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Capability Factor Identification and Influence Assessment on Supply Chain Resilience in Indonesian Automotive Industry

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Abstract: The Automotive Industry is one of the business lines affected by the COVID-19 pandemic in Indonesia. The pandemic causes instability in the Indonesian economy from demand and sales. The supply chain is a long process consisting of parties involved directly or indirectly in fulfilling customer needs: suppliers, manufacturers, shipping, warehouses, checking, and the customers themselves. In an increasingly dynamic and volatile global environment, various events threaten to disrupt supply chain operational activities. For example, the COVID-19 pandemic has caused supply chain management to be very vulnerable due to closing access and lockdown policy. Therefore, the designed supply chain system must withstand disruptions and recover quickly at a minimal cost. Supply Chain Resilience (SCR) is the ability of the supply chain to survive, adapt, and overcome operational disruptions that can damage the supply chain system so that the supply chain can quickly recover from disruptions and reconstruct the supply chain to be stronger than before. SCR has attributes that enable companies to anticipate and overcome disruptions. The Automotive Industry in Indonesia needs to identify what capabilities have been or will be used to anticipate supply chain disruptions which are then quantified to find out which capabilities have the most effect on increasing supply chain resilience. The method used in this study is DEMATEL (Decision Making Trial And Evaluation Laboratory) - ANP (Analytic Network Process) based, which can visualize causal relationships between factors through a cause-and-effect diagram and show the extent to which these factors influence each other.

Keywords: Automotive, capabilities, resilience, DEMATEL-ANP, influence.

Introduction

Several industries in the third quarter of 2020 experienced negative growth based on YoY (year on year) values. Based on the Ministry of Industry (2020), there are six categories of the industry: the transportation equipment industry; leather, leather goods, footwear industry; machinery and equipment industry; rubber industry, rubber and plastic products; textile and apparel industry; and the non-metallic minerals industry, which shown in Figure 1. The transportation equipment industry experienced the most significant decline from the third quarter of 2019 to the third quarter of 2020, where the lowest peak was in the second quarter of 2020, reaching -34.29%. However, in the third quarter of 2020, the transportation equipment industry experienced a slight increase to -29.98%, indicating improvement efforts to increase the national economy [1].

There are 12 parts of the transportation equipment industry sub-sector consisting of ships and the like, combat vehicles and their parts, spare parts for two or three-wheeled motor vehicles, bicycle parts and the like, aircraft and their parts, engine parts for two and three-wheeled vehicles, and others [1]. Negative national economic growth has led to a decline in the value of exports of industrial commodities in Indonesia. The Ministry of Industry of the Republic of Indonesia stated that the 4-wheeled motorized vehicles and more experienced a decline in export value from 3.65 billion USD in 2019 to 2.37 billion USD in 2020. The automotive industry, which is the pioneer in the growth of the manufacturing industry, also includes the four and more-wheeled motorized vehicles. Therefore, the growth of the automotive industry has a role in increasing the national economy. Furthermore, the automotive industry is global, so the Indonesian automotive industry must compete with other countries to develop further.

The Automotive Industry is one of the business lines affected by the Covid-19 pandemic in Indonesia. The pandemic causes instability in the Indonesian economy from demand and sales. Vehicle sales in the country have decreased significantly [1]. Along with the falling demand for automotive products, it also disrupted the production process of automotive manufacturers. The Association of Indonesian Automotive Industries noted that the decline in car production has been visible since April 2020, in line with the government's implementation of the Large-Scale Social Restrictions policy [1]. Total recorded national

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production during January-May 2020 was 352,571 units. This figure is down 32.8 percent compared to last year's figure in the same period. Based on the news in [1], the Minister of Industry explained that his party continues to spur the automotive industry's performance amid the pressures of the Covid-19 pandemic.

The supply chain is a long process consisting of parties directly or indirectly involved in fulfilling customer needs by involving the manufacturers, suppliers, shipping, warehouse, checking, and the customer himself [2]. However, each industry, especially automotive companies, in the supply chain process involves various suppliers, production, processes, product variations, and the possibility of having distributors to fulfill customer demands.

