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Linkages analysis risk factors of the return process in logistics fast moving consumer goods

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A B S T R A C T

This study analyzed the linkage of risk factors in the return process of fast-moving consumer good (FMCG) logistics systems. The risk of returning products due to expired, near expiration, order errors and bad stock (damaged) haunts sustainable supply chains in the industry. In four business processes, warehousing, transport/distribution, production/supply and order processing identified twenty-two risk factors that cause the return process. The decision-making and trial evaluation laboratory (DEMATEL) method helps decision-makers simplify causal relationships between twenty-two complex risk factors. Through the depiction of the matrix and the network relationship map, twelve risk factors entered the dispatcher group, namely risk factors that can affect other risk factors that impact the return process on the FMCG logistics system. The result becomes a reference for decision makers to prioritize risk factors management that have a relationship with other risk factors, because the impact obtained will be maximal.

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1. INTRODUCTION

In recent years, risk management and sustainable supply chains (SSCs) have caught the attention of researchers [1]–[3]. Today, with the globalization of business operations, logistics systems are threatened by all sorts of uncertainties and disruptions. Almost every month, serious transportation accidents and natural disasters worldwide are reported in the media. As a result, effective and efficient risk management schemes are a top priority. The Covid-19 pandemic in 2020 impacted economic activity in almost all industrial sectors. The retail industry sector, especially fast-moving consumer good (FMCG), is said to have experienced the worst contraction in the last 20 years. The year 2021 is considered a challenging time, although the government has started to run a vaccination program that is considered the key to national economic recovery.

FMCG characteristics can be seen from two perspectives, the perspective of consumers and producers. From a consumer perspective, FMCG characteristics are demonstrated by high product purchase frequency, low attachment, and low price. From a producer's perspective, its characteristics are high sales volume, extensive use of distribution channels, and high inventory turnover. These characteristics often lead to problems on the

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manufacturer's side. High sales volumes, for example, require producers to maintain their production capacity. This production capacity is not just the availability of machine capacity and labour. This capacity availability problem often arises from the supply side of raw materials, both in terms of type and amount of supply and continuity. The supply of raw materials that need to be considered is not only in the main ingredients. Delays in the production process can occur due to the unavailability of supporting materials. The unavailability of packaging materials can disrupt the production process or delay the delivery of products to retailers. From a logistics perspective, this is a problem in the inbound logistics aspect.

On the other hand, manufacturers also face problems in the outbound logistics aspect. Problems can occur when fulfilling requests or shipping finished products to retailers. Various causes can occur, such as the unavailability of the type and number of products requested or the unavailability of the delivery fleet.

The SSC mechanism is a combination of forwarding logistics and reverse logistics. A sustainable supply chain has now become a strategy developed by many companies. This concept illustrates how the current generation meets its needs without compromising the needs of future generations [4]. The risk factors that arise in SSC can differ due to its more complex nature, mainly because it integrates three aspects of sustainability or triple bottom line: environmental, social, and economic [5]. The SSC mechanism is a concept responsible for the flow of goods such as products, components, and materials from where they are consumed to where they come. This process varies depending on the reason for the return. According to De Brito & Dekker [6], product returns to manufacturing companies are generally due to the manufacturing process, distribution and consumer return.

Briefly, the reason for product return occurs is because (a) product related: product quality or defects are low, difficult to install, performance does not match the needs of the user [7]; (b) related return policy: restrictions on return policies [8]; (c) related experience: a positive previous return experience [9], past and recent purchase experience [10]; (d) related to price: finding a better price [11]; (e) psychologically related: purchase regret [7] and (f) changes in perception (e.g., perceived quality, preferences) in the repeat period [12].

Decision makers need to pay close attention to risk factors that are the cause of these risk events. According to Sunil & Manmohan [13], inter-risk factors can cause substantial damage, and then [14] added that the interrelationships that occur could, directly and indirectly, affect the risk event. Its impact occurs on all supply chain actors. To see the linkage, some researchers used the decision-making and trial evaluation laboratory (DEMATEL) method to explore interconnections between risk factors. DEMATEL can reduce errors in the decision-making process involving expert knowledge that is usually inaccurate, subjective or even inconsistent because it is done verbally. This method helps decision makers because it can visualize experts' opinions about the complex structure of causal relationships through a matrix or direct relationship digraph.

The Dematel method's reliability is shown in Wu et al.'s research [15]. The study shows that this method can be implemented in various fields, such as service quality, portfolio selection, technology selection, higher education, and other group decision-making. In addition, the Dematel method is commonly used to select and determine the relationship between criteria [16]. In its development, the implementation of the Dematel method has been integrated several times with other methods, such as the fuzzy method [17]- [19].

