

Strategies on Establishing Supply Chain Resilience in the Era of VUCA

Zhengxie Li^{1,2,*}

¹Philippine Christian University Center for International Education, Manila, 1004, Philippines

²Guizhou Communication Vocational College, Guiyang, 551400, China

114779200@qq.com

*Corresponding author

Abstract: The world is now in an era of uncertainty, namely the Ukaera (VUCA), The world's supply chain is experiencing the risks and tests of factors such as material shortage, insufficient transport capacity, rising resource price, unclear policy, national war and so on, leading to the unpredictable and invisible fluctuations in the supply market. In particular, the impact of COVID-19, including restrictions on travel and gathering of people and delayed resumption of work, have had a severe impact on labor, inventory, production, transportation and orders in the manufacturing industry. Facing the more complex and changeable operating environment in the future, establishing a flexible supply chain is an effective way to deal with this uncertainty, and the digital innovation of the supply chain can improve the resilience of the supply chain.

Keywords: VUCA Era, Supply Chain Resilience, Digital Supply Chain

In the 1990s, the U. S. military used VUCA (volatility, uncertainty, complexity, ambiguity) to describe the difficult challenges of the combat environment, and later scholars in strategic management applied the concept to a dramatically changing business environment as the "VUCA era".

In recent years, with COVID-19 outbreak, trade friction, Ukraine conflict escalation, anti-globalization wave, lead to material shortage, insufficient capacity, resources, unknown policy global economic uncertainty, market competition changes frequently, accelerated the arrival of the VUCA era, has brought great difficulties to the supply chain management.

1. Under The Background of Vuca, The Supply Chain Management Presents The Features of Vuca

VUCA represents variability, uncertainty, complexity, and ambiguity. The VUCA era means continuous, unpredictable changes that have become the norm in certain industries and sectors of the business world. In this change, the supply chain itself is increasingly VUCA (Table 1), and poses disruptive challenges to the way enterprises operate and manage [1].

Table 1: Supply chain VUCA characteristics.

Volatility	It ers that events encountered in the supply chain are unpredictable or unstable, but information about such events is available and the impact is generally predictable.
Uncertainty	The causal relationship of an event encountered in the supply chain is known, but other information about the event is difficult to obtain.
Complexity	Because the environment and the supply chain themselves are many related to each other and variables, the causal connection of events is difficult to establish.
Ambiguity	The events encountered in the supply chain are unpredictable, and the causality is not clear.

With the rapid development of the global economy and the deep cooperation among global enterprises, the members of the supply chain are distributed in different countries and interdependent

and interconnected. A large amount of materials, capital and information flow among the members, thus forming a highly complex network structure and increasing the complexity of the supply chain. This increasing complexity brings more and more instability and uncertainty to the supply chain, which then leads to a high ambiguity in the supply chain. In the situation where the VUCA characteristics of the external environment and the VUCA characteristics of the supply chain itself overlap together, the supply chain faces more and more sudden risks, which can easily lead to the interruption of the supply chain. Different from the traditional supply chain risks, these sudden risks are difficult to predict in advance, and even many risks belong to the "unknown unknown". Therefore, the traditional risk management framework of "identification-evaluation-response-monitoring" is difficult to apply to the response of sudden risks [2].

2. Increase Supply Chain Flexibility in Responding to the VUCA

In its report, Bamboo Supply Chain: resiliency in the COVID-19 Era, the Digital Supply Chain Institute says bamboo has 28,000 pounds of steel with a tensile strength, and only 23,000 pounds, which can withstand strong winds because it bends and moves as the wind blows. Bamboo is much lighter than steel, yet elastic and grows fast means companies need to build a flexible supply chain as strong, resilient and resilient as bamboo [3].

The concept of Supply Chain Resilience, first proposed by Prof. Christopher and Peck in 2004, defines supply chain resilience as "the ability to restore a disrupted supply chain to its original state or to a more ideal state." Lean processes are not enough. The supply chain must be flexible and responsive to market volatility. Once emerging from the current pandemic situation, increased resilience will be a priority for many companies, according to a new Gartner survey [4]. Supply chain leaders can adopt the following six strategies (Fig. 1) to establish a more flexible supply chain system.

