



The Concept of International Trade and Solutions to International Supply Chain Crises

Dr: Lakhdar Boumarhab

(PHD , University of Ahmed Ben Yahya Tissemsilt / lakhdar1806@gmail.com)

Dr: Sami Fouad Brek

(Lecturer Classe B University of DJILALI BOUNAAMA Khemis Miliana/ email:
s.brek@univ-dbk.m.dz)

Dr: Hicham zerrouki

(Lecturer Classe A University of DJILALI BOUNAAMA Khemis Miliana email/
h.zerrouki@univ-dbk.m.dz)

Dr: Nabil Guebli

(Lecturer Classe A University of DJILALI BOUNAAMA Khemis Miliana email:
n.guebli@univ-dbk.m.dz)

Submission: 24.03.2026. Accepted: 12.06.2026. Publication : 17.08.2026

Abstract:

The study aimed to shed light on the concept of international trade, which encompasses export and import activities and is based on differences in resources and demand among countries. This enables access to markets and products that are not available locally. It also addressed international supply chains, which ensure the flow of goods from suppliers to consumers across borders, including logistics, transportation, and insurance. Furthermore, the study examined the various crises facing these supply chains—such as natural disasters, geopolitical events like wars and conflicts, cyberattacks, and other disruptions—as well as the solutions and strategies adopted to these challenges.

Through this study, a set of key findings was reached, the importance of strengthening relationships with suppliers through diversifying the supplier base, promoting trade liberalization, and the necessity of utilizing information and communication technologies—such as artificial intelligence and machine learning—in planning, producing, managing, and optimizing supply chain activities. This is achieved by processing vast amounts of data, forecasting trends, and performing complex tasks in real time. Moreover, artificial intelligence can enhance decision-making processes related to supply chains and improve their operational efficiency.

Keywords: International trade, supply chains

Introduction

With the emergence of convergence between countries in the demand for goods and services and the convergence of cultural and social characteristics, which contributed to



narrowing the consumption gap between societies, and products and services became similar in their composition and took on an international character after having been characterized by a local character, trade exchanges became a major factor in the political and economic strategy of all countries of the world, as they participate in international exchange through the natural distribution of resources and wealth, which made each country distinguished by resources and wealth that are not available in other countries, which explains the need of each country for others, which necessitated exchange between them. Any in-depth reading of global economic history can lead us to understand the main role that international trade plays in shaping the features of this history, and the recovery and prosperity of international trade is considered an essential indicator of the vitality, growth and stability of the global economy.

Therefore, international trade plays a strategic role in international transactions through the export or international marketing of goods and services. Supply chains also face a major challenge to international trade, especially with the ongoing impacts and changes that have emerged.

At the beginning of the twenty-first century, like the financial crisis of 1970 Since 2008, and subsequently the COVID-19 pandemic, and geopolitical wars such as the Russian-Ukrainian war and the American-Israeli war on Iran, these chains are considered the beating heart of international trade, which is more interconnected and developed with the increase in globalization and technological and digital developments that have affected most fields and areas, including commercial and economic ones. With most industries today relying heavily on global supply chains, the failure to understand the main challenges facing supply chains today is in itself an imminent danger that threatens the current global economic system. This led to a slowdown in global economic growth. Through this research paper, we attempt to provide a brief analysis of the causes and solutions based on recent studies.

1.1 The problem of the study:

The research problem revolves around the following main question:

How has the supply chain crisis affected international trade? And what are the proposed solutions?

2.1 Hypotheses:

In order to answer the previous problem, we propose the following hypothesis:

- The supply chain crisis has manifested itself in global trade through shipping disruptions and increased costs.
- The crises have prompted countries to diversify supply chains and strengthen ports, with a focus on digital risk management.

3.1 Importance of the study:

The importance of the study stems from the crucial role that supply chains play in facilitating international trade by efficiently connecting producers and consumers across borders, without which the global flow of goods would be slower and more expensive, limiting access to international markets.



4.1 Study Objectives:

This study aims to highlight the following:

- *Addressing the theoretical framework of international trade and Supply chains;*
- *Understanding the concept of international trade and supply chains;*
- *Understanding the importance of international trade and supply chains;*
- *Addressing the reality of supply chains and international trade starting from the beginning of the crises of the twenty-first century;*
- *Addressing the most urgent solutions to mitigate the impact of supply chains on international trade.*

5.1 Methodology:

In order to determine whether the hypothesis is true or false, The deductive approach was adopted through the tools of description and analysis, and this is by describing the study variables as defining international trade supply chains and the reasons for resorting to them, in addition to analyzing some international crises that directly and significantly affected the flow of international trade supply chains.