This paper briefly addresses risk management, which identifies the return process risk factors in FMCG logistics. Contributions made (1) research on FMCG industry risk management found to focus on forwarding supply chain [20]–[22], while Giannakis & Papadopoulos [23] and Agnestia & Yuliawati [24] conduct risk management on reverse logistics in the non FMCG industry. Many studies have been published that have tried to identify critical risk factors for return processes in the FMCG industry logistics. This research reduces these gaps and expands supply chain risk management (SCRM) into the context of the return process on logistics activities. (2) Managerial implications indicate that supply chain managers must formalize the risk management process to appropriately obtain the dominant risk factor to assist the decision-making process. Here is the formulation of the research question in this study:

RQ1: How to identify risk factors of the return process on sustainable FMCG industry logistics?

RQ2: What is the interconnectedness of risk factors of the return process on the logistics of the sustainable FMCG industry?

RQ3: How are critical risk factors viewed from the point of view of logistics services in the sustainable FMCG industry?

This research provides a decision-making framework for determining critical risk factors of the return process on the logistics of the sustainable FMCG industry.

2. RESEARCH METHODS

In this study, the DEMATEL method was used to describe the dependence of risk factor process return on the logistics system of FMCG companies. Risk factors that contribute to product returns, such as expired products, near expiration, order errors and bad stock (damaged), are identified and analyzed to make it easier for decision-makers to reduce these risks. Fig. 1 is the stage of this research method. In this study, the DEMATEL method was divided into five stages.

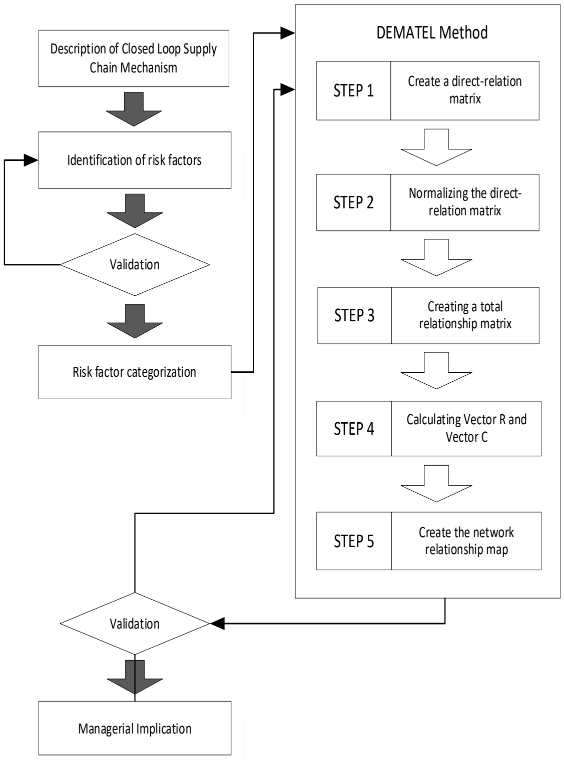

Fig 1. Stages of solving problems

Step 1. Create a direct relation matrix (Matrix A)

The relationship between risk factors is measured using a paired matrix nxn, called matrix A. The evaluation scale of the intensity relationship between risk factor i and risk factor j is done. It uses a scale of 0 to 4, as Torbacki & Kijewskam [25], in which the value is 0. which means not impact/very low, and a value 1 means low impact. Value 2 has a moderate impact. Value 3 has a big impact. Value 4 has a very large impact. The diagonal of the matrix is set to be 0.

Step 2. Normalize the direct relation matrix (Matrix X)

The normalization matrix (X) of matrix A is obtained through the following equations (1) and (2):

$$X = k \, . A \qquad (1)$$

$$k = \min \left[\frac{1}{max \sum_{j=1}^{n} |X_{ij}|}, \frac{1}{max \sum_{i=1}^{n} |X_{ij}|} \right] ;$$

j,i = 1,2, …., n (2)

Step 3. Create a total relationship matrix (Matrix T)

Matrix T is derived from the multiplication of matrix X and identity matrix as written in equation (3) below:

$$T = X\,(1 - X)^{-1} \qquad (3)$$

I = identity matrix

Step 4. Calculating Vector R and Vector C

Next, calculate Vector R, which is the summation of rows in matrix T and Vector C, which is the summation of columns in matrix T. Vector R is calculated using Equation (5) and Vector C with equation (6).

