Designing A Technology-Based Supply Chain Resilience Strategy in the Beauty Industry Against Pandemic Disruption

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ABSTRACT

The case of Covid-19 decreases day but day, but customer behavior has changed into covid behavior which shifted into technology. While the supply chain remains vulnerable, much research conducted proposes resilience enhancing strategies applied into technology. Therefore, this research focuses on designing a framework that contains technology-based strategies to increase supply chain resilience of the beauty industry starting from the proactive, concurrent, and reactive phases using the Best-Worst Method and ELECTRE. Three major steps were carried out for this research, starting with step (1) analyzing and identifying risks and strategies that affect the resilience of the beauty industry supply chain, (2) weighting the risks using the Best-Worst Method, and (3) ranking the strategies toward the risks using ELECTRE. At the end of the research, a framework which contains supply chain resilience strategies has been formed through identifying and weighting risk, as well as identifying and prioritizing the strategies. The riskiest risk is short product cycle, and the highest strategies rank are collaboration, knowledge, financial strength, and others.

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1. INTRODUCTION

For almost three years, various activities around the world have been paralyzed due to the Covid-19 pandemic crisis. Starting from the economic, social, education, tourism, transportation, to the supply chain sector, all have been affected by the pandemic due to the enactment of various new policies to minimize the spread of Covid-19. Talking about the supply chain sector, (Ozdemir et al., 2022) stated that the pandemic had an enormous impact on the supply chain of perishable goods. Uncertainty during a pandemic has made the perishable goods industry vulnerable to various problems because perishable goods have a limited shelf life and must be shipped, processed, distributed, and sold before the expiration date. The beauty industry has enormous disruption during pandemic, since people are required to keep their distance, wore masks, and carried out various activities from home, which means that the use of cosmetics will not be as much when doing activities outside the home. In other words, there is no reason for some people to use cosmetics during a pandemic. One of the surveys conducted by McKinsey stated that around 50% of cosmetic consumers wanted to buy less cosmetics during the pandemic (Gerstell et al., 2020a). From this survey, it can be concluded that sales of cosmetics have decreased during the pandemic (Ozdemir et al., 2022) McKinsey also reported that around 30% of beauty industry outlets were permanently closed during the pandemic. This fact really threatens the sustainability of the cosmetics industry because according to data, 85% of cosmetic sales occur through retail stores (Gerstell et al., 2020a)

As the pandemic progresses, various technologies have emerged to offset supply chain risks impacted by Covid-19. Several factories have implemented additive manufacturing to simplify the production process with all the constraints and risks of a pandemic, such as several beauty equipment industries that use 3d printers to produce their mainstay products so that there is no shortage of supply (Bø & Mjøsund, 2022). The retail world is no exception, which has implemented online stores to facilitate the process of buying and selling remotely (Har et al., 2022a), which has also been adopted by the beauty industry. This made Sephora's online cosmetics sales and some Chinese e-commerce increase by 30% (Gerstell et al., 2020a). Buying and selling online was known long before the pandemic, but there are still many customers who rely on retail stores because they have a different buying experience compared to just buying from home. Shopping directly at retail makes it easier for customers to choose a shade, try the existing cosmetic or skincare textures directly, and experience first-hand the experience of 'touching' and 'tasting' products without fear of differences in shades and texture (DESY YULIASTUTI, 2022a)). But the pandemic has finally shifted the customer's need for beauty products to shop online without the option to shop in other ways. While the increase in online sales has still not offset the decline in sales through retail stores during the pandemic, it appears here that the pandemic has shifted customer behavior towards technology, and the beauty supply chain should respond to this change in a similar way, namely by offering technological updates. that can satisfy partners in their supply chain

