

**A STUDY ON HOW WMS CONTRIBUTES TO ACHIEVE EFFICIENCY OF  
WAREHOUSE OPERATIONS, INVENTORY MANAGEMENT AND ITS ROLE IN  
EXPORTING AND LOGISTICS SYSTEMS**

**PROJECT REPORT**

**Submitted to the School of Maritime Management,  
Indian Maritime University, in partial fulfilment of the requirements for the award of  
degree of “Master of Business Administration”**

**In**

**INTERNATIONAL TRANSPORTATION AND LOGISTICS MANAGEMENT**

**SUBMITTED BY**

**AMAL KURIAN**

**(Register No: 2005305005)**

**Under the Guidance of**

**DR. SREEJA K**

**Assistant professor, SMM Kochi**



**SCHOOL OF MARITIME MANAGEMENT, INDIAN MARITIME UNIVERSITY  
KOCHI CAMPUS,**

## DECLARATION

I **AMAL KURIAN (Registration No: 2005305005)** student of school of Maritime Management, INDIAN MARITIME UNIVERSITY – COCHIN hereby declares that this project report titled **“A study on how WMS contributes to achieve efficiency of warehouse operation, inventory management and its role in exporting and logistics systems”** submitted in partial fulfilment for degree of **“Master of business Administration in International Transportation and Logistics Management”** is my original work carried under guidance of my project guide Ms . DR. SREEJA K(Assistant Professor) . This work is only prepared for academic requirement, and not for any other purpose. The empirical findings and suggestions in the report are based on information collected by me and not copied from elsewhere.

AMAL KURIAN

REG. NO: 2005305005

DATE:

PLACE: KOCHI

## **CERTIFICATE**

This is to certify that, this project report titled “**A study on how WMS contributes to achieve efficiency of warehouse operation, inventory management and its role in exporting and logistics systems**” submitted to **School of Maritime Management, Indian Maritime University, Cochin Campus** by **AMAL KURIAN** for the partial fulfilment of the requirements for the award of the degree of **MASTER OF BUSINESS ADMINISTRATION IN INTERNATIONAL TRANSPORTATION AND LOGISTICS MANAGEMENT** is a bona fide record of work carried out by him under my guidance.

DATE:

Dr. SREEJA K

(PROJECT GUIDE)

INTERNAL EXAMINAR

EXTERNAL EXAMINAR

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AMAL KURIAN

MBA-ITLM

REG NO: 2005305005

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# **CHAPTER-1**

## **INTRODUCTION**

## **1. INTRODUCTION**

Warehousing can be defined as a location with adequate facilities where volume shipments are received from production centre which are then broken down in to particular order and shipped onwards to the customer. Warehousing is an integral part of any logistics system. The warehouse is a link between producer and customer. Warehouse Management provides the insight into your inventory and the warehouse management tools to help you increase customer satisfaction and reduce costs.

Warehouse Management exchanges information with many other functional areas in the solution including Logistics, Production and Trade, to help improve your overall business performance. Warehouse Management is used to optimize Inventory, Labour, Physical Space, and Time.

Warehouse can play a key role in the integrated logistics strategy and its building and maintaining good relationships between supply chain partners. Warehousing affects customer service stock-out rates and firm's sales and marketing success. A warehouse smoothens out market supply and demand fluctuations. When supply exceeds demand, demand warehouse stores products in anticipation of customer's requirements and when demand exceeds supply the warehouse can speed product movement to the customer by performing additional services like marking prices, packaging products or final assemblies

It is a key part of the supply chain and primarily aims to control the movement and storage of materials within a warehouse and process the associated transactions, including shipping, receiving, put away and picking. The systems also direct and optimize stock put away based on real-time information about the

status of bin utilization. Warehouse management systems often utilize Auto ID Data Capture (AIDC) technology, such as barcode scanners, mobile computers, wireless LANs and potentially Radio-frequency identification (RFID) to efficiently monitor the flow of products. Once data has been collected, there is either batch synchronization with, or a real-time wireless transmission to a central database. The database can then provide useful reports about the status of goods in the warehouse. The objective of a warehouse management system is to provide a set of computerized procedures to handle the receipt of stock and returns into a warehouse facility, model and manage the logical representation of the physical storage facilities (e.g. racking etc.), manage the stock within the facility and enable a seamless link to order processing and logistics management in order to pick, pack and ship product out of the facility.