$$T = \left[t_{ij}\right]_{nxn} \; ; \quad \text{i,j} = 1,2, \ldots, \text{n} \qquad (4)$$

$$R = \left[\textstyle\sum_{j=1}^{n} t_{ij}\right]_{nx1} \; ; \quad \left[t_{ij}\right]_{nx1} \qquad (5)$$

$$C = \left[\textstyle\sum_{i=1}^{n} t_{ij}\right]_{1xn} \; ; \quad \left[t_{ij}\right]_{1xn} \qquad (6)$$

Furthermore, vectors R and C are used to obtain significance values (R +C) and relation (R-C). The R+C result describes the risk factor's importance to the return process, while R-C describes the level of causal relationship to the risk factor. Some risk factors with a positive R-C value have a more significant influence and are assumed to be important risk factors, often referred to as dispatchers. Conversely, a risk factor with a negative R-C value means receiving more influence and is commonly called a receiver.

Step 5. Create the network relationship map (NRM)

The depiction of NRM is done through the calculation of threshold values. Various methods can be used to determine this value. This study determines the threshold value by taking the average element in the total effect matrix (T).

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After that, the value on matrix T will be compared with the threshold value obtained. A value in the T matrix greater than the threshold value indicates that the risk factor has an influence or association with other factors. At the same time, if the value in matrix T is smaller than the threshold value, then the risk factor does not have a strong relationship.

3. RESULTS AND DISCUSSION

3.1. Depiction of closed-loop supply chain (CLSC) FMCG company "A"

This research focuses on the return process of the CLSC logistics system of company "A", an FMCG company that produces cosmetic products. The company developed a production system based on forecasting, often called make-to-stock (MTS). Cosmetic products produced by company A are categorized into two: makeup base and care. The CLSC mechanism is a combination of forwarding logistics and reverse logistics. CLSC's depiction of company "A" can be seen in Fig. 2. In the picture, it can be seen that the supply chain actors involved in FMCG Company "A" consist of suppliers, manufacturers (factories), warehouses, distributors, retail (stores) and customers. The forward logistics mechanism in FMCG Company "A" begins when material flow flows from upstream to downstream. The company has several factories that, in this study, are categorised into two: local and import factories. Both categories of factories produce cosmetic products with different variants. A local factory is a factory located in Indonesia that produces variants of cosmetic products, which are marketed domestically and exported abroad. While the import factory is located abroad, whose variants of cosmetic products are marketed in Indonesia and other countries.

FMCG Company "A" has two warehouses located in eastern Indonesia (Eastern DC) and west (Western DC). Warehouses in the eastern part specifically distribute products to the distributor of company "A" located in the eastern part of Indonesia, including Central Java, East Java, Bali, Lombok, Sulawesi, Kalimantan and Papua. Likewise, vice versa, warehouses in the west specifically distribute products to distributors spread across the western part of Indonesia in the region: West Java, Jakarta, Bogor, Depok Tangerang, Bekasi, Sumatra and Pontianak. Furthermore, distributors distribute products to all stores spread throughout Indonesia, both modern and traditional.

