

A Study on General Warehouse Operation with Reference to the Contiship Logistics (Pvt) Ltd

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ABSTRACT

One of the main components of the logistics industry is general warehousing, which also represents one of the foundations of international trade. In its capacity as a facilitator of products being sent from a supplier to a consumer on a worldwide scale, warehousing forms an integral part of the global supply chain. This paper seeks to examine the various operational components associated with general warehousing, as well as the impact of these components on the success of global businesses; therefore, through the analysis of a case study on an integrated logistics firm specializing in freight forwarding (import/export) and supply chain operations based out of Chennai, India, this paper will demonstrate how successful global businesses have operated and can operate by utilizing the successful use of warehousing and logistical systems. The method of research employed in this paper consists of both descriptive and quantitative analyses and relies on both primary data (via direct observations) and secondary data (from previously published literature). The major operational activities/building blocks of warehouses identified through this research were as follows: receiving, inspecting, storing, inventory management, order processing, and shipping. Results indicate that operational inefficiencies are the result of limitations imposed by space constraints, reliance on manualization of operations, and insufficient interdepartmental cooperation in terms of the analysis of performance measures. The researcher recommends that warehousing firms invest in the acquisition of warehouse management systems (WMS), the implementation of lean methodology (e.g., 5S) as an approach to maximizing available resources, and the use of best practice techniques to improve warehouse operational performance and effectiveness.

Keywords: *General Warehouse Operation, Contiship Logistics (Pvt) Ltd*

LOGISTICS AND SUPPLY CHAIN NETWORKS

The logistics and supply chain networks are an important part of trading and industry that our world relies on today. Many actions are taken in order for a product to be delivered to the end user; therefore an entire supply chain of steps must be made to ensure the product is moved, stored, handled, packaged, inventoried, and any other form of activity related to transportation of products between two locations where logistics provides a type of efficiency

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in the flow of goods from their source, or origin, to their destination, or end-user, as well as providing minimal costs associated with moving the goods along the supply chain from their source to their destination, therefore logistics is a way to connect suppliers or manufacturers, along with distribution, retailing, and the end-user for products through a comprehensive system of companies that provide the products to their final customer in a timely manner, and make those products readily available when needed, through the establishment of a transportation network.

Warehousing plays an important role in logistics. General warehouses will support international businesses by providing storage facilities, handling operations and moving of goods across borders, and are considered an essential part of the movement of goods in both international and domestic markets. With the growth of global trade, the efficiency with which warehouses operate have become key metrics of supply chain effectiveness, as well as elements that influence the ability for a business to remain competitive with other businesses.

This research will be conducted within a logistics and supply chain company that handles freight forwarding and integrated supply chain services that are located in Chennai, India, as defined in the Companies Act. The Chennai area has the largest port in India and is one of the major centers for exports related to chemicals, automotive and textile.

Logistics and supply chain management are key components today of trade and industry. Product delivery to a customer encompasses many steps including transportation, storage, handling, packaging, inventory control and management of the information surrounding all these activities - all components of logistics. The purpose of logistics is to ensure a smooth, efficient flow of products from point of origin to final delivery at the lowest possible price. Logistics is how manufacturers connect with suppliers, distributors, retailers and ultimately consumers through an organized manner of operations that provide timely delivery and product availability.

Warehousing plays a critical role in the logistics function. General warehousing operates as support systems for international businesses; providing storage, handling and distribution services that facilitate international and domestic movement of goods. As the volume of international trade continues to escalate at a rapid pace, warehouse operating efficiencies will continue to be strong indicators of supply chain performance and therefore very important in determining the competitiveness of businesses.

This study is focused on a freight forwarding and integrated supply chain company doing business in Chennai, India, incorporated under The Indian Companies Act. Chennai is one of the major International Ports in India which serves as a centre of export and also has very large export volumes of chemicals, automotive products and textiles.

Objectives of the Study

Primary Objective

- To study the operational aspects of general warehouses and their role in international business.

Secondary Objectives

- To understand the concept and functions of general warehousing.
- To analyse key warehouse operations involved in international trade.

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- To examine the importance of warehouse efficiency in global supply chain management.
- To identify operational challenges faced by general warehouses.
- To suggest measures for improving warehouse operational efficiency in international business.