(Har et al., 2022a). Seeing the demands that must be met by the beauty industry supply chain to satisfy customers whose desires have shifted towards technology, as well as the risks and disruptions experienced by the beauty industry supply chain during the pandemic, it is clear that the beauty industry needs to review its concept of supply chain resilience in order to be able to survive through technological disruption after the Covid-19 pandemic or similar disruptions in the future (Ozdemir et al., 2022). Therefore, this research will focus on supply chain technology to increase supply chain resilience. From the research that has been realized, and considering the existing research gaps, this research will produce a draft framework for each phase of supply chain resilience, as well as strategies that must be carried out by beauty industry supply chain to survive in the amid major disruptions such as technological disruptions during and after the Covid-19 pandemic using the Best-Worst Method (BWM) and ELECTRE. The BWM method will be used to weighting the risks experienced by the beauty industry supply chain during pandemic, while the ELECTRE method will be used to rank the supply chain resilience strategy against risks that have occurred.

2. LITERATURE REVIEW

Supply Chain Resilience

A supply chain may not go according to plan due to events that disrupt or threaten the continuity of the supply chain. Disruptions that threaten the supply chain can take various forms based on 2 categories: (1) probability of occurrence and (2) severity. Based on the probability of occurrence, they are grouped into 2: high and low. Meanwhile, based on the level of severity, supply chain disruptions can be grouped into 3: low, medium, high (A. Kumar et al., 2021)

Events that have a high probability of occurrence can be caused by internal or external factors. Disturbances of this type can generally be predicted, or their arrival can already be anticipated due to similar incidents in the past, so proactive measures are needed to deal with this kind of disturbance. Events that are unlikely to occur, or more accurately referred to as events that have a low probability of occurrence, are statistically very small, in fact almost impossible. Events like this are handled rather slowly compared to events with a high probability of occurrence because it requires a good understanding from various perspectives or a kind of reactive action to handle them. However, this does not rule out the possibility that this event requires proactive action if the disturbance lasts a long time and becomes dynamic (A. Kumar et al., 2021)

Low supply chain disruption can be identified through 2 things, namely having a short- term impact both from an operational and financial perspective, as well as having a low downstream impact (or domino effect). Interruptions of moderate severity impact the company's operations and finances within a few weeks to months, and the downstream impacts that occur are quite pronounced. Lastly, high supply chain disruption, which will be a serious challenge for the supply chain, has long-term impacts from an operational and financial perspective. Because it has a long-term impact, this

type of disorder has a high domino effect, and can cause ongoing damage that can only be dealt with by developing resilience (A. Kumar et al., 2021).

Since the 'start' of the Covid-19 pandemic, various supply chain studies have begun to focus on topics around vulnerability and resilience. If "supply chain vulnerability" focuses on the consequences of uncertainty that occur during a disruption, then "supply chain resilience" focuses on the strategies which support supply chain to recover to its original state after experiencing the consequences during a disruption. According to (Ali et al., 2017), supply chain strategies are classified into 3 main categories, where each category has capabilities according to its function. (1) Proactive Strategy, which supports the supply chain before disruption occurs, must have the ability to prepare the supply chain so that it can anticipate (Blessley & Mudambi, 2022)), evaluate (Burgos & Ivanov, 2021), analyze (U.S. Department of Homeland Security, 2019), understand (Hosseini et al., 2019)), and respond (Belhadi et al., 2021) to disturbances. (2) The Concurrent Strategy will support the supply chain when disruptions are occurring. This strategy must make the supply chain have the ability to respond (Ali et al., 2017), adapt (Blessley & Mudambi, 2022), be responsive (Burgos & Ivanov, 2021)) (Blessley & Mudambi, 2022), plan and take action (U.S. Department of Homeland Security, 2019), and against (Singh et al., 2019)). The last (3) Reactive Strategy, requires that the supply chain has the ability to recover (Ham, 2018) (Hosseini et al., 2019)) (Singh et al., 2019) (Blessley & Mudambi, 2022) (Hossain et al., 2022), learn (Ali et al., 2017) (Blessley & Mudambi, 2022)), and take opportunities (Burgos & Ivanov, 2021) from the disturbances that have occurred because this strategy will sustain the supply chain. supply when the disturbance is over. Of the 3 existing strategies, supply chain indicators can be grouped into 3 strategies as shown in Table 1 below.