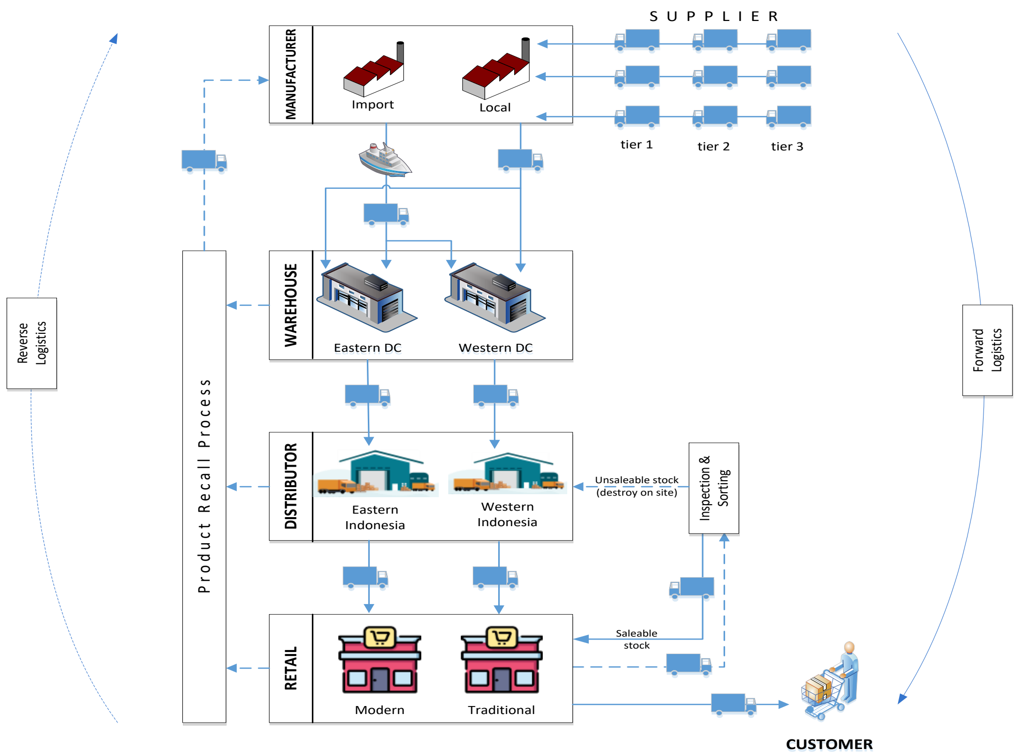

Fig 2. Closed-loop supply chain FMCG Company "A"

Furthermore, the reverse direction mechanism from downstream to upstream is known as reverse logistics. The process of returning products to FMCG Company "A" begins when there is a claim from the store due to several conditions, such as expired products, near expiration, order errors and bad stock (damaged). The distributor then follows up the claim from the store by taking back the product. At the distributor's location, the returned product will go through an inspection &sorting process to ascertain the actual condition of the product. As a result of this process, the product will be categorized into two, namely saleable stock and unsaleable stock. Products that fall into the category of saleable stock mean that the product is still in good condition and worthy of resale. Products in this category are then packed and redistributed to stores. While products that fall into the category of unsaleable stock will be destroyed at the distributor's location.

In addition, a product recall process is also included in the return of products. The company conducts a product recall if it is found to manufacture a defect, which is a product that does not follow standards and does not meet the expectations of its users. Although rare, the company also pays attention to product returns because of this process. The entire product recall process is sent to the factory.

3.2. Identify risk factors of return process on logistics FMCG company "A"

This study focused on the return process in the logistics system of FMCG Company "A". As mentioned above risk event in the return process is the occurrence of product return because the product expired, close to expired, order error, bad stock (damaged) and product recall. The identification of risk factors is made in two ways, first by searching reputable scientific journals, then the second by interviewing personnel who handle logistics systems in FMCG Company "A" and the stakeholders involved. The experts in this research have been pursuing supply chain &logistics for 20 years in seven different FMCG industries. The initial eight years in the distributor section and the last 12 years moved to the manufacturing/principal sector. Identification of risk factors carried out in four logistics system processes involved in the return process: warehousing, distribution, production/supply and order processing. The following in Table 1 results from identifying risk factors obtained through these two mechanisms.

3.3. Categorization of Risk Factors

Risk factors identified in the four process areas involved in the return process on the FMCG company's logistics system "A" as many as twenty-two. Categorizing risk factors depends on the purpose of the study, one of which can be seen from which area the risk is identified. Basset & Mohammed [26] categorize the risk factors of telecommunications equipment companies into six categories: financial, supply, environmental, operational, control and plan, and IT / information. Meanwhile, Panjehfouladgaran [27] categorized the 42 identified RL risks into three categories: strategic, tactical, and operational. In this study, risk factors were then grouped into three categories based on their characteristics, namely: Facility Risk Factors (FRF), Operational Risk Factors (ORF) and Information Risk Factors (IRF). Table 2 shows the grouping of risk factors in these three categories.

Based on Table 2, it can be seen that in Facility Risk Factors (FRF), there are three factors, Operational Risk Factors (ORF), there are twelve factors and Information Risk Factors (IRF), there are seven factors. Furthermore, data processing will be carried out using the DEMATEL method. This method aims to get risk factors that are included in the dispatcher group, namely the influencer and the receiver group, namely the receiver

3.4. Implementation DEMATEL Method

3.4.1. *Create a direct-relation matrix*

Evaluation of risk factors in Table 2 is conducted through interviews with three interested experts who understand the return process of FMCG company logistics system "A". The intensity of their relationships assesses twenty-two risk factors categorized in facility, operational and information risk factors to determine the impact and effectiveness of their relationships.