Need of the Study

Reasons for Conducting the Research

As global trade has expanded, logistical & supply-chain activity has become far more complex, increasing the need for efficient warehouse operations as operational support systems within the current global business environment. Warehousing is an essential part of supporting international businesses as it provides points for the storage and handling of products, ultimately enabling the storage, handling & transportation of product as well as facilitating the flow of product across the borders of countries. This research project seeks to identify how the operation of general warehousing supports global trade and supports supply chain management, as well as to explore how the operation of warehousing can support the ongoing reduction of logistics costs and the time from order to delivery of a product. The project will help to identify operational issues that adversely affect the efficiency of warehousing operations, evaluate the impact of warehousing operations upon inventory control methods and customer satisfaction, provide an overall understanding of the need for the systematic management of warehousing operations in an increasingly competitive global marketplace, and provide an in-depth understanding of the strategic importance of general warehousing to the operation of international business.

It is expected that this research will provide useful information to assist organizations as they seek to enhance their operational efficiency through general warehousing.

Ultimately, it is expected that this research will assist organizations in the quest for improved operational performance in general warehouse operations, as well as provide them with an understanding of how general warehouses provide strategic support for international business; thereby, improving the efficiency of their warehouse operations, enhancing the performance of their supply chain, and supporting the sustainable development of international trade.

Scope of the Study

This paper is about the operation of general and forward warehousing and the role of general and forward warehousing in providing business efficiencies and effectiveness to international businesses. The following are the purposes of this research.

- First, investigate the definition and significance of general and forward warehousing operations in relation to international businesses.
- Second, examine the different types of operational activities performed, such as receiving, inspecting, storing, controlling inventory, order picking, and shipping.
- Third, analyse the role of general and forward warehousing to facilitate the conduct of international trade through changing the movement of products at their production facility (import) and also by changing the shipment from an international production facility to the port of destination (export).
- Fourth, investigate general warehousing and its role as a component in the global supply chain.

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- Fifth, evaluate the different methods to handle materials within the general warehousing environment as well as evaluating the different technologies used within the warehouse operation.
- Sixth, identify the various operational obstacles and challenges affecting general/forward warehousing operations.
- Seventh, limit the analysis to operational aspects with no detailed financial or legal analysis.
- Lastly, most of this study is based on secondary data as it relates to international business and logistics, and some areas were supplemented with a case study.

Statement of the Problem

To achieve optimal results for the global supply chain, global supply chain will rely on the efficiency of international warehousing facilities. If an international warehouse does not operate efficiently, it can create many inefficiencies throughout the global supply chain, which negatively impacts overall performance and can have a significant impact on logistics | operations as well. The most common operational inefficiencies found in warehousing are unsatisfactory storage space, excessive reliance on manual order processing, inadequate inventory control and management systems; delays in the operational cycle (i.e., peak activity) and poor integration of technology. All of these issues ultimately contribute to higher logistics costs & a decline in the reliability of service.

Other operational limitations affecting supply chain logistics companies are delays in the transportation of cargo; inconsistent inventory levels; inefficient use of warehouse space and the inability to efficiently coordinate and integrate transport and warehousing operations. A lack of an efficient WMS system increases the time it takes to process orders, resulting in inaccurate inventory information and an organization's inability to compete effectively with their service levels meeting customer expectations

REVIEW OF LITERATURE

1. Janka Saderova (2021) Two racking systems were compared and contrasted—a standard pallet rack with wide aisles and a dynamic flow pallet rack—for three separate evaluations: (1) capacity (square footage), (2) amount of product handled by the amount of aisle space, and (3) investment cost. The dynamic flow pallet rack was determined to be the better option—having an overall capacity of 720 pallet units, while utilizing a first in and first out (FIFO) product movement process—for use in warehousing environments. The study presented here has relevance to logistics organizations aiming to maximise their storage area and throughput capabilities, and serves as a reference for implementing systematic design methods to produce optimum operational efficiencies across many variations of warehouse layouts.

2. Afonso Vaz de Oliveira (2022) The scientific method and an existing warehouse to examine the receipt of product into the warehouse as well as how to enhance the process for receiving product. He completed this task by using a type of industrial simulator, Arena®, to redesign the facility by improving workstation allocation and maximizing warehouse productivity and efficiency through additional throughput time reductions in the movement of material into the warehouse. After the redesign was implemented, there was an increase in productivity in addition to multiple cost savings associated with operations. Additionally, the redesign of the facility allowed for a more ergonomic and organized work environment due to the 5S methodology being employed as part of the redesign. The results of this study show

that using an evidence-based approach to redesigning a warehouse facility results in significant benefits, and provides a solution for improving the efficiency and effectiveness of manual receiving operations in multiple types of warehouse facilities.