TABLE 1. Supply Chain Indicators According to Phase

Phase	Proactive	Concurrent	Reactive
Indicators	Awareness Information Sharing PPP Robustness SC-Network Design Security SCRM Visibility Collaboration Knowledge Digitalization	Adaptability Collaboration Agility Digitalization Flexibility Redundancy Revenue Sharing Velocity	Contingency Planning Financial Strength Building Social Capital Knowledge Management Sustainability

Impact of the Pandemic on the Supply Chain of the Beauty Industry

Adapted from an article published by McKinsey, (Gerstell et al., 2020a) has reported on the impact of the Covid-19 pandemic on the beauty industry, which consists of the cosmetics, body and hair care, perfume, and several personal care products industries. In the article, it was reported that the Covid-19 pandemic had made various industries vulnerable, including the cosmetics industry. The first problem experienced by the beauty industry was the closing of several outlets in various regions. The policy during the

pandemic to stay at home forced several public places to close, so several industries that distributed their products through retail stores were forced to close their outlets, including the cosmetics industry. This is surely very detrimental when most of the cosmetics industry's revenue is derived from sales through retail. A survey by Gerstell et al (2020) confirmed that 60% of Americans buy their cosmetic products through retail stores. Even though several beauty product brands have tried to maximize their sales through online sites, this survey proves that the increase in online sales cannot compensate for the decrease in sales due to store closures. Even when China tried to reopen 90% of retail stores and distributors of cosmetics and other beauty products, their sales were still down by 30% -70% compared to before the pandemic. This has resulted in well-known beauty product brands having to discount up to 40% for their products that are sold online as a form of promotion, so that later when their retail stores reopen, they will get visits from customers (Gerstell et al., 2020b)

Various services that involve physical contact in the beauty industry, such as spas, beauty salons, and hair salons, have also been forced to close their businesses due to policies that require minimal physical contact. Some spa services continue to provide services, but in the form of free services to frontliners such as doctors or nurses as a form of humanity. But free service of course will not provide financial benefits. In addition, do it yourself (DIY) self-care products are becoming increasingly popular in some circles, causing factory-made products distributed through salons to experience decreased sales and financial losses (Gerstell et al., 2020b) Multinational cosmetics companies such as CosmeticiCo are reported to have experienced demand disruptions as their customers have deemed purchasing cosmetics as a less important necessity since their outlets were closed. CosmetiCo is also having difficulty obtaining raw materials and establishing cooperation with its suppliers, because most cosmetic suppliers are in China, and China has experienced the most severe disruptions during the pandemic. The pandemic crisis has also tested CosmetiCo's social sustainability practices that have been adhered to for years ((Silva & Ruel, 2022a). The second problem is, even if cosmetic products are given a discount to attract people's attention, no one wants to bother dressing up extravagantly when all activities are carried out from home using an online meeting site that may have prepared a filter to give a make-up effect. Even if they want to leave the house, people are required to wear a mask that covers half of their face, and this makes make-up activities less important. Due to this, sales of cosmetics and perfumes belonging to well-known brands have decreased by 55% and 75% during the pandemic (Gerstell et al., 2020b).

Store closures, disruption of cooperation between supply chain partners, and decreased profits are the three direct impacts of the Covid-19 pandemic on the beauty industry. There are several indirect impacts that occur, from the upstream side for example, there is a reduction in production, a reduction in working time, and a reduction in the workforce. Meanwhile, from the downstream side, many cosmetic products have passed their expiration date before being sold. Of the various things that are detrimental to the beauty industry, especially the cosmetics industry, McKinsey believes that all these