6.1 Research divisions:

The study elements were addressed by dividing them into two main axes:

First topic: The concept of international trade.

Second axis: The concept of supply chains

Third axis: Supply chain crises and possible solutions

2. First axis: The nature of international trade and supply chains.

1.2 Definition of International Trade:

Before addressing the definition of international trade, it is necessary to refer to the most important terms used in economics to define it. Some believe that international trade is limited to exports (goods and services that a country sells abroad) and imports (goods and services that it imports from abroad), without referring to the movement of capital and the migration of people. These transactions are recorded within the current account in the balance of payments of the country, and this process allows countries to access products and markets that may not be available locally.

Some call it foreign trade, which refers to all activities related to the movement of goods, services, and capital across borders, including associated operations such as transportation, insurance, and logistics. The term is often used in close conjunction with international trade in economic literature.

Therefore, the concept of international trade is one of the most important concepts in international economics, as it deals with studying the flows of goods and services between different countries, analyzing the economic, political and social reasons behind these exchanges, in addition to the impact of countries' trade policies on their economic balances. Among the most important modern definitions of international trade, we mention the following:



"It is represented in the most important forms of economic relations, according to which goods and services are exchanged between countries in the form of exports and imports."¹or "It is a set of international economic transactions that include various goods and services and factors of production such as labor, capital movement and technology that cross the territorial borders of different countries in the world."²

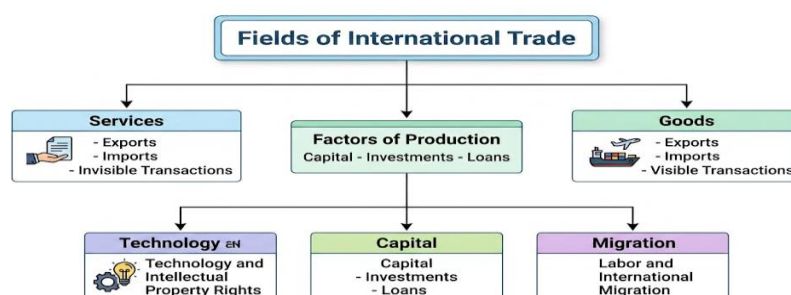
It is also defined as "a branch of economics that specializes in studying international economic transactions, represented by the movement of goods, services and capital between different countries, as well as the trade policies that countries apply to influence the movement of goods, services and capital between different countries."³It is also "the process of trade in goods, services and other different factors of production between several countries with the aim of achieving mutual benefits for the parties to the exchange."⁴

Some define it as "the movement of goods, people and capital across the territorial borders of one country to another, i.e., it is a commercial connection that transcends the territorial borders of the state, where one country exports its surplus products to another country."⁵

Therefore, foreign trade is an exchange of goods between countries, which includes many areas, most notably the movement of physical goods across international borders in their various consumer or production forms, the exchange of services which include transportation, insurance, shipping, as well as the exchange of money, which includes the movement of capital for the purpose of investment, as well as international loans and international migration.

The areas of international trade can be defined by the following figure:

Figure No. (01) Areas of International Trade



¹- Hussam Ali Daoud, Economics of Foreign Trade, Dar Al-Masirah for Publishing, Distribution and Printing, Amman2002, p. 13.

²- Abdel-Muttalib Abdel-Hamid, Economic Theory, Partial and Macro Analysis of Principles, University House, Alexandria, Egypt,2000 AD, p. 374

³- Muhammad Ahmad Al-Siriti, Foreign Trade, University Press, Alexandria, Egypt,2009, p. 08.

⁴- Hamdi Abdel-Azim, International Trade Economics, Dar Al-Nahda Al-Arabiya, Cairo, Egypt,2000, p. 13

⁵- Murad Abdat, Foreign Trade in Light of Economic Transformations and the Challenges of Free Trade, PhD Thesis, University of Algiers03, Algeria, 2014, p. 02.



Source: Abdel-Mottaleb Abdel-Hamid, *Economic Theory: A Micro and Macro Analysis of Principles*, University Press, Alexandria, Egypt 2000 AD, p. 375.