3. Guerrero D. (2022) Presents a quantitative analysis of the relationship between warehouse location, activity range, and operation features based on data from 1,674 data points performed on Warehouse Locations in France. The study demonstrated that location has a significant effect on the spatial extent and operational efficiency of warehouses, with warehouses located outside of metropolitan areas showing fundamentally different operation characteristics compared to those located within metropolitan areas. The data also indicates a substantial strategic advantage to placing warehouses near large ports, allowing logistics service providers the ability to deliver timely and competitively priced freight solutions.

4. Karahan Kara et al. (2023) Provided a framework to enable warehouse managers to evaluate and select WMS (Warehouse Management System) software for use in all types of warehouses based on the implementation of WMS in warehouses. The evaluation and selection process included methodologies to evaluate and rank WMS based on either: multi-criteria decision-making (MCDA using weighting using CRITIC) or multi-criteria ranking (MCRD using ranking using TOPSIS) approaches or using a single-value neutrosophic set theory. The results indicate that 'ease of use' was the most important factor in the evaluation of WMS. Logistics companies that have not implemented a WMS to date can use the results in this study as a useful tool to guide them through the process of determining the criteria to evaluate and select the correct solution for their unique organization(s).

5. Maarten van Geest's (2022) systematic literature review published in Applied Sciences looks at how implementing the Internet of Things (IoT), Radio Frequency Identification (RFID), Augmented Reality (AR), and Automated Vehicles (AV) will affect warehouse configurations and barriers to implementation, as well as technology's role within smart warehouses. Findings show if an organization implements any of these technologies across their entire warehouse operation will improve service quality, productivity, and cost effectiveness while reducing errors. This study is relevant to any logistics organization that is looking at moving from manual warehousing practices toward newer smart warehouse practices based on technological advancements.

6. Agnieszka A. Tubis (2023) Literature review published in Sensors shows that warehouse operations and design can be done using Industry 4.0 (I4.0) principles by summarizing results from 240 previously published studies. The primary technologies used in I4.0 warehouses consist of IoT, RFID, AR, and AV systems.

Two major concepts associated with I4.0 smart supply chains are providing real-time digital data exchange of inventory information, which allows the entire supply chain to have concurrent access to the same information regarding their inventories. Understanding these concepts is critical for warehousing organizations to remain competitive in today's rapidly evolving digitized logistics landscape.

7. G. Mandar Sugiarto and Deddo Suprayitno This research paper provides a qualitative overview of the key reasons for discrepancies between actual physical and logical quantities of warehoused inventories at PT Dai Nippon Printing Indonesia, along with corrective measures. The reasons for discrepancy were categorized into five groups: Man, Machine, Method, Material, and Environment. Corrective actions suggested by the authors include

implementing employee training programs, upgrading warehouse transportation equipment, repairing network servers used to manage logistics systems, and ensuring proper administration of goods upon receipt. The root cause analysis methodology employed in this study is broadly applicable to diagnosing and resolving operational issues in warehouse management.

8. Volodymyr Dachkovskiy (2021) Prepared by researchers at the National Defence University of Ukraine, this study presents a comprehensive methodology for assessing logistics operations using hierarchical analysis, maximum element distribution, dynamic programming for route safety, and progressive standard methods. While originally designed for military logistics, the methodology offers valuable insights applicable to civilian logistics organizations seeking to evaluate and optimize resource allocation across warehouse zone distributions.

9. Leonardo Guerin et al. (2021) This study describes how warehousing and the movement of warehouses within (outside) the São Paulo metropolitan area have changed. There are many reasons for shifting warehouses to the outer regions of São Paulo, such as lower land costs; less of a tax burden; near expressway systems & routes to freight transportation. This study provides valuable information about what factors to consider when choosing where to locate logistics operations (warehouses) and shows the value of locating warehouses close to industrial; large ports; and major road systems.

10. Szabolcs Lovas (2021) This research published in the IJERPH outlines opportunities for implementing chemical compliance strategies to promote and protect employee health. Conclusions from that research indicate warehouse employees working at freight terminals where chemicals can be found are exposed at much higher rates to pulmonary and neuromuscular disorders than those who work in open areas where no freight can be shipped via truck or rail. With this new information, a viable basis exists to develop an all-encompassing occupational safety and health (OSH) program for the warehousing industry in chemical manufacturing/industrial locations.

CASE STUDY ANALYSIS AND INTERPRETATION

Comparative Summary of All Case Studies

Below is a summary table presenting all ten case studies along with the respective strategies and lessons learnt by each company to assist in pinpointing the most suitable strategy for Contiship Logistics Pvt. Ltd.

