supply and demand, globalization issues, shorter product life cycles, and technology diversification (Oliveira et al. 2022). Tang and Musa (2011) defined risk as an unreliable and uncertain resource that can disrupt the supply chain, while uncertainty is described as the risk of a mismatch between supply from producers and demand from consumers. Most businesses lacked a well-structured supply chain risk management and mitigation framework. As a result, it's no wonder that risks are cited as the primary reason why supply networks fail to meet expectations (Abolghasemi et al. 2015).

2.2 Content Validity Index (CVI)

The CVI is a measure of inter-rater consistency. There are numerous ways for calculating the degree to which two or more assessors' ratings are consistent or congruent (Polit et al. 2007). The CVI was estimated at the item level (I-CVI) as well as at the scale level (S-CVI). The number of people who considered the item was relevant (i.e., ratings of ≥ 3) was divided by the number of content experts to get the I-CVI. I-CVI were calculated by dividing the number of experts who gave a 3 or 4 to the relevancy of each item by the total number of experts and indicating the proportion of agreement on the relevancy of each item, where the index might range from zero to one. Furthermore,

S-CVI was calculated as the average of the I-CVIs and defined as the fraction of total items evaluated content validity (Caruso, et al., 2017).

3. Methods

The data used in this study is primary data from a questionnaire that have filled out by 5 experts from the cosmetics industry in Indonesia, as shown table 1. The I-CVI value was utilized to determine the validated supply chain risk indicators and sub-indicators in this research. In equation 1, the total number of experts is divided by the I-CVI number. In equation 2, the total number of items is divided by the S-CVI number. Table 2 explain that if we have 5 experts, then the supply chain risk sub-indicator is considered valid if the I-CVI value is 0.80 or greater.

Table 1. The List of Experts in Cosmetics Industry

Experts	Experience
Expert 1	23 Years
Expert 2	20 Years
Expert 3	15 Years
Expert 4	12 Years
Expert 5	9 Years

$$\mathrm{I-CVI} = \frac{\text{Total expert agreeing}}{\text{Total expert}} \quad (1)$$

$$\mathrm{S-CVI} = \frac{\sum \text{I-CVI}}{\text{Total item}} \quad (2)$$

Table 2. Evaluation of I-CVIs with Different Numbers of Experts and Agreement

(1) Number of Expert	(2) Number of Expert Agreeing	(3)[a] I-CVI	(4)[b] Pc	(5)[c] K*	(6)[d] Evaluation
3	3	1.00	0.125	1.00	Excellent
3	2	0.67	0.375	0.47	Fair
4	4	1.00	0.063	1.00	Excellent
4	3	0.75	0.25	0.67	Good
5	5	1.00	0.041	1.00	Excellent
5	4	0.80	0.156	0.76	Excellent
6	6	1.00	0.016	1.00	Excellent
6	5	0.83	0.094	0.81	Excellent
6	4	0.67	0.234	0.57	Fair
7	7	1.00	0.008	1.00	Excellent
7	6	0.86	0.055	0.85	Excellent
7	5	0.71	0.164	0.65	Good
8	8	1.00	0.004	1.00	Excellent
8	7	0.88	0.031	0.88	Excellent
8	6	0.75	0.109	0.72	Good
9	9	1.00	0.002	1.00	Excellent
9	8	0.89	0.014	0.89	Excellent
9	7	0.78	0.070	0.76	Excellent

[a]I-CVI, item-level content validity index
[b]pc (probability of a chance occurance) was computed using the formula for a binomial random variable, with one specific outcome pc = [N! / A! (N-A)!]*.5^N where N = number of expert dan A = number of agreeing on good relevance.
[c]k *kappa designating agreement on relevance; k* = (I-CVI-pc)/(1-pc).
[d] Evaluation criteria: Fair = k 0.040 - 0.059; Good = k 0.060 - 0.74; Excellent = k >0.74
Source: Polit et al. (2006)

4. Data Collection

Supply chain risk indicators and sub-indicators were collected from several related studies. Based on the literature review, a total of 6 indicators and 36 sub-indicators were identified, as shown in table 3 below.

Table 3. Supply Chain Risk Indicators and Sub-indicators

Supply Chain Risk Indicators	References	Supply Chain Risk Sub-indicators
Logistic and Supply Chain	Abbasian et al. (2021), Enyinda et al. (2010), Jaberidoost et al. (2015), Breen (2008)	Procurement Cycle Time, Delivery Time Flexibility, Delivery Quantity Flexibility, Product Variation Flexibility, Number of Suppliers, Quality Management System, Information Visibility, Technology Level, Counterfeit Products, Contract Agreement, Third Parties, Delivery Location, Delivery Process, Competitors
Manufacturing	Abbasian et al. (2021)	Employee Factor, Product Research and Development, Production Cost, Material Storage, Inventory Management
Organizational and Strategic	Jaberidoost et al. (2015), Abbasian et al. (2021)	Time to Market, Employee Skills, Information Flow, Mergers and Acquisitions, Waste Management
Financial	Abbasian et al. (2021), Enyinda et al. (2010), Jaberidoost et al. (2015)	Inflation Rate, Currency Fluctuations, Regulation, Financial Problems
Marketing	Abbasian et al. (2021), Pettit et al. (2010)	Demand, Consumer Taste, Digital Disruption, Customer Service
Macro	Abbasian et al. (2021), Jaberidoost et al. (2015), Pettit et al. (2010)	Politics, Natural Disasters and Terrorism, Pandemic, Security