This matrix A shows the experts' assessment of twenty-two risk factors in three categories using a scale of 0-4, with the diagonal of the matrix set to 0. In this study, risk factors assessment was conducted by (a) looking at the influence between three categories, namely information, operational

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and facility, (b) looking at the influence between risk factors in the information category, (c) looking at the influence between risk factors in operational categories and (d) looking at the influence between risk factors in the facility category. For example, Table 3 (a) shows the intensity of the relationship between FRF, ORF and IRF. The risk factor in the row indicates me, while risk factor j is in the column. The expert assessment for the relationship between FRF risk factor and ORF is 3, which means that FRF risk factor has a big impact on ORF risk factor. However, the ORF risk factor has a moderate impact on FRF, shown with a value of 2. Furthermore, the intensity of the relationship between other risk factors can be seen in Table 3, which shows Matrix A, i.e. direct-relation to the extent to which risk factor i affects risk factor j.

Table 1. Identification of risk factors in four process areas

Code	Risk Factors	References	Description
		Warehousing	
A.1	Poor inventory accuracy	[28]	System inaccuracies in inventory, causing a difference in the number of products stored
A.2	Error of inventory management implementation	Expert's feedback	Product returns can occur due to warehouse operator errors in implementing inventory management.
A.3	Inappropriate product handling	[29]	Inaccuracy in the handling of the product can result in the occurrence of product defects.
A.4	Inappropriate storage handling	[30]	Inaccuracy in the storage of products can result in product defects.
A.5	Poor warehouse infrastructure	[30]	Limitations of storage infrastructure affect the return of products
A.6	Failure of product handling facilities	[30]	Failure operation of product handling facilities may cause product damage
		Transportation	
B.1	Poor transport capability	[29]	Limitations on the mode of transportation used in the delivery of products
B.2	Accident during in transit	[31]	Accidents in product delivery
B.3	Damage product during in transit	[31]	Product damage during the delivery process
B.4	Poor infrastructure condition at destination	[31]	Poor infrastructure at delivery sites
B.5	Lack of on time in full (OTIF) performances	[31]	Delays in product delivery
		Production/Supply	
C.1	Changes in consumer preferences	[32]	Failure to respond to changing consumer preferences
C.2	Raw materials quality problem	[33]	QC inaccuracies can result in the resulting product being damaged
C.3	Incorrect price / discount	Expert's feedback	Errors in pricing and discounting products
C.4	Instability of machines capability	[26]	Product damage can occur due to poor engine capabilities.
C.5	Frequent machine breakdown	[26]	Unstable engine capabilities have the potential to cause product damage
C.6	Unstable manpower capability	[26]	The instability of operator capabilities can increase the occurrence of human error in the production process
C.7	Error of quality control/quality assurance (QC/QA)	[34]	Errors in the final inspection may result in product defects being sent to consumers.
		Order Processing	
D.1	Error of order management	[35]	Errors in managing orders (in the case of due dates)
D.2	Lack of order allocation	[35]	Order allocation error (in terms of number)
D.3	Order executions failure	[35]	Consumers unilaterally cancel orders
D.4	Inaccuracy demand supply forecast	[36]	Inaccuracies in demand-supply forecasting

Table 2. Categories of risk factors

Category	Risk Factors	
FRF: Facility Risk Factors	A.5	Poor warehouse infrastructure
	A.6	Failure of product handling facilities
	B.4	Poor infrastructure condition at destination
ORF: Operational Risk Factors	A.1	Poor inventory accuracy
	A.2	Error of inventory management implementation
	A.3	Inappropriate product handling
	A.4	Inappropriate storage handling
	B.1	Poor transport capability
	B.2	Accident during in transit
	B.3	Damage product during in transit
	C.1	Changes in consumer preferences
	C.4	Instability of machines capability
	C.5	Frequent machine breakdown
	C.6	Unstable manpower capability
	C.7	Error of quality control/quality assurance (QC/QC)
IRF: Information Risk Factors	B.5	Lack of on time in full (OTIF) performances
	C.2	Raw materials quality problem
	C.3	Incorrect price / discount
	D.1	Error of order management
	D.2	Lack of order allocation
	D.3	Order executions failure
	D.4	Inaccuracy demand supply forecast

3.4.2. *Normalize the direct-relation matrix*

Furthermore, the normalization of matrix A uses equations (1) and (2). In matrix, the main diagonal remains worth 0, and the maximum number of each row and column is 1. Table 4 shows matrix X, which is the result of the normalization of matrix A.

3.4.3. *Create a total effect matrix*

The total effect matrix (T) is constructed from the normalization of the direct-relation matrix using equations (3). The matrix operation is completed with the =MININVERSE function in Ms Excel. Table 5 is the result of the calculation of the total effect matrix (T).