Warehouse management systems can be standalone systems or modules of an ERP system or supply chain execution suite. The primary purpose of a WMS is to control the movement and storage of materials within a warehouse. You might even describe it as the legs at the end-of-the line that automates the store, traffic and shipping management. In its simplest form, the WMS can data track products during the production process and act as an interpreter and message buffer between existing ERP and WMS systems. Warehouse Management is not just managing within the boundaries of a warehouse today; it is much wider and goes beyond the physical boundaries. Inventory management, inventory planning, cost management; IT applications & communication technology to be used are all related to warehouse management. Warehouse management today also covers the container storage, loading and unloading

**THE FOLLOWING ARE THE MAIN FUNCTIONS THAT WAREHOUSING SERVES TODAY**

- **Consolidation:** This helps to provide for the customer requirement of a combination of products from different supply or manufacturing sources. Instead of transporting the products as small shipments from different sources, it would be more economical to have a consolidation warehouse. This warehouse will receive these products from various sources and consolidate these into shipments, which are economical for transportation or as required by the customers.



Fig1.1 consolidation block diagram

- **Break bulk:** As the name suggests, the warehouse in this case serves the purpose of receiving bulk shipments through economical long-distance transportation and breaking of these into small shipments for local delivery. This enables transportation economies with combination of long-distance bulk transportation, break bulk warehousing, and short distance small shipments in place of long-distance small shipments.

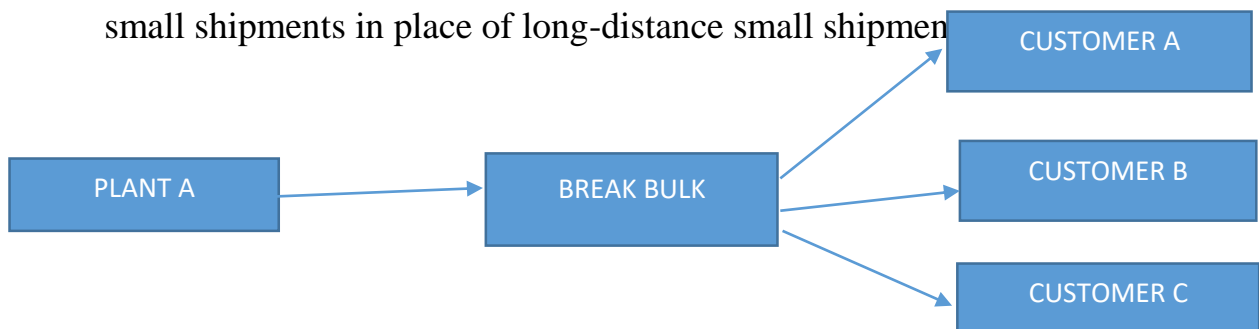


Fig1.2 break bulk block diagram

- **Cross docking:** This type of facility enables receipt of full shipments from a number of suppliers, generally manufacturers, and direct distribution to different customers without storage. As soon as the shipments are received, these are allocated to the respective customers and are moved across to the vehicle for the onwards shipments to the respective customers at these facilities. Smaller shipments accompanying these full shipments are moved to the temporary storage in these facilities awaiting shipments to the respective customers along with other full shipments.



Fig1.3 cross docking block diagram

- **Product mixing:** Products of different types are received from different manufacturing plants or sources in full shipment sizes. These products are mixed at these warehouses into right combination for the relevant customers as per their requirements. Some products that are commonly required in most product mixtures are kept in constant storage at these warehouses and continuously provided for the product mixture shipments requiring these.