5. Results and Discussion

From 6 indicators and 36 sub-indicators presented through a questionnaire, 27 sub-indicators identify to be valid. The proposed sub-indicators were approved by at least 4 of the 5 experts. According to Polit et al. (2006) minimum limit for the standardized agreement approach if the total value of S-CVI is 0.8 (Excellent). Table 4 shows the outcomes of indicators that were declared valid.

Table 4. List of Valid Supply Chain Risk Indicators and Sub-indicators According to Experts

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Number of Expert Agreeing	I-CVI Value
Logistic and Supply Chain	Procurement Cycle Time	5	1,0
	Number of Suppliers	4	0,8
	Quality Management System	5	1,0
	Information Visibility	4	0,8
	Technology Level	4	0,8
	Contract Agreement	4	0,8
	Third Parties	4	0,8
Manufacturing	Material Storage	4	0,8

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Number of Expert Agreeing	I-CVI Value
	Inventory Management	5	1,0
Organizational and Strategic	Information Flow	5	1,0
	Mergers and Acquisitions	5	1,0
	Waste Management	5	1,0
Financial	Inflation Rate	5	1,0
	Currency Fluctuations	4	0,8
	Financial Problems	5	1,0
Marketing	Demand	5	1,0
	Digital Disruption	4	0,8
	Customer Service	4	0,8
Macro	Natural Disasters and Terrorism	5	1,0
	Pandemic	5	1,0
Average			0,91

5.1 Logistic and Supply Chain

A supply chain is a concept in which product flow, information flow, and financial flow are all governed by a regulatory framework. If the company does not know the level to which supply chain performance has been accomplished, a complicated supply chain structure involving numerous stakeholders, both internal and external, can generate problems. A well-managed supply chain can create low-cost, high-quality, and timely items, allowing the company to meet its target market and earn profits (Wahyuni et al. 2019). Table 5 shows the explanations of each sub-indicators as part of supply and logistic risk indicator.

Table 5. Supply and Logistic Risk

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Explanation
Supply and Logistics	Procurement Cycle Time	The length of time required in the material procurement process
	Number of Suppliers	The limited number of trusted suppliers causes high dependence on one supplier
	Quality Management System	Product quality that does not meet standards, for example, cracks in bottles, damaged packaging, suppliers sending products that are too close to the expiration date, and more.
	Information Visibility	Lack of visibility of information related to material stock, finished goods, and demand forecasting (forecast)
	Technology Level	There is no capable technology to control the fleet and delivery information in real-time
	Contract Agreement	There is no concession to the agreed work contract, while sales are potentially volatile

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Explanation
Supply and Logistics	Third Parties	Risks that occur while using third-party services (3PL) such as damage to goods during storage or delivery, loss of goods during the distribution process, increase in rental prices, tight contracts with third parties, and others

5.2 Manufacturing

With a growing focus on sustainable production, manufacturers must continue to offer higher-quality, lower-cost products while also controlling resource use (including waste) across entire industrial ecosystems (Ghadge et al. 2012). Table 6 shows the explanations of each sub-indicators as part of manufacturing risk indicator.

Table 6. Manufacturing Risk

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Explanation
Manufacturing	Material Storage	Material storage errors that require special treatment, causing damage to the material
	Inventory Management	Lack of control over material inventory, warehouse efficiency, finished goods stock, and others

5.3 Organizational and Strategic

Financial instability, just-in-time outsourcing, firm mergers, new technology, e-business, shorter time-to-market, and other factors are influencing the global business climate today, driving organizations to adapt new ways of conducting business (Ghadge et al. 2012). Table 7 shows the explanations of each sub-indicators as part of organizational and strategic risk indicator.

Table 7. Organizational and Strategic Risk

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Explanation
Organizational and Strategic	Information Flow	There is a miscommunication that disrupts the smooth running of work
	Mergers and Acquisitions	The existence of taking over from control of a company can cause all components in it to adjust and adapt to the new organizational culture and structure
	Waste Management	Lack of management of chemical waste generated from the cosmetic production process so that it can pollute the environment

5.4 Financial

Financial risk is one of the important supply chain. Cash cycle is important to maintain because it is the main support for running production (Abbasian et al. 2021). Table 8 shows the explanations of each sub-indicators as part of financial risk indicator.