In an increasingly dynamic and volatile global environment, various events threaten to disrupt supply chain operational activities and jeopardize their efficient and effective performance. For example, the COVID-19 pandemic shows how supply chain management is vulnerable due to closing access and lockdown policy. The prepared supply chain system must withstand and recover from disruptions quickly and at a minimal cost. Supply Chain Resilience (SCR) is the ability of the supply chain to survive, adapt, and overcome operational disruptions that can damage the system and make it recover from disruptions quickly while reconstructing the system to be stronger than before [3,4]. SCR has capabilities that allow companies to anticipate and overcome disruptions [5]. Those capabilities can be innate or developed throughout the organization, including operations, logistics, transportation, and human resources. The Automotive Industry in Indonesia needs to identify what capabilities have been or will be used to anticipate disruptions which are then quantified to find out which have the most effect on increasing supply chain resilience.

In various industrial sectors, there are several studies about supply chain resilience. Liu *et al.* [6] study aim to determine the factors that affect the resilience of cross-border e-commerce supply chains using Fuzzy-DEMATEL. The studied factors are efficiency, adaptation, flexibility, and collaboration. Zhang *et al.* [7] identify companies that are most resilient to supply chains with particular preferences for partner companies in China's supply chain framework during the COVID-19 pandemic using AHP-Topsis-DEMATEL, where the factors studied are Flexibility_Order, Fulfilment, and Efficiency. Aggarwal and Srivastava [8] explore the collaborative resilience phenomenon by identifying and modeling the critical success factors of the automotive industry supply chain collaborative resilience (SCR) in India using Grey-based DEMATEL. The factors studied are Flexibility Sourcing, visibility, dan recovery. Ramesh *et al.* [9] present a framework to identify supply chain risk factors. It will analyze the indicators in consideration of contextual relationships between factors. He also developed an overall supply chain risk score for the electronics industry in India using DEMATEL-ANP. The factors studied are anticipation, organization, and market position. Ramezankhani *et al.* [10], Rajesh and Ravi [11], Samvudi and Jain [12], and Tarei *et al.* [13] also conducted research using DEMATEL-based methods, and Table 1 shows each of the factors studied. DEMATEL is an acronym for Decision Making Trial And Evaluation Laboratory, which can visualize causal relationships between factors through cause-and-effect diagrams and show the extent to which these factors influence each other.

The Automotive Industry in Indonesia needs to identify capability factors and analyze the relationship between factors to understand and evaluate the overall phenomenon to improve supply chain resilience (SCR). Previous researchers have used dynamic systems modeling tools to perform simulations and SEM to capture interdependencies between variables.

The output of the SEM method is an analysis of the interrelationship between factors, calculating the variable's weight in which the ranking of each factor is obtained [14]. The dynamic system method determines factors to gain insight into behavioral patterns based on time [14]. DEMATEL is an improvement over the previous method by helping to "visualize complex causal relationship structures by quantitatively depicting them in matrices or diagrams" [15]. Furthermore, DEMATEL shows each variable's priority and level of influence and critical variables that affect it [16]. In addition, DEMATEL – as suggested by Hosseini *et al.* [17]- is equipped with methods to "handle the complexities of human judgment in the decision-making process" and focuses on facilitating modeling in a probability environment [8]. Finally, the Analytic Network Process (ANP) determines factor weights and prioritizes them [13].

Based on the problems mentioned earlier, research on supply chain resilience in Indonesia's automotive industry is needed. First, the researchers must identify the capability factor to obtain the most influential capabilities factors, among other factors. The method used in this study is DEMATEL-Based ANP which is the proper method to include interactions and dependencies between dimensions and criteria that arise in the case of real-world problems. DEMATEL-Based ANP can determine capability factors in the automotive industry supply chain, analyze causal relationships between factors through cause-and-effect diagrams, and integrate with the Analytic

Network Process (ANP) to determine factor weights and prioritize them. The results of this weighting will be arranged based on the ranking. Therefore, DEMATEL-based ANP is the proper method to be a factor determination tool. Furthermore, this methodology can verify the interdependence of variables and attributes.

This research did not use DEMATEL AHP because the assessment and weighting of factors did not depend on lower factors; the method also needs to be based on a hierarchy. Meanwhile, ANP was in the form of a network and can be widely applied because the ANP network is varied and reflects problems like the actual situation. This research did not use DEMATEL Grey because it solves an uncertain problem, while in this study, the case is specific and already happened. The data used in Grey is discrete data with incomplete information. DEMATEL Fuzzy was also not chosen because the problem is ambiguous, challenging to measure and express, and usually uses a linguistic variable. DEMATEL Fuzzy methods are usually subjectively used, and the expert panel might have an inaccurate assessment. In contrast, the factor variables in this study are clear and based on literature sources. The experts in this study are experts in the automotive field with at least five years of experience.