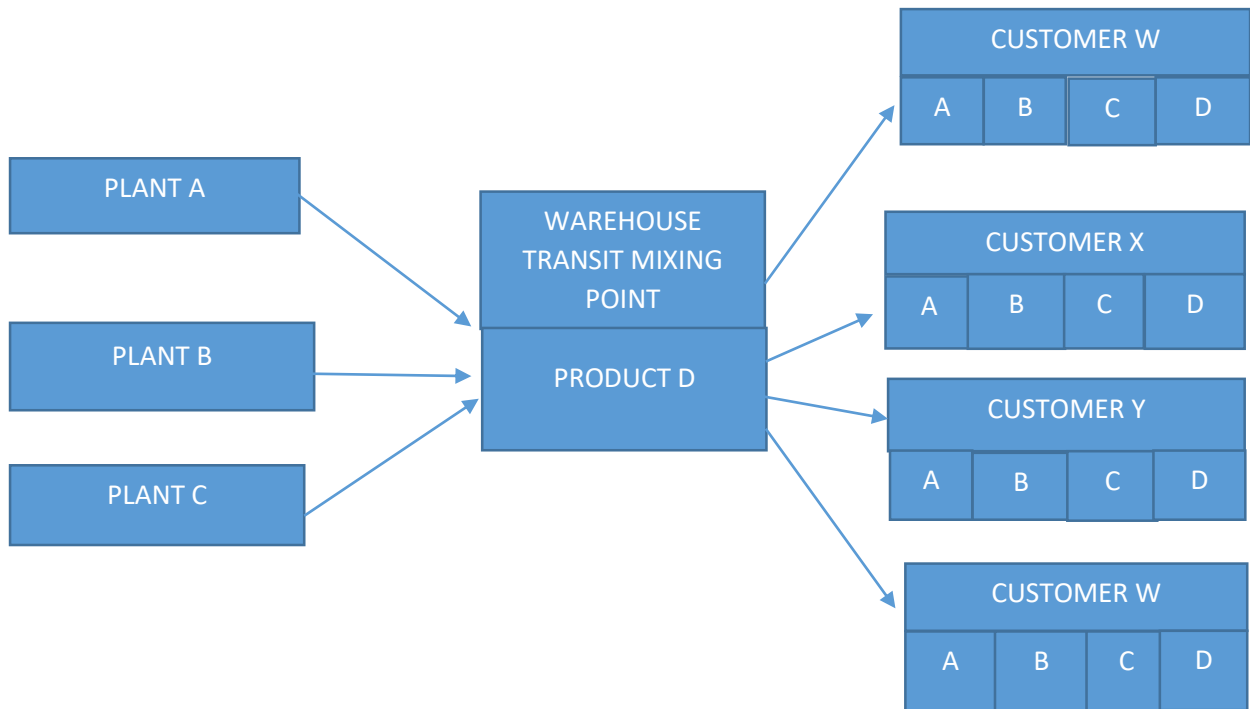


Fig1.4 product mixing block diagram

- **Stock piling:** This function of warehousing is related to seasonal manufacturing or demand. In the case of seasonal manufacturing, certain raw materials are available during short periods of the year. Hence, manufacturing is possible only during these periods of availability, while the demand is full year around. This requires stockpiling of the products manufactured from these raw materials. An example is mango pulp processing. On the other hand, certain products like woollens are required seasonally, but are produced throughout the year, and thus need to be stockpiled as such.

- **Postponement:** This functionality of warehousing enables postponement of commitment of products to customers until orders are received from them. Manufacturers or distributors for storing products up to the packaging stage utilize this. These products are packaged and labelled for the particular customer only on receipt of the order.
- **Positioning:** This permit positioning products or materials at strategic warehouses near the customers. These items are stored at the warehouse until ordered by the customers when these can be provided to the customers in the shortest leadtime. This function of warehousing is utilized for higher service levels to customers for critical items and during increased marketing activists and promotions.
- **Assortment:** Assortment warehouse store a variety of products for satisfying the requirements of customers. For example, retailers may demand different brands of the same product in small quantities rather than larger quantities of the single brand.

### **1.1. STATEMENT OF THE PROBLEM**

The implementation of WMS will contribute to achieve maximum profit, which enhanced the warehouse operations better in such a way that streamline all warehouse operations and reduce or eliminate the amount of time wasted by employees moving around the warehouse and distribution centre. Warehouse operations can o be upgraded only by Implementing a proper WMS otherwise delays can be seen at each and every process. This delay can even cause inefficiency entire warehouse operation and efficiency. The implementation of a WMS is directly linked with the efficiency that warehouse operators brings out. A decrease of the operation average time, the reduction of people engaged in the process and the increase of productivity can also be achieved by its implementation. Not all warehouses need a WMS it depends upon the type of

operations, level of service. There should be discussion prior to its implementation which helps to select which kind of WMS is needed and will it be enough for your warehouse operations etc.