Table 8. Financial Risk

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Explanation
Financial Factor	Inflation Rate	There is a continuous increase in prices for a certain period, causing an increase in material prices
	Currency Fluctuations	Unstable currency exchange rates (affecting export-import activities)
	Financial Problems	Late bill payments from consumers, problems when making transfers, especially for payments to and from abroad

5.5 Marketing

Low trust in domestic products, market challenges particularly at the international level, and demand changes are the most common marketing-related concerns (Abbasian et al. 2021). Table 9 shows the explanations of each sub-indicators as part of marketing risk indicator.

Table 9. Marketing Risk

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Explanation
Marketing Factor	Demand	The number of fluctuating demand results in uncertain sales so that demand forecasts become less accurate
	Digital Disruption	There are changes in digital technology and new business models that affect the value of an item and cause intense competition between business people
	Customer Service	There are disturbances during the service process to consumers both online and offline resulting in not achieving customer satisfaction and potentially switching to other products

5.6 Macro

The cosmetic supply chain faces fundamental and structural vulnerabilities as a result of macro issues (Abbasian et al. 2021).Table 10 shows the explanations of each sub-indicators as part of macro risk indicator.

Table 10. Macro Risk

Supply Chain Risk Indicators	Supply Chain Sub-indicators	Explanation
Macro Factor	Natural Disasters and Terrorism	The occurrence of natural disasters and terrorist attacks can cause delays in the production and distribution process
	Pandemic	The occurrence of a pandemic can cause delays in business activities both within one country and across countries due to social restrictions

The average I-CVI value is 0.91, so it is considered valid. Figure 2 shows 20 valid indicators in the supply chain of the cosmetics industry in Indonesia.

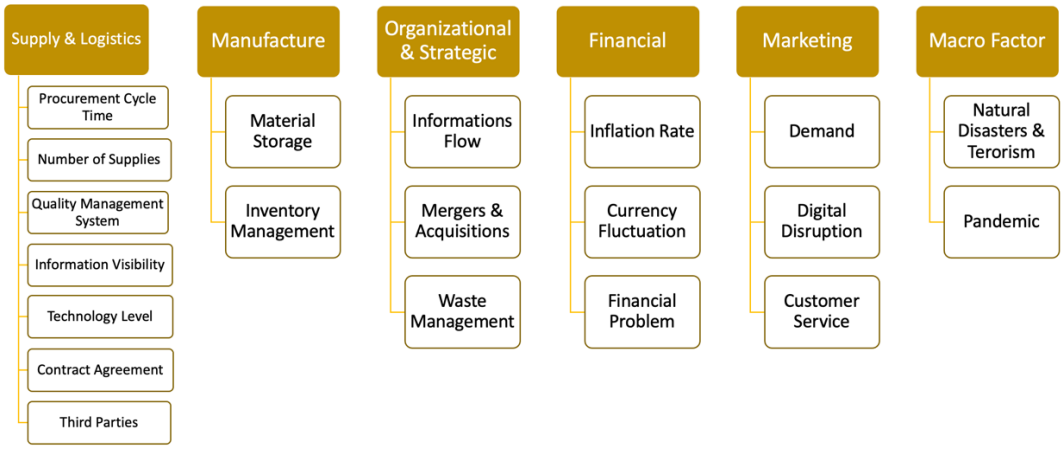

Figure 2. Valid Indicator of Supply Chain Risk in Indonesian Cosmetic Industry

6. Conclusion

The slightest risk that arises in the supply chain flow will undoubtedly affect the organization's smooth business activities. This research successfully identify the possible risks that emerge in the supply chain of Indonesian cosmetics industry. A total of 36 risks have been found, consisting of 6 factors: supply and logistics, manufacturing, organizational and strategic, financial, marketing, and macro. After validation process with experts, the researcher found 20 relevant risks in the supply chain of the cosmetics industry in Indonesia with the average of I-CVI value is 0,91. The limitation of this research is that the research is limited to identifying, classifying, and validating risks in the supply chain of the cosmetics industry in Indonesia. Further research can be carried out using the Multi-criteria Decision-making (MCDM) method such as ANP-based DEMATEL to determine the priority of the risks that arise so that they can be carried out for consideration inappropriate risk mitigation strategies.

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Biography

Tia Atika Putri is currently a master's student in the Industrial Engineering study program specializing in Production and Logistics Systems at Universitas Indonesia. In 2019, she had her bachelor's degree in Industrial Engineering at Universitas Islam Indonesia. She was an assistant of Industrial Statistics and Optimization Laboratory specializing in Operations Research. In addition, she also worked as a Production Planning and Inventory Control in a printing company before moving to a cosmetic company with the same position. Her research concentrates on manufacturing, production systems, supply chain, and data management.

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