DEMATEL-Based ANP has been applied successfully in many situations, such as improving marketing, tourism policy, airline partner selection, and controlling information security risks [18]. The factors and subfactors studied did not exceed 15 in previous studies, but this study combined several subfactors from previous studies to reach 21 subfactors. The reason above is the advantage of this research compared to previous research.

Methods

Supply chain resilience has become an integral part of supply chain management. However, without adequate identification and quantification of capabilities, the practice of supply chain resilience will have problems. The Multi-Criteria Decision Making (MCDM) decision-making methodology can complete the quantitative measurement of capabilities with priority values from various capabilities and sub-capabilities. Compared to other decision-making methodologies, MCDM is simple and requires fewer samples with a more efficient way of taking quantitative measurements of supply chain capabilities [16]. This study describes the capability factor in supply chain resilience obtained from the literature study. The researchers use a quantitative measurement to determine the priority of a capability factor. In addition, this study presents a method to determine the priority scale on supply chain resilience capabilities through the DEMATEL method.

DEMATEL stands for Decision Making Trial And Evaluation Laboratory, which can visualize the causal relationship between factors through cause-and-effect diagrams and show how these factors influence each other. DEMATEL eliminates the need for large data sets and can be used to develop applicable models across a particular organization or setting. In addition, DEMATEL can determine the strength and causal relationship between variables. Therefore, it is beneficial in modeling new phenomena as it gives rise to a step-by-step approach to its implementation [7, 8, 19], and Analytic Network Process (ANP) is used to determine factor weights and prioritize them [13].

DEMATEL is an improvement over the previous method by helping to "visualize complex causal relationship structures by quantitatively depicting them in matrices or diagrams" [15]. Through DEMATEL, the priority and severity of each variable's influence and the critical variables that influence it can be known [16]. DEMATEL – as suggested by Hosseini *et al.* [17] - is equipped with methods to "handle the complexities of human judgment in the decision-making process" and primarily facilitate modeling in a probability environment [8]. This study uses DEMATEL-Based ANP to capture the relationship between capability factors obtained from Network Relationship Maps (NRMs). Therefore, the DEMATEL- Based ANP method is preferred to research the priority of capability factors in automotive supply chain resilience in Indonesia. The method has been applied successfully to many situations, such as improving marketing, tourism policy, airline partner selection, and controlling information security risks [18].

The DEMATEL- Based ANP can be formulated as:

$$X = vA \tag{1}$$

where

$$v = \min_{ij}\left(\frac{1}{\max\limits_{1\le i\le n}\sum_{j=1}^{n} a_c^{ij}}, \frac{1}{\max\limits_{1\le j\le n}\sum_{i=1}^{n} a_c^{ij}}\right) \tag{2}$$

$A = [a_{ij}]$ is an nxn matrix. Matrix A represents the respondent's average assessment, which shows the direct influence of factor i on factor j in the ANP pairwise comparison. Each respondent/ expert gave a rating scale with a Likert scale ranging from 0 to 4 (0 indicating "no effect" and four indicating "very strong influence").

X is the capability subfactor's direct influence matrix. We construct the direct effect matrix by multiplying the initial average matrix with the Z value. Z value is one way to normalize data of capability subfactor. Z values are constructed by minimizing one per column maximization and one per row maximization of capability subfactor. In the direct effect matrix X, we can see the initial effect between the existing elements, obtained by normalizing Matrix A, where all the main diagonal elements are equal to zero.

Then we calculate the subfactor effect matrx (T_c), which explain the influence between elements in detail and complete using:

$$T_c = X + X_1 + X_2 + \cdots + X_h = X\,(I - X)^{-1} \quad (3)$$

where I is the identity matrix, and $X_1, \ldots, X_h$ are matrices of all subfactors.