2.2. Reasons for the existence of international trade: Among the most important are the following:

- Unequal distribution of natural resources: Not every country possesses all resources (oil, minerals, agricultural land) to the same extent, which forces it to import.

Differences in technology and work skills: A country's superiority in producing certain goods with high technology makes it an exporter of them, while other countries that are less developed in this field import them.

- Specialization and international division of labor: Each country focuses on producing goods in which it has a "comparative advantage" (lower production costs), and trades them with others.

- Differences in production costs: The variation in prices of production inputs (labor, energy, raw materials) from one country to another determines cost advantage and trade advantage.

- There is a surplus in domestic production: When a country produces a surplus beyond its domestic needs, it seeks to export it to increase economic returns.

- Differences in consumer tastes and income levels: Consumer demand has diversified to include goods not produced locally, such as luxury products or specialized technology.

- Economies of scale: The ability to reduce the cost per unit when producing in large quantities for export.

3.2- The importance of international trade: The importance of foreign trade can be highlighted in the following points:

- Increasing the rate of economic growth by reducing the prices of goods in which the country has a comparative and competitive advantage, thereby increasing national income and increasing welfare.

International trade is considered an outlet for disposing of surplus production beyond the needs of the local market, where local production is greater than what the local market can absorb.

- The ability to finance many projects through investment and importing foreign capital, especially for developing countries.

- The ability to utilize foreign labor and expertise, because achieving high economic growth rates requires skilled technical personnel from the workforce, which may not be available in the country.

- The ability to convert local savings into investments, especially in developing countries that need to import equipment, machinery and investment goods that are not produced by the local economy.

- The ability to acquire modern technology and techniques that lead to increased productivity compared to technologically advanced countries.



- The dependence of developing countries on foreign trade for development and economic progress requires a lot of capital, expertise and technical progress from abroad, and these are essential pillars of development for those countries. On the other hand, we find that those countries that have preceded in the field of development are a permanent market for the products of developing countries of raw materials (primary) and thus a source of foreign currency for these countries.

These points highlight the importance of international trade in exporting or marketing goods and services internationally, as it plays a strategic role in international transactions. Furthermore, the success of international marketing efforts depends on the ability and efficiency of the export management apparatus in securing acceptance from the end customer or importer of the goods and services..

3- Second axis: The concept of supply chains

From a historical perspective, supply chains were simple and operated within limited geographical areas. Local producers made simple products such as perfumes, fabrics, or bread, and it was often easy to obtain all the components used in their manufacture from a location close to where the final product was consumed. However, supply chains in our modern economy have become extremely complex, involving a large number of producers from all over the world. For example, a mobile phone may contain aluminum extracted in Africa, silicon produced in South America, microchips made in Asia, design and software in North America, and all its parts may have been assembled in a factory in Asia before consumers receive it via a European shipping company. This means that the product is no longer locally produced in one country, but rather several companies from several countries participate in its production, which requires international or global supply chains.

Therefore, no economic activity can carry out its tasks and achieve its goals without the need for other institutions, whether for obtaining raw materials and inputs used in the production and transformation process, or in terms of distributing products and providing services. Every institution is directly or indirectly linked to other institutions that aim to fulfill the needs and desires of consumers, and this is what constitutes supply chains. We find that every institution belongs to a specific supply chain that influences it and is influenced by it.

1.3. Definition of supply chains: It consists of a network made up of suppliers, manufacturers, retailers, and the end consumer, supporting three basic types of flows. The supply chain, or in other words, the flow of materials, information, and money; is a network of organizations involved in various processes and activities that produce value in the form of products and services delivered to the end consumer. It is also defined as a network or system of professional units that produce, assemble, transform, and distribute goods and services from suppliers to customers according to their needs and demands. The supply chain is a link that begins and ends with the customer; all materials, finished products, information, and



transactions flow through this chain. It is a dynamic network of facilities for all organizations, despite their differences and conflicting objectives.⁶