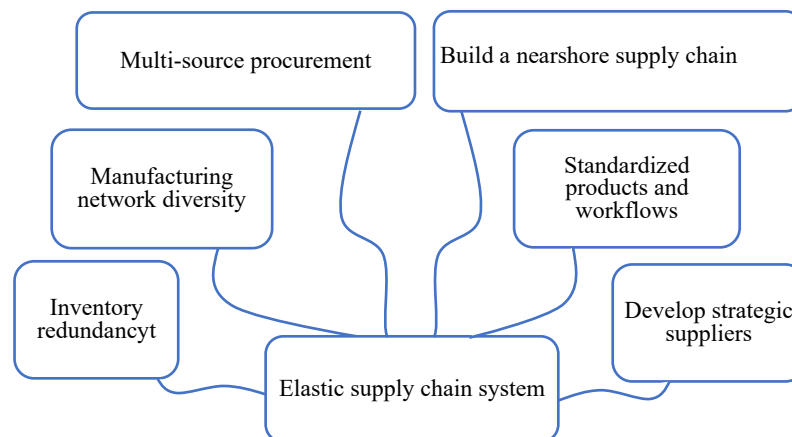


Figure 1: Build 6 major strategies of flexible supply chain.

2.1. Jointly Build Inventory Redundancy

When a small probability risk occurs, in order to ensure uninterrupted supply chain resilience, adding some redundancy, such as additional inventory and capacity buffer, is an important strategy to improve supply chain resilience. However, excessive redundancy means higher costs, and the resulting "cow-whip effect", and the redundancy design should not only focus on the level of elasticity, but also need a trade-off between the level of elasticity and the cost it causes [5]. In order to overcome the "bullwhip effect", the supply chain members can jointly build an appropriate amount of redundancy in the inventory, and share the cost through the contract design among the members to realize the coordination of the supply chain.

2.2. Manufacturing Network Diversity

In the past few years, the operation of supply chain interference makes many companies to alert "put eggs in the same basket" production risk, the industrial chain configuration from previously mainly considering production efficiency to efficiency and industrial safety, has begun to diversify its manufacturing base, which means that keep the cost of the multiple production plant more as the cost of business, rather than inefficiency.

For example, Japanese auto parts suppliers such as Yazaki are setting up production bases in North Africa to diversify their supply chain during the escalating situation in Russia and Ukraine and increasing geopolitical risks in eastern Europe. Foxconn, the world's largest contract electronics manufacturer, has recently accelerated its investment in India to diversify its manufacturing base because of a long trade war between the United States and China[6].

2.3 Establish a Multi-Source Sourcing Strategy

The essence of the multi-source procurement strategy focusing on risk mitigation and the standby procurement focusing on risk response are to maintain the diversification of suppliers to ensure the procurement flexibility of enterprises in an uncertain environment. Compared with single-source procurement, enterprises in the multi-supplier mode simultaneously have two or more different suppliers that can make up for each other and form a stable supply combination [7]. This can not only meet the needs of the supply chain to deal with risks, but also the existence of multiple suppliers can significantly enhance the initiative of the buyer enterprises, enabling it to gain stronger bargaining power in the business contacts with suppliers. For example, most automakers around the world have launched diversified vehicle battery supply channels, in order to avoid the risk of unstable supply due to surging demand, but also considering to further reduce manufacturing costs.

2.4 Build a Nearshore and Regional Supply Chain

By moving warehousing or distribution closer to the end market, strengthening cooperation with suppliers close to consumption points can significantly reduce delivery times in the current situation of widespread supply difficulties and delivery delays. In addition, driven in diversified, personalized consumer demand rising, based on artificial intelligence, big data analysis and block chain technology of supply chain end-to-end digital management services and C2M mode, in order to more close to personalized consumption, nearshore and shore production can meet the supply chain fast, flexible, more transparent trend[8].

2.5 Standardized Products and Workflows

Break down complex requirements layer by layer until they are decomposed into parts or workflows that can be standardized. Through the structural elements, size, material properties, design methods, drawing requirements, etc., to develop the common standards[9]. When has a unified standard, different suppliers produce the same type of products with extremely high compatibility. Even if one link in the supply chain is unexpected, other suppliers will quickly fill it up to reduce the dependence on a single supply source and enhance the ability to resist risks. Standardization of components across multiple products (especially those that are not visible or important to the customer) actually simplifies the procurement strategy and creates opportunities to place more quantities between multiple vendors, thus enhancing resilience.

