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Faculty of Economics, Commercial Sciences and Management Sciences

Supply and Global Transport

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pedagogical book intended for second-year Master's students specializing in Finance and International Trade

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أهداف التعليم:

تمكين الطالب من التحكم في عمليات وإجراءات الإمداد والنقل الدولي التي تتطلبها التجارة الدولية.

المعارف المسبقة المطلوبة :

على الطالب أن يكون متمكن من مختلف المفاهيم المتعلقة بالتسويق الدولي و التجارة الدولية.

محتوى المادة:

- مقدمة في الإمداد الدولي.
- النقل متعدد الوسائط.
- إدارة سلاسل الإمداد.
- مستندات النقل الدولي.
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- التغليف الدولي والحاويات.
- النقل البحري .
- النقل الجوي الدولي.
- النقل الطرقي الدولي العابر.
- النقل بالسكة الحديد.
- معايير اختيار وسائل النقل.

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المراجع:

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Summary :

Introduction :

Logistics science is one of the latest areas to enable it to meet the challenges facing companies, related to the need to make optimal use of available resources and capabilities, and to face competition pressures. Companies looking to endure in business must now provide a product that is superior to their competitors in terms of both quality and prices. The activities associated with the logistics process (such as transportation, storage, communications, handling and procurement) have been carried out within all economic institutions for many years. However, the newness of the logistics issue is due to the emergence of an integrated management concept that has spread during the 1950s and evolved in recent years.

In a world where geographical borders no longer hold the same meaning—a world where a product is manufactured in China, assembled in Mexico, marketed in Europe, and purchased by a consumer in the Middle East—the **international supply chain** emerges as a complex and vital process linking these disparate links. At the heart of this chain beats **international supply and transportation** like a lifeblood artery, moving goods and materials across continents, ensuring the continuity of industry and commerce, and making the world a true "global village."

International supply and transportation is no longer just a business support function; it has transformed into a **strategic weapon** wielded by companies and nations to achieve a competitive advantage in the global marketplace. A deep understanding of this complex system—from planning and execution to monitoring—has become a fundamental requirement for any entity looking to expand its operations beyond its local boundaries. It is a dynamic field that requires specialists with comprehensive knowledge of logistics, international regulations, and the latest technologies to confront challenges and seize opportunities in a non-stop global economy.

Through this pedagogical book, we aim to provide a comprehensive and authoritative reference for students and researchers. It is designed to foster a deep understanding of the fundamental dimensions of this vital sector and to systematically develop the essential skills and capabilities needed to proactively address future challenges in the field.

To this end, this meticulously prepared work masterfully blends theoretical foundations with practical applications. It examines the subject of international supply and logistics from multiple, diverse perspectives, striving to construct a clearer and more integrated picture of this sector and the pathways for its continuous development.

Ultimately, this publication is positioned as a key contribution to enhancing the reader's expertise and refining their professional practice within this dynamic, rapidly evolving, and challenge-rich domain.

Chapter one: The Concept of Logistics Management

1. Definition of logistics management

Logistics or supply terms vary but fall under business management, and we can find them with other labels such as physical distribution, material management, transportation management, supply chain management[1].

A firm's logistics management may involve one or more of the following tasks : purchase, Executing order commands, warehouse and storage management, transportation, handling, packaging, customer service standards and scheduling of product orders. The efficiency and effectiveness of the activities in question depends on successful planning and coordination.

Logistics management is a long-standing area that blends management science with other traditional areas such as marketing, production and financial management. Transport and storage activities are one of logistics' most important activities. The novelty in this domain arises from the concept of administrative coordination among the previously mentioned operations, better than managing each activity separately, Logistics enhances the value of products or services aimed at satisfying consumer needs and managing sales, however effective coordination in logistics management has only been actually applied in recent times.

Many confuse transport, physical distribution, and supply activities with the concept of logistics; however, logistics is a more comprehensive and general concept. It integrates all these activities at the same time, as it relates to the management of all transport and storage operations that enable the seamless flow of products from the acquisition of raw materials to their delivery in a usable form to customers, ensuring rapidity, appropriateness, and cost-effectiveness.[2]

Linguistic definition of logistics: a field of military science that encompasses the supply, maintenance, and transportation of goods, personnel, and institutions.

Logistics is defined in Arabic as the discipline of coordinating the movement of goods, energy, information, and human resources from the point of production to the point of consumption. Completing international trade, global import/export activities, or the transportation and

[1] Thabet Abdel Rahman Idris, Gestion des affaires logistiques, University House, Alexandrie, 2002/2003, p. 13.

[2] عبد العليم صابر، إدارة اللوجستيات، الدكتور دار الفكر الجامعي، الإسكندرية، الطبعة الأولى، 2008، ص13.

manufacturing of raw materials or products is challenging, if not impossible, without contemporary logistical support.[3]

The following are some of the definitions of logistics for associations and economists, based on the historical evolution of the concept of logistics:

In 1922, In his book "Principles of Marketing," Clark Frad E highlights the necessity of addressing transportation and storage functions prior to acknowledging their significant impact on production costs.[4]

In 1948, the American Marketing Association described logistics as "a series of activities concerning the movement of finished products from the production line, including transport, material handling, storage, and other distribution-related functions."[5]

The Board of Directors of Logistics Business recognized In 1960, logistical activities in the United States were defined as the process of "planning, implementing, and controlling the efficient and effective flow and storage of raw materials, finished goods, and associated information from production centers to consumption centers to achieve customer satisfaction." This contemporary term encompasses all actions related to the transportation of raw materials and components from suppliers to the organization, inside the organization during the manufacturing process, and subsequently the distribution of final goods to markets and consumers.[6]

This concept implies that logistics should exclusively concentrate on the movement of tangible items. However, reality contradicts this notion, as numerous enterprises provide services instead of tangible products and encounter various logistical challenges. Consequently, they might significantly benefit from the logistical operations employed in manufacturing entities. Logistical operations are essential not just for goods-producing entities but also for service institutions.

Secondly, this definition signifies that logistics operations relate to the movement of goods to and from the institution, so involving production as an integral component of logistics activities. This is incorrect as logistical activities are distinct from technical production procedures,

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[3] Ronald H.Ballou رونالد اتش بالو، إدارة اللوجستيك – تخطيط و تنظيم و رقابة سلسلة الإمداد، تعريب: د. تركي إبراهيم سلطان، د. أسامة أحمد مسلم، دار المريخ . الرياض، المملكة العربية السعودية. 2006. ص25.

[4] أقاسم عمر، الإمداد الشامل – مدخل إدارة التكلفة و السياسات المتبعة–، أطروحة مقدمة لنيل شهادة الدكتوراه، جامعة تلمسان، 2009–2010، ص03، اقتباسا من كتاب F.E Clark, Principal of Marketing, Network the Marmillan campany, 1922, p16.

[5] Pierre Médan, Anne Gratacap, Logistique et Supply Chain management, DUNOD, Paris, 2008, p09-10.

[6] علي فلاح الزعبي، مرجع سابق، ص27.

including machine scheduling, quality control of production processes, and manufacturing operations and stages.

In 1963, the National Center for Physical Distribution Management (NCPDM) was established, which defined physical distribution as: "A term that describes the integration of two or more activities through which the planning, directing, and controlling of the flow of raw materials, semi-finished products, and finished products from the source to the point of consumption is carried out. These activities include the quality of services provided to customers, demand estimation, distribution-related communications, inventory control, material movements, order processing, after-sales services, selection of inventory and factory locations, returned purchases or reuse of returned items or those directed to damaged inventory, transportation organization, effective goods transportation, and storage."

According to Ballou's 1999 definition, supply activity is described as "a task specifically designed to deliver goods and services to customers at the appropriate location and time, under the stipulated conditions, ensuring the involvement of all organizational elements in this process." He discusses the relationship between the supply function and other organizational functions, illustrating the essential interconnectedness required to attain optimal efficiency in supply management.

The primary objective of competent logistics management is to deliver goods and services to customers in specific markets, aligning with their needs and preferences, while optimizing time, location, and safety, thereby significantly contributing to the company's objectives of customer satisfaction, enhanced productivity, and profits .

Logistics is the process of ensuring the availability of the appropriate product in the correct quantity, in optimal condition, at the designated location, at the precise time, for the intended customer, at the minimal cost, thereby enhancing the organization's competitive position and differentiation, and afterwards augmenting its productivity, profitability, and sustainability[7].

2. **Logistical operations**

The current concept of logistics activities relates to the administrative functions associated with the strategic planning of an institution's plans, overseeing their execution, and regulating their application in programs designed to generate profit for the institution while simultaneously

[7] علي فلاح الزعبي، مرجع سابق، ص28.

satisfying consumer demands. This includes the coordination of the institution's operations, including production, financing, and sales, within a cohesive operational structure. This definition encompasses all of the following elements:

Logistics activities are distinct from manufacturing activities as they are primarily involving humans.
Logistics activities are designed to support exchanges, whether involving a singular transaction or multiple ones.

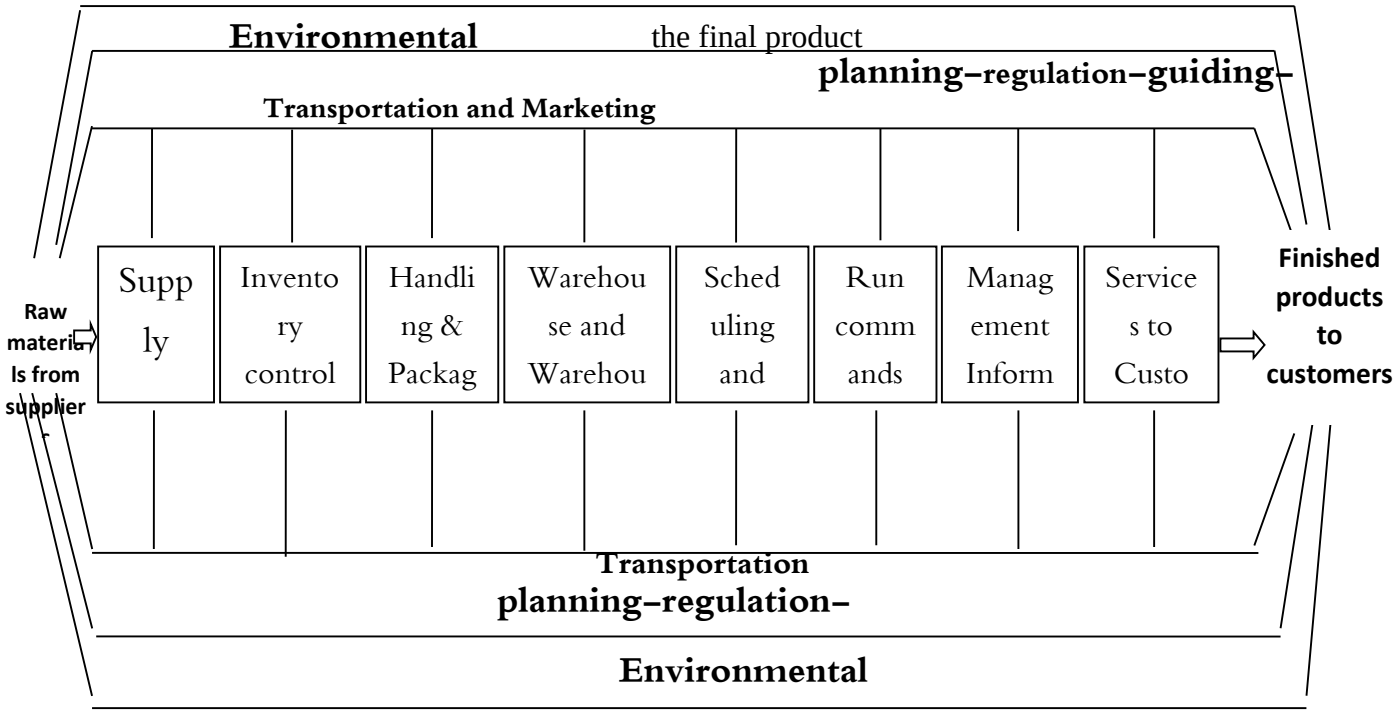
Exchanges include not only goods but also services. The initiative in the exchange process can come from the client looking to purchase items or from the seller searching for purchasers for their products in the market.

The logistics system comprises: [8]

- Provision;
- Inventory control;
- Handling and packing;
- Management of storage and warehouses;
- Scheduling and planning;
- Running the commands;
- Administration of the information management system;
- Customer service.

[8] نهال فريد مصطفى، إدارة اللوجستيات، و د.جلال إبراهيم العبد، دار الجامعة الجديدة للنشر، 2003، ص11.

Figure (1): Overlap between the activities of regulating flows from raw materials to the final product



Source : Dr. Abdel-Alim Saber, Logistics Management, Dar Al-Fikr Al-Gam'i, Alexandrie, première édition, 2008, p. 15.

Logistics activities involve coordinating the movement of raw materials from supply sources to markets as end products, influenced by specific environmental variables encompassing economic, political, legal, and social factors that define the institution's context.

The recent developments in logistics operations can be summarized as follows:[9]
- The initial strategy emphasizes operations that facilitate the acquisition of raw materials from the source to the institution and afterwards to the production line.
The second direction include operations that manage the shipment of the item from the institution to the customer or consumer.

- The third technique, termed reverse logistics (waste recycling), emphasizes the return of products from the customer to the business for whatever reason.

3. **Varieties of logistics**

[9] فارس الجواري، مسئول اللوجيستية والدعم الفني لمكتب انتخابات، العراقيين في سوريا لانتخابات عامي 2005 و2010.

We must distinguish among several types of logistics based on the organization's objectives and characteristics :[10]

• Supply logistics : This category facilitates the purchase of essential raw materials for the institution's operations and production facilities.

• General supply logistics: This category facilitates the acquisition of diverse items essential for the operations of service institutions and administrations (such as office supplies, for instance).
• Production logistics: This category emphasizes the procurement of essential materials and components for the production process and the planning of production activities.
• Logistics of distribution :[11] This entails providing end customers with their required resources and goods via distributors, accomplished through individual retail outlets or huge commercial markets.
• Military logistics: It pertains to the provision of supplies and military equipment to soldiers on the battlefield.

• Facilitate logistics "Support logistics": This concept originated in the military sector but has since expanded to several domains, coordinating all essentials for the sustained functioning of a complex system.

• After-sales service activity: This concept parallels supporting logistics; however, it occurs within product sales markets and is frequently termed "service management" to denote the oversight of this activity.

• Reverse logistics: This category involves the reverse movement of goods from customers back to suppliers or manufacturers, encompassing returned items, repairs, and waste that requires systematic disposal.

4. The evolution of logistical operations and their importance

Phases of Historical Evolution of Logistics Activities

Logistics activities, in their contemporary understanding, are of relatively recent origin, as economic institutions did not recognize the concept of logistics until the 1950s. The most

[10] Yves Pimor, Logistique : production – distribution – soutien, 4eme edition, DUNOD, Paris, 1992, 2005. p03
[11] La logistique –tour d'horizon, Ministère de l'écologie, du développement durable de la mer, république française, p06.

common notion prior to that was the idea of selling. It has progressed through several phases over time, which we will delineate as follows:

1) The interval from 1945 to 1965: In this duration, the notion of logistics activities materialized as an integrated function due to various factors, including the concentration on direct and indirect distribution channels and their structuring, the prioritization of customer service, advancements in systematic approaches, and the progression of total cost analysis through the introduction of a scientific basis for assessing alternatives in logistics activities.[12]

2) The period from 1966 to 1972 is regarded as the development of the concepts and foundations of logistics activities, during which physical distribution management and materials management developed to improve institutional performance. Numerous research have concentrated on identifying the advantages achievable in operational domains due to the advancement of the integrated logistics concept, which has garnered the interest of several institutions. Material distribution management began from marketing but is also associated with transportation and storage operations. Material management originated from production and manufacturing but is also associated with logistics. Consequently, the notion of logistics arose as a cohesive function aimed at improving performance metrics. [13]

3) The 1973 phase: This phase experienced substantial political and economic transformations globally, characterized by escalating oil prices, rising costs of various resources and industrial goods, and increased expenses for institutional and corporate requirements. This resulted in the development of current standards and methodologies, encompassing long-term commitments and advanced planning.

4) The phase of integrating logistics management activities: To integrate logistics activities, achieve the institution's objectives, and address business needs, it was essential to implement an integrated system for the storage and transportation of semi-finished or finished materials and products all through the organization. Moreover, the integrated logistics management system links production and marketing operations. The integrated logistics management system contains two supplementary operations: materials management (sourcing) and physical distribution activities (storage, transit, and handling).

[12] علي فلاح الزعبي، مرجع سبق ذكره، ص32.

[13] نهال فريد مصطفى، مرجع سبق ذكره، ص 24.

Reasons and factors for the creation of logistics business management

Business interest in logistics activities wasn't discovered until post-1955, when the costs related to these activities escalated. During that period, companies became convinced that maintaining their competitive position, attaining competitive advantage, and enhancing productivity and profitability commenced with cost reduction and delivering excellent customer service.[14] This evolution in modern management theory, which established in the 1960s, developed from an integration of economic, social, and technological factors. The rationale and determinants for the beginning of logistics management activities are:

a. Technological advancement: The revolution in information and communication technology has addressed logistical challenges, including the variety of transit methods, storage options, and product varieties. It has facilitated the integration of logistical activities, resulting in cost reductions in distribution, supply, and procurement (i.e., overall logistical costs).
b. Considerations on increasing costs: Institutions came across challenges in attaining cost reductions in production and marketing, making the improvement of logistics activities the sole method to optimize expenses and augment productivity, particularly as logistics costs constitute a significant portion of the national output.
c. achieving client satisfaction: The main goal of every enterprise is to deliver a product or service that satisfies the needs of the consumer, thus ensuring their complete satisfaction.Attaining customer satisfaction: The foremost objective of every enterprise is to deliver a product or service that fulfills the needs of the client, so ensuring their satisfaction. Logistical tasks, including storage, shipping, order preparation, and information management, enhance the product or service's value and largely focus on achieving customer satisfaction.
d. Length of supply and distribution lines: The development of foreign trade, globalization trends, and increased interest in international marketing have led to a significant reliance on logistics activities and raised their costs.Length of supply and distribution lines: The development of foreign trade, globalization trends, and the increasing interest in international marketing have led to a significant reliance on logistics activities and raised their costs.

[14] علي فلاح الزعبي، مرجع سبق ذكره. ص32.

e. Diversity of consumption patterns: Due to the increase in population density in certain areas at the expense of others, this has resulted in the concentration of sales and marketing in specific points. Additionally, the needs, desires, and tastes of consumers have evolved, leading to a greater need for storage, which in turn has increased transportation and storage costs.
f. Military Field: Logistics first emerged in military organizations, during World War II, which witnessed the largest and most precise logistics operations through which thousands of equipment, personnel, and supplies were transported.
g. The emergence of modern marketing principles: The goal of the organization is to achieve customer satisfaction and provide goods/services at the right price, specifications, and time. This can only be achieved if the organization prioritizes quality and sets the appropriate price, which has led to the emergence of physical distribution management as part of marketing and supply.[15]

5. **Benefits and importance of logistics activities**

The importance of the topic lies in the fact that logistics activities are among the oldest and the newest activities of the institution at the same time. However, serious attention to logistics activities in institutions did not emerge until the mid-1950s and early 1960s, when costs began to rise significantly.