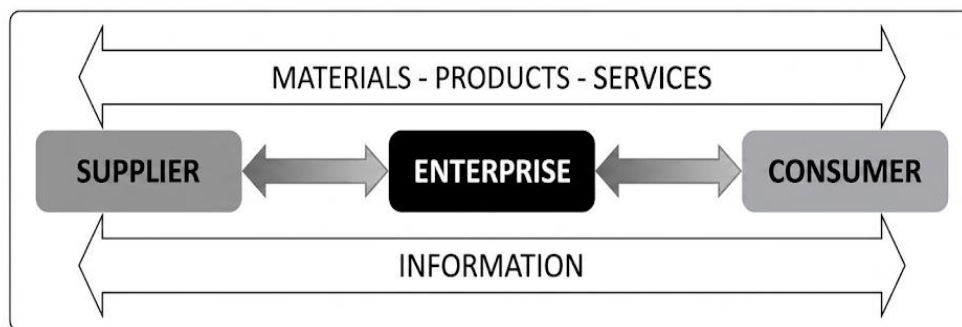
Therefore, supply chains are an integrated network or complete system that covers the stages of purchasing, manufacturing, distribution, logistics and sales. They include the entities, processes and resources that transform raw materials into finished products that reach customers. Their management includes the flow of goods, data and money from suppliers to end consumers, with the aim of achieving efficiency and balance between supply and demand, starting with raw materials and ending with product delivery, with a focus on reducing costs and increasing customer satisfaction.

Supply chains can be likened to a long train, each carriage representing a stage. If one carriage malfunctions, the entire train stops. This is exactly what happens when there is a minor malfunction at any stage; it can lead to delayed shipments, shortages of goods, or higher prices.

2.3. Types of supply chains: Any organization that participates effectively or efficiently in the flows from origin to destination is called a supply chain actor; thus, in the supply chain, organizations play specific roles as either suppliers, producers, service providers, retailers, or end customers.⁷

1.2.3. Direct Supply Chain: In this case, the supply chain is limited to the producing organization, its direct supplier, and its end customer. This is the minimum supply chain, as shown in the following figure:

Figure No. (03) Direct Supply Chain



Source: Jihène Tounsi, Modeling for the simulation of the global supply chain in a mechatronic SME production environment, PhD dissertation in Industrial Engineering, University of Savoie, 2009, p. 34.

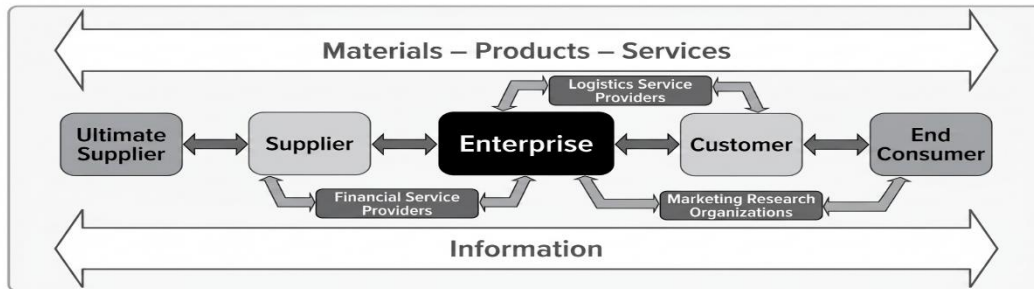
⁶- Jaafar Saadi, Supply Chain Management and its Importance in Improving Organizational Performance, PhD Thesis, Kasdi Merbah University of Ouargla, Algeria 2020 AD, pp. 24-25.

- Jihene Tounsi, model for the simulation of the global logistics chain in an environment for the production of ⁷ PME mechatronics, this is a doctorate in a generation in the industry, University of Savoie, 2009, p. 34.



2.2.3. Extended Supply Chain: This type of supply chain includes other categories of actors, namely: the supplier's supplier or the end supplier at the source, and the customer's customer or the end customer at the downstream, as shown in the following figure:

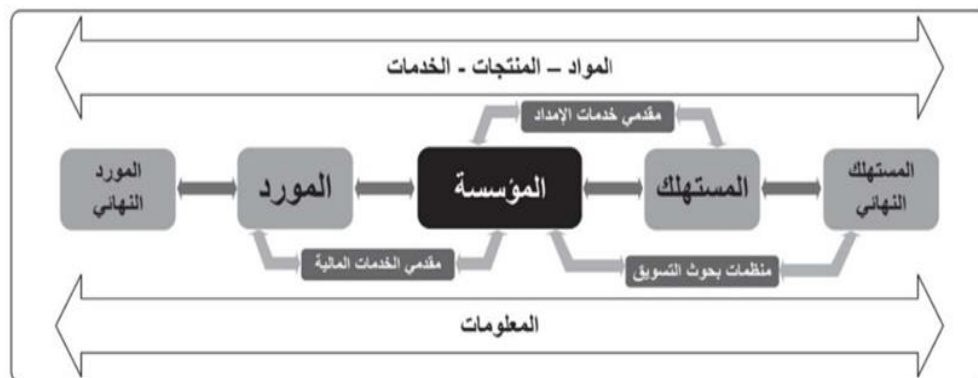
Figure No. (04) Extended supply chain



Source: Jihene Tounsi, Ibid, p. 35

3.2.3. The Overall Supply Chain This type of supply chain takes a network form, comprising all the organizations involved. It is highly complex due to the numerous links and diverse relationships between the various actors, as illustrated in the following figure:

Figure No. (05) The overall supply chain



Source: Jihene Tounsi, Ibid, p. 35

4. Supply chain components: A supply chain consists of an integrated system that defines all aspects of the production process and includes the companies, people, technologies, and resources required to move products or services from suppliers to customers. It utilizes all available resources to deliver the final product to the consumer. Its most important elements are purchasing, manufacturing, distribution, logistics (which may include product transportation), and finally, sales. The main steps in the supply chain include the following:⁸

- Planning inventory and manufacturing processes to ensure a sufficient balance between supply and demand
- Manufacturing or sourcing the materials needed to create the final product



- Assembling the parts and testing the product.
- Packaging the product for shipping, or storing it for later.
- Transporting and delivering the final product to the distributor, retailer, or consumer
- Providing customer service support for returned items.

5. Supply chain objectives: In general, the supply chain aims to reduce or minimize overall costs, improve overall quality, maximize customer service, and increase profitability. Several key objectives exist, including:

- Increase production efficiency, thereby reducing waste and lowering costs.
- Getting the right product at the right place and time, at the lowest cost.
- Keep inventory to a minimum and provide the best customer service.
- Reducing the production cycle time.
- Reducing risks in the supply chain; therefore, there is a positive feeling about inventory levels, operations, and end customer service levels.

6. The importance of the supply chain: In fact, every product that reaches the end user represents the cumulative effort of many organizations collectively. These organizations form the supply chain, and the importance of the supply chain lies in:⁹

- It provides more job opportunities as it includes many activities such as transportation, production, storage, and others.
- Providing individuals with various necessities of life such as food, water, medicine and healthcare.
- Facilitating the exchange and transport of various goods through ports, airports and railways.
- Reduce costs and boost profit margins by developing production processes and improving relationships with suppliers.
- Facilitating communication between different parties.
- Improving the level of customer service.

In addition, the supply chain can help distribute risks. If a region of the world is experiencing political or economic turmoil, companies with a supply chain can often continue to operate smoothly by obtaining materials from other regions. They are also responsible for delivering goods and materials to areas in dire need. For example, the supply chain ensures that relief aid reaches disaster-stricken areas in a timely manner. The efficient functioning of the supply chain is essential for maintaining global economic stability and promoting economic growth.

7. Risks of vein chains: Modern supply chain problems are complex and present many common challenges; the most significant supply chain risks are as follows:

- Potential shortcomings in transparency: Transparency enables stakeholders to understand the state of the supply chain.

⁹ -<https://bakkah.com/ar/knowledge-center>



Waste due to an insufficient production cycle Companies that measure supply, demand, or capacity inaccurately may end up with excess inventory.

- Dissatisfied business partners and customers: The company's ultimate goal is to meet customer expectations; this includes managing those expectations realistically, but also providing a valuable product.

- Lost or delayed goods: Goods that are lost at any point in the chain ultimately delay the entire process and can negatively affect customers.

- Increase customer expectations New technologies and businesses raise customer expectations, which can be difficult to manage and impossible to meet if not managed properly.

Flexibility in dealing with sudden changes in the supply chain External factors can cause unexpected changes in the supply chain, so best practices are to be prepared for the unexpected and able to pivot if necessary.

- Difficulty in predicting demand, due to the constant change in consumer trends.

- The possibility of goods being lost or delayed, which delays the entire supply process and may negatively affect customers.

- The increased level of customer expectations resulting from new technology and business practices makes meeting them difficult.

Risks also have a vital impact on the efficiency of the supply chain, as they may lead to financial losses. Risks may arise from internal or external factors, and they do not follow a specific direction in their flow. Risks usually come from factors such as supply and demand and the prices of products and services, and they take many forms such as:

Natural disasters.

- Poor product quality.

- Cash flow constraints.

Unexpected requests.

- Problems with the processes.

Ineffective management.

Changes in personnel or organizational structures.