Table 3. Direct-relation matrix for category

A	FRF	ORF	IRF
FRF	0	3	1
ORF	2	0	3
IRF	2	3	0

Table 4. Normalization of the direct-relation matrix for categories

X	FRF	ORF	IRF
FRF	0.00	0.50	0.25
ORF	0.40	0.00	0.60
IRF	0.40	0.50	0.00

Table 5. Total effect matrix for category

T	FRF	ORF	IRF
FRF	2.04	2.72	2.39
ORF	2.78	2.91	3.04
IRF	2.61	3.04	2.48

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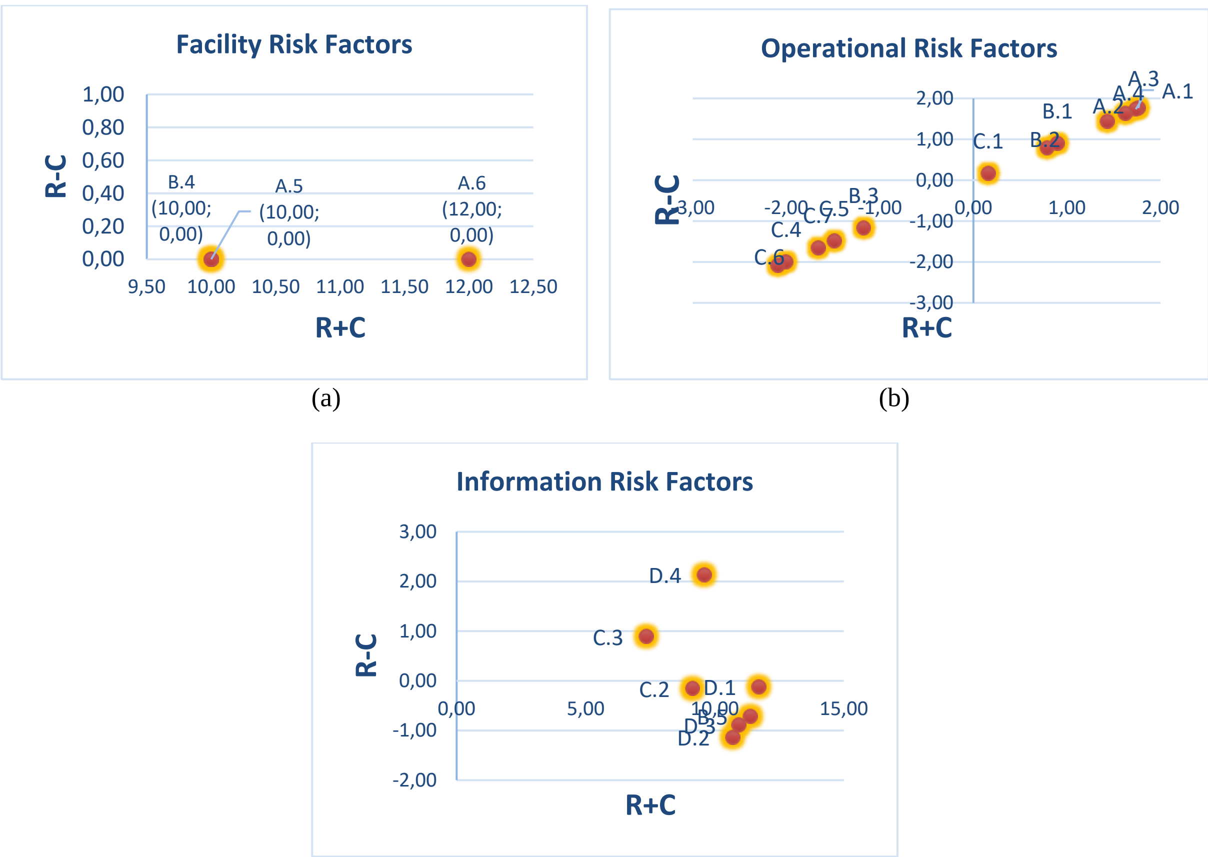
Table 6. Positions "significance" and "relation" for Tk and Tf