The neglect in focusing on logistics activities, both in the past and present, is due to a set of reasons that we will mention as follows:[16]

- Ignoring the role of efficiency in logistics activities as one of the sources that can be relied upon to achieve productivity and profitability.
- The unavailability of sufficient and accurate data for senior management regarding the cost of logistics activities in companies;
- The logistical activities are distanced from other primary responsibilities of the institution, such as production and marketing, resulting in a lack of data regarding the costs of these activities independently.[17]

Logistical activity refers to the process of gathering and managing the activities and tasks

[15] عبد الغفار حنفي، رسمية قرياقص، ادارة المواد و الامداد، دار الجامعة الجديدة للنشر، الاسكندرية، مصر، 2002، ص14.

[16] ثابت عبد الرحمن إدريس، جمال الدين المرسي، المنشات التسويقية: مدخل وصفي تحليلي، مكتبة الفلاح، 1994، الكويت، ص256-257.

[17] ثابت عبد الرحمن إدريس، إدارة الأعمال اللوجيستية، الدار الجامعية، الإسكندرية، 2003/2002، ص28.

related to providing the goods and services needed by the organization in an integrated manner. Logistics activity is defined as the activity that refers to the strategic management of the process of storing both raw materials and semi-finished and finished products, and transporting these elements from suppliers, within the facilities of the organization, and towards customers and clients. The goal of practicing logistics activities is to provide inventory of finished products and raw materials in the required quantity, at the right time and place, in good condition, and at the lowest possible cost. The meaning of the above is that the flow of these materials into the institution and the flow of products out of the institution towards distribution points is done through what is called the logistics system. Logistics activities aim to achieve both spatial and temporal benefits, as the value of materials and products increases once they are available in the right place and at the right time. The new management of logistics activities views each activity in the supply chain through its role and contribution to the value-adding process in terms of time and place.

Therefore, logistics operations are one of the new fields in administrative sciences due to their ability to:

• Creating value for customers and suppliers;

• Helping companies and logistics business management institutions to face competitors and market pressures;

• Helping companies and logistics management institutions to efficiently and minimally use available resources and capabilities;

• Helping companies and institutions manage logistics operations to face the impacts and conditions of globalization, the World Trade Organization, and the International Organization for Standardization (ISO).

• Helping companies and logistics management institutions achieve cost savings by linking different functions and activities.

Logistics creates value for consumers and suppliers who are connected to the company, in addition to value for the company's shareholders. And in logistics, value is expressed in terms of time and place.

And the benefits of logistics operations can be distinguished as follows:

1. Spatial utility: This utility allows the consumer to obtain the product in a suitable location. This does not mean choosing the nearest places for the consumer and providing the product there. It can be said that spatial utility involves selecting the locations where the consumer is expected to find the product, from the place of production to the places of consumption, taking into account the distributed regions and locations.Spatial utility: This utility allows the consumer to obtain the product in a suitable location, which does not necessarily mean choosing the closest places to the consumer and providing the product there. It can be said that spatial utility involves selecting the locations where the consumer is expected to find the product, from its place of production to its consumption locations, taking into account the regions and places distributing it.

2. Temporal utility: This utility is achieved through storage, which preserves the product and makes it available to the consumer at the time they need it. For example, agricultural crops are produced in specific seasons of the year, although due to storage, they are available throughout the year. Additionally, various types of meat and fish are stored or frozen and made available to the consumer when they need them. The role of the producer here is to store the products until they are needed.

3. Possessory benefit: This benefit is achieved through the sales process, and the role of the intermediary in this case is to transfer the ownership of the products from one party to another, that is, from the producer to the consumer, so that the latter can obtain, use, and benefit from them.

4. Value utility: It is the value that the consumer perceives in a product or service when it takes a certain form or position. Intermediaries enhance product utility by disaggregating it into smaller packages that cater to consumer demands and strategically exhibiting it in locations that facilitate visibility for these clients.

The increasing interest in logistics operations is due to several reasons, which we will mention:

- High cost considerations: The cost of logistics operations often represents a significant portion of the total costs for most companies. And added value can be achieved here by rationalizing and reducing these high costs, thereby maximizing the benefit.

- Length of supply and distribution lines: The modern economic tends to focus on the integrated global economy, so many companies have become interested in researching or developing appropriate strategies that enable them to practice international marketing and achieve global competition for their products through price and quality. Moreover, the pursuit of this goal has not been limited to individual companies but has extended to the level of government efforts and international policies, where global economic blocs have been formed. Additionally, the focus on international marketing has increasingly relied on logistical performance, leading to higher logistical costs. Consequently, there has been a growing interest in logistical activities within every business organization, especially multinational companies or large-sized enterprises whose production is not confined to local markets, due to the cost of long supply and distribution lines.
- Logistics operations are important for strategy: Companies spend a long time and a great deal of effort in finding ways to differentiate their products from those of competitors. That is, the differentiation strategy, especially in terms of cost (product prices), largely depends on the efficiency of logistics activities. In other words, logistics operations can help the organization expand in the market, increase its market share, and consequently boost its profitability.
- Logistics operations add significant value to the customer: Undoubtedly, any product or service holds little value when it is not available to potential customers at the right time and place. But when the organization makes exceptional efforts to provide these products or services to its current and potential customers at the right time and place through order preparation, information, storage, transportation, and other activities, it will increase the added value of these services for the customers. Customer satisfaction primarily depends on the assurance of product availability through the guarantee of their flow and movement via various effective logistics activities.
- The increasing desire of customers for an appropriate and quick response: The spread of ATMs and the growing use of the internet and email in recent years have made customers expect to receive their needs and desires for goods and services as quickly as possible. In addition, the development of information systems, automated manufacturing processes, and production flexibility has helped companies adopt what is known as mass production, as well as mass marketing. In light of all this, logistics activities have become particularly important, manifested in facilitating rapid responses to customers in the market by quickly providing goods and services that meet their needs and desires.

6. **The Mix of Logistics Activities and Their Relationship**

Logistics is nothing more than a set of functional activities that are repeated several times through the channel that transforms raw materials into final products, which hold multiplied value in the eyes of consumers. And because the sources of raw materials, factories, and sales points are not located in one place, logistics activities are repeated many times before the product reaches the market. And then, logistics activities are repeated again, because used products are recycled through the reverse logistics channel.[18]

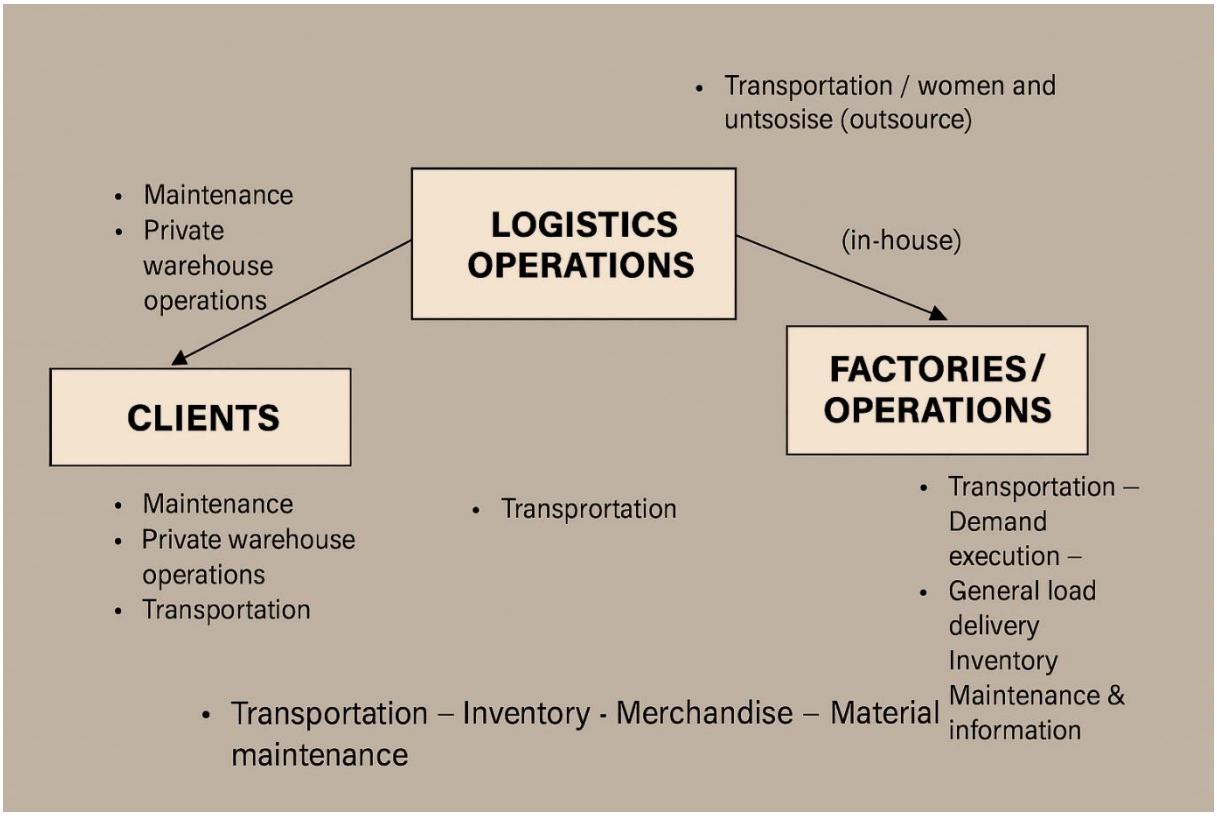
Mix of logistics activities

The product lifecycle – from a logistics perspective – does not end with its delivery to the customer; products may get damaged and need to be returned to their source for repair or replacement. And the reverse logistics channel may require a separate design. The supply chain ends with the final delivery of the product. And when planning logistics, the reverse channel must be taken into consideration.

The activities that need to be managed and are related to logistics differ from one organization to another according to the type of organizational structure of the companies, and the opinions and perspectives of سenior management members regarding the elements and components of logistics work, and the relative importance of logistics activities.

[18] Ronald H.Ballou.26 رونالد اتش بالو، مرجع سبق ذكره، ص

Figure (2): Components of the Logistics System



Source : *Ballou, R.H. (2004) Business Logistics/Supply Chain Management: Planning, Organizing and Controlling the Supply chain. 5th Edition, Pearson/Prentice Hall Inc., New Jersey.*

- **Logistics business activities consist of the following:**

  Core activities

  1. Customer service: This refers to the company's approach to serving its customers and the level of costs it will incur to meet customer demands. The collaboration with the marketing department is done in order to:[19]

  - Identifying consumer needs.
  - Determining the customer's response to the service.
  - Transportation activity: It represents one of the important components in distribution and supply, and its cost can range from 35% to 65% of the total system cost.

- Where it is carried out:

[19] Ronald H.Ballou رونالد اتش بالو، مرجع سبق ذكره، ص 27.

- Choosing the method and serving the customer.
- Consolidation of shipping loads.
- Determining the transportation route.
- Truck tour.
- Choosing the equipment.
- Running transport requests.
- Review of transportation price categories.

3.Warehouses (Inventory Management): The institution/company must provide a reasonable level of its products and production supplies to carry out the production process and meet customer demands, as it is rare for these to be provided immediately to the company. And it is done through inventory management:

- Policies for storing raw materials and finished products;
- Short-term sales forecasting;
- A mix of products and storage points ;
- The number, size, and location of storage points;
- Payment plans and Just-In-Time (JIT) attraction.

4. Predicting the expected demand: This refers to determining the quantities expected to be requested over a certain period and the accompanying services, which affects the company's purchasing, production, and distribution plans.

5. Information flow and order processing: Information flow and processing of order requests:

- Intermediary procedures in sales and storage orders;
- Methods for transferring and converting order processing information;
- Order rules.

6. Handling management: Handling refers to the activity that results in loading materials and goods onto transportation means or unloading them until receipt and delivery or storage using specific tools and methods.

The first handling movements begin in the supplier's or source's warehouses, where materials are loaded using appropriate transportation and moved to the purchasing institution. There, delivery, unloading, and inspection procedures take place in designated areas. After that, goods and materials are lifted, transported, and arranged in the warehouses according to the available

space, taking into account the preservation of material integrity until they are handled again and transferred to the requesting departments.[20]

7. Warehouse Management: This includes managing available warehouse spaces, selecting suitable locations, internal organization, and designating shipping, inspection, and production areas within them.

8. Packaging: This ensures the transfer of products and raw materials without exposure to damage during the distribution, supply, handling, shipping, and transportation processes.
9. Production needs: This involves providing production materials and supplies in terms of their locations, sources of generation, required quantities, purchase timing, appropriate quality, and better management of supplier relationships.

10. Scheduling and planning production and its flow to the market: This involves balancing the production process with the quantities and types required by customers to provide them at the right time and place.

11. Marketing Information and Communication Systems: A company that prioritizes distribution and supply efficiency should ensure the existence of information systems that reflect the performance level of these activities, the associated costs, and the speed of delivering this information.

12. Reverse design of distribution and supply outlets: Given the presence of product defects or the possibility of damage during shipping, transportation, handling, and customer returns, which can be costly and affect the company's profitability and services, there should be reverse channels to suppliers.

13.Determining the cost of distribution and supply activities: Since the cost of distribution and supply reaches 25% to 30% of the total cost of the company's products, these companies have realized the importance of analyzing all elements of supply and distribution costs in order to reduce overall costs and maximize profits. Studies have indicated that the main components of logistics cost **are**:

Cost of customer service level;

[20] Ballou, R.H. (2004) Business Logistics/Supply Chain Management: Planning, Organizing and Controlling the Supply chain. 5th Edition, Pearson/Prentice Hall Inc., New Jersey.p27

Transportation cost;
Warehouse management cost;
Cost of holding inventory;
Cost of orders and requests;
Cost of bulk purchasing.

Auxiliary activities:

1. Warehouses: Determining warehouse space and organizing and arranging the warehouses.
2. Handling raw materials: equipment selection and order processing procedures.
3. Purchases: Selecting supply sources, timing of purchases, and economic order quantities.
4. Packaging: Designing packages for handling and storage purposes.
5. Collaboration with operations and production: Sequencing production outputs.
6. Information maintenance: Analysis of information and control procedures.
7. Communications regarding distribution.[21]
8. Parts and auxiliary services.

The distinction between core and auxiliary logistics activities mentioned earlier is actually due to the fact that core activities are generally practiced in a logistics channel and in every company, while auxiliary activities may vary in practice from one organization to another according to the nature and circumstances of each company. On the other hand, the cost of performing logistics activities depends on the level required to be carried out for these activities in a company. It is worth noting that storage and transportation constitute the largest portion of the total costs of business and logistics activities, as practical reality indicates that they represent about 50% to 75% in some companies. As is well known, transportation adds spatial value to products, while storage adds temporal value or time to these products in the eyes of customers.

Transportation is considered one of the essential logistics activities, as it is unimaginable for any company to carry out its activities without providing the necessary movement for the raw materials it needs or for the final products it wishes to market and supply to its customers in the market. Transportation methods include railways, trucks, airplanes, water transport, and others. The importance of this logistical activity is evident through the problems or crises

[21] ثابت عبد الرحمن إدريس، مرجع سبق ذكره ، ص23

faced by some companies due to strikes by transportation workers' unions in certain countries, whether for reasons related to transportation tariffs or other reasons. This results in the stoppage or disruption of production and marketing in these companies, or leads to the spoilage of some products due to the inability to send them to their target markets.

Storage is also considered one of the essential logistics activities due to the difficulty of immediate and small-quantity supply of raw materials needed for factories, or the difficulty of immediate delivery of final products to customers. In addition to the economic savings resulting from storing raw materials and other production supplies due to bulk purchasing. Of course, storage achieves what is known as flexibility in production and distribution. As for order processing, it represents the third and final activity of the core logistics activities, which usually involves lower costs compared to transportation and storage costs. Nevertheless, this activity is considered highly important due to its relation to the total time taken from receiving the order from the customer to the delivery of the final products or services. Consequently, it significantly impacts customer service and satisfaction.

As for the auxiliary logistics activities, they vary in their practice from one company to another, despite their undeniable importance in the integrated logistics business system. This variation is due to various reasons, including the size and nature of the company's activity, available resources, and others.

7. **The relationship of the logistics function with other functions**

The increasing importance of logistics activities within the organization requires the reorganization and restructuring of some activities that were previously considered the responsibilities of the production and marketing departments. The main objective of the marketing department is to increase the institution's revenue through a set of activities such as promotion and market research. As for production management, it primarily focuses on manufacturing the product while reducing its costs through the exercise of responsibilities related to production planning, quality control, and scheduling.

Logistics activity occupies an intermediate position between production and marketing, which illustrates the overlap of some functions and responsibilities. Therefore, some activities are common to both the marketing and logistics fields. For example, packaging has a promotional

aspect, but at the same time, it represents one of the elements of protecting the goods during the stages of transportation and storage.

We also find that purchasing and production scheduling activities fall under both the production and logistics domains. Production management is concerned with obtaining raw materials of the right quality and price, as well as the sequence of production processes and the time required to complete them. As for logistics systems, they focus on both sourcing and distribution, as well as the time required for the sourcing and distribution processes.

In addition to the above, we find that marketing the products of one of the companies requires the use of several distribution channels in order to reach various consumer segments. However, using this structure as distribution channels results in the transportation of small shipments, which means higher logistics costs. This means that the distribution channel structure that aligns with marketing objectives may not align with logistics objectives. Next, we will review the relationship of logistics activities with various departments:

• Relationship with production management:

One of the primary tasks of the supply management department is to serve the interests of production by providing its needs for production supplies in a manner that does not disrupt or complicate its tasks in any way. This requires continuous coordination between them, which includes, above all, complete exchange of information and data. Therefore, the production department must provide the supply management department with information and data about the following:

- The difficulties in using certain types of materials;
- Scheduling the need for these supplies.

The supply department must also provide the production department with information about:

- Delivery dates and chances of delays;
- The technical or technological development in the production of materials and production supplies needed for the productive process;
- Alternative or new materials and raw materials that appear in the markets.

• The relationship with the marketing department:

And the most important information and data provided by the marketing department to the supply department are:

- The value of current and expected sales, in addition to various marketing plans;
- Information about the customers who buy the company's products;
- Marketing research also helps in developing purchase information when making purchasing decisions;
- The marketing department also benefits from data on developments in the markets for materials and production supplies to formulate its marketing policies in line with the characteristics of these materials at appropriate prices and costs.

• Relationship with financial management:

Any decision in the project has financial implications, whether directly or indirectly. Therefore, the relationship between supply management and financial management is clear. In addition to the financial management department providing information about financial allocations, the supply management department supplies the financial management department with the following:

- Any changes in the quantity of current or expected purchases;
- The timing of the purchase process so that funds can be arranged in a timely manner;
- Reporting any violation by the supplier, whether it is a delay in the delivery date or in the agreed specifications, to take the necessary action by imposing a fine or otherwise.

- Tasks and responsibilities of logistics business management

  The element that the company must focus on in the supply and distribution topic is the tasks it must perform to manage its distribution channels efficiently, which include:

  • The existence of a communication and information system to achieve connectivity and integration among its members;

  • Effective planning of supply and distribution activities;

  • Adoption of a joint inventory control system;

  • Purchasing, receiving, and material requirements planning;

  • Taking on risks and sharing in the returns;

  Achieving cooperation and coordination between the company and members in the distribution channels to ensure the success of the work and maximize value and profits.