### **1.2. OBJECTIVES OF THE STUDY**

1. To understand the factors that determines the successful implementation of the warehouse management system
2. To understand what changes or update has been introduced with the implementation of WMS and its impact on data accuracy
3. To analyse and understand the key differences before and after the implementation of WMS based on some factors
4. To analyse the change in employee performance after the implementation of WMS
5. To define the process by which assets are identified, maintained in the Inventory System and the factors affecting the level of inventory

### **1.3. SCOPE OF THE STUDY:**

The aim of this study is mainly focused on the impact of WMS in logistics business and its contribution in achieving maximum efficiency of warehouse operations, what changes that it can brought about by mainly focusing on some key areas, what benefits are it given to the workers, to what extend it enhanced the employee performance etc can understood from this study

Part of this study is how WMS influenced the significant implementation of logistics processes. Identifying the shortcomings in the workforce and suggesting a better way to do it will increase the efficiency of warehouse.

#### **1.4. SIGNIFICANCE OF THE STUDY**

The study is basically conducted to understand and have an idea about how warehouse management system contributes towards the success of a warehouse or distribution centre, this study also contributes find out other aspects which includes whether its implementation gives any add on value to the employee performance, to understand how effectively a WMS can optimize productivity, was it successful in providing accurate inventory records, does all warehouses needs a WMS, what contribution it provides towards the entire logistics systems, how long the efficiency and effectiveness of warehouse operations can be improved by managing the time and cost saving methods are needed to be find out from this study.

#### **1.5. RESEARCH METHODOLOGY**

The study is based on published data. The secondary data was collected from various publications, research papers, journals, articles etc. The purpose of this research is to find out the impact of implementing a warehouse management system and how far it contributes to achieve efficiency of warehouse operations.

#### **1.6. LIMITATION OF THE STUDY**

- The project report is limited to secondary data

**CHAPTER-2**  
**REVIEW OF LITERATURE**

## **2. REVIEW OF LITERATURE**

There are researches in the Warehouse Management Systems which reveals the benefits attained by the businesses. Warehouse Management Systems (WMS) helps the Logistics business in managing and tracking the Inventory. A warehouse management system or WMS primarily aims to control the movement and storage of materials within a warehouse and process the associated transactions, including shipping, receiving, put-away and picking. A warehouse management system (WMS) is a database driven computer application, to improve the efficiency of the warehouse by directing cutaways and to maintain accurate inventory by recording warehouse transactions. The systems also direct and optimize stock based on real-time information about the status of bin utilization.

Warehouse Management Systems helps the businesses to maximize their operational efficiency in different areas in the processes. To meet these high performance goals, a way needs to be found to eliminate any waste from the warehouse, to streamline its operations, and improve efficiency in every aspect of warehousing activities. One of the most proactive ways of doing so is the use of a warehouse management system (WMS) that is designed to speed up order turnaround time, improve inventory accuracy, provide instant order status information, manage warehouse space and enhance labour productivity. The WMS application is built based on different factors such as Industry specific requirements, General Logistics Requirements etc. Any WMS application regardless of the business complexity should be able to support some basic logistics functions. The WMS must have tools and functions to support the main

steps and logistic processes of inbound, production and outbound, such as: pre-receiving of materials, concierge management, receiving, inbound quality control, storage, transfer, picking, cyclic counting and shipping.

**Senger (1999)** explained that there are a set of core components that drive the success of any warehouse. Based on the complexities of the industry in which the warehouse is associated, these components include:

- Receiving
- Inventory Management
- Put-Away
- Planning and Picking processes
- Packing and Shipping
- Quality Control (Senger, 1999)

Large companies that utilize a number of these components and warehouse a large amount of products could significantly benefit from the addition of a warehouse management system (WMS)

**Karim (2018)** states that warehouse is more than just a place where inventories are stored. The aims of warehouse management are to increase productivity and accuracy, and reduce and control the cost of inventory and shipping while providing good customer service. Meanwhile, warehousing is primarily for receiving, storing, packing, and shipping goods and requires labor, capital (land, storage, and handling equipment) and information systems, all of which are expensive.