risks will change the cosmetics industry in a better direction to survive through a bad year. Therefore, a strategy is needed to increase supply chain resilience as a form of overcoming the risks that occur. The right strategy will have a positive impact in helping the supply chain survive and recover from disruptions (Gerstell et al., 2020b) The same thing was conveyed by Kilala Tilaar, CEO of a well-known beauty industry from Indonesia named Martha Tilaar Group in a virtual conference in 2022. Kilala stated that the Covid-19 pandemic has caused the beauty industry to experience a decrease in revenue, but there are always strategies to deal with the risks that occur, especially after the beauty industry in Indonesia underwent a shift during the pandemic (DESY YULIASTUTI, 2022b) The development of digital technology is the main reason for the shift in the beauty industry. The existence of e-commerce official stores that are widely known by all levels of Indonesian society has formed a new business model that can cut distribution channels. Many beauty brands choose to sell their products directly through e-commerce rather than distributing them to retail. In fact, this business model is a factor in the birth of new actors in the supply chain of the beauty industry. Several beauty industry companies accept tolling services intended for businesspeople who want to have their own cosmetic or skincare brand. In addition, the widespread use of social media means that many people look at their cell phones more often than they watch television. This is used by several beauty brands to advertise. Even more unique, because the pandemic has forced consumers to shop for beauty products online, it is difficult for customers to judge products directly. So, certain brands take advantage of honest reviews from influencers who honestly evaluate the beauty products offered (Julia Martins, 2021a)

3. METHODS

Literature Review

Quoted from (Karmaker et al., 2023), the literature review process needs to follow predetermined criteria to obtain appropriate library sources, as listed in Table 2 below. But that literature criteria are tentative since it requires a deeper dig of literature and impossible to track the theme of found journal into the details part. From the predetermined criteria, the risks that occur in the supply chain during the pandemic along with their technology-based handling strategies are obtained to satisfy consumers at the end of the supply chain.

TABLE 2. Literature Criteria for Determining Risk and Strategy

Databases	Language	Year	Search Terms	Keywords	Source Selected
International journals available on the web sciencedirect.com	English	2020—2023 (when the Covid-19 pandemic took place and right after the Covid-	(i) "supply chain disruption during pandemic" (ii) "supply chain	(i) "disruption" OR "risk" AND "supply chain" AND "pandemic" (ii) "technology" AND	(i) Related to the problem and research objectives. (ii) Indicating the model or method of research used

		19 pandemic ended)	resilience strategies" (iii) "technology for resilient supply chain during pandemic" (iv) "technology ... to improve ..." (v) *name of technology applied in supply chain* (vi) "supply chain risk pandemic era"	"strategies" AND "supply chain (iii) resilience" AND "post-pandemic" "resilience" OR "supply chain resilience"	to obtain appropriate risks and strategies. (iii) Recommend strategies related to technology and customer satisfaction.

3.2 Best-Worst Method (BWM)

This stage begins with several steps cited from (Rezaei, 2015a) as the main reference regarding BWM steps. The Best-Worst method can produce more reliable and consistent decisions(B. Kumar & Sharma, 2021). The risks from Stage 3.1 above will be weighted, and the process itself will require respondents to score the risks based on pairwise comparison. This research will be scored by 3 respondents who have experience in the beauty industry before, during, and after pandemic so they can cope with the problem and how to face it.

BWM is very flexible when faced with many decision makers, although small amount of decision makers are sufficient (B. Kumar & Sharma, 2021) and the process only requires a little analysis and calculation compared to AHP ((Abdul Ghaffar et al., 2021), and what is even more interesting and different from other MCDM methods is that it does not require a combination of alternatives and criteria, but can be just one of them in the analysis process. Another advantage that BWM has is that it selects the best and worst criteria (or alternatives) first before entering the pairwise comparison process. Another MCDM method weighs the alternatives and criteria through a pairwise comparison process where it is not yet known which alternative or criterion is the best and worst. This can cause the decision maker's assessment to be less consistent, especially when faced with many alternatives and criteria. In addition, an optimization model such as BWM which is formed from 2 single opposite vectors (Best and Worst) can effectively reduce the decision maker's judgment bias because it contains little data, little time, little judgment, and few questions for the decision maker to answer (Rezaei, 2015b)

Detail of Respondents

Code (k)	Experience	Scope of Experience
1	more than 4 years	Store with a certain brand
2	6 years	Store with many brands
3	5 years	