  • Quality and inventory inspection and monitoring.

Logistics operations in non-industrial sectors

The concepts, principles, and logistical activities that have been practiced and proven effective in fields other than industrial sectors, such as the service industry, justify the shortcomings of this perspective on logistics work. In light of the above, we will discuss logistics operations in terms of their importance and practice in non-industrial fields.

1) **Logistics operations in the service industry:**

The service sector in developed countries is characterized by its large size and significantly increasing growth. For example, about 70% of total jobs in the United States are found in the private and public service sectors. There are hundreds of companies and institutions in developed countries and elsewhere that can be classified as service institutions. For example, banks, investment companies, insurance companies, hotels, hospitals, and tourism companies...Etc., these service institutions and others engage in various logistical activities just like industrial companies. But we find that the physical distribution activities in them are somewhat unclear.

Although many service organizations produce and distribute intangible or non-physical products, they engage in numerous physical distribution activities. For example, hospitals that wish to expand their emergency services must make necessary decisions to determine the locations of these service centers and ensure the complete supply of equipment and materials for each center. From here, we can summarize that logistics operations in industrial organizations apply to business organizations, especially since a service characterized as intangible and non-material can only be produced through tangible physical products.

2) Logistics and the military:

The importance of logistics first emerged in wars, and the army that excelled in choosing battle sites, support, and reinforcement was the victor. The concept of logistics has a military origin and was exploited during World War II in the economic aspect.

3) Logistics and the Environment:

The current global changes in all fields have led to an awareness of environmental issues, and managing these issues has necessitated making many decisions required to carry out logistical activities. Among these areas are the collection of waste from residential neighborhoods, factories, and companies, and the collection of recyclable containers to preserve environmental resources.

Chapter Two: Supply Chain Management (SCM)

Despite the wide acceptance of supply (logistics) within organizations for its role in improving the efficiency of product and service flow from the stage of obtaining raw materials from suppliers to the stage of delivery to customers, it was unable to provide a general framework for organizations to use, whether for coordinating their different functions or for coordinating with other organizations involved in the flow of products and services to the end consumer. This is where the concept of Supply Chain Management emerged to address this shortcoming.

1. Definition of Supply Chains:

A **supply chain** is a complex, integrated network of interconnected and interdependent organizations, resources, activities, information, and technologies involved in the multifaceted processes of procuring raw materials, transforming them into intermediate and finished goods, and distributing these final products to customers. It encompasses the entire lifecycle of a product or service, from initial origin (point of extraction or production) to final consumption (point of use), with the overarching goal of maximizing customer value and achieving a sustainable competitive advantage.

This network includes upstream suppliers (e.g., raw material providers), internal organizational functions (e.g., manufacturing, logistics, marketing, finance), and downstream distribution channels (e.g., warehouses, transporters, retailers). The core management of this chain, known as **Supply Chain Management (SCM)**, involves the active coordination and strategic alignment of key flows:

- **Flow of Products/Materials:** The physical movement of goods from suppliers to consumers.
- **Flow of Information:** The bidirectional sharing of data (e.g., orders, forecasts, inventory levels) that drives decision-making across the chain.
- **Flow of Finances:** The movement of money, including payments, credit terms, and ownership arrangements.

Effective SCM focuses on optimizing these flows to achieve key objectives such as cost efficiency, improved quality, speed-to-market, flexibility, and risk mitigation, thereby creating a seamless pipeline that delivers the right product, to the right place, at the right time, in the right condition, and at the right cost.

Key Characteristics of a Supply Chain

Table (1) : Key Characteristics of a Supply Chain

English Term	Arabic Translation	Explanation
Network Structure	**هيكل شبكي**	It is not a simple chain but a multi-layered network of entities.
Integration & Coordination	**التكامل والتنسيق**	Success depends on the seamless collaboration between all partners.
Customer-Centricity	**التركيز على العميل**	The ultimate goal is to meet customer demands efficiently and effectively.
Flow Management	**إدارة التدفقات**	It manages the synchronized movement of materials, information, and funds.
Value Creation	**خلق القيمة**	Each link in the chain should add value to the product or service.
Dynamic Nature	**طبيعة ديناميكية**	It is constantly evolving in response to market changes, risks, and disruptions.

These definitions highlight that a supply chain is not merely a logistical function but a core strategic component of modern business, directly impacting profitability, resilience, and market position.

2. Definition of Supply Chain Management

Supply Chain Management is: the process of coordinating and integrating the movement of the flow of raw materials, products, and related information from the point of origin to the place of consumption efficiently and effectively.

Supply Chain Management is: a set of methods used to effectively integrate suppliers, manufacturers, warehouses, and stores, so that goods are produced and distributed in the right quantities, to the right locations, and at the right time, so that the total system cost is minimized while maintaining the required level of service.

3. Characteristics of Supply Chain Management

- **Flows Extend Beyond Organizational Boundaries:** The flows in supply chains extend beyond the boundaries of a single organization, starting from the supplier's supplier to the end customer. This is one of the most important characteristics that distinguish it from the concept of internal supply/logistics.
- **Comprises Four Types of Flows:**
    - Flow of raw materials, components, and finished products from suppliers towards the end customer.
    - Bidirectional flow of information.
    - Flow of funds/cash from the customer towards the supplier.
    - Flow of returns and reverse logistics.
- **Reliance on Information Technology (IT):** Organizations in the supply chain must control IT to coordinate among themselves for better management of information flow available through communication channels.
- **Unified Goal of Customer Service:** The success of a supply chain requires all its members to adopt the same goal, which is focusing on customer service. This makes SCM an integrated philosophy, not just procedures and methods, for managing all flows in distribution channels from the primary supplier to the end consumer or user. The performance of each organization in the chain affects the performance of all members and the overall performance of the chain.
- **Synonym with Value Chain:** The supply chain is sometimes referred to as the **Value Chain**. This latter term implies that value is added to goods and services as they progress through the chain. Therefore, instead of transferring a product, we speak of supplying the value associated with the product.
- **"Chain" is a Misnomer:** The term "supply chain" is clearly a misnomer, as each organization has more than one supplier or customer; the more accurate term is **Supply Network**.
- **Aims to Reduce Uncertainty and Risk:** SCM aims to reduce uncertainty and risk in the chain, so there is no need for large inventories. It also allows for faster execution of operations, reducing the production and demand cycle, which positively impacts the level of service to the end customer.
- **No Requirement for a Dedicated Department:** Implementing SCM does not necessarily require creating a specialized department, provided the existing management is capable of applying this philosophy and coordinating among itself.

- **Dynamic System:** The supply chain is a dynamic system that evolves over time: seasonal fluctuations, fashion, advertising and discounts, competitors' pricing strategies, etc., have a significant impact on demand.
- **Network with Potentially Conflicting Goals:** The supply chain is a complex network of organizations with different and potentially conflicting goals, hence the need to manage uncertainty to match orders with delivery.
- **Starts Internally:** Applying SCM thinking begins first with managing internal supply chains, considering the relationships between internal departments as customer-supplier relationships. All departments aim to achieve the highest return by reaching the best level of customer service.
- **Requires Internal Collaboration:** Coordination with external suppliers and customers cannot succeed unless the organization applies collaborative planning between internal departments, for example, through a **Sales & Operations Planning (S&OP) meeting**.

4. Stages of Implementing Supply Chain Management

a. Identifying Supply Chain Partners:

Including all entities the organization deals with in the supply chain can complicate it, making it difficult to control. Therefore, management must distinguish between members who play a fundamental role and those whose role is limited to support. Differentiating between these two groups helps simplify supply chains, which should include only the core members:

- **Core Members:** Organizations that perform operational or administrative activities contributing to the production of goods and services directed to a specific consumer or market.
- **Supporting Members:** Examples include truck and warehouse rental companies, marketing service companies, and credit-providing banks. Although important, they do not contribute directly to value addition.

b. Determining the Organization's Position within the Chain:

This affects the organization's ability to manage the supply network. It could be close to supply sources (e.g., a raw material supplier) or close to the end consumer (e.g., a retail company). Furthermore, the organization's tendency to outsource logistics services can affect the structure of the supply chain and the organization's position within it.

5. Identifying Activities Requiring Coordination with Each Supply Chain Member

- **Customer Relationship Management (CRM):** Involves identifying the customer base the organization deals with, determining their needs, forecasting demand, providing customers with information about product types, features, and prices, and tracking customer order fulfillment. This is the first activity the organization must manage in coordination with supply chain members through an efficient and fast communication system.
- **Supplier Relationship Management (SRM):** Involves classifying suppliers into groups based on their importance to the organization. It may enter into partnerships with a limited number of suppliers to implement **Just In Time (JIT)** purchasing, which requires a high degree of coordination and is facilitated by connecting the supplier to the organization via computer networks.
- **New Product Development:** According to the SCM concept, suppliers and customers must participate in developing new products through cross-functional teams with diverse skills and expertise. This helps integrate supply, manufacturing, and distribution processes.
- **Enterprise Resource Planning (ERP):** An information system designed to coordinate all resources, information, and activities needed to complete business processes such as accounting and human resources. It can also exchange data between its different parts. Based on customer orders and with the help of an ERP system (Note: MRP - Material Requirements Planning - is typically a subsystem of ERP for manufacturing), the necessary financial, human resources, time, and procurement requirements can be determined.

d. Determining the Degree of Integration Across the Supply Chain

The success of SCM depends on the degree of integration of planning processes among members, in addition to agreeing on unified control standards that help measure the success of the supply chain.

6. Types of Relationships within Supply Chains

❖ **Vertical Relationships:**

Refer to the traditional links between organizations in the supply chain, such as the relationship between manufacturers and suppliers of materials, spare parts, and semi-finished products, or relationships between manufacturers, distributors, and retailers. These relationships focus on ensuring the flow of products and information within the chain. A third influential party has recently emerged in this relationship: third-party logistics providers (3PL).

- **Horizontal Relationships:**

Involve agreements between organizations in the same line of business, such as cooperation in transport and supply operations. An example is joint purchasing offices (*Centrales d'achat*) among organizations, which aggregate purchases for a group of members to obtain better terms and prices thanks to economies of scale.

- **Full Cooperation / Alliances:**

Involve agreements between companies operating at both vertical and horizontal levels in the supply chain. For example, a group of carriers and shippers might agree to cooperate to reduce the movement of empty trucks.

7. The Strength of Relationships in the Supply Chain

Relationships between two or more members of the supply chain can range across three levels: Transactional Relationships, Cooperative/Partnership Relationships, and Strategic Alliances. This is illustrated below:

a) **Transactional Relationships:**

These are temporary, short-term relationships that end with the conclusion of the transaction. Also called competitive bidding or tenders, because the organization negotiates with a large number of suppliers and chooses the best price for itself, repeating the process periodically. By pitting suppliers against each other, it forces them to lower their prices. However, the organization's lack of long-term commitment to individual suppliers makes them hesitant to invest in specialized assets to improve parts or materials. This can also lead to a loss of trust between the organization and its suppliers. The organization deals with distributors and wholesalers in the same way. Characterized by minimal or no integration or cooperation between buyer and seller.

b) **Cooperative Relationships:**

With increasing competition, organizations realized the importance of forming long-term cooperative relationships with supply chain members, viewing each party as a partner. Cooperation and coordination extend between suppliers and buyers to include all chain members, based on mutual trust and recognition of the benefits of cooperation. These benefits

include: reducing uncertainty and risk, improving product quality, reducing total costs, increasing profitability for all members, and faster response to end customer requests. Inter-organizational information and communication technologies are used to achieve this cooperation and coordination, which requires the exchange and sharing of information (especially point-of-sale data used for collaborative forecasting). Cooperation can be vertical with suppliers and distributors, or horizontal with other organizations (e.g., cooperation between distributors, who might even be competitors in the same sector). The cooperative relationships established by Japanese automotive companies with component suppliers, known as the **Keiretsu System**, are a successful example of long-term contracts. Through the application of JIT or cooperation in designing component parts to improve quality and reduce assembly costs, value is added and shared between the companies and their suppliers.

c) **Alliance Relationships (Strategic Alliances):**

Represent the best form of logistical relationships, as they ensure a full partnership, long-term, and based on creating and maintaining a win-win relationship between all parties in the supply chain. This relationship may even reach the level of merger and acquisition. Forms of alliance include: sharing resources required for a new joint venture, which a single organization might not easily provide alone, and agreements to work on joint research and development projects to develop a new product, for example.

Chapter Three : International Transportation

The transportation function is considered one of the main logistics activities in any organization, as transportation adds value to products by providing spatial utility. Additionally, transportation costs constitute a significant portion, approximately 42%, of the total logistics activities cost. The transportation function involves several decisions made by the responsible party, the most important of which are selecting the mode of transportation and determining the optimal mix of transportation modes. The increase in the efficiency of transportation operations will reflect its impact on the overall efficiency of the logistics system and the productivity of the institution in general. This efficiency in the transportation system leads to an improvement in the competitive position and consequently affects the country's economy. Therefore, the transportation sector is considered one of the important sectors that are prioritized to achieve economic development.

In this chapter, we will attempt to address the concept of transportation and its importance at both the institutional and national levels, as well as the relative significance of each mode of transportation and how to achieve integration between them to benefit from the advantages of each mode in order to achieve the highest degree of efficiency in transporting goods at the lowest cost and in the shortest time.

1. Introduction to the Function of Transport

❖ Definition of the transportation function

Transportation is one of the important economic functions that provides the product with spatial utility, and its activity is limited to efforts aimed at moving products from places of production to places of consumption. We can define transportation as one of the functions of physical distribution through selected routes or distribution outlets that ensure the transfer of the product and its delivery to the consumer, using available means of transportation.

The transportation department is one of the physical distribution departments in the company and is responsible for creating place utility by carrying out transportation and physical distribution activities economically and with a high degree of efficiency and effectiveness. Within the scope of the transportation department, we find that the transportation manager is linked to multiple functional areas such as marketing, production, and finance.

The transportation system consists of two important elements:[22]

1) The network: through which the transportation process takes place, such as the land network, the water network, and the railway network.
2) All devices and media in transportation, including transportation media, departure stations, and arrival stations.

❖ Organizing transportation decisions and classifying carriers:

• Organizing transportation decisions:

Decisions related to the movement of goods and materials from supply sources to the buyer's warehouses usually affect the profitability of the institution due to the high transportation costs, which negatively impact profitability. However, if transportation costs are low, the impact is positive. Therefore, some companies establish a dedicated transportation department specialized in selecting the necessary transportation means to execute the movement of goods and materials.[23]

Transportation costs are not limited to transportation fees only, but also include other

[22] على فلاح، زكريا أحمد عزام، مرجع سبق ذكره، ص252.

[23] مؤيد عبد الحسين، حاكم محسن محمد، ادارة المواد والمشتريات (منهج كمي)، زهران للنشر، عمان الأردن، 2011، ص180.

costs related to the transportation process such as loading and shipping costs, and so on. The size of transportation costs is also affected by the distance and proximity to supply sources. This places the responsibility on the transportation management to choose the appropriate and suitable means of transportation, taking into account all related regulations, laws, and transportation conditions according to the different types and categories of goods.

• Classification of carriers:

- The public carrier: This type of carrier for materials and goods is characterized by being general and comprehensive and is marked by formality. Here, these specifications generally apply to the administrative units affiliated with the state that are intended to provide services to all individuals and institutions in the country where this public carrier operates. The fees for the services determined by this public carrier are characterized by being fixed and set by the relevant ministry in the state, and the most important feature that distinguishes them is that they are reasonable, if not symbolic.[24]

- The contracted or private carrier: This type of carrier consists of specialized local or international transport companies that own their own land, air, and sea transport fleets.

- Self-transport: This means that the institution takes care of transporting its goods by itself, and this applies to materials and goods purchased from external suppliers or the transportation of materials and goods sold to external parties.

2. **Importance of transportation activity:**

2.1. The importance of the transportation system at the organizational and national levels:

The transport activity holds great importance in commercial transactions, as without it, goods would have to be consumed in the places where they are produced, which would paralyze the exchange movement, considered the lifeblood of commercial life. With strong and extensive transport networks within the community, it leads to an increase in both specialization and division of labor, as well as enhancing the ability of

[24] مؤيد عبد الحسين، مرجع سبق ذكره، ص182.

production elements to move from one place to another in a timely manner.

The importance of transportation activity at the institutional level: Transportation helps to add temporal and spatial benefits to the product, as the speed of product transfer from one point to another is determined by the efficiency of this function. Transportation activity affects a set of key economic decisions in the business field, which are:

• Production decision: Since industrial facilities that produce tangible goods take into account the possibilities of transporting raw materials and finished goods, as well as transportation costs, in production decisions.

• Purchasing decisions: The nature of purchases is largely influenced by transportation considerations, regardless of whether the institution operates in the industrial or commercial sector.

• Decisions on the location of institutional facilities: Although decisions on the locations of production centers, warehouses, storage facilities, and sales centers are influenced by many factors, transportation considerations also affect these decisions.

• Pricing decisions: Although there is no direct relationship between changes in transportation costs and the company's profits, transportation costs are one of the important elements considered when setting pricing policies.

2.2 The importance of transportation activity at the national level: An advanced transportation sector at the national level contributes to the development and progress in other fields of the country, as it contributes to:

• The impact on the pattern and strategy of economic development that the state intends to pursue, especially in the industrial sector, because transportation services of various kinds affect the process of industrial localization in terms of choosing production centers and marketing outlets. Where a combination of economic and social factors converge to determine the process of industrial localization.

Transportation costs represent one of the most important economic factors in this field, as the choice of industrial location depends on:

The location of industries producing raw materials and their proximity or distance from the relevant industry (impact on the input side).

The ability to transport various goods in large sizes (impact on the output side).
- Locations of trading and final consumption markets (impact on the distribution side).
• Contributing to the increase in capital formation rates (both physical and human), as the services of the transport sector facilitate the transfer of technological knowledge, which becomes more effective in raising economic growth rates when embodied in the form of goods, productivity rates, and advanced production techniques. This leads to an increase in productive capacity, which is one of the most important determinants of economic development. This explains the rising percentage of expenditure on the transport sector—especially in developing countries—where expenditure on the transport sector in all its forms accounts for nearly 40% of total expenditure on various service sectors.

• Working to enhance the state's capacity for specialization, division of labor, and organization of the benefits of comparative advantages in production, interpreting this as each state individually acquiring comparative advantages in producing a specific product or a group of products at low costs, which leads to an increase in products (supply) and consequently achieving a surplus of those products and exporting it to global markets, thereby obtaining the necessary foreign currency resources used to provide the goods and capital requirements needed for economic development programs.

• Improving the balance of payments position by increasing the country's export capacity and generating more foreign currencies, in addition to the effective role of the transportation sector—especially maritime transport—in reducing the costs of transporting exported products abroad, thereby lowering the balance of payments deficit.