	T_k	R	C	R+C	R-C		T_f	R	C	R+C	R-C
	Facility					A.5	Poor warehouse infrastructure	5.00	5.00	10.00	0.00
FRF	Risk	7.15	7.43	14.59	-0.28	A.6	Failure of product handling facilities	6.00	6.00	12.00	0.00
	Factors					B.4	Poor infrastructure condition at destination	5.00	5.00	10.00	0.00
ORF	Operational	8.74	8.67	17.41	0.07	A.1	Poor inventory accuracy	3.29	1.52	1.76	1.76
	Risk					A.2	Error of inventory management implementation	3.18	1.74	1.43	1.43
	Factors					A.3	Inappropriate product handling	2.89	1.15	1.74	1.74
						A.4	Inappropriate storage handling	2.91	1.28	1.62	1.62
						B.1	Poor transport capability	2.59	1.69	0.90	0.90
						B.2	Accident during in transit	2.52	1.73	0.79	0.79
						B.3	Damage product during in transit	1.60	2.77	-1.17	-1.17
						C.1	Changes in consumer preferences	3.30	3.14	0.16	0.16
						C.4	Instability of machines capability	1.65	3.65	-2.00	-2.00
						C.5	Frequent machine breakdown	2.06	3.54	-1.49	-1.49
						C.6	Unstable manpower capability	1.53	3.61	-2.09	-2.09
						C.7	Error of quality control/quality assurance (QC/QC)	2.23	3.88	-1.66	-1.66
IRF	Information	8.13	7.91	16.04	0.22	B.5	Lack of on time in full (OTIF) performances	5.34	6.05	11.39	-0.71
	Risk					C.2	Raw materials quality problem	4.49	4.65	9.15	-0.16
	Factors					C.3	Incorrect price / discount	4.12	3.23	7.35	0.89
						D.1	Error of order management	5.79	5.92	11.71	-0.12
						D.2	Lack of order allocation	4.78	5.92	10.70	-1.14
						D.3	Order executions failure	5.02	5.92	10.94	-0.89
						D.4	Inaccuracy demand supply forecast	5.86	3.73	9.59	2.13



(a) (b) (c)

Fig 3. (a) Total effect matrix for a risk factor in the facility category, (b) Total effect matrix for a risk factor in the operational category, (c) Total effect matrix for a risk factor in the information category

3.4.4. *Calculating vector R and vector C*

Next, create a causal relationship in the form of a diagram. Mapping diagrams using the sum of rows (R) and columns (C) according to equations (5) and (6). The horizontal axis that shows "significance" uses R+C, and the vertical axis that shows "relation" uses R-C. Table 6 shows the calculations R+C and R-C for all categories.

In Table 6, it can be seen that the category of IRF-information risk factors shows the highest R-C value. IRF is the most important category because it has a strong influence compared to other categories. The IRF category has the strongest influence, while the lowest category related to the return process on the logistics system of FMCG Company "A" is FRF-facility risk factors. Next, in Fig. 3 can be seen the depiction of matrix T, which shows the causal relationship between risk factors in three categories.

3.4.5. *Create the network relationship map (NRM)*

This study's threshold values used the average element value in the Total effect matrix (T). The threshold value obtained in each matrix is as follows, for a category matrix of 2.67; FRF matrix of 1.78; the IRF matrix is 0.72. And the ORF matrix is 0.21. Next will be compared the value on matrix T with the threshold value obtained. Table 7 shows whether there is a relationship or linkage between risk factors. The omitted value means that the value on the T matrix is lower than the threshold value.

3.5. Managerial Implication

The occurrence of customer product returns indicates an improper operating process along the supply chain. The return process in FMCG logistics, namely the occurrence of return products such as expired products, near expiration, order errors and bad stock (damaged), in company "A" is identified as coming from four business processes, namely warehousing, distribution, production/supply and order processing. Warehousing obtained six risk factors, transport/distribution obtained five risk factors, production/supply obtained seven risk factors and order processing obtained four risk factors. Risk factor evaluation in this study was observed in three categories, namely facility risk factors (FRF), operational risk factors (ORF) and information risk factors (IRF), using the DEMATEL method to find causal relationships between risk factors. The values R+C and R-C are used to test the degree of importance and dependence between risk factors. Data processing by the DEMATEL method produces groups of dispatchers (Table 8) and receivers (Table 9).

The findings showed that the information risk factors category (Table 6) influenced the return process in FMCG logistics. Risk factor inaccuracy, demand-supply forecast and incorrect price/discount to distributors and/or retail/stores are considered to have a major influence on the occurrence of product returns. Inaccuracy of information about demand-supply from the store to the distributor can cause the inventory of products in the store to excess; further, if the product turns out to be less desirable to consumers, there is a risk of expired products and must be done the return process. Errors in informing prices or discounts from distributors to retail/stores can cause retailers/stores to cancel orders, resulting in product returns. The occurrence of risk factors is certainly an event that is not expected and desired by the company because the impact of the process is long and certainly not financially profitable. In the process, if there is a claim from the retail/store, the distributor must make the claimed product and then the inspection &sorting process is carried out. If the product falls into the category of saleable stock, then the product will be packed and redistributed to the store, but if not, it will be destroyed by the distributor. In terms of cost, the company must bear some additional costs, such as the cost of taking products from consumers, the cost of culling for unsaleable stock and the cost of packaging and redistribution for saleable stock products.