2.6 Build Strategic Suppliers

The best way to protect companies from environmental change is to build strategic partnerships. Quickly and reliably overcome supply chain risks through strategic suppliers. Integrate with the business and process of strategic suppliers, build an electronic information sharing platform for resource sharing; such as real-time sharing of sales forecast, inventory information, transit orders, etc[10]. For companies of sufficient size, a strong relationship with suppliers and with third-party logistics worldwide is crucial to achieving production diversification and distribution to different countries.

3. Digital Innovation Can Improve Supply Chain Resilience

Digital supply chain is a new supply chain based on the new generation of information technology and modern management concepts and methods such as the Internet, the Internet of Things, big data and artificial intelligence. It is value-creation-oriented and data-driven for the overall planning, design and operation of supply chain activities[11]. On the one hand, digital capability can help enterprises strengthen their information processing capabilities and quickly respond to the market; on the other hand, it can establish new supply chain operation modes such as intelligent production through the full

visualization and traceability of the end-to-end supply chain (Fig. 2).

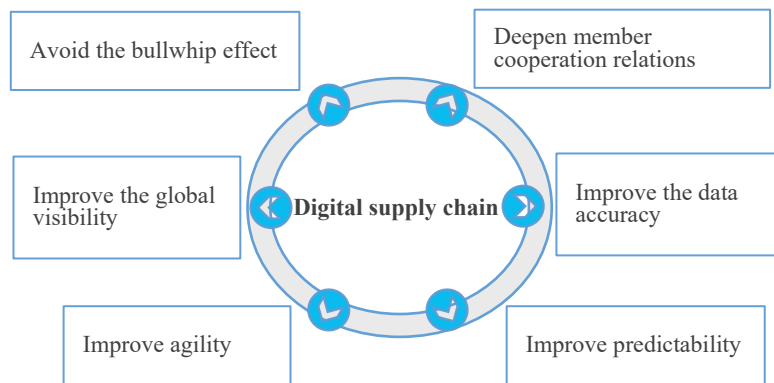


Figure 2: The role of digital supply chains.

Goldner analyst Sarah Hippold (Sarah Hippold) published a research briefing, "Goldner Forecasts the Future of Supply Chain Technology," on January 26, 2021. Digitization remains a strategic priority for supply chain organizations, the briefing said. In Goldner's 2019 Supply Chain Technology User Demand Survey, most respondents claimed that digitalization was their core strategy and focus, and that supply chain management digital technology was a capability ahead of their competitors. Digital resilient supply chains and operations deliver better, faster, more complex and lower cost disruptions than passive corresponding supply chains. Through digital strategy and capability upgrading, we can better support enterprises to make forward-looking decisions, so as to grasp the market opportunity more accurately and quickly, and adjust the business in time, to ensure that enterprises can obtain the maximum profits[12].

4. Build Digital Supply Chain Paths

Build the overall architecture of digital transformation systematically, and use the "START" digital transformation method model (Fig.3) to accelerate the digital transformation of enterprises and guide enterprises to build a digital supply chain.

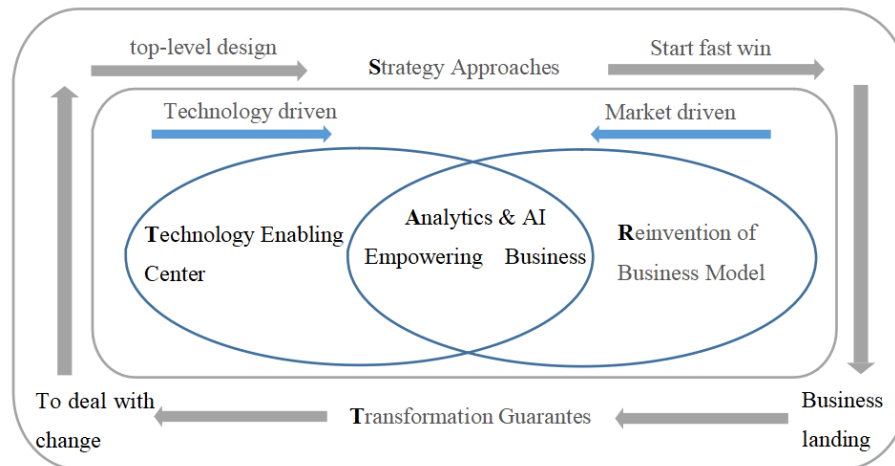


Figure 3: The "START" digital transformation methodological model.