3. **The Importance of an Efficient Transportation System:**

If we look at the transportation system at the community level, we will find that this system has a clear impact on the level of economic activity in that community. When a cheap transportation system and affordable means of transport are not available, the community is usually concentrated in areas where agriculture exists, with most consumption occurring near production sites. However, with the availability of a low-cost and reliable transportation system, the economic structure of the community also begins to change, and production and its centers start to disperse geographically.[25]

we need to compare developing countries with developed countries to see how transportation plays an important role in creating a high level of economic activity. In developing countries, production and consumption occur closely, with many workers engaged in agricultural production and a small percentage of the total population living in cities. Geographical areas limit the scope of production, and usually, the economic standard of living for each citizen rises. An efficient transportation system contributes to market competition and reduces goods.[26]

This is often the most cited benefits :

Bigger competition:When good and low-cost transportation means are not available, the market for the enterprise will be limited to the geographical areas surrounding the production centers. If the production cost for any company is not lower than the production cost for another company in another area in a way that enables the first company to cover the transportation cost, there will be no competition between the two companies. Each company will produce only in its surrounding area and consider this area its market. However, when transportation means improve and their cost decreases, any producer can produce and distribute in any area, thus competing with producers in other markets.

In addition to encouraging direct competition and cheap transportation, it is required that the transportation be of high quality. Indirect competition should also be encouraged by providing goods in the market. Goods imported from foreign markets have an impact on stabilizing the prices of similar products in the market.

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[25] Ismail Mohamed El-Sayed, Mohamed Tawfiq El-Madi, Dr. Mohamed Ahmed Hassan, Supply and Distribution Management, Dar Al-Fikr Al-Jami'i, Alexandria, 2006. p. 132.

[26] Ronald H. Ballou, OpCit, p. 160

Advantages of large-scale production : Since the presence of transportation means provides larger and wider markets, production occurs at a larger scale, achieving economic production efficiencies. In fact, the large market size leads to production efficiencies due to the optimal use of available production facilities and the emergence of specialization in production processes (which in turn leads to increased production again). Additionally, the availability of good transportation means makes synchronization between the place of production and the place of consumption unnecessary, allowing the company to choose the best production locations that achieve economic efficiencies regardless of consumption locations. Expanding markets can also lead to a reduction in production costs. Cheap transportation allows for the segmentation of market and production locations, providing the freedom to choose production sites, which are established in areas with geographical advantages[27].

Price reduction: Low cost transportation also contributes to reducing product prices, and this happens not only due to intense market competition but also because transportation is an important cost element in production, sales, and other distribution costs. As transportation becomes more efficient and performs well, society benefits by raising the standard of living. The more efficient transportation activities become, the more it leads to price reductions and an increase in the standard of living for individuals in the community.

In many markets, fresh fruits, vegetables, or other perishable products are only available at certain times of the year due to seasonal production and the lack of suitable conditions for growing these products. Meanwhile, many of these products are available at this time in other parts of the world. Fast and affordable shipping makes these products available in markets where they were not previously available at this time.

Supply Chain and Logistics: It enables Just-In-Time (JIT) manufacturing, reducing the need for large, costly inventories. Businesses can get raw materials delivered and finished products shipped to market quickly and predictably, lowering operational costs.

[27] Ismail Mohamed El-Sayed, previously mentioned reference. p.133

Labor Mobility: It allows people to commute to jobs over greater distances, giving employers access to a larger, more skilled talent pool and giving workers more employment opportunities.

Market Access: Farmers can get perishable goods to distant urban centers, and small businesses can reach national and global markets. Efficient ports and airports are critical for international trade.

Attracting Investment: Companies looking to build new facilities or headquarters consistently prioritize locations with robust transportation infrastructure. A region known for traffic gridlock is a less attractive investment.

4. **International transport and its importance in international trade**

The success of the transportation industry is rapidly evolving and can be relied upon. The transportation system contributes to the expansion of global trade, and low-cost transportation has allowed local companies to benefit from the advantage of differing labor costs around the world, thereby exploiting raw materials found in distant regions and providing goods in markets beyond local ones. Therefore, the logistics professional must be aware of the specific needs for global goods transportation.

Maritime transport dominates global transport, as it carries more than 50% of the trade volume in dollars and about 99% by weight. While air transport carries about 21% of the trade volume in dollars. And the rest is transported by trucks, railways, and pipelines[28].

The important advantages of foreign trade can be summarized as follows:

- Imported goods can be summarized and processed to change their characteristics, assembled, displayed, cleaned, sold, mixed with local and foreign goods, re-packaged, sorted, and also shipped to other countries.[29]

- Foreign governments impose taxes on goods when they enter the client's area of the importing country.Foreign governments pay taxes on goods when they enter the customer's

[28] Ronald H. Ballou, op.cit, p. 161.

[29] محمد محمود كمال، تقويم إدارة نظام النقل بالسكك الحديدية، الأكاديمية العربية للعلوم و التكنولوجيا، سوريا، 2011/2010، ص06.

area of the importing country.

- It is possible to refill in larger or smaller quantities.It is possible to refill in larger or smaller quantities.

- Goods that are subject to damage, or evaporation are not subject to taxes on the lost quantities.Goods that are subject to shrinkage, damage, or evaporation are not taxed on the lost quantities.

- It is possible to exempt capital from taxes and restrictions to achieve a greater profit.It is possible to exempt capital from taxes and restrictions to achieve a greater profit.

5. Characteristics of the Supply and Demand Side of Transportation Services

The distinctive characteristics of the demand side for transportation services are :

- The demand for transportation services is a derived or induced demand: This means that transportation services of various types are not demanded for their own sake, even though transportation is an independent activity in its own right. Rather, it is a demand to meet different needs. For organizations, the demand for transportation is to move finished goods from their production sites to distribution and consumption centers. And to achieve and maximize the profitability of the producer and the welfare of the consumer.

- The variation in demand rates for alternative transportation services due to differences in the availability of transportation service time: Demand rates for transportation services are affected by the ability of the transportation mode used to shorten the time it takes for a trip from one place to another.

- Variation in demand rates for transportation services according to the level of economic activity: Generally, the demand for transportation services is characterized by fluctuation and irregularity. This is due to a close correlation between the demand for services and the economic situation, as the demand for transportation increases during periods of economic boom due to the expansion of existing production and consumption centers, or the addition of new production sites and marketing outlets.

- Seasonal fluctuations: They vary according to the diversity of economic activity in different sectors, where these fluctuations are more evident in the agricultural sector than in the industrial sector. In the agricultural sector, demand fluctuations occur when agricultural activity is limited to a single main crop, or to main crops with a single growing season, such as summer and winter crops[30].

-Traffic management:
The main responsibility of transportation management includes daily oversight of the shipping process. In the case of relying on services rented from specialized transportation companies, the management's responsibility is limited to purchasing these services and overseeing them. In the case of the establishment owning its own transportation means and equipment, the extent of responsibility placed on the transportation management includes managing and scheduling the operations of the shipping fleet.

And in both cases, we find that the transportation management is committed to providing transportation services efficiently, which leads to achieving the objectives of the logistics function. The tasks of the transportation management include the following activities:

- Classification of goods: This activity refers to the process of classifying the goods being transported and shipped into similar groups based on their characteristics, which affect handling and transportation costs. This classification helps in determining shipping rates or prices directly.

- Obtaining the lowest shipping rates: Agreeing on the lowest prices or rates for shipping in light of a certain level of service is considered one of the most important responsibilities of transportation management. But it should be noted here that the lowest transportation cost may not necessarily lead to the overall logistics activity costs reaching their minimum level. It is therefore necessary to arrive at a means of transportation that provides the required level.

- Scheduling transport times: The importance of this function lies in the fact that any delay in loading or unloading operations leads to serious problems in operational processes, in addition to the delay penalties that are incurred in such cases.

[30] حماده فريد منصور، مقدمة في اقتصاديات النقل، مركز الإسكندرية للكتاب، الإسكندرية، 2001. ص65.

- Management of shipping documents: The management of transportation involves several shipping documents, the most important of which are the bill of lading and the shipping invoice.

- Monitoring traffic routes: In large countries, it is necessary for the traffic management department to monitor transportation means as they move between different geographical locations to or from the institution, in order to intervene and address any problems that may arise in the traffic routes and to ensure the accuracy and regularity of transportation times.

- Review: The complexity of classifying goods and determining the corresponding transportation prices for each category or rank requires the Transportation Management Department to make some special review efforts in order to ensure the correctness of the decisions.

- Claims and compensations: In the event that the transportation service does not meet the standards set by the logistics department, some compensations can be claimed, and usually, the amount of compensation is agreed upon between the institution and the transportation company without the intervention of higher authorities. It is noted that the high amount of compensation received by the institution is often considered evidence of the inefficiency of transportation decisions.

6. Main Means of Transportation

All forms of transportation sell their services directly to companies that want to transport their goods, and there is no intermediary between them. However, there are intermediaries who sell the transportation services of companies even though they do not actually own them, and these are called freight forwarders. And this is the indirect form of transportation channels. Transportation activities represent the largest portion of the cost element in any supply system. However, the trade-off between transportation alternatives does not only consider the cost factor. Generally, the logistics manager has four transportation alternatives to choose from, which are:

- **Road or land Transport**

It is divided into:

- **Railways**: Railways are considered long transport lines and slow carriers of raw materials such as coal, chemicals, and minimally processed goods like food, paper, and wooden products. The average length of the line was about 720 miles in 1995, with an average train speed of 22 miles per hour.

Most countries around the world, especially developed ones, have increasingly focused on railways due to their ability to transport large quantities of goods and their low operating costs. The large quantities of goods transported lead to a reduction in transportation costs, in addition to being considered a clean means in terms of environmental pollution, especially after the expansion in the use of electric locomotives. However, this method is criticized for its inability to reach many areas that are not connected by rail lines, as the cost of constructing them is very high, which limits their spread and widespread benefit. In addition to its relative slowness compared to trucks and planes, for various reasons such as loading or unloading goods at these stations... Etc.

Railway services exist in two forms, both of which are legal: the public carrier and the private carrier. The public carrier sells transportation services to all shippers and is guided by economic rules and location regulations set by government agencies. In contrast, private carriers are owned by the shipper and are for their exclusive use. And due to its limited operations, there is no need for economic regulations.

Railways occupy the top position in terms of relative importance as a means of transportation in many countries around the world, both in terms of the quantity of goods and the number of kilometers covered, and at a relatively low cost. Therefore, this method is often used for transporting raw materials from farms, mines, and forests due to the large sizes and weights of these materials and their relatively low value.

One of the advantages of the railways maintaining their importance in the field of freight transport is the differentiated tariff system they follow, which charges a decreasing fee per ton/km as the distance increases. There are several factors taken into consideration when determining the freight rate for transporting different types of goods over a unit distance. Among the most important of these factors are: the value

of the goods, their size relative to their weight, the perishability of the goods, the shape of the carriage, and the quantity of the shipment. Thus, railways encourage the transportation of raw materials, large and heavy goods, and low-value items, as their transportation cost is lower than that of manufactured goods. Moreover, railways are not affected by weather conditions like competing means, especially trucks and airplanes, and they often follow a "door-to-door" system, using trucks to transport goods from the "origin" to the departure station and from the arrival station to the "destination," thus overcoming the disadvantages of railways compared to trucks.

On the other hand, the main disadvantages of using railways are concentrated in the following:

- Limiting its services to the areas where it has lines.
- It is characterized by relatively slow speed and long delivery times, due to the multiple stops of trains along the route to unload or add other goods.
- Lack of flexibility, meaning it is restricted to running on certain lines that it cannot exceed, and in most cases, there is a need to complete the transportation process using other means.
- The railways offer various services to the shipper, which require special equipment.

- Trucks (trailers): Unlike railways, trucks transport finished or semi-finished goods over a distance of 1,039 km, and for partially loaded trucks (440 km), noting that the shipping volume is less than that of railways.

There are some differences between rail services and truck services, despite their competition to transport the same product in many cases. Trucks are characterized by the following:

- It allows for door-to-door shipment transfers without the need for reloading or unloading.
- The services provided by heavy transport vehicles are characterized by flexibility, as they are available at any time, continuously, and whenever the company needs them.
- The company can contract with specialized transportation companies, thereby obtaining transportation and shipping services that suit its conditions without bearing the capital

expenses and administrative problems associated with owning its own transportation fleet.

However, this method is criticized for its high transportation costs compared to water and rail transport. Therefore, their use may be limited to transporting small-sized and limited-quantity goods or in cases where water transport or railways are not available. It must be said here that trucks are often, if not always, complementary to other modes of transport. Planes can only reach airports, so goods are transported to the airport and then by trucks, and the same goes for other means of transport.

- **Air transport:**

Originally, this means of transport was used for carrying passengers, but due to the expansion in the production of large aircraft, intense competition, and the necessity to operate flights on schedule regardless of the number of registered passengers, the full transport capacity of the aircraft was not utilized. This encouraged airlines to accept cargo transport, especially during periods when passenger transport decreased. These companies found that transporting goods was a profitable and economical process, which led them to acquire cargo planes specifically for freight..

However, this policy is still limited in use due to its high costs, and therefore it is used to transport expensive and lightweight goods, and this method is characterised by its great speed in transporting goods, and this type of transport is witnessing an increase in reliance on it due to the time it saves and the high speed of implementation, and this method is similar to the means of water transport and trucks by its high variable cost and relatively low fixed costs, due to the fact that serious roads are used for free, and their use does not require any investment expenditure as is usual in the case of building roads and laying railways, in addition to the cost of constructing airports using public funds of the state This is due to the fact that serious roads are used free of charge, and their use does not require any investment expenditure as is usual in the case of road and railway construction, in addition to the construction costs of airports using the public funds of the state, and transport by this means is limited to high-value goods such as electronic equipment and goods whose transport requires special conditions and speed of transport such as flowers and fresh agricultural products

As for its disadvantages, they are related to its high costs and the inability to reach many areas that do not have airports. Additionally, it requires the use of other means of transportation to move goods from airports to the places where they are needed, which may be hundreds of kilometers away. The cost is high, equal to three times the cost of rail transport, and it is characterized by its high speed despite the waiting time and long distances. Among its problems are the limited storage space for goods and the allowed weight. However, with the emergence of giant aircraft that can carry 130-155 tons during flight, and the advancement of technology in the aviation world, the cost of shipping has decreased. Additionally, theft, damage, and loss in air freight are minimal. The legal forms of air transport are the general form, the special form, and the contractual form.

- **Pipelines:**

Although this mode of transportation ranks second after railways in terms of the number of tons/mile transported, many people are not even aware of its existence. The services of this mode of transportation are limited to the transport of liquid or gaseous goods such as oil, natural gases, and other similar products. Pipeline systems, like railways, are characterized by high fixed costs and low variable costs, due to the exorbitant costs required for laying the pipelines. Pipeline transportation offers very limited services and capabilities, and the most commonly transported products via pipelines are crude oil and refined petroleum products.

The likelihood of loss or damage to products in the pipes is low for the following reasons:

- Liquids and gases are not prone to damage like finished products.
- The limited risks that could occur to the pipes.

- **Water transport:**

Water transport, which is divided into river transport and maritime transport, is considered the oldest and most important means of transportation, especially for large-volume goods such as coal, iron, steel, and grains. The use of this form of transport requires the presence of a loading point specific to the institution on the waterway itself; otherwise, the institution would have to use an additional means of transport. Therefore, the use of this form is relatively

limited, as it is not preferred for transporting high-value products due to the damage and loss they may incur from climatic factors.

7.Characteristics of the maritime transport industry

A- The close connection between maritime transport and international trade:

Maritime transport has been closely linked to international trade in goods and commodities since ancient times, due to the advantageous characteristics of maritime transport, the most important of which is its high capacity. A ship can carry thousands of tons of goods in a single voyage, and there are giant oil tankers that transport thousands of tons in each trip.
Estimates of the contribution of maritime transport to international goods trade reach around 80% or more. Therefore, it can be said that maritime transport leads the flow of goods in international trade. The success and spread of container shipping, along with its strong association with maritime transport, have further enhanced the distinguished status of maritime transport.

B- Big data systems and maritime traffic services:

The maritime transport industry encompasses a vast amount of essential information necessary for the smooth operation of the maritime transport system, whether on navigation routes or in ports. This includes information about geographical areas, units of measurement, and types of currencies, as well as data about seaports, including docks, warehouses, companies operating in the port, available facilities, types of fees and their categories, as well as data about ships, their characteristics, arrival and departure data, waiting times, and movement on the docks, etc.Etc.

C- **Diversity of naval fleets**

The types of naval fleets vary from fishing fleets to commercial and military fleets. There are also carriers similar to the standardized trains in railways. In maritime transport, there are coal carriers, grain carriers, and oil carriers, which are carriers with standardized cargo. In fact, some of these specialized carriers form an independent market of their own, such as oil carriers. The types of goods transported by sea, as well as their physical and chemical properties, affect the size and shape of ship equipment. This impact extends to the diversity of their types according to the functions of maritime transport they perform, and consequently determines the shape and

composition of the maritime transport fleet. For example, we mention the following types of ships:

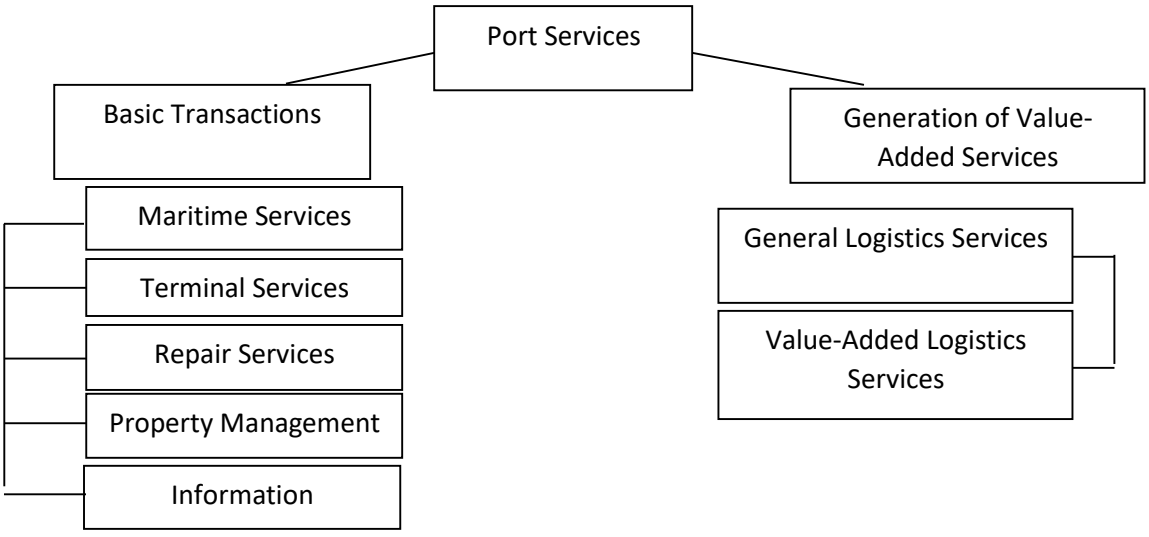
- Tanker ships where giant oil tankers with a capacity of 250,000 tons have become familiar in the maritime transport industry, serving two functions: the first is transportation and the second is storage, to address supply shortages or price increases at any time, with the aim of aligning supply and demand to stabilize and control prices;

- Container ships;
- Roll-on/roll-off ships;
- Bulk cargo ships, which are common ships;
- General cargo ships, which are the most common type of ship in the maritime transport industry;
- Car carrier ships;
- Shared carriers.