**CHAPTER-3**  
**WAREHOUSE MANAGEMENT**  
**SYSTEM**

### **3. WAREHOUSE MANAGEMENT SYSTEM**

A WMS is an IT database used to improve warehouse efficiency by coordinating warehouse activities and maintain accurate inventory by recording warehouse transaction. Warehouse system plays a vital role in supply chain business. All warehouse systems share the basic of warehousing function such as receiving, storage, and retrieval of the productions. Even though the philosophies behind these applications are similar, the characteristics for each system could be varied greatly

#### **3.1. THE VALUE OF WMS**

WMS offerings are designed to streamline all warehouse operations and reduce or eliminate the amount of time wasted by employees moving around the warehouse and distribution centre. Employees in non-automated warehouses spend much of their workday walking around locating items. Time is also wasted moving among different locations for shipping, receiving, restocking and fulfilment.

#### **3.2. BENEFITS OF A WAREHOUSE MANAGEMENT SYSTEM INCLUDE**

##### **3.2.1. IMPROVED SUPPLIER AND CUSTOMER RELATIONSHIP**

A warehouse can improve customer satisfaction and drive sales through better tracking and timely delivery

### **3.2.2. REDUCED OPEX**

The warehouse operating expenses can be reduced much better through more efficient use of space, labour and systematic movement of inventory

### **3.2.3. SAFETY AND SECURITY IMPROVEMENTS:**

The chances of accidents and injury is better controlled, because WMS offering calculate the most efficient movements throughout the warehouse.

### **3.2.4. PROCESS OPTIMIZATION**

By optimizing processes throughout the warehouse, companies will be able to pick and automate the types of processes that work best for their specific businesses. That includes picking materials based on algorithms like wave, zone and batch picking. A variety of input methods like smart scales, RFID and bar codes may be used and optimized as well.

### **3.3. FUNCTIONALITIES PROVIDED BY THE WAREHOUSE MANAGEMENT SYSTEM ARE AS FOLLOWS**

- Provides the searching facilities based on various factors. Such as warehouse, category, customer, stock
- Warehouse management system also manage the sell details online for customer details, stock details, warehouse
- It tracks all the information of the product, sell, customer etc
- Manage the information of the product
- Shows the information and description of the warehouse, category
- To increase the efficiency of managing the warehouse, product
- It deals with monitoring the information and transactions of customers
- Manage the information of warehouse

- Editing, adding and updating of records is improved which results in proper resource management of warehouse data

### **3.4. TYPES OF WAREHOUSE MANAGEMENT SYSTEMS**

Warehouse management systems come in a variety of types and implementation methods, and the type typically depends on the size and nature of the organization. Based on warehouse control system, literature distinguishes three types of warehouse management systems

**3.4.1. Basic WMS:** This system is apt to support stock and location control only. It is mainly used to register information. Storing and picking instructions may be generated by the system and possibly displayed on RF-terminals. The warehouse management information is simple and focuses on throughput mainly.

**3.4.2. Advanced WMS:** Above the functionality offered by a basic WMS, an advanced WMS is able to plan resources and activities to synchronize the flow of goods in the warehouse. The WMS focuses on throughput, stock and capacity analysis.

**3.4.3. Complex WMS:** With a complex WMS the warehouse or group of warehouses can be optimized. Information is available about each product in terms of where it is located (tracking and tracing), what is its destination and why (planning, execution and control). Further, a complex system offers additional functionality like transportation, dock door, and value added logistics planning which help to optimize the warehouse operations as a whole.

Warehouse management systems can be standalone systems or modules of an ERP (Enterprise Resource Planning) system or supply chain execution suite. The primary purpose of a WMS is to control the movement and storage of

materials within a warehouse. The WMS can be deployed as a paper-based, RF/wireless based or combination of both.

### **3.5. THREE CONCEPTS THAT ARE COMMONLY USED IN A WMS**

The transactions or process warehousing like shipping, receiving, put away, move, and picking of stocks can be done with several concepts. In WMS itself there are three concepts that are commonly used: -

- FIFO (first in first out) often means that the goods or material that first enters the warehouse must be the first to exit.
- LIFO (Last In First Out) items that were the last time entered must first come out.
- FEFO (First Expired First Out) the fastest expired items must first come out.