The sum of T_c row-wise and column-wise can be written as

$$R = \left[\sum_{j=1}^{n} T_c^{ij}\right]_{nx1} = [T_c^{i}]_{nx1} = (r_1, \ldots, r_i, \ldots, r_n)' \quad (4)$$

$$S = \left[\sum_{i=1}^{n} T_c^{ij}\right]_{nx1} = \left[T_c^{j}\right]_{nx1} = \left(s_1, \ldots, s_j, \ldots, r_n\right)' \quad (5)$$

The horizontal axis vector shows the importance of the criteria by adding R and S, i.e., $(R + S)$. While the vertical axis vector is calculated by subtracting the R to S, i.e. $(R - S)$ if the result is positive, then the criterion affects other elements and vice versa; if the result is negative, it means other elements influence the element. The graph of influencing and being influenced (causal) from the operatio*nal data* $(R + S)$ and $(R - S)$, which is called the network relations matrix (NRM).

$$T_c = \begin{array}{c} \\ D_1 \begin{array}{c} c_{11} \\ \vdots \\ c_{1n_1} \end{array} \\ \vdots \\ D_i \begin{array}{c} c_{i1} \\ \vdots \\ c_{in_i} \end{array} \\ \vdots \\ D_m \begin{array}{c} c_{m1} \\ \vdots \\ c_{mn_m} \end{array} \end{array} \overset{\begin{array}{ccc} D_1 & D_j & D_m \\ c_{11} \ldots c_{1n_1} & c_{j1} \ldots c_{jn_j} & c_{m1} \ldots c_{mn_m} \end{array}}{\begin{bmatrix} T_c^{11} & \cdots & T_c^{1j} & \cdots & T_c^{1m} \\ \vdots & & \vdots & & \vdots \\ T_c^{i1} & \cdots & T_c^{ij} & \cdots & T_c^{im} \\ \vdots & & \vdots & & \vdots \\ T_c^{m1} & \cdots & T_c^{mj} & \cdots & T_c^{mm} \end{bmatrix}} \quad (6)$$

Finally we construct the total dimension effect matrix T_d on capabilities which formulated as:

$$T_d = \begin{bmatrix} t_d^{11} & \cdots & t_d^{1j} \cdots & t_d^{1m} \\ \vdots & & \vdots & \vdots \\ t_d^{i1} & \cdots & t_d^{ij} \cdots & t_d^{im} \\ \vdots & & \vdots & \vdots \\ t_d^{m1} & \cdots & t_d^{mj} \cdots & t_d^{mm} \end{bmatrix} \begin{array}{l} \\ \to \ \sum_{j=1}^{m} t_d^{1j} = t_d^{1} \\ \to \ \sum_{j=1}^{m} t_d^{ij} = t_d^{i} \\ \to \ \sum_{j=1}^{m} t_d^{mj} = t_d^{m} \end{array}$$

Results and Discussions

Capabilities are attributes that enable companies to anticipate and deal with disruptions. Capabilities can be innate, or brand-new developed throughout the organization, including finance, operations, logistics, transportation, and human resources.

From a literature review, the researchers obtained the capability factor of the supply chain resilience of the Indonesian Automotive Industry. These factors are then validated and weighted by the expert to determine the weight of the influence between factors. As a result, the expert has validated 21 capability subfactors based on the literature review, shown in Table 1.

We then assessed the capability subfactor for the influence between the subfactors using a 5 (five) Likert scale through pairwise comparisons. Finally, the researchers asked an expert to rate the defined statements on the questionnaire. Position and experience are the criteria for the expert. This study discusses supply chains, so the expert criteria require positions related to supply chains such as logistics, supplier management, plant directors, and factory managers who have at least five years of experience to provide an objective assessment based on experience. This questionnaire aims to obtain data on the influence and relationship between the capability subfactors in the study. The period of the assessment is from September to December 2021. The assessment in the questionnaire of the influence between subfactors has a value from 0 to 4 with the following information: 0 indicates not very influential, 1 indicates does not affect, 2 indicates moderately affects, 3 indicates effects, and 4 indicates very influence.

Table 2 shows the data of experts who perform the Inter-capability Influence Assessment. Using equation (1)-(6), we calculated the total subfactor effect matrix (T_c) and the total factor effect matrix (T_d) on capabilities (see Table 3). The total dimension effect matrix (T_d) concerns the dimensions/ clusters of (T_c). This research generated the total effect matrix (T) by doing a limit to minimize the effect of the indirect effect. Finally, calculate the total influence matrix for subfactors and factors to determine the influence between factors (T_c and T_d).