ELECTRE I

The risk's weight obtained from Stage 3.2 as well as strategies from Stage 3.1 are combined to calculate the rank of strategy using ELECTRE I. In terms of ELECTRE, the risk's weights will role as criteria, strategies as alternatives, and the same respondents as Table 3 will score the strategies toward the risks following steps by (Yadav et al., 2018)) as the main reference ofELECTRE. The reason for using ELECTRE 1 here is the research objective wants to choose the smallest set of best strategies (alternative), and the most important thing is ELECTRE can be easily combined with other MCDM methods or integrated with other broader methods, in this caseELECTRE will be combined with Best-Worst Method (Govindan & Jepsen, 2016).

4. RESULTS

Literature Review

From the literature review process based on literature scope in Table 2, a list contains 9 risks during pandemic as well as 8 strategies of Proactive phases, 8 strategies of Concurrent phases, and 7 strategies of Reactive phases which each strategy has the ability to face the risks andto enhance supply chain resilient have been identified and listed. All those 4 lists are shown in Table 4 to Table 7 below.

TABLE 4. Identification of Long-Term Supply Chain Risks during the Covid-19 Pandemic

Code	Risk	Source
A1	Technical constraints related to electronic facilities used during the pandemic	Ketchen and Craighead (2020), Queiroz et al (2022)
A2	Uncertainty in demand and time to receive supplies of goods, including inflexibility in terms of time and quantity in fulfilling requests	Ganesh & Kalpana (2022), Okorie et al (2020), Paul and Chowdhury (2020)
A3	Reductions in production capacity, including reductions in manpower, production stoppages, and machine breakdowns	Biswas and Das (2020), Gupta, Madgavkar, and Yadav (2020), Ganesh & Kalpana (2022)
A4	The price form supplier increases for various reasons	Aljuneidi, Bhat, Boulaksi (2023)
A5	Deliveries were hampered due to route closures during the lockdown, including unsupported customer locations and limited delivery modes	Biswas and Das (2020), Ganesh & Kalpana (2022), Tirivangani et al (2021)
A6	Lack of partners to work with, including losing contracts with partners and having no backup partners	Kraude, Narayanan, and Talluri (2022), Wang and Webster (2020)
A7	Difficulty coordinating with supply chain partners, including order cancellations and unfulfilled requests	Silva & Ruel (2022), Okorie et al (2020), Ganesh & Kalpana (2022)
A8	Short product life cycles, including perishable raw materials and fast expiry of products	Ganesh & Kalpana (2022)

| A9 | Demand and profits decreased dramatically to the point of experiencing losses or even bankruptcy | Zhang, Mu, and Sun (2021), Ganesh & Kalpana (2022) |

TABLE 5. Identification of Long-Term Supply Chain Risks during the Covid-19 Pandemic

Code	Risk	Source
A11	Understanding the disturbances that occur and how to handle them using technology (awareness, scrm, visibility)	Zhou et al (2023)
A12	Understanding the shortcomings and weaknesses of digital technology systems to create a strong system and avoid cybercrime (security)	
A13	Opening hybrid stores (online and offline) to familiarize partners with switching to online shopping slowly (robustness)	Sarkar et al (2022)
A14	Integrating historical data on an ongoing basis to facilitate prediction and meet demand (information sharing & knowledge)	Mahmud et al (2023)
A15	Increasing resource awareness of disturbances that occur, as well as handling them through digital technology so that they can analyze digital-based data, including demand data (awareness, knowledge, digitalization)	Belhadi et al (2021)
A16	Informing product details through integrated sites (information sharing & knowledge)	Hossain et al (2022)
A17	Looking for other partners online by utilizing GPS or near-by systems to help meet customers whose locations are less accessible, including looking for 3PL partners who can offer fast, safe, and hygienic logistics services in real-time from suppliers and to customers (collaboration, sc-network design, management)	Ahmed et al (2023), Bø and Mjøsund (2022)
A18	Collaborating with various parties to facilitate the digitization process, including with government agencies to create a distribution network that is safe and not dynamic so that it is not too vulnerable	Silva and Ruel (2022), Zamiela, Hossain, and Jaradat (2022)