Of the three concepts above, usually the most widely used concept is FIFO (first in first out), but for now almost all products will begin to lead to the FEFO system even for spare-part products though. Of course this FEFO is needed for warehouse functions that function as many relationships in and out of various sources.

### **3.6. AFTER WAREHOUSE MANAGEMENT SYSTEM LAUNCH**

The resources required to operate the system are much greater than prior to implementation can be realised after the successful implementation of WMS. This is primarily due to the data-intensive nature of the software and the fact that

warehouses are in a state of flux; racks are moved, placement and removal strategies changed, new items added, new processes developed.

Warehouse accuracy is paramount for the software to operate and, to do this, data will need to be entered accurately and in a timely fashion. Although most WMS implementations will reduce labour costs in the placement and removal of materials, there is often an added warehouse management function required just to operate the software.

### **3.7. FACTORS INFLUENCING THE IMPLEMENTATION OF WMS**

A warehouse management system (WMS) is a type of software solution designed to optimize and provide support to warehouse operations, aside from having a clear view of the warehouse inventory, WMS also offers access to many functions such as receiving, put-away, picking, sorting, shipping and tracking of goods. In implementing a warehouse system, the organization should conduct a thorough planning and careful understanding of the system requirement. Ensure to gather all crucial factors and key benefits that will help achieve an effective system.

The total cost of the system is one of the crucial factors that need to be considered. Try not to get a simple system that in the end, it will just cost a huge impact to re-construct because it did not work the way the business wanted. System requirements, users' responsibility and comprehensive system training will also play a big part in the implementation stage of the system, a system will not properly work without a user interface and understanding.

#### **3.7.1. SYSTEM REQUIREMENTS AND CUSTOMIZATION**

In selecting a warehouse inventory management system, it is important to ask the right questions and define the operational needs. This will benefit the warehouse to run with smooth transactions and free from error. Each business has different

needs and requirements according to its day-to-day operations. A common warehouse system should provide a way to store, control, arrange, achieve and analyse inventory data. Furthermore, the other importance of customizing a system is to improve the system security function and the ability to give the users a different level of system access, features and functions.

### **3.7.2. TOTAL COST OF IMPLEMENTATION**

The total cost will be the highest contributing factor in purchasing a warehouse management system. A new warehouse system will require adjustment to properly align and suit the warehouse operation and user requirements. It is also important to know the future cost associated with the software maintenance such as system upgrade, the cost per license, and initial training provided. Some companies include the training and step-by-step procedures for the implementation of the software but not the system upgrade cost.

### **3.7.3. ROLE AND RESPONSIBILITY OF USERS**

Setting up the access roles for each user is one of the most important things to consider in implementing the warehouse management system. The key roles are warehouse manager, supervisor, picker, packer, and receiver. The warehouse manager's role is considered a super-user role. This role has full control to manage and overview the overall function of the system. The supervisor's role is the one who plans, arranges, and supervises the daily operational activities such as shipment orders, shipment preparation, stock inventory, and outgoing shipment.

The order picker's role has access to the entire picking task in the system while the order packer's role has the access to the packing screens, this screen will provide all the required information such as printing shipping labels, packing slips, cancelling the order, scanning the barcodes, and selecting the type of box. Receiving and unloading of goods to a staging area, reporting damaged goods, and put-away pallets of goods into inventory location are the receiver's role.

#### **3.7.4. DATA FLEXIBILITY AND COMPREHENSIVE TRAINING**

Having a user-friendly system in a warehouse will accelerate the workflow of the warehouse operation because a warehouse system that is not designed for user-friendliness can affect the work progress. It is also important for the system to provide accurate, manageable, and flexible data as the user will always depend on and rely on it. A warehouse system with accurate and flexible data will increase customer satisfaction and provide credibility to the business. Depending on the warehouse system requirement and complexity associated with it, more training for the workforce should be provided.

Assigned users must fully understand every function of the system and how it will affect the whole operation if problems occurred during the implementation stage. Users should be systematically trained on how the system works. This will pay huge dividends in the short- and long-term use of the employees. The most implemented warehouse system includes step-by-step procedures and guidelines to be followed by the user and by the warehouse itself. It is important to know the significance of these procedures and their effects.