After constructing the total effect, creating a Network Relation Map (NRM) is the next step. Making this NRM is preceded by constructing the threshold value used to determine the direction of the arrow from one capability factor to another capability factor or one subfactor to another. This research obtained the factor threshold value from the average matrix of the total influence factor (T_d). The obtained subfactor threshold value is from the average matrix of the real influence of the subfactors (T_c). Table 4 shows the Threshold Value results on the Average Total Matrix. After constructing the influence relationship between factors and subfactor's capability, Table 5 shows the results obtained from the summary of the capability factors that give influence.

Table 1. Subfactors of supply chain resilience capability of automotive companies in Indonesia

Code	Factor	Subfactor	Source
D1	Flexibility sourcing	The company is flexible on supply contracts and supplier capacity.	[5, 6, 8, 20, 21]
D2		The company has alternative suppliers if the primary supplier cannot deliver supplies.	[5, 6, 8, 20]
E1	Flexibility manufacture	The company is flexible to changes in batch size and production lead times	[5, 22]
E2		Flexible company to reconfigure manufacturing process activities	[5, 6, 22]
F1	Flexibility order fulfilment	The company has good inventory management to overcome production shortages	[5, 21, 23]
F2		The company has alternative distribution modes and is flexible in transportation capacity for product delivery.	[5, 6, 13]
G1	Capacity	The company has sufficient workforce capacity even though the supply chain is experiencing disruptions.	[5, 21]
H1	Efficiency	Companies can perform productivity with limited labor and resources	[5, 7, 10]
H2		The company has standardized processes and preventive maintenance	[5]
I1	Visibility	The company has information technology to exchange information with suppliers, customers, operators, markets, and external monitoring in real-time and accurately.	[4, 5, 6, 8, 21, 22]
J1	Adaptability	Our company can deal with disruptions and take advantage of disruptions.	[5, 20, 21, 24]
J2		Companies develop alternative technologies to deal with disruptions	[55
K1	Anticipation	The company identifies and prioritizes risks to anticipate disruptions	[4, 5, 6, 9, 13, 20, 21, 22, 25]
K2		Companies can monitor or communicate irregularities and "near misses."	[5, 9, 20, 21]
K3		The company recognizes early warning signals when a disturbance occurs and is capable of emergency preparedness.	[5, 6, 9, 20, 21]
L1	Recovery	The company can quickly return to normal operating conditions after a disruption occurs.	[4, 5, 6, 8, 20, 21, 25, 26]
L2		The company has a resource mobilization and communication strategy to deal with disruptions.	[4, 5, 8]
M1	Dispersion	The company has a comprehensive and spread distribution in suppliers, production, and delivery of products.	[5, 24, 26]
N1	Collaboration	Companies communicate between supply chains for collaborative decision-making and share risks and benefits with partners.	[4, 5, 6, 13, 21, 22, 26]
O1	Organization	The company has a culture of creative problem solving when there is disruption and conducts regular training for employees.	[5, 6, 7, 9, 20, 25]
P1	Market Position	The company has product brand equity, loyal customers, and a high level of satisfaction.	[5, 7, 9, 21, 25]

Table 2. Expert who performs influence assessment between capability subfactors

Expert	Company/ Institution	Position	Experience
Expert A	PT SGWM Motor Indonesia (Wuling Motors)	Plant Senior Director	> 20 Years
Expert B	PT Isuzu Astra Motor Indonesia	Factory and Technical General Manager	> 20 Years
Expert C	PT Astra Daihatsu Motor	Logistics Manager and Automotive Trainer	11-15 Years
Expert D	PT Isuzu Astra Motor Indonesia	Supplier Management	9 Years
Expert E	Ministry Of Industry	Policy Analyst - Standardization Agency and Service Industry Policy	16 - 20 Years