TABLE 6. Identification of Concurrent Strategy for Supply Chain Resilience

Code	Risk	Source
A21	Prioritizing problems to be handled while coordinating with experts or stakeholders to solve them with the concept of digitalization (adaptability, collaboration, digitalization)	U.S Homeland Security (2019)
A22	Improving digital systems and inviting customers to shop through e-commerce channels (adaptability)	Kumar et al (2023)
A23	Integrating online and offline data (omnichannel) so that customers have a choice of channels for transactions (adaptability, flexibility, velocity)	
A24	Collaborating with 3PL which can offer integrated logistics services in real time as well as parties who can design storage warehouses that have temperature guard technology so that stored goods and stock are not damaged before distribution (redundancy, digitalization, collaboration)	Ahmed et al (2023), Har et al (2022)
A25	Optimizing production planning (with the help of a 3D printer) to have a lot of stock to meet demand whenever the customer wants (redundancy)	Profili et al (2021)
A26	Performing Big Data analysis to assist in predicting inventory, capacity, and in fulfilling demand accurately, including integrating product stocks from	Ahmed et al (2023)

Code	Risk	Source
	various Warehouses and channels to find out real- time stock and find out which warehouses still have a lot of stock to be allocated to warehouses who lack stock (agility, flexibility)	
A27	Using IoT-based sites or applications (such as Siri or Smart Beacon) that can help customers find the desired information regarding supplier conditions (digitalization, velocity)	Har et al (2022)
A28	Providing general training to employees regarding existing technological innovation strategies, or recruiting workers who are experts in technology (knowledge, adaptability)	Zhou et al (2023)

TABLE 7. Identification of Reactive Strategy for Supply Chain Resilience

Code	Risk	Source
A31	Demand management by promoting through social media, e- commerce, or retail applications as well as promoting smart packaging that is informative and considers social (ethical) and environmental (green teach) aspects *(financial strength & sustainability)*	Kim and Jang (2021)
A32	Designing a Digital Twin-based data system to increase data transparency for all supply chain actors, including stock data, order tracking, etc. *(contingency planning & sustainability)*	Ahmed *et al* (2023)
A33	Creating online catalogs that have AI face detection technology so that they can carry out independent analysis of skin types and suitable products as well as AI 3D Makeup technology to make it easier for customers to find cosmetic colors according to customer wishes *(contingency planning)*	Har *et al* (2022), Modgil, Singh, and Hannibal (2022)
A34	Using AI RFID in warehouses to help manage goods automatically *(management)*	
A35	Demand Management by conducting promotions in the community through AI smart beauty devices that can measure skin health along with product recommendations that need to be used, as well as to build a contribution to public awareness of skin health *(financial strength & social capital building)*	
A36	Placing AI smart vending machines at several points to reach a wider market without labor and space rental costs and innovating in AI Digital Self-Service to increase customer satisfaction, to increase profits *(contingency planning & financial strength)*	
A37	Providing special and advanced training to retail workers to understand the strategies that will be applied *(knowledge)*	Zhou *et al* (2023)

Best Worst Method (BWM)

All the risks above in Table 5 will be scored by the respondents using pairwise comparison. The result of weighting is shown in Table 8 below. Due to the Consistency Ratios gained are less than 0.5, it indicates that the scoring is valid. The risk which gains the highest weight is short product life cycles, including perishable raw materials and fast expiry of products (A8). This is in line with the concept of cosmetic products as perishable goods which have a limited shelf life and must be stored in certain places (Gerstell et al., 2020b). The second and third positions as the most disruptive risks to retail are the prices of goods from suppliers increasing for various reasons (A4) and demand and profits decreasing drastically to the point of experiencing a loss or even bankruptcy (A9). These two risks are supported by various sources who say that during a pandemic, many transportation accesses including ports (Narasimha et al., 2021) and routes (Tirivangani

et al., 2021) were closed, so that the flow of goods stopped which led to scarcity of goods and expensive goods. Supporting a survey conducted by (Gerstell et al., 2020b) that people spent little money to buy beauty products during the pandemic and many retail outlets were closed, the demand for and income for the beauty industry is declining.