D- Seaports:

Seaports represent one of the most important elements of the maritime transport industry, as they serve as the gateways equipped to provide maritime facilities for ships from the sea side and land facilities for other means of transport from the land side. Maritime ports are considered one of the most important pillars of the maritime transport industry due to their crucial role in providing the necessary maritime facilities for the operation of ships.

Figure (3): Main Port Activities According to the World Bank



Source : intégration et concurrence entre le transport et les activités logistique, OCDE, Forum International des Transports, Table ronde, 146. P78.

And the importance of distinguishing between seaports lies in the following:

A- The difference in the purpose of the seaport, and consequently the difference in the facilities and ships that frequent the port.

B- The equipment varies from one port to another depending on the functions the port provides. The military port requires special equipment to offer maritime facilities to naval fleets, while the fishing port requires different equipment.

The port facilities are linked to their functions, as the port may provide services for export and import goods, and then perform traditional functions of loading, unloading, and storing goods. Additionally, the port may offer passenger transport services.

Types of ports in terms of the nature of the functions and services they provide:
In this regard, the ports vary between:

- Commercial ports: They are equipped with the necessary facilities for handling and storing goods, and they are tasked with providing maritime and commercial movement services for commercial ships.

- Oil ports: They contain a massive network of oil transport pipelines.

- Service Ports: They directly serve maritime movement operations and ensure its security by providing necessary maintenance services for ships, and their functions do not include loading and unloading operations.

- Storage ports or warehouses: They perform the role of commercial mediation between countries that are parties to the international trade exchange process, specializing in collecting and storing certain types of goods and then re-exporting them to areas where there is demand in global markets.

- Dry bulk cargo ports: These goods are characterized by their massive volume, and therefore their maritime transport requires specific specifications in the ports through which the transport process takes place, whether in terms of choosing the port location or the necessary facilities available in those ports, such as the need for large spaces in the port and the introduction of a cargo handling system through machines. The importance of having such ports becomes clear when we know that about 40% of the total maritime trade consists of dry bulk cargo.

- Fishing ports: They serve the fishing activity and their area and importance vary according to the relative weight of the fishing activity.

Shipping companies:

It specializes in transporting available loads of exports and imports on maritime routes, and its activities may vary or be limited to transporting the following: crude oil and its derivatives, petroleum products, cargo transportation, passenger transport services, and operating ferries between adjacent ports.

8.Comparison of the characteristics of transportation methods

- ***Criteria for comparing transportation methods:***

  One of the main tasks of the logistics system manager is to compare different transportation methods and the quality of each method. There are a set of criteria that the manager can rely on to make the comparison decision, the most important of which are:

  - The price of the transportation service for the shipper is considered the line haul rate for transporting goods, in addition to the costs of other services provided. The cost of the service varies depending on the types of transportation. And it is up to the logistics system manager in the organization to decide whether the additional services accompanying the use of a particular means justify the increase in the associated cost compared to other means. Assuming the services provided are similar, the cost factor becomes the most important criterion used in the comparison between transportation alternatives.

  It is worth noting that the basic facts regarding the cost of each mode of transportation should not lead to the conclusion that the optimal situation for the organization regarding the most suitable mode of transportation requires choosing the low-cost option. Rather, the organization should study alternative modes of transportation in terms of their impact on other physical distribution costs.

  For example, choosing railways may lead to savings in transportation costs, but it may result in increased additional costs, including the cost of transporting goods from railway stations or warehouses to intermediary warehouses or markets, and the cost of

insurance during transportation and handling....etc., leading to an increase in the total transportation cost, and thus the appropriate decision may be to use trucks or trailers instead of railways.

-. **Time:** The time taken to transport goods from the shipping station to the warehouses or target markets represents one of the criteria for comparing different transportation methods. Previous studies have shown that the average delivery time varies according to the performance characteristics of the transportation service.

This time includes: the time required for loading, handling, delivery, and movement between the shipping point and the destination station. This time affects the ability of the logistics manager to provide effective service to customers. It is noted that there is a correlation between the nature of the transportation mode in terms of speed and the rate of payment charged for providing the transportation service. In light of this, air transportation is considered the most expensive mode of transport, but it is faster, in contrast to water transportation.

- **. Reliability**: The concept of reliability refers to the degree of trust and the ability to achieve consistency in the supply process by the means of transportation. Both the factor of time and reliability affect storage costs, including the opportunity costs of lost sales due to the unavailability of the product. In addition to its impact on the level of service provided to customers. And this collectively affects the efficiency level of the company's physical distribution system.

- The ability to cover the market: This refers to the capability of the transportation method to move goods to specific areas such as warehouses or markets. Therefore, the absence of rivers or railways in certain areas means it is difficult to service these areas through those means.

- **Capabilities/Facilities:** This refers to the extent to which a means of transport can provide the necessary capabilities and conditions for transporting specific types of goods.

- Security or loss and damage: Because carriers differ in their ability to transport loads without loss or damage, which becomes a key factor in choosing a mode of transport. Traditional carriers have an obligation to transport the cargo with reasonable care to avoid loss or damage, and their liability is reduced if the loss or damage is due to external factors. Although carriers

may be the direct cause of the loss, there are specific costs associated with it that the shipper must be aware of before choosing a shipping method.

- Nature of the goods: If the goods are low-cost raw materials and large in size, the best way to transport them is by land or sea. If the goods are liquid and in large quantities, such as oil, they can be transported by pipelines, sea, or by trucks (tankers).

- The time interval between the date of the order for the goods and the time when the need arises: When the time is short and the need is urgent, the fastest means of transport, which is the airplane, should be used. However, if the available time is long, another means such as maritime transport, trucks, or railways can be chosen.

- The price and size of the goods: One of the factors that the transportation management considers when choosing the means of transport is the size of the required shipment. When it is small, the appropriate means of transport for its size is selected, and when it is large, large trucks are chosen to accommodate this large size. The cost factor is also taken into consideration due to the relationship between the size of the shipment and transportation fees. Regarding the cost, the buyer chooses the appropriate mode of transport, the suitable vehicle, and the carrier, as well as the route that ensures the safety of goods transportation. This may result in additional time, leading to higher transportation costs. It also requires knowledge of cargo classification and the tariffs for transportation routes (transportation fees), which facilitates the selection of suppliers.

- Material capabilities of institutions: Institutions with limited financial resources resort to low-cost transportation means, especially since such institutions do not own their own transportation means. On the other hand, institutions with significant financial capabilities, even if they own suitable transportation means, are capable of renting them from others and can rely on the appropriate means as dictated by the surrounding circumstances.

- Dealing with long distances: It is necessary to rely on modes of transport that have the capability to cover long distances, such as road transport or railways.

- The services provided by each means: Transportation means offer many services for shipping, among which we mention: moving goods and delivering them to the store or the

customer's warehouse, allowing goods to stop during shipping at certain points where they are stored and adjustments are made, then re-shipped without incurring any additional costs.

In general, regardless of the criteria used to choose the mode of transport, the institution should base its policy in this area on balancing these factors, especially cost, speed, and regularity.

Table (2): Transport Modes Ranked by Key Criteria

Cost	**Speed**	**Reliability**	**Capacity**	**Market Coverage**	**Safety**	**Fastest Avg. Delivery**
Air Transport	Air Transport	Pipelines	Water Transport	Trucks	Pipelines	Rail
Trucks	Trucks	Trucks	Rail	Rail	Water Transport	Trucks
Rail	Rail	Rail	Trucks	Air Transport	Rail	Water Transport
Pipelines	Pipelines	Air Transport	Air Transport	Water Transport	Air Transport	Pipelines
Water Transport	Water Transport	Water Transport	Pipelines	Pipelines	Trucks	Air Transport

Source: Thabit Abdelrahman Idris, *Introduction to Logistics Management*, p. 270.

It is noted that there are factors that may alter this ranking, the most important of which are:

- The type of product being shipped.
- The distance over which transportation occurs.
- The management methods employed by the owners of these means.
- The relationship between transportation companies and the user.
- Weather conditions.

9.The importance of choosing a mode of transportation

To determine the importance of choosing the appropriate mode of transport, it is essential to identify the impact of the transportation process on the entire supply chain. This can be done

by analyzing current transportation costs, the company's profit margins, and the impact of transportation on other elements within the physical distribution system :

- Transportation costs: Transportation costs range from less than 1% (for machinery) to more than 30% (for food products) of the specified selling price of the products, depending on the nature of the product and the success of its marketing. In any case, transportation costs range between 5% and 6% of the retail price of the products.

- Increasing profits: The transportation process represents a direct cost added to the product price, and thus reducing transportation costs leads to increased profits (assuming the price remains constant). The impact of reducing transportation costs on increasing profits is evident in two ways.

- Supply Chain: Transportation is considered a system through which the product is moved between two or more locations, and the means of transportation must be suitable, not only for the two parties in the supply chain but also for the work environment through which the transportation process takes place. Sufficient information must be obtained to complete the transportation of goods and enable production entities, customers, transportation companies, and governmental and financial institutions to monitor progress.

In logistics and supply chain management, the selection of a transport mode—whether by ship, plane, truck, rail, or pipeline—is a complex calculation that balances cost, speed, reliability, and product characteristics. This decision is fundamental to creating an efficient and resilient supply chain.

❖ Cost Efficiency and Profitability

This is often the primary driver. The choice of mode has a direct and massive impact on the total cost of delivering a product.

- **Transportation Cost vs. Inventory Cost:** This is a classic trade-off.
  - **Slow, Cheap Modes (Sea, Rail):** Have lower per-unit costs but longer transit times. This means money is tied up for longer in "in-transit inventory," and higher safety stock levels are needed in warehouses to guard against delays.
  - **Fast, Expensive Modes (Air, Truck):** Have higher direct costs but faster delivery, reducing in-transit inventory and allowing for lower safety stock (the "just-in-time" model).

- **Total Landed Cost:** The mode choice affects more than just the freight bill. It influences costs like packaging (air freight requires less robust packaging than ocean freight for the same item), insurance, warehousing, and handling.

❖ Speed and Transit Time

The urgency of the delivery is a crucial factor, directly linked to market demands and operational models.

- **Time-Sensitive Goods:** Perishable food, urgent medical supplies, high-fashion items, and critical machine parts often **must** use air or expedited trucking to maintain their value and function.
- **Lead Time to Market:** For products with long lifecycles (e.g., furniture, commodities), slow ocean freight is acceptable. For short-lifecycle products (e.g., consumer electronics), getting to market first via air can be critical for capturing market share.
- **Customer Satisfaction:** Meeting promised delivery dates is a key component of customer service. A reliable mode choice builds trust and reduces the cost of customer complaints and returns.

❖ Reliability and Consistency

In modern supply chains, predictability is often as important as speed. Consistent transit times allow for leaner inventory management and more precise production planning.

- **Modal Characteristics:**
  - **Air and Truck:** Generally offer high reliability and precise tracking.
  - **Rail:** Very reliable on main routes but can be subject to congestion and delays in yards.
  - **Ocean:** The least reliable, highly susceptible to weather, port congestion, and scheduling complexities.
- **Impact:** Unreliable transportation forces companies to hold higher "buffer stock" inventory, tying up capital and warehouse space.

❖ Product Characteristics and Safety

The nature of the goods themselves dictates the viable transport options.

- **Value:** High-value, low-weight items (e.g., pharmaceuticals, electronics) can absorb the cost of air freight. Low-value, high-weight items (e.g., coal, grain) require the low cost of sea or rail.
- **Perishability:** Goods like fresh flowers, fish, and certain chemicals have a short shelf life, necessitating the speed of air or refrigerated trucking ("reefers").
- **Size, Weight, and Density:** Very large or heavy items (e.g., wind turbine blades, construction equipment) are often restricted to ocean or specialized rail transport.
- **Hazardous Nature:** Dangerous goods (e.g., chemicals, fuels) are subject to strict regulations that may favor certain modes like rail or specialized tanker trucks/ships.

❖ Global Reach and Accessibility

The mode choice determines a company's geographic market reach.

- **International Trade:** Ocean and air freight are the only practical modes for intercontinental trade. The choice between them defines a company's global supply chain structure.
- **Last-Mile Delivery:** While a container may cross an ocean by ship, the final delivery to a store or home almost always requires a truck. This makes trucking an indispensable part of almost every goods movement, a concept known as **intermodalism** (using multiple modes for a single journey).

❖ Environmental Impact and Sustainability

This is an increasingly critical factor for corporate responsibility and regulatory compliance.

- **Carbon Footprint:** The carbon emissions per ton-mile vary dramatically by mode.
  - **Most Sustainable:** Rail and Sea freight are the most carbon-efficient.
  - **Least Sustainable:** Air freight is by far the most polluting.
  - **Middle Ground:** Trucks fall in the middle but are a major source of urban emissions.
- **Corporate Image:** Consumers and investors are increasingly favoring companies with sustainable supply chains. Choosing a lower-emission mode, even if slightly slower, can be a powerful branding and ethical decision.

❖ Security and Risk Management

The risk of theft, damage, or loss varies by mode and route.

- **High-Risk Goods:** High-value electronics and pharmaceuticals are more vulnerable to theft in certain transport corridors or while sitting in port. Air freight often provides greater security and less handling.
- **Cargo Insurance:** Insurance premiums are directly influenced by the perceived risk of the chosen mode and route.

10.Multimodal Transport

In the past fifteen years, there has been significant development in transportation and its equipment, including railways, which has led to the emergence of multimodal international transport. Multimodal transport has evolved remarkably in recent years, prompting international organizations to propose projects for multimodal transport system agreements that clarify the policies and mechanisms for implementing this system, keeping pace with the rapid advancements and changes in international industry and trade methods.

A. Definition of intermodal transport:

The multimodal transport system is a new technology in the field of transportation designed to facilitate the movement of goods between two points in different countries under a single legal responsibility. It is a cross-border transport system aimed at facilitating the flow of transport, using different modes of transport coordinated according to a fixed and stable approach.

Multimodal transport is also considered the latest advanced transportation method due to its low costs, reduced travel time, and preservation of goods during their journey from the origin to the final consumer, which is known as door-to-door service.

The role of multimodal transport in serving international trade has evolved and expanded with the advent of containerization since the early 1960s, using containers to transport goods by more than one mode of transport without the need to unload their contents. The United Nations Convention on International Multimodal Transport, signed in 1980, defined it as "the carriage of goods by at least two different modes of transport based on a multimodal transport contract, where the multimodal transport operator takes the goods into his custody from a place in one country to the place of delivery in another country."

But it is necessary to distinguish between multimodal transport and similar new types of transport:

Mixed transport

It involves the transportation of goods using different modes of transport and under multiple transport contracts for each stage of the journey. It differs from multimodal transport in that it involves multiple transport contracts, whereas multimodal transport assumes execution under a single transport contract.

Sequential transport - through transport

It assumes the involvement of several carriers and one mode of transport. This is the case, for example, for transporting goods from Amsterdam to Algeria via Paris, where the transport from Amsterdam to Paris is done by Plane No. 1, and then the transport from Paris to Algeria is done by Plane No. 2.

Combined transport

It is similar to multimodal transport, carried out by several carriers, at least two of whom are subject to different legal systems. However, joint transport differs from multimodal transport in that the former is based on the diversity of legal systems applicable to different stages of transport, rather than the diversity of means of transport. It is therefore possible for combined transport to be carried out by a single transport operation subject to different legal systems, as is the case with land transport where the first part is executed in France by a land carrier subject to French law and the rest of the transport is carried out abroad by a land carrier subject to the legal framework of the convention on the contract for the international carriage of goods by road. The transport here is carried out by a single transport operation under different legal systems, and such transport is referred to as combined transport, not multimodal transport.

B. The following conditions must be met in the multimodal transport process:
1- To be done under a single document that covers all stages of transportation (door-to-door).
2- The organization of transport should be handled by a multimodal transport contractor who will be responsible for the goods throughout all stages of transport, using a single bill of lading and delivering them in the best condition.

3- The transportation should be for a comprehensive transportation fee that includes all stages of the goods' transportation.

4- The transport must cross at least two countries and use at least two means of transport.
5- A contract for the transportation of goods, not people.

Multimodal transport, in essence, is an innovative legal concept that has commercial and economic implications.

The novelty in this matter is the connection between two or more of these means of transport to provide an integrated transport service committed by one person based on a single transport contract, under a single responsibility, and a single total fee, within a special legal system.

Multimodal transport, in essence, is a new legal system for transport, not a new transport system added to the previously known unimodal systems. The new addition is not the transport itself but the legal system that governs and connects all or some of those unimodal systems in a multimodal transport contract.

C. The purpose and essence of the multimodal transport system

Transportation plays a crucial role in the economic and social development of the state, as the pace of economic growth is significantly affected by the efficiency of the country's transportation systems. The aim of the multimodal transportation system is to improve the efficiency of international trade by rationalizing transportation operations with the intention of:
• Achieving savings in the total cost of transporting goods.

• Reducing the time spent on trading and transporting goods.

• Guaranteeing the delivery of goods on time (JIT).

• Providing more protection and security and reducing the likelihood of damage to the goods during the overall journey.

• Ensuring the highest efficiency in transporting goods, whether by choosing the best methods or routes for their movement or the most suitable means of transport for carrying them.

Thus, the essence of multimodal transport actually involves two important philosophies: the

first is economic, and the second is legal. The economic theory is represented by the pursuit of benefiting from the qualitative characteristics and advantages of different modes of transport by combining the use of two or more modes to transport goods in order to achieve the desired advantages according to customer demands. For example, the qualitative advantage of truck transport is flexibility, for rail transport it is the ability to carry large shipments, for water transport it is relatively low transportation costs, and for air transport it is achieving speed in transportation.

As for the legal theory, it is represented by the unity of the carrier's transport contract, the unity of the transport document, the unity of liability for the goods, the unity of the transport fee, and the unity of the goods insurance document for the entire journey.

Multimodal transport will not be able to perform its role to the fullest through the synergy of added value represented by logistics services and supply chain management for customers, on one hand, and on the other hand, multimodal transport requires a vast abundance of information technology and databases.

D. The importance of the multimodal transport system

The importance of this system comes in response to global changes in the fields of economy, trade, and manufacturing, such as:

- The global economic forces that reflect the new world order and the trade regulations that control production and consumption markets and cross-border activities.
- The increasing technical value of global trade and the rationalization of transportation expenses and logistics costs.

- The trend towards achieving the integration of transportation modes at the global level has intensified, and the management of transportation activities and logistics costs has become more complex.

The evolution of types, sizes, loads, and technologies of various transportation modes, along with the increasing trend towards benefiting from the principle of economies of scale, with the availability of information networks that serve as the backbone of system performance.

Using more than one mode of transportation in an integrated manner for freight transport

inevitably leads to benefiting from the advantages that each mode offers in terms of cost, speed, and safety. Thus, the final result is obtaining a transportation service at a lower cost and with a better level of service, with the optimal use of transportation means compared to the situation where goods are transported outside the multimodal transport chain. This positively impacts the national economy by reducing the total cost of transporting goods at the national level.