Table 1

#	Company	Key Strategy	Lesson for Contiship
01	Amazon	Robotic picking + Chaotic WMS storage	Invest in a Dynamic Warehouse Management Solution to efficiently and accurately pick
02	Walmart	Cross-docking + RFID inventory tracking	Use Barcode/RFID technology for Ongoing Live Visibility of Inventory
03	DHL Supply Chain	Collaborative Robots & AI for Order Picking	Use Semi-automated Processes to Reduce Seasonal Fluctuations in Demand
04	Toyota	JIT + 5S Lean methodology	to Support Facility Layouts & Reduce Clutter Create New Facility Layouts and Reduce Clutter

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#	Company	Key Strategy	Lesson for Contiship
05	Flipkart (India)	Multi-zone WMS + hybrid procurement	Decide on the type of WMS to Implement Across India
06	Mahindra & Mahindra	Simulation-based warehouse planning	Uses technology digitally to determine Space.
07	Cardinal Health	Agent-based analytics modelling	Uses Analytic Data for Enhanced Delivery Route Optimisation and Efficiency
08	Nature's Best	Unified WMS across multi-building DCs	Bring All Areas and Zones Under a Unified Warehouse Management System to Provide Greater Inventory Visibility.
09	Kuehne+Nagel	Simulation-designed multi-order picking	Produce a Picking Process Plan Prior to Scaling Operations
10	DHL / Red Crescent	Rapid 5S-based warehouse structuring	Create Basic Zoning/Flow Instantly.

India Chemicals Industry — Warehousing and Logistics Context

India's chemical industry is a very dynamic sector. It is one of India's most strategically important industries affecting warehousing and logistics. Currently, (2024) The chemical industry has an estimated total value of approximately US\$ 278 billion and will be on a strong growth path to reach approximately US\$ 300 billion from 2025 to 2028 and US\$ 1 trillion by 2040. The chemical industry accounts for 7% of India's Gross Domestic Product and is capable of providing employment to more than 2 million individuals. There are around 80,000 different types of chemical products exported from India to over 175 different countries around the world. India is currently the sixth-largest producer of chemicals in the world, third in Asia, and is the largest exporter of dyes in the world accounting for approximately 16% –18% of the total exports of dyes globally. This level of production and export of chemicals will create a substantial need for efficient warehousing, freight forwarding and supply chain management.

Table 2: India Chemicals Industry — Key Performance Indicators at a Glance

Metric	Current Value	Projection
Market Size	US\$ 278B (FY24)	US\$ 300B by 2025-28
Long-term Target	—	US\$ 1 Trillion by 2040
Market CAGR (FY19-28)	5.4%	11-12% CAGR (2021-27)
Global Rank	6th largest producer	5-6% global value share (2030)
GDP Contribution	7% of India's GDP	US\$ 383B to GDP by 2030
Employment	>2 million people	Growing with sector expansion
Products	>80,000 commercial products	Exported to 175+ countries
Shareholder Returns	28% TSR (2020-24)	vs 7% global average

Global Positioning of Indian Chemicals

The position of India in the World of Chemicals is very favourable. India accounts for 2.5% of the World's total sales of chemicals. India is ranked 9th for exports of chemicals and has the 6th largest imports (with the exception of pharmaceuticals). India is the 3rd highest

consumer of polymers in the World, with polymer consumption projected to reach 60 million tonnes by the year 2040. As such, the world position of Indian chemicals creates complex warehousing and logistics needs at ports such as Chennai which serves as a key gateway for inbound and outbound shipments of chemicals (imports and exports).

Table 3: India Chemicals — Global Rankings

Category	Global Position
The Chemical Producer (worldwide)	the Largest Chemical Producer in the world.
The Chemical Producer (Asia)	the 3rd Largest Chemical Producer in Asia.
Agrochemical Producer	the 3rd Largest Agrochemical Producer.
Polymer Consumer	the Largest Polymer Consumer in the world.
Dye Exporter	Largest exporter of dyes (worldwide 16-18% of total dye exports)
Agrochemical Exporter	4th Largest Net Exporter
Chemical Exports Rank	9th largest in the world in total green exports

Five Key Market Segments and Logistics Implications

The Indian Chemical market has 5 segmentation areas that have requirements for storage and shipping; Bulk Chemicals are at 71% of Chemical production; the bulk of Petrochemicals and polymers will need their own dedicated storage; fertilizers will require very large warehouses located near where farming takes place, as has record domestic production (of fertilizers) in 2023/24 of over 314 lakh metric tons; Specialty Chemicals are expected to have a total market worth of about \$64.5 billion in 2024 growing to approximately \$92.6 billion by 2033 (at an approximate CAGR of 3.8%), therefore require storage that is very specific, compliant warehouse space; Agrochemical has an estimated total market worth of approximately \$15.5 billion in 2024 (over 130 countries export to), therefore require sufficient port freight forwarding and cold chain capacity to sustain international traffic.