4.1. Strategy Approaches

Developing a digital strategy and clarifying the path of transformation includes making detailed plans to implement digital solutions to improve efficiency in various business areas, including engineering, manufacturing and customer service. Digital transformation is itself a broad business strategy [13]. Starting from the enterprise development strategy, consider various internal and external driving factors, set business goals, and to achieve internal and external benefits, to put forward requirements for the executive level, both to do the operation level of continuous improvement, and to

establish a new process, system, system and supporting digital ability, but also to continuously measure the cost and benefits, in order to achieve operation and new ability to establish a balance between the two aspects.

4.2. Technology Enabling Center

Using digital technologies such as cloud computing, big data and artificial intelligence, the traditional supply chain model will be transformed and upgraded with the customer as the center [14]. Specification, high operability and practical management system, with digital technology can assign supply chain system, then through sensors, Internet of things, 5G technology build acquisition, acquisition, transmission and execution command data, reshape the enterprise business model, make its demand, prediction, collaboration, execution, decision-making ability, realize technology innovation can assign business development.

4.3. Analytics and AI Empowering Business

Digital transformation of supply chain, the Internet of Things first. Business intelligence operation is mainly reflected in the enterprise operation decisions are based on data. The Internet of Things technology is widely used in the supply chain physical equipment and logistics, and it has the ability to obtain external real-time data. Therefore, business performance is a data-based business visualization performance, statistical data analysis and application performance, and data-based business warning and response performance in risk management performance [15]. In the supply chain, supply chain insight and planning, supplier and source finding management, global supply chain optimization and digitalization of supply and demand balance.

4.4. Reinvention of Business Model

Through digital technology to make enterprises efficiently define the product life cycle stage, define product requirements, design, specifications, implementation, use of financing, operation, maintenance services, rather than just focus on the core manufacturing capacity, through digital technology, realize information between enterprises and enterprises, enterprises and users, make users to participate in design, cloud design, no physical design, design, open design, collaborative design, etc is possible. builds a digital ecosystem through enterprise digital transformation, completes data interconnection and integration, utilizes the new value of various services, and seeks for new revenue sources, new products and services, and new business models. Through digital technology to make enterprises efficiently define the product life cycle stage, define product requirements, design, specifications, implementation, use of financing, operation, maintenance services, rather than just focus on the core manufacturing capacity, through digital technology, realize information between enterprises and enterprises, enterprises and users, make the users participate in design, cloud design, no physical design, open design, collaborative design, etc is possible [16-17].

4.5. Transformation Guarantes

Use digital technology to integrate their own resources, integrate multiple supply chains and multiple sales channels into supply chains, and promote enterprises to change their production mode, organizational structure, corporate culture and a series of reform measures. In addition, we should establish the overall concept and collaborative thinking of digital supply chain talents, and constantly strengthen the thinking of digital supply chain.

5. Conclusions

1) This paper analyzes the noteworthy supply chain trends in 2021 and in the future. They show that a resilient, agile supply chain is the future of the supply chain.

2) Lean process is not enough in the supply chain. The supply chain must be flexible and responsive to market volatility. The flexible supply chain can easily expand or contract according to the current market demand. To achieve this supply chain flexibility, organizations must: ①build cross-functional or cross-border teams to address supply chain shortages; ②build more inventory and raw material buffering; ③develop expectations and worst scenarios; ④examine other shipping routes and potential local sources;⑤explore technologies that can help them diversify and innovate throughout their supply

chain.

3) Digital technologies such as artificial intelligence, big data, and 5G enable the supply chain to be adjusted as needed to minimize interference.

4) Supply chain operation in the digital era faces many challenges. The correct countermeasure for enterprises is to formulate the strategy of supply chain operation transformation and implement the digital transformation. Meanwhile, it is also very important to establish the overall concept and collaborative thinking of digital supply chain talents, and constantly strengthen the supply chain thinking. According to the current economic development model, it is not difficult to see that the digital supply chain is the development trend of The Times. Whoever takes the first chance will win in the competition.