E. Requirements for implementing multimodal transport chains in developing countries

To activate the multimodal transport system between Arab countries, the primary focus should be on stimulating intra-Arab trade, the common Arab market, exchanging free trade agreements, and other activities related to production, distribution, and consumption. Starting to take effective steps to implement the multimodal transport system among Arab countries will significantly activate the establishment of the Arab Common Market Agreement, especially since many of them in the Mashreq Arab countries, the majority of the Maghreb Arab countries, and some Southern African countries have excellent and some good infrastructure such as roads, railways in some, and airports. However, the implementation of multimodal transport concepts in Arab countries requires the availability of a set of essential factors, the most important of which are :

- Appropriate infrastructure: As is well known, the application of modern concepts for freight transport has basic requirements related to the availability of suitable infrastructure. For example the requirements for implementing multimodal transport chains can be given as follows:

- Transshipment stations for goods: These stations serve as the connecting links between transportation modes, where goods are transferred from one mode to another in a seamless manner, ensuring minimal time and cost.

- Container exchange stations: Container exchange stations are one of the essential pillars in activating integrated transport mechanisms between different modes, whether they are established as part of intermodal stations or as separate entities.

Transport network: The term "network" here refers to the movement axes of roads and railways in terms of accessibility and capacities. Here, the availability of the network alone is not

sufficient to implement integration and interconnection between different modes of transport in a transport chain, but it also requires that the network's capacities qualify it for that.

- **Legislation that keeps pace with the adoption of multimodal transport as a mode of transport:** Legislation comes as one of the most essential requirements for the implementation and application of multimodal transport concepts. The legislation here pertains to regulating the completion of basic requirements (interchange stations - container exchange stations) or the legislation that defines the responsibilities of carriers and freight forwarders, in addition to the legislation related to compliance with agreements governing multimodal transport links or the legislation favorable for joining transit transport agreements such as the TIR Convention.
- **Multimodal Transport Operators:** A multimodal transport operator is defined as the person who undertakes the organization of door-to-door transport operations using more than one mode of transport under a single transport document that covers all stages of the journey.

5. **The role of dry ports in activating multimodal transport chains:**

Seaports are one of the most important elements of the maritime transport industry, as they serve as gateways equipped to provide maritime facilities for ships from the sea side and land facilities for other means of transport from the land side. Seaports vary in terms of geographical nature, as one can distinguish between natural ports and industrial ports, which are represented by dry ports that can be established far from the seashores. From this standpoint, we will try in the following sections to learn more about the concept of the dry port.

- **A. Definition of dry ports:**

Ports hold great importance in all countries that overlook seas or oceans, and this importance stems from their ability to accommodate a large volume of imported goods from abroad. However, these ports can suffer from significant pressures if the volume of imported goods is large, and these pressures increase with poor organization. Therefore, the best solution to alleviate these pressures is to create temporary storage facilities for goods arriving at the ports, which are relatively far from the seaports; these facilities are commonly referred to as dry ports or dry docks (sometimes also called logistics ports).

A dry port is defined as: "an equipped facility established deep inland away from the sea to perform multiple functions depending on its location and purpose of establishment." Wikipedia defines it as follows: "A dry port (sometimes called an inland port) is a freight terminal directly connected to the road or rail network leading to the seaport. The dry port is used as a center for consolidating goods arriving from the sea in preparation for distribution to suppliers." The dry port also contains storage and unloading centers for goods, centers for the maintenance of trailers and trucks, and customs clearance and inspection services. Its purpose is to alleviate the pressure on the storage capacity and customs space that are congested in seaports.

According to the United Nations Economic and Social Council, a dry port is a facility located in inland areas; its functions are similar to those of seaports in terms of storing and distributing goods, including customs clearance services. It also means a geographical cluster of independent companies and organizations involved in the transportation of goods (such as freight forwarders, shippers, and carriers), providing related services (customs inspection, tax payment, storage, maintenance and repair, and banking communications using information and communication technology)[31].

The dry port is described as an inland intermodal terminal directly connected by road or rail to one or more water ports, and it can serve as an alternative to ports with all their services in certain areas[32].

What can be concluded from the aforementioned definitions is the fundamental difference between the dry port and wholesale distribution centers; this difference is evident in the possibility that distribution centers may not be connected to ports and may not have facilities accompanying port operations, which must be available in a dry port. On the other hand, there is a difference in customs clearance operations, which do not occur at distribution centers unlike dry ports.

[31] Conseil économique et social des nations unies, "question intersectorielle concernant la gestion de la mondialisation dans le domaine du commerce et des transports: promotion des ports secs comme moyen de faire bénéficier les zones non côtières des avantages de la mondialisation", Point 4 de l'ordre du jour provisoire, 17 août 2006, p2

[32] Lina Trainaviciute, "The Dry Port - Concept and Perspectives", FDT- Association of Danish Transport and Logistics Centres, Denmark, 28th of August 2011, p23.

The concept of dry ports is one of the modern concepts that has emerged in the field of multimodal transport. They are established to complete multimodal transport and achieve logistical concepts, to prevent congestion at sea and air ports, and to add value. It is essential for them to have distinguished infrastructure that connects them with various transport modes and a high-efficiency communication network. These areas are subject to customs control. Therefore, a dry port is a goods reception port that is not located at sea but on land. It is a storage station for goods directly connected to roads or railways leading to the dry port, where it is used as a center for consolidating goods coming from the sea in preparation for distribution to suppliers.

It is important to distinguish between a dry port and a land port; the latter refers to land border centers located on main road networks that connect each country with neighboring countries.

Table (3): The Four Generations of Seaports

Ports of Generation	Description	Development Strategies	Services Provided	Impact Area	Information System
First Generation	Connects two types of transport	Not specific to this generation	Traditional lifting, storage, no focus on customer needs	Port activities at the quay level	Slightly advanced
Second Generation	Transport hub, industrial and commercial activities	Expansion of ship size and services	Packing, packaging, transformation	Distribution center, logistics activities	Computerized information exchange
Third Generation	Equipped with logistics platforms for international trade	Internationalization and diversification	Designated logistics services for shippers	Port community: proximity to urban areas	Networked computerized information system
Fourth Generation	Network ports	Not specific	Expanding capacity and services	Harmonization of port activities	International port cooperation

Source :abdelkader boumessila, "les ports algériens situation et perspectives", les ateliers de FCA, china dayly information corp, 2012, p13.

- **B. Components of the dry port:**

  The dry port consists of a set of open spaces in addition to a container cargo terminal and facilities as follows:

  • Areas for incoming filled containers and outgoing containers.

• Empty or unloaded inbound container yards, in addition to empty transit containers that exceed the port's capacity and have waiting periods longer than the specified and customary duration.

• Administrative offices, customs offices, and electronic communications.

• Workshops for repairing, cleaning, and preparing containers.

• Parking spaces.

• Container loading and unloading station: Known as the container cargo station, it is an integral part of the dry port, and its function is to handle containers during their loading or unloading.

- **C. Characteristics of the dry port:**

The dry port must possess several characteristics to perform its role to the fullest, and among these characteristics, Tsilingiris and Laguardia mentioned the following:

- The costs of handling containers in the dry port must be lower than the costs of utilizing the land used in its construction, and the labor costs must also be lower.
- The final costs of handling containers and goods at the dry port must be less than those at the sea port, plus the costs of transporting them from the second port to the first.
- To have large spaces and facilities with a multi-media design to expedite port operations, leading to positive financial impacts;
- The dry port should be in direct connection with a seaport either by rail or road;
- The dry port must have great ease in transportation using the latest technologies;
- The dry port should provide the same types of facilities and services that can be offered at a seaport.

Table (4): Differences Between Dry Ports, Seaports, and Distribution Centers

Distribution Center	**Seaport**	**Dry Port**
Inland areas	Coastal areas	Coastal and inland areas
No customs inspection	Customs procedures	Customs procedures
No port-related facilities	Port operation requirements	Port operation requirements
Wholesalers and distributors	Shipping agents, carriers, customs, banks	Shipping agents, carriers, customs, banks
No direct connection to seaports	Direct/flexible connection to seaports	Direct connection to seaports and distribution centers

Source: Prepared by the researcher based on previous sections.

D. Dry port jobs:

The dry port aims to alleviate the pressure on seaports and reduce the financial and time costs of port operations. As we summarized above, the dry port must be a highly efficient station. The main functions performed by the dry port to achieve this goal can be summarized as follows:

- Shipping and transporting goods by rail:

The process of transporting goods from the seaport to their place of use or consumption is carried out through various means of transportation, but the most important means of transport between the seaport and the dry port is the railway. This makes the movement of transportation smoother and also contributes to environmental preservation.

- Sorting:

When unloading ships from containers, the port operators classify the goods according to the supply chains they need to be pumped into. This process is somewhat difficult and requires large spaces within the port. In the dry port, this problem arises much less sharply due to its large area and the possibility of expansion as well.

- Storage:

The dry port has a much larger storage capacity than the sea port. Additionally, the storage periods for goods, which can vary along with their delivery destinations, can be scheduled more easily than at the sea port. Therefore, the congestion present at the latter, which poses a storage problem, will be significantly less severe at the dry port.

- Providing special services (the most important of which is customs clearance): One of the most important specialized services for dry ports is customs clearance and inspection. And when this is done at the dry port instead of the seaport, the waiting time, which can sometimes be very long and cause congestion at the seaports, is reduced. Additionally, performing regular maintenance is much easier in the dry port than in the sea port due to the ease of organizing spaces, equipment, and maintenance schedules.

- Completing and connecting multimedia transport links:

Multimodal transport is a transportation system that relies on more than two modes of transport to ensure door-to-door delivery. There are places that do not necessarily have to be seaports

where the mode of transport is changed. These places are precisely defined, subject to customs supervision, and are called dry ports.

- Its importance in the logistics chain:

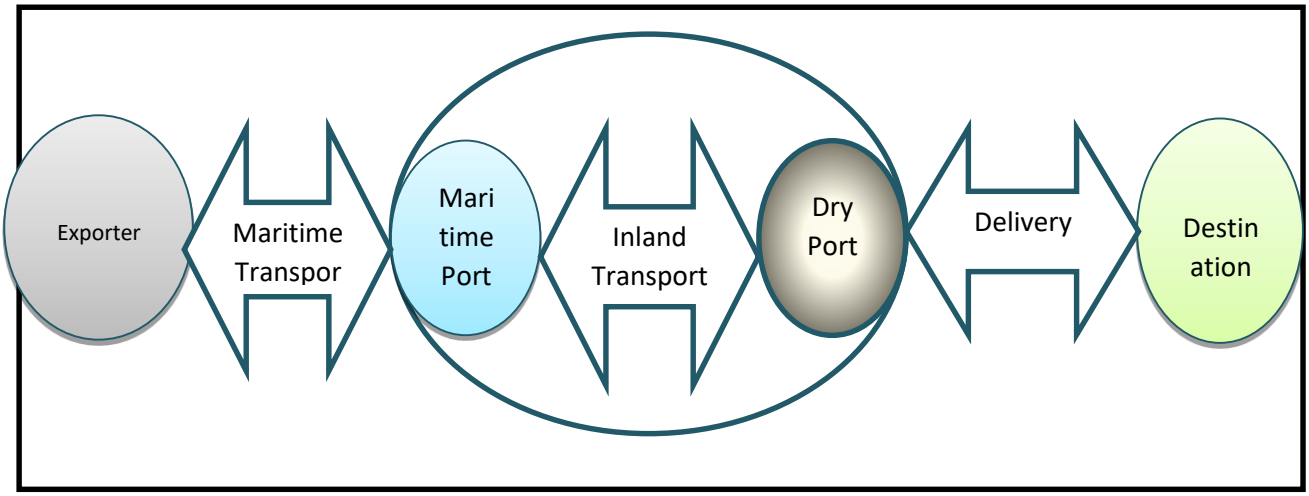
The role of logistics is to connect the supply and physical distribution operations required by any project into a single network. This way, projects can achieve market competitiveness by reducing the costs of transporting goods through tight control over all stages of the transportation process, from the raw material supply stage to the delivery of the finished product to the consumer. The multimodal international carrier is committed to completing the physical supply of finished products to the consumer market at the agreed-upon time and at the lowest possible cost.

- Preventing congestion at seaports:

In light of free trade and the noticeable increase in trade exchange, ports have transformed from areas of loading, unloading, and storage to mere transit areas for goods. Maritime ports have entered the multimodal transport chain as one of its links. These ports now have back areas (near or far) to complete the storage and proper handling of goods for the concerned parties. These back areas are called dry ports, which play a significant role in eliminating congestion at maritime ports.

The following figure illustrates a summary of the operation of dry ports and their connections with seaports:

Figure (4): Summary of Dry Port Operations



As we can see from the diagram, dry ports act as intermediaries that connect the transportation of goods from the seaport to their destination. Therefore, the presence of dry ports will contribute to organizing the transportation and storage process, and reducing the pressure on seaports, especially if the latter are characterized by their small size and proximity to urban areas.

E.The importance of dry ports for national development and the gains achieved from them:

We can summarize the main benefits of using dry ports in several key points, the most important of which are:

• Reducing the total transportation expenses and costs;

• Transitioning from road transport to rail transport, which is considered more environmentally friendly (reducing local environmental issues in cities);

• Enhancing the role of ports in transport chains, and strengthening the role of multi-service intermediaries;

• Limiting the use of central-use sites in seaports;

• Avoid traffic jams and congestion on the roads near the seaport area;

• Developing remote areas, especially in least developed countries, where the benefit for these areas can be in the form of job creation;

• Speeding up the customs clearance process for goods transported abroad by dividing this task between sea and dry ports.

Table (5): Distribution of Dry Port Benefits Among Stakeholders

Benefits	Ship Owners	Chambers of Commerce	Authorities	Labor Market	Service Providers	Local Communities
Balancing Rail and Road Transport				✓		✓
Reducing Port Waiting Times	✓	✓	✓		✓	
Reducing Road Congestion	✓			✓	✓	
Preventing Environmental Pollution				✓		
Enhancing Ports' Role in Transport Chains		✓	✓			
Reducing Use of Costly Port Areas			✓			
Job Creation				✓		

Source: Lina Trainaviciute, "The Dry Port - Concept and Perspectives", FDT- Association of Danish Transport and Logistics Centres, Denmark, 28th of August 2011, p40

Port Performance Indicators:

There is no single effective measure for assessing the efficiency of cargo handling operations and obtaining relevant information about berths. However, there are several different factors used for measurement, known collectively as **"Port Performance Indicators."** To evaluate the performance of cargo handling operations at a port, four main groups of indicators are used:

1. Achievement Indicators:

These are among the most important indicators, as they allow for proper control of financial performance.

Achievement can be defined as the quantity of cargo (in tons) handled within a specific period. There are three main types of achievement indicators:

- **Berth Achievement:**

  This measures the total quantity of cargo handled at a berth during a defined period, usually one year.

  However, certain obstacles may arise when calculating berth achievement — for example, cargo that is handled more than once during loading or unloading, cargo moved to access other cargo, or cargo shifted in preparation for the next stage of the voyage.

- **Ship Achievement:**

  This indicator measures the rate of cargo handling to and from the ship at the berth. It reflects the efficiency of cargo handling operations.
  Ship achievement is expressed in three different ways, depending on the time period used to measure the amount of cargo handled:

  - Tons handled per ship during working hours.
  - Tons handled per ship per hour at the berth.
  - Tons handled per ship per hour in the port.

- **Gang Achievement:**

  This is the average number of tons handled by a group of workers per hour.

2. Service Indicators:

Various indicators are used to measure the quality and level of service provided by a port to its clients. However, one key indicator is generally considered the most relevant — the **total time the vessel spends in the port**:

- **Waiting Time:**

The period between the ship's arrival at the port and its berthing at the quay. This time increases when no berth is available due to port congestion or when tidal conditions prevent berthing.

Waiting time can be reduced by improving the cargo handling rate, increasing the number of working days, and expanding the number of berths.

- **Berth Time:**

  The second component of a ship's total time in port is the duration spent at the berth — whether loading, unloading, or idle (no cargo operations).

  It is measured in hours or days. Reducing berth time depends mainly on two factors: (1) the type of vessel (old or modern, equipped or unequipped with cargo-handling gear), and (2) the type of cargo handled.

3. Utilization Indicators:

These provide a realistic measure of how effectively berth facilities and other port resources are used. The two most important indicators in this group are:

- **Berth Occupancy:**
  The proportion of time a berth is occupied by vessels.
- **Berth Working Time:**
  The proportion of a vessel's scheduled berth time actually spent on operations (loading/unloading).

4. Productivity Indicators:

While the previous three categories provide useful information for management systems, they do not directly measure the **efficiency** and **effectiveness** of berth operations.
Efficiency here refers to the ratio between the output achieved and the effort expended.
In ports, an appropriate measure of operational efficiency in cargo handling is the **cost per ton of cargo handled.**

Chapter Four : International Transport Documents

The international carriage of goods is evidenced and materialized through a transport document, which is generally prepared according to a standardized model for each mode of transport. A distinction is made between transport documents prepared by the carrier and those prepared by forwarding agents.

1. Bill of Lading (B/L – Le Connaissement)

Although maritime transport is one of the oldest modes of carriage, the use of Bills of Lading is relatively recent. In the past, the owner of the goods would accompany them from one place to another. This practice disappeared due to the lack of time on the part of traders. In its place, the carrier began issuing a receipt acknowledging the delivery of goods, known as the Bill of Lading.

Definition:
A Bill of Lading is a document or receipt issued by the maritime carrier, its agent, or the ship's master to the shipper or its agent. It evidences the receipt of the goods on board the ship and the carrier's undertaking to transport them to the agreed destination under the contract of carriage. It is issued in at least four copies: one for the carrier (shipowner), one for the shipper, one for the ship's master, and the original retained by the ship's agent at the port of issue.

According to Article 1(7) of the Hamburg Rules, a Bill of Lading is a document evidencing the contract of carriage by sea and the receipt or loading of goods by the carrier, who undertakes to deliver the goods against surrender of the document. Any statement therein regarding delivery of goods to order, under endorsement, or to bearer confers corresponding rights under the contract of carriage.

Note: A Bill of Lading differs from a Transport Invoice (Facture de transport), which is an accounting document indicating the various charges related to transport services (basic freight, service charges, surcharges, discounts, fines, document fees, etc.).

Contents of a Bill of Lading:

- Names and addresses of the shipping company, shipper, and consignee.
- Ports of loading and discharge.

- Ship's name, nationality, and tonnage.
- Serial number of the B/L and number of copies issued.
- Description of the goods shipped: quantity, type, weight, volume, distinguishing marks.
- Freight payable (whether fully on arrival or partially).
- Place and date of issue, and number of copies.
- Whether the carriage is on deck or below deck, if specified by the shipper.
- Date and signature of the maritime carrier or its representative (handwritten or otherwise).

Functions of the Bill of Lading:

- It serves as evidence of shipment of the goods, acknowledging receipt and stating their quantity and apparent condition on loading.
- It serves as evidence of the contract of carriage. Although this contract is consensual, the law requires written evidence through the Bill of Lading.
- It represents title to the goods, allowing the holder to dispose of them, including selling or pledging while at sea.

Evidentiary Value:

Between the carrier and the shipper, the B/L is prima facie evidence of its contents but may be rebutted by written proof (e.g., a letter of indemnity issued by the shipper to obtain a "clean" B/L). For third parties (consignees, insurers), the B/L constitutes conclusive evidence in their favor, reinforcing confidence and facilitating transfer of ownership while the goods are in transit.