### **3.7.5. RFID TECHNOLOGY INTEGRATED WITH WMS**

Radio frequency identification is also known as RFID – refers to a wireless system consisting of two types: tags and readers. A warehouse management system that is combined with RFID technology will help improve the efficiency of warehouse management and be able to provide speed on receiving and delivery of goods. RFID Technology offers accurate real-time information, picking location and the ability to plan the product allocation, reduces labour costs by hiring less workforce needed for tracking and warehouse operations.

### **3.7.6. BLOCK CHAIN TECHNOLOGY FOR WMS**

Block chain technology provides the power to control, track and record the movement of both goods and information to the entire warehouse operation. In a warehouse management system, a proper infrastructure is set to develop the ability to serialize the materials with tagging and record them in a platform that is shared in the network. Any transaction recorded in the block chain is undisputable, transparent, and has no chances of fraud.

This system makes everything in the network visible, manageable and secured. For example, when a shipment is delivered, the received confirmation, date and time of delivery, and condition will be transmitted to the block chain system to be verified with agreed terms and conditions. Once verified, proper payments will be issued to the designated paying channels. This type of automation increases efficiency, integrity, and data security.

### **3.7.7. TECHNOLOGICAL RISKS AND CONTINGENCY PLAN**

An efficient warehouse management system allows a warehouse to operate smoothly and productively. Downtime and weak data security are common

drawbacks in implementing a warehouse system. Downtime error occurs when there is a poor network connection, system failure, and sometimes due to human error that causes production time lost. To prevent this system error, practice regular system tests and if necessary, upgrade the system to the latest version.

### **3.7.8. EFFICIENT LABOUR MANAGEMENT**

A WMS lets you freely determine which picking, packing and putting-away methods work most effectively for your business. In addition to helping optimize inventory placement and route creation, WMS solutions can determine the best employee for the job. In addition to creating schedules and assigning daily tasks, WMS software can be used to gain a broader understanding of your workforce.

### **3.8. WMS SUPPORT ON DATA ACCURACY**

To help mitigate data accuracy issues it is critical to select a warehouse management solution that can accurately collect, store and transmit inventory and activity records with the help of automated data collection tools.

Implementing automated data collection devices helps to improve operational accuracy by reducing manual data entry for a variety of activities. Using the WMS as a centralized database for all that information helps ensure reliability and easy access to critical information.

### **3.9. WAYS WMS CAN INCREASE LABOUR PRODUCTIVITY**

The introduction of WMS, the change of warehouse layout, and the new distribution of goods led to the alteration in work performance.

Through the usage of software programs, warehouses are able to identify quickly and sort out received items, record them electronically and transfer the information to the ERP database. Employees can use this in order to avoid errors

made through manual methods. The system allows individual accounts for data entry; this increases accountability and decreases errors made by employees.

The improvement in the productivity due to effective inventory quality and management results in employees working in fewer hours. This reduces the need for overtime hours for the staff

When there is increased accuracy, it reduces the number of mistakes being made by employees within the warehouse. This can in turn increase morale as employees are less stressed and anxious.

### **3.10. SIGNALS THAT A WAREHOUSE NEEDS A WMS PROGRAM**

Demand for frequent, accurate, and quick SKU inventory cycle counts and inventory file updates

Short customer orders due to “no stocks” or “stock outs

Customer back orders due to lost inventory

Cancelled customer orders or customer complaints

Customer order numbers increase

Decrease or to maintain the customer order/delivery cycle time with accurate orders that are delivered on time to a correct address

Small size customer orders increase

SKU numbers or pick positions increase

Vendor SKU deliveries and vendor number increase

Inventory quantity and storage positions increase

Assure proper SKU rotation

**CHAPTER-4**  
**INVENTORY MANAGEMENT**  
**SYSTEM**

#### 4. INVENTORY MANAGEMENT SYSTEM

Inventory Management is an enterprise-wide discipline concerned with the identification and tracking of Information Services (IS) hardware and software assets.

Its three main areas of concern are:

- Acquisition.
- Redeployment.
- Termination.

**Acquisition** procedures are established to assist personnel in procurement of software and hardware products. Its main purpose is to ensure that proper justifications are performed and that financial guidelines are followed.