References

- [1] Geraint John, *Future of Supply Chain: Crisis Shapes the Profession*, Gartner Supply Chain Executive Report, 2020 - 12.
- [2] A. Kaufman, C. H. Wood, G. Theyel, *Collaboration and technology linkages: A strategic supplier typology*. *Strategic Management Journal*, 2000, 21(6), pp. 649 - 663.
- [3] Sarah Watt. *Enable a Purpose-Driven Supply Chain to Boost Stakeholder Value*, Gartner, 2021.
- [4] W. Ho, X. Xu, P. K. Dey, *Multi-criteria decision making approaches for supplier evaluation and selection: A literature review*. *European Journal of Operational Research*, 2010, 202(1), pp. 8-14.
- [5] Kao Guo, et al. "Supply chain lifecycle decision analytics." *Security Technology (ICCST)*, 2014 International Carnahan Conference on. IEEE, 2014.
- [6] Anitha P, Malini M. Patil, "A Review on Data Analytics for Supply Chain Management: A Case study", *International Journal of Information Engineering and Electronic Business(IJIEEB)*, Vol. 10, No. 5, pp. 30-39, 2018. DOI: 10. 5815/ijieeb. 2018. 05. 05.
- [7] Leveling, J., Edelbrock, M., & Otto, B. (2014, December). *Big data analytics for supply chain management*. In *Industrial Engineering and Engineering Management (IEEM)*, 2014 IEEE International Conference on (pp. 918-922). IEEE.
- [8] Julianty Surasma Surung, I Putu Agung Bayupati, Gusti Agung Ayu Putri, "The Implementation Of ERP In Supply Chain Management On Conventional Woven Fabric Business", *International Journal of Information Engineering and Electronic Business(IJIEEB)*, Vol. 12, No. 3, pp. 8-18, 2020. DOI: 10. 5815/ijieeb. 2020. 03. 02.
- [9] Thitirath Cheowsuwan, Sudarat Arthan, Supan Tongphet, "System Design of Supply Chain Management and Thai Food Export to Global Market via Electronic Marketing", *International Journal of Modern Education and Computer Science(IJMECS)*, Vol. 9, No. 8, pp. 1-8, 2017. DOI: 10. 5815/ijmeecs. 2017. 08. 01.
- [10] Cheng Qin, Tang Shuyi, "Manufacturer's Pricing Strategy for Supply Chain with Service Level-Dependent Demand", *IJEM*, vol. 4, no. 4, pp. 1-13, 2014. DOI: 10. 5815/ijem. 2014. 04. 01.
- [11] M. Haddara, "ERP systems selection in multinational enterprises: A practical guide," *Int. J. Inf. Syst. Proj. Manag.*, 2018.
- [12] Kamble, Shridhar, Aaditya Desai, and Priya Vartak. "Data mining and data warehousing for supply chain management." *Communication, Information & Computing Technology (ICCICT)*, 2015 International Conference on. IEEE, 2015.
- [13] I. Winda, I. Made, and I. Ketut, "Developing Manufacturing Application using Enterprise Resource Planning Concept," *Int. J. Comput. Appl.*, 2017.
- [14] I. Antoniadis, T. Tsiakiris, and S. Tsopogloy, "Business Intelligence during Times of Crisis: Adoption and Usage of ERP Systems by SMEs," *Procedia - Soc. Behav. Sci.*, vol. 175, pp. 299 - 307, 2015.
- [15] Aloysat Garaja Aliyev, Roza Ordukhon Shahverdiyeva, "Scientific and Methodological bases of Complex Assessment of Threats and Damage to Information Systems of the Digital Economy", *International Journal of Information Engineering and Electronic Business(IJIEEB)*, Vol. 14, No. 2, pp. 23-38, 2022. DOI: 10. 5815/ijieeb. 2022. 02. 02.
- [16] Junmin Kim. *Blockchain Supply Information Sharing Management System Based on Embedded System. Distributed Processing System (2022)*, Vol. 3, Issue 2: 60-77.
- [17] Tagne, J. S., Ningaye, P., & Kobou, G. (2021). *The Effects of Openness on Managerial Innovation in Cameroonian Companies*. *Journal of Organizational and End User Computing (JOEUC)*, 33(4), 28-43.