Table 4: India Chemicals — Agrochemicals Segment Breakdown

Segment	Market Share (2021)	Key Driver
Insecticides	51%	Rice, cotton and vegetable crops use a lot of insecticides
Fungicides and Bactericides	32%	People protect wheat, grapes and soybean crops with fungicides and bactericides
Herbicides	16%	Farmers need herbicides to control weeds, in paddy and maize fields
Others	1%	Rodenticides and fumigants are used by some people

Solutions for the Above Problems

1. Implementation of Warehouse Management System (WMS)

Logistics companies should use a Warehouse Management System to manage everything that happens in a warehouse. This includes when things come in where they are stored keeping track of what we have getting orders ready and sending them out. A good Warehouse Management System lets us see how stock we have at any time. It also means we do not have to keep track of things by hand. It helps us pick the right things faster. The system should work for different areas of the warehouse and bring all of those areas together so

management can see what is happening with the inventory. This helps cut down on movement.

2. Using Lean Principles (5S Methodology)

Warehouse operations need to use the 5S methodology. This means they have to sort things put them in order make them shine standardise them and sustain all of this. The 5S methodology will help make the warehouse layout better reduce the time it takes to find things and make the work environment safer and more organised. Other lean practices like Just-In-Time inventory and cross-docking can also help reduce waste make the most of the space and improve how things are done. The 5S methodology and these lean practices will help solve problems with managing space and reduce the cost of holding inventory.

3. Using Technology. Barcode and RFID Tracking

Using barcode or RFID-based tracking systems can make a difference in being able to see what inventory is available in real time across all areas of the warehouse. This will reduce mistakes made by hand improve the accuracy of stock and make it faster to send out goods. Adding technology will also make sure inventory records are accurate and help transportation and warehousing work better.

4. Making Reverse Logistics Planning Better

The processes, for logistics need to be improved to reduce delays and make better use of vehicles. Planning and coordinating the return trip can be done efficiently to reduce the number of times vehicles run empty. Working closely with customers to plan the return of freight can reduce the time vehicles are not being used and make use of resources. Planning the return of cargo better can make the whole warehouse work productively. The warehouse operations will benefit from reverse logistics planning and the use of the 5S methodology.

5. Workforce Training and Process Standardisation

Employees should receive regular training in the use of digital tracking tools and modern warehouse management systems. Standardising all inward and outward flows, along with basic inventory tracking procedures, can be implemented immediately regardless of scale. Training programmes in equipment handling, technology systems, and operational procedures will reduce human error and improve service reliability.

CONCLUSION

According to this research, general warehousing not only is essential to international business, but also is strategic to enabling global business operations. This has been demonstrated through the case study analysis conducted on a freight forwarding business based in Chennai, India that highlights the importance of effective warehousing and the challenges faced in a globally competitive logistics environment.

The research identified the following major operational challenges (which also affect supply chain operation efficiencies) within international logistics companies: space limitations, reliance on manual operations, inadequate integration of technology, and misalignment between transportation and warehousing operations. Ultimately these challenges contribute to higher logistics costs and have a negative impact on an organization's ability to deliver products and services to customers in an effective and timely manner.

All the ten case studies done on multiple global corporations (including Amazon, Walmart and DHL) have shown that mid-size logistics organizations can manage their warehousing

functions quite well by using a version of Warehouse Management Systems (WMS) used strategically; applying Lean principles (e.g., 5's, Just-in-Time (JIT)); using tracking capability powered by technology; and making decisions designed to leverage Information.

The ten case studies revealed four common findings: (1) The use of WMS is an important enabler in achieving real-time visibility over inventories; (2) Lean principles can lead to cost and space efficiency (in terms of warehouse size and utilization); (3) Technology can be utilized to transform warehousing operations; and (4) Analytics can provide insights to support warehouse managers making better decisions.

Logistics companies that invest in a structured warehouse management process with the implementation of enabling technologies and training their workforce will be able to significantly enhance operational efficiency and reduce costs and service quality — all critical in maintaining competitiveness while enabling sustainable growth in their international logistics business operations.

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Conflict of Interest

The author(s) declared no conflict of interest.

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