8. Supply chain elements: The supply chain is based on four basic elements:

1.8. Integration Integration is a key element of supply chain success, achieved through coordination and cooperation among all departments in the supply chain, relying on effective communication between them. This, in turn, enhances the efficiency and effectiveness of the supply chain and helps achieve the desired results.

2.8. Operations The existence of highly efficient operations is a fundamental element upon which the strength and success of the supply chain is based, and the operations need to be continuously monitored by managers to ensure their efficiency, including the equipment used in manufacturing.

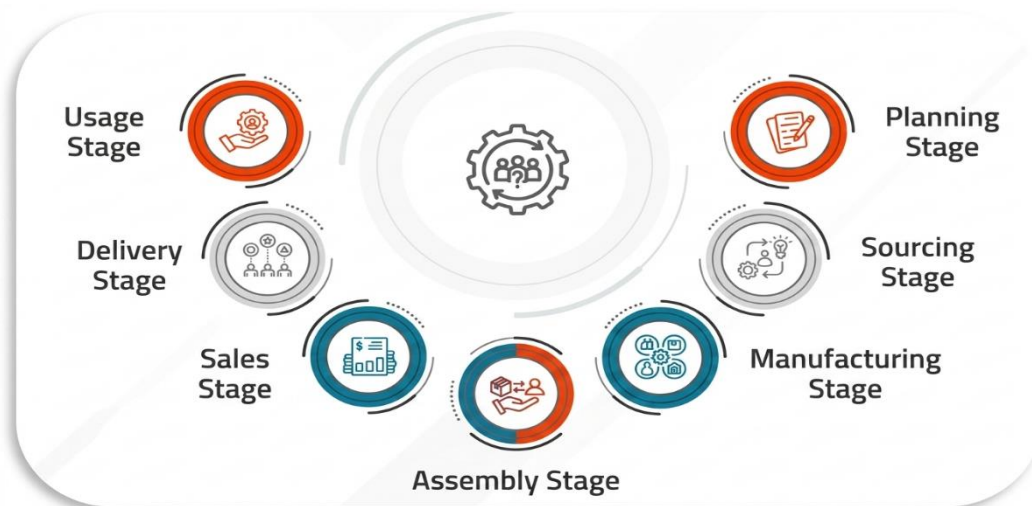


3.8. Purchase: The purchasing element is a fundamental element upon which multiple activities in the supply chain are based. If the required materials are not purchased due to their unavailability, this results in a delay in the production process of the materials, and may lead to an accumulation of inventory quantities, and ultimately this leads to damage to the company's cash flow.

4.8. Distribution: The distribution phase is one of the elements that cannot be overlooked in the supply chain. If the distribution process is carried out efficiently, this means ensuring that the product or service is delivered to the customer. To ensure this, companies rely on logistics programs in managing product transportation operations.

9. Supply chain stages: This can be summarized in the following figure¹⁰

Figure No. (02) Supply chain stages



1.9. Planning phase: At this stage, the company begins planning based on the customer's requests, determining the quantity and type of raw materials required and who the best suppliers are from whom these materials can be purchased. It is also responsible for determining the number of resources and the total cost of production. This stage requires that market products undergo testing to determine their quality, and it must also identify the wholesalers and retailers to be dealt with after the product is manufactured.

2.9 Supply Phase: After determining the size and type of raw materials required, the next step is to purchase them. They are then processed, refined, and prepared for storage after being transported to the factory. The workers must be able to store these materials according to the required standards and using the equipment and tools designated for this purpose.

3.9. Manufacturing stage: This stage is supervised by product designers and engineers to ensure compliance with the required quality standards when manufacturing the product, as the

¹⁰ <https://bakkah.com/ar/knowledge-center/>



raw materials in this step are manufactured according to the company's resources of personnel, technological techniques and machinery, and according to market demands.

4.9. Assembly phase: At that stage, the manufacturing process is completed and the products undergo modifications to improve quality, in preparation for their distribution to wholesalers or retailers. Companies also look into the possibility of producing secondary products that represent complementary goods to the basic products.

5.9. Sales phase: Preparations begin at that stage to promote the products in preparation for their sale by merchants, through the use of marketing campaigns and the launching of discounts, through various marketing means, most notably social media platforms, television advertisements, store offers, in addition to email. Merchants also use people in charge of selling the products, such as sales representatives, and specialists in marketing and advertising, such as marketing managers.