Types of Bills of Lading:

- **Straight B/L:** Issued to a named person. Only that person may demand delivery.
- **Order B/L:** Issued to order or endorsement of a named person (shipper or consignee). Transferable by endorsement like a bill of exchange or cheque. Unlike negotiable instruments, however, order B/Ls require explicit mention of transferability.
- **Bearer B/L:** Issued "to bearer," transferable by delivery. Rarely used due to high risk of loss or theft.
- **Clean vs. Claused B/L:** A clean B/L contains no reservations or remarks as to the goods. If the carrier inserts reservations (e.g., "said to weigh…," "shipper's load and

count," or "weight unknown"), the B/L becomes a "claused" or "foul" B/L. Shippers may provide a letter of indemnity to obtain a clean B/L despite reservations.

Paramount Clause: If the shipper and carrier agree to apply the Brussels Convention of 1924 (Hague Rules), known as the Clause Paramount, it prevails over national law.

By Reference to the Goods:

- **Shipped B/L:** Confirms goods actually loaded on board.
- **Received for Shipment B/L:** Acknowledges receipt of goods for loading but not yet shipped. Common where immediate loading is not possible.

Electronic Bill of Lading:

The e-B/L mirrors the paper B/L but is transmitted electronically to an address designated by the shipper, together with a unique key (password) for subsequent transactions. The right of control can be transferred to a new holder, who receives a new key, thereby becoming the sole party entitled to claim delivery.

2. Air Waybill (AWB)

An AWB (La lettre de transport aérien – LTA) is effectively a "ticket" for carriage of goods by air. It is a receipt issued by an international airline evidencing acceptance and readiness to transport. It is not a document of title and therefore non-negotiable. Standardized by IATA's Cargo Services Conference under the Warsaw Convention (1929). The shipper is responsible for the data entered and receives the signed AWB before actual shipment.

It includes details such as:

- Shipper (sender) and consignee (receiver) information
- Description, quantity, and weight of the goods
- Flight details and route
- Terms and conditions of transport

The AWB is **non-negotiable**, meaning it does not represent ownership of the goods (unlike the Bill of Lading in maritime transport). It primarily facilitates **customs clearance**, **tracking**, and **proof of delivery**.

There are two main types:

- **Master Air Waybill (MAWB)** – issued by the airline to the freight forwarder.
- **House Air Waybill (HAWB)** – issued by the freight forwarder to the actual shipper.

3. CMR Consignment Note (Lettre de voiture)

The CMR note evidences the contract of international carriage of goods by road under the 1956 Geneva Convention (in force 1958). It comprises four copies (red for sender, blue for consignee, green for carrier, black for secondary carrier).

It serves as:

- **Proof of the contract of carriage** between the consignor (sender), the carrier, and the consignee (receiver).
- **Receipt of the goods** by the carrier.
- **Evidence of delivery** at the destination.

The document includes key details such as:

- Names and addresses of consignor, consignee, and carrier.
- Description, weight, and quantity of goods.
- Route, vehicle identification, and delivery instructions.
- Liability conditions according to the CMR Convention.

The CMR Note is **not a title of ownership** but ensures **uniform legal standards** and **carrier liability** across international road transport operations among member countries.

4. TIR Carnet (Carnet de Transit International Routier)

The TIR system under the 1975 UN Convention facilitates international transit by road under customs guarantee. The IRU is the only international body authorized to print and distribute TIR Carnets to national guaranteeing associations.

Each Carnet has a unique reference and contains vouchers (e.g., 4, 6, 14, or 20 pairs) usable for successive countries transited. Each Carnet is single-use and must be returned to the national association after completion for final control and archiving by the IRU.

The TIR Carnet serves as:

- **A customs guarantee document** covering duties and taxes during international transit.
- **A record of the shipment's route**, with vouchers (volets) stamped at each border crossing.
- **A unified control tool**, recognized by over 60 countries.

The system allows a **single customs inspection** at the point of departure and another at the destination, simplifying and accelerating international road transport.

6. CIM Consignment Note (Rail Transport)

The **CIM Consignment Note** is a **standard transport document** used in **international rail transport** under the **COTIF Convention** (Convention concerning International Carriage by Rail), particularly its annex known as **CIM (Uniform Rules Concerning the Contract of International Carriage of Goods by Rail)**.

It serves as:

- **Proof of the contract of carriage** between the shipper and the railway carrier.
- **Receipt for the goods** taken in charge by the rail company.
- **Evidence for delivery** at the destination station.

The CIM Note includes:

- Details of the consignor (sender), consignee (receiver), and rail carrier.
- Description, quantity, and weight of the goods.
- Route, wagon number, and border crossing points.
- Applicable liability and legal terms according to COTIF-CIM rules.

It is not a **document of title**, but it unifies procedures and legal responsibilities for **cross-border rail transport** among the member countries of the **OTIF (Intergovernmental Organisation for International Carriage by Rail)**.

7. Combined Transport Bill of Lading (CTBL)

The **Combined Transport Bill of Lading (CTBL)** is a **transport document** used when goods are carried by **more than one mode of transport** (e.g., sea, road, rail, air) under a

single contract of carriage.

It is typically issued by a **multimodal transport operator (MTO)** who assumes responsibility for the entire transport operation — from the place of receipt to the final place of delivery.

The CTBL serves as:

- **Evidence of a multimodal contract of carriage**.
- **Receipt of goods** by the MTO.
- **Document of title**, enabling transfer of ownership through endorsement (if negotiable).
- **Proof of delivery** at the destination.

It contains key details such as:

- Shipper, consignee, and MTO information.
- Description, weight, and quantity of goods.
- Means and route of transport across different modes.
- Liability clauses for each leg of the journey.

The CTBL harmonizes documentation for **intermodal logistics**, simplifies customs procedures, and ensures legal clarity regarding carrier responsibility throughout the transport chain.

8. Documents Issued by Forwarders

Documents issued by forwarders are transport and logistics documents prepared by freight forwarders — companies or agents who organize international shipments on behalf of exporters and importers.

These documents confirm receipt of goods, describe the transport arrangements, and often act as **evidence of the forwarding contract** between the shipper and the forwarder.

They are particularly useful when the forwarder consolidates cargo from multiple clients or manages **door-to-door transport services**.

The main types include :

1. **FCR (Forwarder's Certificate of Receipt)**

- Issued by the forwarder to confirm that goods have been received in good condition and are ready for dispatch.
- It is **not a document of title**, meaning it does not transfer ownership.

- It serves mainly as proof that the forwarder has taken responsibility for shipment arrangements.

2. **HAWB (House Air Waybill)**

- Issued by a forwarder to the shipper for **air freight**.
- Represents the agreement between the shipper and the forwarder, while the **MAWB (Master Air Waybill)** is issued by the airline to the forwarder.
- Used when multiple shipments are consolidated under one master air waybill.

3. **HBL (House Bill of Lading)**

- Issued by the forwarder for **sea freight**, similar to the HAWB but used in maritime transport.
- It may be **negotiable (transferable)** and serves as a **contract of carriage** between the shipper and the forwarder.
- The **Master Bill of Lading (MBL)** is then issued by the shipping line to the forwarder.

These documents ensure **flexibility, traceability, and control** in logistics operations and help forwarders manage complex multimodal shipments efficiently.

Chapter Five: International Packaging and Containers

Packaging represents the first thing a consumer encounters when becoming acquainted with a product and is the primary appearance of the commodity. Undoubtedly, distinctive, diverse, and high-quality packaging adds significant value to the product. Given the differences between countries in terms of social, cultural, and climatic characteristics, it becomes essential to pay attention to packaging policy. Despite the quality of local products, it is often difficult to market them in international markets due to a lack of good and acceptable packaging.

1. Importance of Packaging in International Trade and Marketing:

Good packaging, from the consumer's perspective, is packaging that provides safety, both during use and after use. Post-use safety is particularly important, as the disposal of packaging should not cause any effects or harm to aquatic life, plants, etc.

For the distributor, good packaging is packaging that performs important functions in international markets, similar to those performed by good packaging at the local level. For example, good packaging should not lead to poor utilization of shelf display space, should help display the product in stores in a way that allows the consumer to see and examine it, and should allow for easy pricing of the product. Packaging should also enable wrapping methods that reduce store losses due to spoilage or breakage. Attracting consumer attention to the product is one of the most important functions that good packaging must serve, helping to increase product turnover and profits.

Consequently, a number of factors compel a company to design packaging that suits the different conditions of international markets:

- Variations in climate and weather from one country to another;
- The nature of transport routes and the long distances between countries;
- The long period products spend on display shelves or in storage in distribution outlets and channels;
- Differences in average income from country to country, meaning the company may have to design different sizes of goods to suit income levels, thus varying the shapes and sizes of packaging;
- The growing trends towards green marketing and environmental protection, which compel the concerned company to choose packaging materials that are environmentally friendly.

2. Definition of Packaging and Its Levels

Definition of Packaging:

Packaging is defined as the process of designing and preparing containers or wrappings that enclose products and protect them during transportation, storage, handling, and display until they reach the final consumer.

Packaging is considered a fundamental element of the supply chain. Its role goes beyond mere protection of goods to include facilitating handling, transportation, and storage operations, as well as enhancing the product's image and marketability.

In other words, packaging can be described as **the art and science of protecting a product and presenting it in an appropriate form for marketing, transportation, and storage with efficiency and safety.**

Objectives of Packaging:

1. **Protection:** Safeguarding the product from external factors such as humidity, dust, shocks, or damage during transport and storage.
2. **Facilitation:** Enabling easier handling, transportation, and distribution.
3. **Storage:** Assisting in the organization of products within warehouses and optimizing space utilization.
4. **Marketing:** Attracting consumers and providing a positive image of the product.
5. **Information:** Displaying data related to the product, such as production date, weight, ingredients, and usage instructions.

Levels of Packaging:

Packaging is generally divided into **three main levels** depending on its position in the supply chain and its function:

- ***Primary Packaging:***

This is the immediate container or wrapping that directly encloses the product and provides the main protection.

Examples include: a water bottle, a medicine blister pack, or a chocolate wrapper. **Function:** Protecting the product, preserving its properties, and ensuring its hygienic safety.

- ***Secondary Packaging:***

This level groups several units of primary packaging together.

Examples include: a carton containing multiple water bottles or boxes of medicine. **Function:** Facilitating handling and transportation, and providing additional protection for primary packaging.

- ***Tertiary Packaging:***

This level consolidates several units of secondary packaging into larger units used for transportation and storage.

Examples include: stacking cartons on pallets and wrapping them with plastic film. **Function:** Ensuring efficient and safe shipping and distribution over long distances.

3. **The Global Packaging Industry**

Table (6) : **The Global Packaging Industry**

Indicator	**Value / Rate**	**Source**
Global packaging market size in 2025	**USD 1.18 trillion**	Mordor Intelligence
Projected market size in 2030	**USD 1.44 trillion**	Mordor Intelligence
Global compound annual growth rate (CAGR) 2025–2030	**~3.92%**	Mordor Intelligence
Share of plastic materials in the 2024 market	**~42.12%**	Mordor Intelligence
Flexible packaging growth rate (CAGR)	**~4.88% by 2030**	Mordor Intelligence

Market share by end use – Food sector	**~28.54%** (2024)	Mordor Intelligence
Market share by region – Asia-Pacific	**~40.18%** (2024)	Mordor Intelligence
Fastest-growing region	**Middle East & Africa (~4.84% CAGR)**	Mordor Intelligence
Industrial packaging market size (2024)	**USD 74.94 billion**	Fortune Business Insights
Industrial packaging market forecast (2032)	**USD 114.54 billion**	Fortune Business Insights
E-commerce packaging market size (2023)	**USD 78.33 billion**	Grand View Research
Projected size in 2030 (E-commerce packaging)	**USD 235.84 billion**	Grand View Research
E-commerce packaging CAGR (2023–2030)	**~17.1%**	Grand View Research
Global packaging units	From **3.7 trillion units (2018)** to **4.1 trillion (2023)**, expected **4.5 trillion (2028)**	Research & Markets

Analytical Commentary on the Table

- ✓ **Market Size and Growth:**

The global packaging market demonstrates steady expansion, expected to reach **USD 1.44 trillion by 2030**, with an annual growth rate of approximately **3.92%**. This indicates a mature yet resilient industry that continues to evolve in response to new market needs and sustainability trends.

- ✓ **Material Composition:**

Plastics remain dominant, accounting for around **42%** of all packaging materials. However, environmental concerns are prompting a gradual shift toward sustainable and recyclable alternatives.

- ✓ **Flexible Packaging Boom:**

Flexible packaging shows faster growth (**~4.88% CAGR**) due to its cost efficiency, lighter weight, and suitability for e-commerce logistics. It offers reduced material use and improved transport convenience.

- ✓ **Sectoral Distribution:**

The **food industry** represents the largest end-user segment, consuming roughly **28.5%** of global packaging demand. This highlights the centrality of food safety, shelf life, and branding in packaging innovation.

- ✓ **Regional Distribution:**

The **Asia-Pacific region** leads the global market, holding more than **40%** of total share, driven by rapid industrialization, population growth, and expanding consumer markets. Meanwhile, the **Middle East and Africa** regions are projected to record the **highest growth rate (~4.84%)** as logistics infrastructure develops and consumer markets expand.

- ✓ **Industrial and E-Commerce Packaging:**

Industrial packaging is projected to grow from **USD 74.9 billion (2024)** to **USD 114.5 billion (2032)**, reflecting increased manufacturing and export activity.
E-commerce packaging is experiencing **the fastest growth**, expanding at a rate of **17.1% CAGR**—driven by the global surge in online shopping and the need for durable, lightweight, and sustainable shipping materials.

- ✓ **Global Packaging Units:**

The number of packaging units worldwide is increasing steadily—from **3.7 trillion in 2018** to a forecasted **4.5 trillion by 2028**—reflecting rising global consumption and the diversification of packaged goods.

- ✓ **Sustainability Trends:**

Across all regions, there is a strong shift toward **eco-friendly packaging**, the use of biodegradable materials, and innovations in recycling technologies. Companies are increasingly investing in circular economy practices to reduce waste and carbon emissions.

- ✓ **Sustainability Orientation:**

There is a strong global trend toward **sustainable packaging**, emphasizing the use of **recyclable materials** and the **reduction of plastic consumption**. This shift is driving companies to adapt their operational and production practices. (*Source: Mordor Intelligence*)

- ✓ **Growth of Flexible Packaging:**

Flexible packaging is expanding rapidly due to its **material efficiency** and the growth of **e-commerce**, which requires **lightweight and adaptable packaging solutions**. (*Source: Mordor Intelligence*)

- ✓ **E-Commerce as a Major Growth Driver:**

E-commerce has become a powerful engine of growth for the packaging industry, increasing demand for **shipping and intermediate packaging** to ensure the safe delivery of goods. (*Source: Grand View Research*)

- ✓ **Regional Differences:**

Significant **regional disparities** exist: the **Asia-Pacific region** leads the market in overall size, while the **Middle East and Africa** are projected to record the **highest growth rates** in the coming years.
(*Source: Mordor Intelligence*)

4. **Containers and Their Place in International Transport**

Container transport holds the largest share of global cargo shipping, due to the service it provided to the transport system represented by door-to-door transport, which allows the maritime carrier complete control over the goods through all stages of their movement between geographical locations and different transport modes. Thus, containers became the optimal

means for international multimodal transport, and container ships became the main means of transport on sea voyages.

Container transport was a revolution in the transport industry that occurred in the early 1960s and had its impact on the maritime transport industry worldwide. Containers brought about significant changes in the design of ships, cranes, ports, and operations, as well as influencing commercial practices. They also enhanced the growth of combined transport operations, which had an impact on roads, trucks, railways, logistics, and distribution services to and from the port.

- **Definition of a Container:**

Definition according to the 1972 Geneva Convention on Container Safety: "A container is an article of transport equipment suitable for repeated use, of a durable character sufficient to withstand handling in ports and on ships, designed specifically to facilitate the transport of goods by one or more modes of transport without intermediate reloading, and to be stabled and/or handled quickly, equipped with devices inherent for these purposes."

Definition by the International Container Bureau (BIC): "A container is a receptacle designed to contain loose or lightly packaged goods intended for transport without intermediate handling or interruption in shipment."

- **The Origin of Containers:**

The idea of the "container" was born in the 1950s in the United States of America by **Malcom McLean** (November 14, 1913 - May 25, 2001), the owner of a domestic transport company. His experience and interests in this field led him to realize that goods could be transported from the source to the customer faster and at a lower cost if loading and unloading processes were shortened. He found that this could be achieved by loading many goods of different sizes and types into a large box that could accommodate them (the container), thus saving the handling of a large number of parcels and the use of a large workforce.

From here, container transport began to develop significantly, but it was limited to transport from the loading port quay to the arrival port quay, i.e., only the sea transport phase. However, the real renaissance of container use did not begin until the early 1960s, in response to the needs of international trade. Containerization helped conclude door-to-door contracts, which positively impacted international trade.

Its use in maritime transport further developed in 1964 when the Australian Shipping Company operated a specialized container ship named *Kooringa* between the ports of Melbourne and Fremantle. Then, in 1965, Sea-Land Service announced its entry into transatlantic trade with container-carrying ships, each capable of carrying 1,261 containers. These ships are widespread today, as they combine the advantages of containers with the modern technology found in this type of ship, especially regarding loading and unloading operations.

- **Types of Containers:**

They vary according to the type of goods to be transported, as well as the technical specifications of the container in terms of foundations and the type of materials used. They can be divided into:

a) General Cargo Containers: These are containers not made for a specific type of goods. They are subdivided into types based on container foundations and methods of access for stuffing and stripping. The most important include:

- **General Purpose Containers:** Fully enclosed containers with solid roofs and sides. At least one of their sides has a door and they are designated for transporting various types of goods, i.e., dry or liquid goods when packed in cartons, metal, or plastic containers.
- **Open-Top Containers:** Containers similar to general purpose containers except for having a removable and transferable roof made of fabric or plastic, which can be fixed to the four sides of the roof. This type is used for transporting very heavy or large-volume goods, as well as for shipping goods that can only be lifted by overhead cranes.
- **Bulk Cargo Containers:** For goods like flour, grains, etc. The container is filled and emptied through a special hatch by gravity, tilting, or air pressure.
- **Platform (Flatrack) Containers:** These are flat without side walls, hence called *plateforme*, but they have the same length and width as standard containers and are equipped with corner fittings to enable handling, and sometimes with wheels to allow rolling for loading, unloading, and stacking on port quays. They are used for transporting heavy equipment.
- **Open-Side Containers:** These are characterized by having only front and rear walls, but with open sides, hence called *flat containers*. They are used for transporting heavy equipment.
- **Garment Containers:** Equipped with hangers, ropes, and clips for hanging clothes using hooks. Designed specifically for transporting luxury ready-made garments and formal suits.