Tabel 3. Matrix of total influence of factors (T_d) on capabilities

	D	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**∑R**
D	**0.24**	0.29	0.27	0.24	0.23	0.26	0.24	0.25	0.26	0.24	0.26	0.23	0.23	3.25
E	0.25	**0.26**	0.25	0.23	0.22	0.24	0.23	0.24	0.25	0.23	0.25	0.22	0.22	3.11
F	0.25	0.28	**0.23**	0.23	0.22	0.25	0.23	0.23	0.25	0.23	0.25	0.22	0.22	3.08
G	0.19	0.25	0.21	**0.17**	0.20	0.21	0.21	0.21	0.22	0.20	0.21	0.19	0.20	2.67
H	0.27	0.31	0.28	0.27	**0.23**	0.27	0.26	0.27	0.28	0.26	0.27	0.25	0.25	3.45
I	0.23	0.25	0.23	0.20	0.20	**0.19**	0.21	0.22	0.23	0.22	0.24	0.19	0.20	2.82
J	0.24	0.27	0.25	0.23	0.22	0.24	**0.21**	0.23	0.25	0.23	0.24	0.22	0.23	3.05
K	0.27	0.31	0.28	0.25	0.25	0.27	0.26	**0.25**	0.29	0.26	0.27	0.25	0.25	3.45
L	0.29	0.32	0.29	0.27	0.25	0.28	0.26	0.27	**0.27**	0.28	0.29	0.25	0.27	3.59
M	0.25	0.28	0.26	0.22	0.22	0.24	0.22	0.23	0.25	**0.19**	0.24	0.21	0.23	3.04
N	0.29	0.32	0.30	0.26	0.25	0.29	0.26	0.27	0.29	0.28	**0.24**	0.24	0.27	3.57
O	0.26	0.30	0.27	0.26	0.24	0.27	0.26	0.27	0.28	0.26	0.27	**0.20**	0.26	3.42
P	0.18	0.19	0.18	0.17	0.18	0.18	0.18	0.17	0.19	0.17	0.18	0.16	**0.14**	2.28
∑S	3.22	3.63	3.28	3.01	2.93	3.18	3.06	3.10	3.34	3.04	3.22	2.83	2.96	

Based on Table 5, we obtained the value of R, a row element, and S, a column element. After that, the addition of row elements with column elements $(R + S)$ and subtraction of row elements with column elements $(R - S)$ with each capability factor. We obtained the R-value from the sum of the elements in the row contained in the total capability factor (T_d). The obtained S value is from the sum of all elements in the column contained in the total capability factor (T_d). Adding row by column elements $(R + S)$ and subtracting row by column elements $(R - S)$ help create Network Relation Map (NRM). NRM is useful for knowing the value and influence between factors and subfactors. If the value $(R - S)$ is positive, then the factor affects other factors, and if the value $(R - S)$ is negative, then the factor is influenced by other factors. The value $(R + S)$ shows the primary importance of the capability factor, while the value (R-S) shows the level of influence of one capability factor on other capability factors. The greater the value $(R + S)$, the more important the capability factor is. If the value $(R - S)$ is positive, the capability factor tends to influence other factors more. If the value $(R - S)$ is negative, then the capability factor tends to be more influenced by other factors.

Based on Table 5, flexibility sourcing, efficiency, anticipation, recovery, collaboration, and organization are influencing factors, showing that the six factors affect other factors. As the quality of these factors increases, the factors affected will also increase, and vice versa. While the influenced factors are manufacture flexibility, order fulfillment flexibility, capacity, visibility, adaptability, dispersion, and market position, these factors are influenced more by other factors. If the six influence factors increase quality and quantity, it will affect the "influenced" factors. For example, the influence factor is efficiency, where

Table 4. Results of threshold values on capabilities

No	Type	Threshold value	No	Type	Threshold value
1	Capabilities	0.218	8	Adaptability	0.213
2	Flexibility Sourcing	0.242	9	Anticipation	0.254
3	Flexibility Manufacture	0.258	10	Recovery	0.271
4	Flexibility Order Fulfilment	0.228	11	Dispersion	0.193
5	Capacity	0.169	12	Collaboration	0.240
6	Efficiency	0.230	13	Organization	0.203
7	Visibility	0.187	14	Market Position	0.140

Table 5. Summary of capability factors that influence and influenced

Factor	R	S	R+S	R-S	Description
Flexibility sourcing (D)	3.253	3.220	6.474	0.033	Influence
Flexibility manufacture (E)	3.106	3.632	6.738	-0.526	Influenced
Flexibility order fulfilment (F)	3.084	3.280	6.364	-0.197	Influenced
Capacity (G)	2.668	3.011	5.680	-0.344	Influenced
Efficiency (H)	3.455	2.927	6.383	0.527	Influence
Visibiity (I)	2.818	3.180	5.998	-0.363	Influenced
Adaptability (J)	3.053	3.060	6.114	-0.008	Influenced
Anticipation (K)	3.450	3.100	6.551	0.350	Influence
Recovery (L)	3.594	3.336	6.930	0.258	Influence
Dispersion (M)	3.043	3.043	6.087	-0.001	Influenced
Collaboration (N)	3.572	3.217	6.790	0.354	Influence
Organization (O)	3.415	2.825	6.240	0.590	Influence
Market Position (P)	2.280	2.955	5.236	-0.675	Influenced