6.9. Delivery phase: At that stage, traders receive the products in their final form, after they have been transported by land or air, and the factory monitors the process of transporting the products to ensure that they eventually reach the customers.

7.9. Usage phase: At this stage, the customer receives and uses the product, and through research and surveys, manufacturers, distributors, and traders are able to determine the customer's evaluation of the product and whether it matches their expectations and meets their needs.

10. Performance Measurement Factors KPIs: The supply chain field relies on numerous performance indicators. KPIs measure the level of performance and efficiency in supply chain activities and processes, and among the most important of these factors are:

1.10. On-time delivery rate: This is an indicator used to measure the level of on-time product delivery by matching the number of delivery requests within a specific timeframe to the total number of requests. In practice, the delivery rate is measured by dividing the number of delivery requests in the schedule by the total number of requests. $100 \text{ i.e., } \text{delivery rate} = \frac{\text{number of delivery requests in the schedule}}{\text{total number of requests}} \times 100$.

2.10. Order Accuracy Rate This rate measures the accuracy of order fulfillment without errors such as invoicing mistakes, and the overall accuracy of order processing. It is calculated as a percentage: $\text{Number of error-free orders} / \text{Total number of orders processed within a specified timeframe} \times 100$.

3.10. Average cost per order: This indicator refers to the total expenses in fulfilling a single order, and helps to identify efficiency gaps in the supply chain. The ratio is calculated as: $\text{total cost elements} / \text{total number of orders fulfilled}$.

4.10. Warehouse efficiency rate: This ratio measures the efficiency of warehouse operations in terms of speed and accuracy, along with the cost of those operations. It is calculated from the moment products are moved from inventory to the final shipment and delivery of orders. High warehouse efficiency helps reduce costs. The ratio is calculated as: $\text{Total volume of resources and time spent on warehouse operations} / \text{Number of orders fulfilled}$.



5.10. Return rate: The return rate indicates the number of orders returned within a specific time period. This indicator may suggest product quality issues. The rate is calculated as: $(\text{Number of Returns} / \text{Total Number of Products Sold}) \times 100$.

4. Third axis: Supply chain crises and possible solutions.

1.4. Supply chain crises: In a world interconnected like a spider's web, products undergo a complex journey before reaching stores or homes through a massive system known as supply chains. This system links factories, ports, warehouses, and shops in a transcontinental network that silently drives the global economy. Although many were unaware of these chains, recent global crises, from the coronavirus pandemic to the war in Ukraine and the tension between China and the West, have highlighted their importance and critical nature. Any minor disruption can lead to shortages of goods, production disruptions, and price hikes. Supply chains have transformed from a logistical matter into a political and economic pressure tactic used by major powers in their struggles for influence. The following are some of the most prominent crises:

2.4. Health crises and natural disasters It is one of the most unexpected factors that can disrupt supply chains without warning, turning every stage from production to distribution into chaos. The COVID-19 pandemic is an example of this, which led to factory shutdowns, shipping disruptions and labor shortages. According to United Nations reports, maritime shipping declined by 4.1%, and global trade fell by 5.6% in 2020.

3.4. Geopolitical events: Wars, conflicts, and economic sanctions are among the most prominent factors that directly affect the flow of vital goods, especially food and energy. An example of this is the Russian-Ukrainian war, which caused a major disruption to grain and energy exports and significantly affected the global food movement.

4.4. Reliance on a single supplier or country When supply chains rely on a single country or major supplier for a basic commodity, they become more vulnerable to disruptions in that source, as exemplified by the chip crisis between In 2020 and 2023, production was concentrated in Asian countries, resulting in damage to 169 industries and losses exceeding \$210 billion.

5.4. Sudden Trade Policies Decisions such as imposing export restrictions or adjusting tariffs, as is happening in the current trade war, can disrupt the movement of goods, halt supplies, and suddenly derail business plans.

6.4. Climate Change: Phenomena such as droughts, floods, and forest fires are among the most significant factors that disrupt production, impede shipping, and weaken infrastructure. According to estimates by the Swiss Reinsurance Institute, the global economy could lose approximately 18% of GDP by 2050 due to these disruptions.

7.4. Cyberattacks Modern supply chains rely heavily on digital and technological systems for their management, making them more efficient but also more vulnerable to cyberattacks. Once one system is breached or disabled, the entire supply chain can grind to a halt or be disrupted for days, leading to massive losses and delays in the movement of goods. An



example of this is what happened in [year]. In 2021, the American company Colonial Pipeline was attacked, disrupting a distribution network that supplies 45% of the East Coast of the United States, leading to supply shortages and price increases.