TABLE 8. Risk's Weight

Risk	k=1	k=2	k=3	Geomean
A1	0.042322	0.341453	0.05889	0.094764
A2	0.35781	0.049023	0.030847	0.081487
A3	0.084094	0.088241	0.075715	0.082516
A4	0.084094	0.088241	0.176669	0.109445
A5	0.065406	0.063029	0.106001	0.075885
A6	0.065406	0.026856	0.075715	0.051044
A7	0.117731	0.049023	0.05889	0.069787
A8	0.117731	0.147068	0.311273	0.175328
A9	0.065406	0.147068	0.106001	0.10065

ELECTRE

By using the same respondent, each respondent was asked to give a score to each of the strategies offered for risks that occur using a scale of 1-10, where the higher the score, the better the strategy is in overcoming the risks that occur. Conversely, the smaller the score, the less effective the strategy given to deal with the risks that occur (Julia Martins, 2021b) The results of each respondent's assessment for all criteria were averaged using the Geomean, and the results of the priority strategies are shown in Table 9 below.

TABLE 9. Top 3 of Supply Chain Strategies Each Phase

Phase	Strategies
Proactive	Collaborating with various parties to facilitate the digitization process, including with government agencies to create a distribution network that is safe and not dynamic so that it is not too vulnerable
	Understand the shortcomings and weaknesses of digital technology systems in order to create a strong system and avoid cyber crimes
	Understanding disturbances that occur and how to handle them using technology
Concurrent	There are IoT-based sites or applications (such as Siri or Smart Beacon) that can help customers find the information they want about supplier conditions
	Collaborate with 3PL which can offer integrated logistics services in real time as well as parties who can design storage warehouses that have temperature control technology so that stored goods and stock are not damaged before distribution
	Provide general training to employees on existing technological innovation strategies, or recruit workers who are skilled in technology
Reactive	Demand Management by conducting promotions in the community through AI smart beauty devices that can measure skin health along with product recommendations that need to be used, as well as to build a contribution to public awareness of skin health
	Provide special and advanced training to retail workers in order to understand the strategies that will be applied
	Placing AI smart vending machines at several points to reach a wider market without labor and space rental costs and innovating in AI Digital Self-Service to increase customer satisfaction, thereby increasing profits

Discussion

In the process of adapting to various new policies that apply during a pandemic, it is necessary to coordinate with the right experts so that they can adapt the digital-based supply chain environment to these new regulations (U.S Department of Homeland Security, 2019). After the pandemic, the application of Big Data and automation integration can help supply chains increase their flexibility (Ahmed et al., 2023a)), especially in terms of meeting demand due to the assistance of devices such as 3D printers that can print several emergency products so that they have sufficient stock (Profili et al., 2021)). In addition, real-time integration of all distribution channels can enhance long-term relationships with customers, and lead to supply chain resilience (B. Kumar & Sharma, 2021) (Ahmed et al., 2023b) A review by (Har et al., 2022b) regarding Industry 4.0 technology has summarized the whole essence of digitalization and flexibility in dealing with disruptions in the supply chain(Har et al., 2022b) stated that the era of Industry 4.0 has come which carries various technological themes such as IoT, Cloud Computing, BDA, AR, and AI. These four technologies are considered to be able to help supply chains respond quickly to changes that occur, as well as simplify supply chain management in various sectors, such as BDA technology which can 'extract' various customer data to shape customer habits and simplify forecasts, as well as IoT technology Siri, Alexa , Google Assistant, or Bluetooth Radio Transmitter which can notify customers about products and promotions available at the nearest retailer every time a customer passes by (Har et al., 2022b)