Table 6. NRM ranking of capabilities factor

Factor	R+S	Importance ranking	R-S	Influence ranking
Flexibility sourcing (D)	6.474	5	0.033	6
Flexibility manufacture (E)	6.738	3	-0.526	12
Flexibility Order Fulfilment (F)	6.364	7	-0.197	9
Capacity (G)	5.680	12	-0.344	10
Efficiency (H)	6.383	6	0.527	2
Visibility (I)	5.998	11	-0.363	11
Adaptability (J)	6.114	9	-0.008	8
Anticipation (K)	6.551	4	0.350	4
Recovery (L)	6.930	1	0.258	5
Dispersion (M)	6.087	10	-0.001	7
Collaboration (N)	6.790	2	0.354	3
Organization (O)	6.240	8	0.590	1
Market Position (P)	5.236	13	-0.675	13

efficiency here is the company's ability to produce output with minimum resource requirements. This efficiency can affect influenced factors such as manufacturing flexibility, which can quickly and efficiently change the amount and type of output. The more efficient the company, the better its manufacturing flexibility, so that the company's capability is getting better to maintain the supply chain. To determine the NRM Ranking of the capability factor, we compiled a table of importance and influence ratings of the thirteen factors. Table 6 shows the NRM Ranking of Capabilities Factors.

Based on Table 6. it can be seen that the level of importance is assessed based on the value $(R+S)$. The greater the value $(R+S)$. The more important the capability factor is. Recovery has the highest $(R+S)$ value compared to other factors; this shows that recovery has the highest level of importance compared to other factors. The influence rating can be assessed based on the value $(R-S)$; the more positive the value $(R-S)$. The more influential the factor is than other factors. Based on Table 6, the organization has the highest level of influence, followed by efficiency and collaboration in ranks 2 and 3. The top three ranking factors on the importance ranking are recovery, collaboration, and manufacturing flexibility. This ranking shows that these factors have the highest importance compared to other factors. So these three factors need special attention by the

Table 7. Influence and influenced of capability subfactors summary

Factor	Subfactor code	R	S	R+S	R-S	Description
Flexibility sourcing (D)	D1	5.521	5.200	10.721	0.321	Influence
	D2	5.064	5.390	10.454	-0.325	Influenced
Flexibility manufacture (E)	E1	4.926	6.015	10.941	-1.089	Influenced
	E2	5.175	5.945	11.120	-0.770	Influenced
Flexibility order fulfilment (F)	F1	5.141	5.401	10.542	-0.260	Influenced
	F2	4.870	5.393	10.263	-0.523	Influenced
Capacity (G)	G1	4.362	4.989	9.351	-0.627	Influenced
Efficiency (H)	H1	5.112	4.941	10.054	0.171	Influence
	H2	6.118	4.674	10.791	1.444	Influence
Visibiity (I)	I1	4.613	5.247	9.860	-0.634	Influenced
Adaptability (J)	J1	3.815	5.165	8.979	-1.350	Influenced
	J2	6.115	4.898	11.013	1.217	Influence
Anticipation (K)	K1	6.172	5.166	11.339	1.006	Influence
	K2	5.448	5.113	10.561	0.335	Influence
	K3	5.197	5.003	10.200	0.193	Influence
Recovery (L)	L1	6.157	5.698	11.855	0.458	Influence
	L2	5.503	5.265	10.768	0.238	Influence
Dispersion (M)	M1	4.976	5.029	10.005	-0.054	Influenced
Collaboration (N)	N1	5.829	5.318	11.147	0.511	Influence
Organization (O)	O1	5.581	4.700	10.281	0.881	Influence
Market Position (P)	P1	3.724	4.866	8.590	-1.143	Influenced