- **Ventilated Containers:** Have openings that ensure adequate airflow inside the container when the vehicle is moving. Used for transporting and storing fresh fruits and vegetables.

b) Special Cargo Containers: These are containers with special design and equipment. Their shapes vary according to the type of goods they are used to transport. Among them:

- **Insulated Containers (Conteneur Isotherme):** Have insulated sides, floors, and roofs to reduce heat exchange between the inside and outside of the container. Used for transporting refrigerated or frozen goods, as well as goods and materials sensitive to temperature. In this type, the walls are insulating without a refrigeration unit.
- **Refrigerated Containers (Conteneur Frigorifique):** Equipped with a refrigeration unit that maintains cold at a specific level. Used for transporting meat and fish.
- **Tank Containers (Conteneur-Citerne):** Used for transporting oils, acids, or for transporting compressed or liquefied gas. They are often in the form of sealed metal tanks.

5. **International Agreements Related to Containers**

a- The 1972 Geneva Convention: This is an agreement concerning container safety, concluded on December 2, 1972, and entered into force on September 6, 1977, at the level of the Customs Co-operation Council (CCC). This convention aims to facilitate international transport by containers. For this purpose, it sets standards for container manufacturing, defines the approval system, as well as facilities for temporary admission and repair of containers. Accordingly, containers that meet the conditions specified in the convention benefit from approval for transporting goods under customs seal.

b- The Istanbul Convention on Temporary Admission: Concluded on June 26, 1990, under the auspices of the Customs Co-operation Council. Its primary objective is to simplify and harmonize customs procedures, particularly by establishing a unified international document that combines all existing agreements on temporary admission. Among the rules set by this convention that concern containers is the temporary admission of containers for transporting goods within the customs territory without paying customs duties and taxes and without providing guarantees, provided they meet the conditions specified in this convention, such as markings, the necessity of approval, and others.

6. **Container Sizes**

In maritime shipping and intermodal logistics, **container sizes** refer to the standardized dimensions of freight containers used to transport goods efficiently across ships, trucks, and trains. These standards ensure compatibility of loading, stacking, handling, and intermodal transfer without needing to unload cargo.

Containers that comply with international norms are often called **ISO containers**, conforming to standards such as **ISO 668** which classifies their sizes, dimensions, and ratings.

Containers vary in length, width, height, and specialized form (e.g. "high cube", refrigerated, open-top). The most common lengths are **20 feet** and **40 feet**, with a standard width of **8 feet**. The standard heights are typically **8 ft 6 in** (≈ 2.59 m) or a "High Cube" version of **9 ft 6 in** (≈ 2.89 m).

Capacity is often expressed in terms of **TEU** (Twenty-Foot Equivalent Unit), meaning a 20-foot container counts as 1 TEU.

Containers may also be categorized into **special types**, such as reefers (refrigerated), flat racks, open-top, or tank containers, depending on cargo requirements.

Standard Container Dimensions (Table)

Below is a simplified table summarizing common container sizes and their external dimensions, along with comments.

Table (7): Standard Container Dimensions

Container Type	**External Dimensions (Length × Width × Height)**
20-ft standard	20 ft × 8 ft × 8 ft 6 in (≈ 6.06 m × 2.44 m × 2.59 m)
40-ft standard	40 ft × 8 ft × 8 ft 6 in (≈ 12.19 m × 2.44 m × 2.59 m)
40-ft High Cube	40 ft × 8 ft × 9 ft 6 in (≈ 12.19 m × 2.44 m × 2.89 m)
45-ft High Cube	45 ft × 8 ft × 9 ft 6 in (≈ 13.72 m × 2.44 m × 2.89 m)

sources: The ISO standard **ISO 668** classifies containers by "series 1" dimensions, defining their nominal lengths, widths, heights, and maximum weights. Additional resources list external dimensions of 20-ft and 40-ft units, as widely used in shipping.

- The **ISO 668 standard** plays a central role in ensuring containers are interoperable globally by standardizing their dimensions, permissible stacking, and load ratings. Container height variants, especially **High Cube** types, enable greater internal cargo volume, which is beneficial for lighter but voluminous goods.
- In practice, about **90% of global container stock** is composed of standard dry freight 20- and 40-foot units.
- For capacity measurement, the TEU unit allows aggregation of different container sizes under a common metric.
- Besides the standard dimensions, specialized containers (reefer, open-top, flat-rack, etc.) are designed to meet specific cargo requirements (temperature control, oversized loads, etc.).

Table (8) : Specialized Containers

Type	**Description / Use**
Reefer Container	Temperature-controlled, used for perishable goods (food, medicine).
Open-Top Container	Without a fixed roof, suitable for oversized cargo.
Flat-Rack Container	With collapsible sides, for machinery or heavy equipment.
Tank Container	For transporting liquids or gases.
Ventilated Container	Used for products that require air circulation (e.g., coffee, cocoa).

Source : https://dcsa.org/newsroom/shipping-container-types-a-guide?utm_source=chatgpt.com
https://www.container-xchange.com/blog/container-types-and-dimensions/?utm_source=chatgpt.com
https://us.kuehne-nagel.com/en/-/overview-of-the-different-container-types-and-sizes?utm_source=chatgpt.com

7. Advantages of Containers

Numerous, which explains the huge expansion of their use after World War II. Among these advantages are:

- Better protection of goods from damage and theft, leading to a reduction in cargo insurance costs.
- Speed in handling (loading and unloading), storage, and savings in packaging materials.

Disadvantages of Containers: Despite the many advantages, their use is not without drawbacks, the most important of which are:

- The high cost of purchasing containers and the high cost resulting from the necessity of returning empty containers.
- The constant need for periodic maintenance (repainting, rust removal, etc.) or repairs (sides, door locks, spare parts, etc.).
- The standardization of container dimensions negatively affects the shipping of some goods that cannot be transported in standard containers.

Chapter Six: Transportation Costs

Transportation cost is not merely the price paid by a company for the service. The actual cost can far exceed just this price, as the cost of using a transport mode is a base cost according to distance and load, plus any additional cost for any extra services provided by the carrier. These include the cost of handling and loading services in the shipping area, the cost of handling and unloading at receiving points, the cost of packaging, preparing, and readying goods for shipment, in addition to the cost of a very important element: insurance on the shipments.

Transportation costs range between 5% and 15%[33] of the total cost of products, depending on the type, and they constitute approximately half of the total supply costs. Therefore, they are among the most important factors in determining the locations of production, storage, and sales points. According to the industrial location theory of the German economist Alfred Weber (1909), there are three economic variables for determining industrial locations: transportation costs, labor costs, and the benefits arising from industrial concentration.

1. The Economic Characteristics of Transportation

These are characteristics that distinguish the supply and demand in transport services and affect its costs, including:

a. **Perishability of the Transport Product:** The transport product, which is the produced carrying capacity, cannot be stored or its use postponed. It is consumed as soon as it is produced, whether utilized or not. Therefore, it is impossible to operate only a part of a truck or a ship when there isn't enough cargo to transport. In other words, if an airplane or truck departs with half its seats or cargo capacity empty, the lost productive capacity is gone forever and cannot be sold later.

This creates significant pressure on transport companies to achieve the highest possible load factor. This explains dynamic pricing systems, such as last-minute offers and discounts to stimulate demand and fill empty capacity. Any error in estimating the quantity, type, or timing of transport demand means a loss for the company due to the waste of part of the transport product that cannot be stored unsold. Since the operating costs of a transport vehicle are largely fixed, whether there is a load or not, determining the size of the transport vehicle is crucial. And

[33] **CSCMP**

since the transport product cannot be stored until demand appears, the importance of timely production of transport is evident; production must occur immediately upon the need for consumption, unlike other industries where a factory produces and stores until demand arises.

b. **Derived Demand for Transport:** Meaning that the demand for transport is not for its own sake like consumer goods, but rather a demand to fulfill other different needs. A traveler's demand for transport is to meet needs such as commuting to work and back or tourism. Even in the realm of goods, the demand for transport by companies is to meet needs for various materials or to distribute products in markets. Therefore, transport companies must study the demand for services and goods to deduce the demand for transport.

   The price of the transport service may be linked to the demand for the transported goods and the final selling prices of those goods. The difference between the price of a commodity at the production site and its price at the consumption site is a fundamental factor in determining the price of the transport service, regardless of the transport cost. Added to this is the extent of competition between transport modes. For example, if there is more than one mode of transport, this puts downward pressure on transport prices, and vice versa. From this, we find that demand conditions, or what the goods can bear in terms of costs, is an influential factor in freight pricing. This means that fluctuations in transport demand follow fluctuations in general economic activity. During recessions, demand for transport decreases, while it increases during booms.

c. **Volatility in Transport Demand (Seasonality):** Demand rates for freight transport services are generally characterized by volatility. Demand for travel rises during summer and weekly holidays and occasions (Hajj, New Year's celebrations...). Demand for crop transport increases during harvest time, and demand for transporting gas and petroleum products increases in winter. This volatility causes transport companies a sharp decline in revenues during off-peak periods and a loss of shipping opportunities during peak periods.
d. **High Fixed Costs, Low Variable Costs:** Transport costs are characterized by high fixed capital costs, which can be several times the variable costs, due to the massive infrastructure projects required for transport that last for several years, such as airports, ports, railways, in addition to the cost of transport means like airplanes, ships, trains, and supporting facilities like fuel stations, loading/unloading equipment, and maintenance facilities. This encourages the achievement of economies of scale, where increasing the number of users (or passengers or goods) leads to a decrease in the average cost per unit, making large companies more efficient.

e. **Achieving Social Returns:** Many projects yield not only direct returns but also a large set of social returns. Transportation is distinguished by the fact that its returns are not just the revenues and net profits from transport operations; there are also indirect returns achieved through the complementary works and services that transport requires. Building a road leads to an increase in the prices of land located on both sides of the road. Operating a passenger transport terminal benefits not only the passengers but also – and perhaps to a greater degree – the commercial shops and apartment owners near the station and parking lots. Factories benefit from transport means passing nearby through the arrival of workers and customers. The absence of such services forces factories to provide means of transport for workers and goods, incurring additional costs. In the interest of fairness, the cost of transport should be borne by its beneficiary, and it is clear that transport users are not the only beneficiaries, which raises the issue of identifying all beneficiaries of transport and the extent of each one's benefit.

f. **Inherently Monopolistic Nature of Transport:** Competition in transport often has negative effects on transport companies. For example, limited cargo and competition between transport modes will lead to the division of cargo among several carriers, meaning each carrier transports a specific quantity that is less than its capacity. This, of course, will increase costs. Since a large proportion of transport costs are fixed (e.g., railways require huge sums to build lines and stations), competition in rail transport would only multiply costs, which is why governments often grant railway companies a monopoly on transport between two cities (competition is absent).

   Monopoly in transport allows for price discrimination based on the passenger's or cargo owner's ability to pay and according to the availability and changes in demand. Price discrimination can be applied to passengers, for example, based on high or low income, peak or off-peak times. For instance, a monopoly allows a transport company to lower freight rates for large-volume, low-value goods like iron ore and cotton, compensating for the loss by raising freight rates for finished products with small weight and high value like watches and clothing. Price discrimination is an advantage of rail transport, which is organized on a monopolistic basis in almost all countries.

   Usually, price discrimination in transport does not affect the cost of the goods discriminated against, especially since they are often high-value goods (transport cost is low compared to their value), or they are luxury goods satisfying non-essential needs. It also does not affect the individuals, goods, or areas discriminated against due to their ability to pay. Furthermore, price

discrimination may be desirable for some people due to their desire for distinction, and it allows for regular transport services regardless of the volume of demand.

g. **Transport Generates Externalities (les externalités):** Externalities occur when an economic agent's activity negatively/positively affects another unrelated economic agent, without the latter receiving/paying for the damage/benefit incurred. The negative externalities of transport include: costs of road maintenance borne by the state, costs of air pollution caused by carbon emissions, costs of social security due to respiratory diseases and traffic accident injuries, time wasted due to congestion, anxiety resulting from noise and environmental degradation. Transport systems were responsible for 23% of global greenhouse gas emissions in 2004, with about three-quarters from road vehicles. Furthermore, 95% of the energy for operating transport means comes from oil.

   Many countries (Western Europe and the United States) are moving towards making public transport almost free or completely free on metro, train, and bus lines within capitals and major cities, while loading the costs of this transport onto other benefiting parties in the form of taxes and fees, in addition to fines on private transport means.

h. **Multimodalism:** The transport of goods or passengers often involves more than one mode of transport (e.g., truck, then ship, then train). True efficiency lies in the seamless integration of these modes. This has led to the emergence of concepts like Intermodal Transport and logistics, which aim to improve the efficiency of the entire supply chain.

   The aforementioned characteristics make the transport industry one of the most challenging to manage and organize, due to the multiplicity and overlap of variables affecting its management, the high-level managerial and technical expertise required for its operation, the continuous financial liquidity needed to provide spare parts and other operational necessities, continuous and emergency maintenance, and the replacement processes required for transport means to keep pace with development and modernization in this field.

2. Classification of Transport Costs:

There are several classifications for transport costs, the most important of which is dividing them into capital and operational costs, or into fixed and variable costs, direct and indirect costs. However, the most commonly used is the division into fixed and variable costs:

- **Fixed Costs:** These are expenses not related to the quantity of operational activity (transporting goods and passengers). The transport company incurs them whether the transport vehicle makes trips or not, moves loaded or empty, the load is full or only partial. Therefore, fixed costs only change with a fundamental change in activity. They include: depreciation of transport infrastructure (construction of ports, stations, airports, railway lines, roads, pipelines), depreciation of transport equipment (ships, airplanes, trucks, railway wagons and locomotives), insurance, administrative expenses, etc.
- **Variable Costs:** These are directly linked to the utilization and use of the transport vehicle. They increase with increased transport activity. They include: wages for truck and train drivers, salaries for aircraft and ship crews, fuel and oils, batteries, tires, repairs and maintenance and spare parts, drivers' wages (the variable part thereof), fines, fees for ports, airports, stations, and highways in some countries.

Some modes of transport are characterized by the majority of costs being fixed and a small portion being variable. This applies perfectly to rail transport. The opposite is true for trucks on roads, where we find that the majority of costs are variable. On the other hand, we find that most costs for pipeline transport are fixed. As for maritime and air transport, the proportion of variable and fixed costs is almost equal. The enormity of fixed costs compared to variable costs in transport justifies reducing freight rates in the case of large shipments.

3. The Fundamentals of Freight Pricing

Freight pricing is not a single, fixed cost but a dynamic calculation based on the balance of supply and demand, plus a complex set of operational expenses and external factors. To understand how a price is determined, it's essential to break it down into its core components and influencing factors.

- Core Components of a Freight Quote (The Building Blocks)

The final price is a sum of the following elements:

A. Base Freight Rate

- The core cost of transporting the goods from origin port to destination port.
- **How it's set:** This is the most volatile component and is heavily influenced by **market conditions** (demand for space vs. available container supply).

B. Fuel Surcharge (Bunker Adjustment Factor - BAF)

- A variable surcharge to cover fluctuating fuel costs for the vessel.
- **How it's set:** Directly linked to global oil prices. It increases when fuel prices rise and decreases when they fall.

C. Currency Adjustment Factor (CAF)

- A surcharge applied to compensate carriers for exchange rate fluctuations, especially if contracts are in a currency different from the carrier's operating currency (e.g., contracting in USD while costs are in EUR or JPY).

D. Terminal Handling Charges (THC)

- Fees levied by ports for the loading, unloading, stacking, and moving of containers within the terminal area. There is typically a THC at the origin port and another at the destination port.

E. Trucking / Haulage Fees

- The cost of transporting the cargo from the warehouse/factory to the port of loading (origin haulage) and from the port of discharge to the final warehouse (destination haulage).

F. Customs Clearance Fees

- Fees for the customs broker or freight forwarder to prepare documentation and clear the goods through customs for export at origin and import at destination.

G. Other Surcharges and Fees:

- **Peak Season Surcharge (PSS):** Applied during high-demand periods (e.g., before holidays) when cargo volumes are at their highest.
- **Congestion Surcharge:** Applied when ports are severely congested, causing delays for vessels.
- **Security Fee (e.g., ISPS):** To cover the costs of enhanced port security measures.
- **Bill of Lading (B/L) Fee:** A fee for issuing the Bill of Lading, the core shipping document.

- Key Factors Influencing Price Levels (Supply & Demand)

These are the factors that cause prices to rise or fall dramatically:

A. Supply and Demand Balance:

- **Supply:** The number of container ships and available space on them (vessel capacity).
- **Demand:** The volume of goods that need to be shipped by customers.
- **Seasonality:** Prices spike sharply during **peak season** (typically August-October) when shipping volumes increase ahead of holiday seasons.

B. Operational Costs:

- **Fuel Prices:** The single largest cost factor.
- **Crew wages.**
- **Vessel and port maintenance costs.**
- **Regulatory compliance costs and taxes.**

C. Geopolitical and Logistical Factors:

- **Port Congestion:** As seen in the Suez Canal blockage or during the pandemic at ports like Los Angeles and Shanghai.
- **War & Conflict:** Disrupting major shipping lanes.
- **Access to Waterways:** Increased costs when transiting canals like the Panama or Suez Canals.
- **Trade Policies and Tariffs.**

3. Pricing Methods: FCL vs. LCL

The pricing structure differs based on how much space you use:

- **FCL (Full Container Load):** You pay a **fixed price for the entire container**, regardless of how full it is (up to its weight limit). This is cost-effective for large shipments.
- **LCL (Less than Container Load):** You pay per **cubic meter (CBM)** or per ton (1,000 kg) for the space your cargo occupies inside a container shared with other shippers. LCL is more expensive per unit of cargo than FCL.

The "Freight All Kinds" (FAK) Rate: Many carriers offer an FAK rate, which is a single price for a container (FCL) that can be used for various types of standard, non-hazardous cargo.

In essence, freight pricing is built by **adding up the core costs and surcharges**, which is then **adjusted up or down** based on the fundamental forces of **supply and demand** in the

market. To secure the best price, shippers must understand these components, plan ahead to avoid peak seasons, and obtain all-inclusive quotes from their logistics partners.

Conclusion

In conclusion, the intricate world of global supply chains and international transport is far more than a mere support function for trade; it is the very backbone of the globalized economy. As this course has detailed, from the foundational concepts of logistics and Supply Chain Management (SCM) to the critical operational details of transport modes, documentation, and costs, mastering this field is essential for any entity aiming to compete and thrive in the international arena.

The journey through the chapters underscores a central theme: **integration**. The evolution from managing isolated logistical activities to overseeing integrated supply chains highlights the necessity of seamless coordination between all partners—from raw material suppliers to end consumers. This integration, facilitated by robust information systems and strategic relationships, is paramount for achieving efficiency, resilience, and customer satisfaction.

Furthermore, the strategic selection of transport modes and the effective use of intermodal solutions, such as multimodal transport and dry ports, are not merely tactical decisions but core strategic imperatives. They directly influence a company's cost structure, market reach, environmental footprint, and ability to deliver on its promises. The supporting pillars of this system—international documentation, specialized packaging, and sophisticated cost structures—are not bureaucratic formalities but essential enablers of smooth, secure, and accountable global trade.

As future leaders in International Finance and Trade, the knowledge encapsulated in this document provides you with a critical lens through which to view global commerce. Understanding the flow of goods is inextricably linked to understanding the flow of capital and information. The challenges and opportunities of the future—from geopolitical shifts and digital transformation to the urgent need for sustainable and resilient supply chains—will require professionals who can navigate this complex, dynamic, and indispensable landscape with expertise and strategic vision. The efficient management of global supply and transport is, and will remain, a definitive source of competitive advantage in the 21st century.

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