AI technology is one of the mechanisms used to increase supply chain resilience because it can develop business continuity capabilities and risk visibility (Modgil et al., 2022a)). Its application has expanded, unlike AR which is still in its early stages. Because AI requires minimal human intervention, the use of AI is rarely applied if not out of necessity (Har et al., 2022b) The sustainability aspect is also a consideration for a supply chain to be able to overcome risks in the supply chain, especially if the sustainability strategy utilizes digital technology (Kähkönen et al., 2023)). The ranking results prove that the top 3 strategies in the Proactive Phase are strategies that rely on collaboration, awareness, and security. These three aspects support the principle of digitalization, that in the digitalization process, a supply chain needs to collaborate, and understand each other the risks that occur in its supply chain (Silva & Ruel, 2022b)). In addition, the increasingly widespread application of digital technology does not escape cybercrimes that endanger supply chain data, so steps are needed to be taken for a 'safe' supply chain network (Zhou et al., 2023a)

In the Concurrent Phase, the top 3 strategies are occupied by digitalization, collaboration, flexibility, knowledge¸ and adaptability. In the previous phase, it was clear that digitization would facilitate collaboration in the supply chain, especially when the supply chain was experiencing disruptions with various risks (Har et al., 2022b) And supply chains that can survive are supply chains that have high adaptability (Zhou et al., 2023b) In the digital era like now, when there are many online platforms that facilitate the industry to continue to grow, the industry must also adjust. As an example, recently the

Shopee e-commerce has been intensively promoting selling via Live video. And beauty industry players are trying to survive by starting to recruit workers who can do Live videos on Shopee, either just as salespeople offering and promoting goods, or like one of their beauty product brands, L'oreal Paris, which also delivers education regarding skin health and appropriate beauty products during Live.

Finally, in the Reactive Phase, the top 3 strategies are occupied by financial strength, social capital building, knowledge, and contingency planning. When it has gone through a disruption, the supply chain must maintain its financial condition (Modgil et al., 2022b). However, along with the development of the era, the supply chain is not only required to survive with big profits and satisfy customers, but also to contribute to the social and environmental spheres. Therefore, it is necessary for the beauty industry to carry out activities that are beneficial to the surrounding environment, such as one of Indonesia's leading beauty product brands, EMINA, which often visits schools to introduce skincare products to high school students. As for the AVOSKIN brand, which recently participated in celebrating National Children's Day to help and contribute to striving for children's rights and protection. Then there is a beauty product brand from England, The Body Shop, which strives for environmental sustainability by using environmentally friendly ingredients for each of its products. Indonesia's famous beauty retailer, Sociolla, provides a point exchange feature in the app for every bottle or packaging of beauty products that have run out. MSBB retail has used vending machines, but only for events.

5. CONCLUSIONS

The risks that occur in the supply chain of the beauty industry have been identified and weighted, where the most disturbing risk is the short product life cycle. And in this way, a framework containing strategies for the resilience of the beauty industry supply chain has been designed, in which strategies in each phase of resilience have been identified and prioritized, and the strategies that rank high include collaboration, knowledge, financial strength, and others. It is hoped that the results of this research can help increase the resilience of the beauty industry supply chain, especially against pandemic disruptions or similar disturbances that may occur in the future. In the academic field, this research can fill research gaps in the field of supply chain resilience, especially the beauty industry supply chain which experienced technological disruption during and after the Covid-19 pandemic crisis. In addition to filling the supply chain resilience gap in terms of 'industrial sector', this research also fills the gap in terms of 'method' by using the Best- Worst Method and ELECTRE which have never been used to identify the phases of supply chain resilience starting from the survive phase, recover, until rebuild. In the industrial sector, this research can be used as an evaluation consideration in helping to increase the resilience of the beauty industry supply chain after the current Covid-19 pandemic crisis, or during similar disturbances that may occur in the future. Considering that this research will present strategies for improving the supply chain at each phase of resilience (survive, recover, and rebuild), it is hoped that in

the future it can help the beauty industry supply chain to know clearly which phases of resilience are still imperfect, and how to fix it.

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