Table 8. NRM ranking of capabilities subfactor

Factor	Subfactor Code	R+S	Importance Ranking	R-S	Influence Ranking
Flexibility sourcing (D)	D1	10.721	1	0.321	1
	D2	10.454	2	-0.325	2
Flexibility manufacture (E)	E1	10.941	2	-1.089	2
	E2	11.120	1	-0.770	1
Flexibility order fulfilment (F)	F1	10.542	1	-0.260	1
	F2	10.263	2	-0.523	2
Capacity (G)	G1	9.351	1	-0.627	1
Efficiency (H)	H1	10.054	2	0.171	2
	H2	10.791	1	1.444	1
Visibility (I)	I1	9.860	1	-0.634	1
Adaptability (J)	J1	8.979	2	-1.350	2
	J2	11.013	1	1.217	1
Anticipation (K)	K1	11.339	1	1.006	1
	K2	10.561	2	0.335	2
	K3	10.200	3	0.193	3
Recovery (L)	L1	11.855	1	0.458	1
	L2	10.768	2	0.238	2
Dispersion (M)	M1	10.005	1	-0.054	1
Collaboration (N)	N1	11.147	1	0.511	1
Organization (O)	O1	10.281	1	0.881	1
Market Position (P)	P1	8.590	1	-1.143	1

company to better develop these factors, which will increase supply chain resilience in the company. The top three ranking factors in the influence ranking are the organization, efficiency, and collaboration. This ranking shows that these factors have the most influence on other factors; the higher the quality. The other factors will follow the increase.

Besides the capability factor summary, the researchers also summarize the capability sub-factor. Table 7 shows the Influence and Influenced of Capability Subfactors Summary.

Based on Table 7. each subfactor's description of influencing and being influenced has been identified. For example, in the Flexibility Sourcing factor with subfactor D1 - the company is flexible on supply contracts and supplier capacity. The more flexible the company is in carrying out supply activities, the more flexible it will be in other matters. On sub-factor D2 - the company is flexible towards alternative suppliers. If the primary supplier cannot deliver supplies, the company needs to have other alternative suppliers to meet the company's supply needs.

Based on Table 8. it can be seen that the level of importance is assessed based on the value ($R+S$). The greater the value ($R+S$). The more important the capability factor is. The importance rating means the factors need more excellent treatment than the lower importance factor ranking to increase supply chain resilience. For example, Subfactor D1 has a higher value than subfactor D2; D1 (flexible supply) has the highest importance compared to D2 (alternative supplier) in the same factor. The same goes for the other factors.

The influence rating can be assessed based on the value (R-S); the more positive the value (R-S) is, the more the subfactor is influential compared to other subfactors. The influence rating means the factors that can influence other factors. The more influential the factor, the more significant the impact on other factors that rank below it, so the influence factors that have a high value need to be treated to a greater degree to impact other factors. For example, the table shows that D1 has a higher level of influence than D2; this shows that D1 (flexible supply) has a higher level of influence than D2 (alternative supplier) in the same factor. The same goes for the other factors.

Conclusion

Supply Chain Resilience (SCR) is the ability of the supply chain to survive, adapt, and overcome operational disruptions that can damage the supply chain system so that the supply chain can recover from disruptions quickly and reconstruct the supply chain to be stronger than before. SCR has capabilities which is an attribute that enable companies to anticipate and overcome disruptions. Therefore, the Automotive Industry in Indonesia needs to identify what capabilities have been or would be used to anticipate supply chain disruptions which are then quantified to find out which capabilities have the most effect on increasing supply chain resilience. The method used in this study is DEMATEL (Decision Making Trial And Evaluation Laboratory) which can visualize causal relationships between factors through a cause-and-effect diagram and show the extent to which these factors influence each other. Based on the Summary of Capability Factors, the factors that influence other factors are flexibility sourcing, efficiency, anticipation, recovery, collaboration, and organization with a positive R-S value. Other influence factors are manufacture flexibility, order fulfillment flexibility, capacity, visibility, adaptability, dispersion, and market position.

The influence rating can be assessed based on the value (R-S); the more positive the value (R-S) is, the more influential the factor is than other factors. Therefore, the organization has the highest level of influence, then followed by efficiency and collaboration in ranks 2 and 3. Lastly, the importance rating can be assessed based on the value ($R+S$). The top three ranking factors on the importance ranking are recovery, collaboration, and manufacturing flexibility. This ranking shows that these factors have the highest importance compared to other factors.

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