8.4. Labor shortages and labor unrest Despite the progress in managing supply chains with technology, the human element remains essential, especially in the stages of transportation and storage. Labor shortages – particularly truck drivers and warehouse workers – lead to slower operations and delayed shipments. In some cases, strikes cause partial or total paralysis of the movement of goods, which directly impacts the flow of supply.

9.4. Weak infrastructure and overcrowding Supply chains rely on efficient ports and roads to ensure the smooth movement of goods, but when infrastructure is outdated or ill-equipped to handle increasing shipping volumes, bottlenecks emerge and congestion increases, leading to significant delays.

5. Strategies for dealing with supply chain crises:

1.5. Liberalization of foreign trade: It is an economic policy aimed at reducing or eliminating tariff and non-tariff barriers (such as duties, quotas, and restrictions) to the exchange of goods and services between countries. This approach seeks to promote economic growth, increase international competitiveness, and facilitate integration into the global economy by abandoning protectionism and adopting free market mechanisms.¹¹

2.5. Use of information and communication technology (artificial intelligence and machine learning): Or what is called smart supply Where the use of artificial intelligence can lead to (AI in supply chains can fundamentally change the planning, production, management, and improvement of supply chain activities by processing massive amounts of data, predicting trends, and performing complex tasks in real time. AI can also improve supply chain decision-making and operational efficiency.¹² It has contributed to transforming aspects of our daily lives and formed the basis for many modern activities.

This strategy encompasses the development of technologies related to artificial intelligence, machine learning, and big data analytics. It represents a tremendous technological advancement and a profound impact on a variety of industries and fields. Perhaps what accelerated the emergence and development of these remarkable technologies in this manner was the repercussions of the COVID-19 pandemic.¹⁹, and the challenges that humanity suddenly found itself facing at the end of 2019 and the beginning of 2020. The following are the most important of these developments and technologies that emerged and spread during this period:

3.5. Using cloud software: Gain a better and broader view of the value chain and suppliers through cloud-based software that provides analytics and key performance indicators for

¹¹ -<https://www.aljazeera.net/ebusiness>

¹² -<https://www.ibm.com/sa-ar/think/topics/ai-supply-chain>



monitoring global and unit-level performance—plus machine training that can perform root cause analysis.

- Responding quickly to changes by reallocating resources and relying on short-term contracts.
- Regionalizing sourcing by outsourcing to nearby countries, outsourcing to allied countries, and integrating knowledge to reduce reliance on global suppliers during times of delays and disruptions.
- Moving towards flexible planning to cope with uncertainty and keeping more available reserve stock "as a precaution".
- Improving transparency and traceability to enhance supply chain performance, detect obstacles, and ensure compliance with sustainability regulations.
- Supporting relationships between suppliers by diversifying your supplier base and facilitating supply chain planning and collaboration based on data sharing, standards, and cloud programs.
- Developing risk-based supply chain plans by running simulations and showing the impact of factors such as increased demand through scenario planning and using advanced data analytics to gain comprehensive insights into all risks.

Conclusion:

The successive crises since the year 2020 revealed the fragility of the global trading system and showed that reliance on long and complex supply chains is no longer a safe option. The world is now witnessing a gradual shift towards a more cautious and flexible model, where low cost is no longer the absolute priority as it was when there was intensive reliance on China as a center for cheap production. That option, despite its effectiveness in reducing costs, led to a huge concentration of industrial and logistical influence in the hands of Beijing, and countries are now paying the price for it.

Despite attempts to promote local manufacturing, achieving complete self-sufficiency is unrealistic, making genuine economic cooperation a necessity for prosperity. Today, the bet is on building flexible and adaptable supply chains capable of absorbing shocks and dealing with the entanglement of trade with politics. Securing supply is no longer just an economic issue, but has become a sovereign matter that affects the stability of countries.

Those who fail to prepare for this new reality expose their economy to increasing risks and find themselves less able to withstand the fluctuations of politics, climate, and markets. In a rapidly changing world, there is no room for waiting, but rather for readiness and early decision-making. Controlling supply chains means being able to accelerate or disrupt the movement of goods, and this is achieved through possessing real instruments of influence, such as production, manufacturing, ports, payment systems, and technology.