Table 7. NRM matrix for category

NRM	FRF	ORF	IRF
FRF	-	2.72	-
ORF	2.78	2.91	3.04
IRF	-	3.04	-

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Table 8. Risk Factors Dispatcher Group

Dispatcher		R	C	R+C	R-C	Ranking
D.4	Incorrect price / discount	5.86	3.73	9.59	2.13	1
A.1	Poor Inventory accuracy	3.29	1.52	1.76	1.76	2
A.3	Inappropriate product handling	2.89	1.15	1.74	1.74	3
A.4	Inappropriate storage handling	2.91	1.28	1.62	1.62	4
A.2	Error of inventory management implementation	3.18	1.74	1.43	1.43	5
B.1	Poor transport capability	2.59	1.69	0.90	0.90	6
C.3	Changes in consumer preferences	4.12	3.23	7.35	0.89	7
B.2	Accident during in transit	2.52	1.73	0.79	0.79	8
C.1	Raw materials quality problem	3.30	3.14	0.16	0.16	9
A.5	Poor warehouse infrastructure	5.00	5.00	10.00	0.00	10
A.6	Failure of product handling facilities	6.00	6.00	12.00	0.00	11
B.4	Poor infrastructure condition at destination	5.00	5.00	10.00	0.00	12

Table 9. Risk Factors Receiver Group

Receiver		R	C	R+C	R-C	Ranking
C.6	Unstable manpower capability	1.53	3.61	-2.09	-2.09	1
C.4	Instability of machines capability	1.65	3.65	-2.00	-2.00	2
C.7	Error of quality control/quality assurance (QC/QC)	2.23	3.88	-1.66	-1.66	3
C.5	Frequent machine breakdown	2.06	3.54	-1.49	-1.49	4
B.3	Damage product during in transit	1.60	2.77	-1.17	-1.17	5
D.2	Lack of order allocation	4.78	5.92	10.70	-1.14	6
D.3	Order executions failure	5.02	5.92	10.94	-0.89	7
B.5	Lack of on time in full (OTIF) performances	5.34	6.05	11.39	-0.71	8
C.2	Inaccuracy demand supply forecast	4.49	4.65	9.15	-0.16	9
D.1	Error of order management	5.79	5.92	11.71	-0.12	10

The dispatcher group identified twelve risk factors: six risk factors from the warehousing process, three risk factors from the transport/distribution process, two risk factors from the production/supply process, and one from the order processing process. Based on table 8, the three most important risk factors are inaccuracy of demand-supply forecast, poor inventory accuracy and inappropriate product handling. The three risk factors cause different risk events, and inaccuracy demand-supply forecasts result in product return because of the possibility of expired product risk, poor inventory accuracy results because there is a risk of an order fulfilment error. In contrast, inappropriate product handling causes product defect risk. Risk factors inaccuracy demand-supply forecast can cause the risk of expired products, so product returns must be made. Likewise, poor inventory accuracy, where there is misinformation about the accuracy of inventory levels in both distributors and/or stores, can cause order cancellations. Risk factors include inappropriate product handling, where product defect occurs due to errors in handling products in the warehouse, both at distributors and retail/stores. The handling for all product return processes is the same as previously described. Information about the relationship between risk factors is the basis for decision-makers in managing the occurrence of risk due to the return process at FMCG companies.

4. CONCLUSION

This research aims to develop a decision-making framework to assess risk factors that affect the return process in FMCG logistics. The proposed framework uses the DEMATEL method to identify risk factors relationships to realize a sustainable supply chain. The findings showed that the risk factor that contributed the most was the inaccuracy demand-supply forecast (D4) of the twelve risk factors in the dispatcher group. In this group, there are three risk factors in the FRF category, two in the IRF category, and seven in the ORF category. These risk factors result in product returns due to expired products, inaccuracies in inventory levels both at distributors and stores, and mishandling of products in warehouses. Decision makers must pay close attention to the risk factors in this group because risk factors in this group can affect other risk factors resulting in a return process.

Further research development is wide open due to the limitations of the framework developed here. Research can be developed by identifying risks in different aspects to involve experts from a wider and more numerous field. In addition, further research can also be quantitatively validated the data used.

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