**Redeployment** procedures are responsible for ensuring that assets are tracked when moved from one location to another and that budgetary considerations are adjusted as needed. Should a product be moved in conjunction with its original owner then the Inventory System is updated to reflect the new location. Should a product location and owner change, then the Inventory System must be updated to reflect the new owner and their location. In this case, the old product is deleted from the original owner's budget and added to the new owner's budget.

**Termination** is responsible for deleting the asset from the inventory when it is discontinued, or replaced. The owner's budget will be updated to reflect the asset

termination and the asset will no longer be listed when location reports are generated.

An inventory management system is software that manages the supply chain and the delivery system. Companies use an IMS to manage raw materials in manufacturing and handle finished goods for retail.

One of the key benefits of inventory management software is automation. The system can define replenishment points and then get automatic reminders when stock gets low and provides prompts for cycle checks based on your settings. Managers use the software to trace a product by customizable groupings, such as expiration date, as well as lot and serial number. This allows you to trace a component or raw material to the finished good and finally to the customer order. If a recall happens, you can trace what components were used to make specific products and which customers received them. The inventory management technique is more useful in determine the optimum level of inventory and finding answers to problem of safety stock and lead time. Inventory management has become highly developed to meet the rising challenges in most Corporate entities and this is in response to the fact that inventory is an asset of distinct feature.

#### **4.1. WHY IS INVENTORY MANAGEMENT IMPORTANT?**

Inventory management is vital to a company's health because it helps make sure there is rarely too much or too little stock on hand, limiting the risk of stock outs and inaccurate records.

#### **4.2. BENEFITS OF INVENTORY MANAGEMENT:**

The two main benefits of inventory management are that it ensures you're able to fulfil incoming or open orders and raises profits. Inventory management also:

#### **4.2.1. SAVES MONEY**

Understanding stock trends means you see how much of and where you have something in stock so you're better able to use the stock you have. This also allows you to keep less stock at each location (store, warehouse), as you're able to pull from anywhere to fulfil orders — all of this decreases costs tied up in inventory and decreases the amount of stock that goes unsold before it's obsolete.

#### **4.2.2. IMPROVES CASH FLOW**

With proper inventory management, you spend money on inventory that sells, so cash is always moving through the business.

#### **4.2.3. SATISFIES CUSTOMERS**

One element of developing loyal customers is ensuring they receive the items they want without waiting.

### **4.3. INVENTORY MANAGEMENT PROVIDES**

- Up-to-date information about data processing resources through the creation and archiving of records in a centralized repository.
- Financial records specific to a single component, or groups of components.
- Service records for all components in the inventory.
- Data used to support configuration diagrams of the hardware and software components contained within specific locations, or the entire data processing environment.

#### **4.4. ADVANTAGES OF INVENTORY MANAGEMENT**

Accurate inventory management is key to running a successful product business. Tracking stock regularly can help avoid stock errors and other problems. The following are the benefits of strong inventory management:

**4.4.1. BETTER INVENTORY ACCURACY:** With solid inventory management, you know what's in stock and order only the amount of inventory you need to meet demand

**4.4.2. REDUCED RISK OF OVERSELLING:** Inventory management helps track what's in stock and what's on backorder, so you don't oversell products.

**4.4.3. COST SAVINGS:** Stock costs money until it sells. Carrying costs include storage handling and transportation fees, insurance and employee salaries. Inventory is also at risk of theft, loss from natural disasters or obsolescence.

**4.4.4. AVOIDING STOCK OUT AND EXCESS STOCK:** Better planning and management helps a business minimize the number of days, if any, that an item is out of stock and avoid carrying too much inventory.

**4.4.5. GREATER INSIGHTS:** With inventory tracking and stock control, you can also easily spot sales trends or track recalled products or expiry dates.

**4.4.6. BETTER TERMS WITH VENDORS AND SUPPLIERS:** Inventory management also provides insights about which products sell and in what volume. Use that knowledge as leverage to negotiate better prices and terms with suppliers.

**4.4.7. MORE PRODUCTIVITY:** Good inventory management solutions save time that could be spent on other activities.

**4.4.8. INCREASED PROFITS:** A better understanding of both availability and demand leads to higher inventory turnover, which leads to greater profits.

**4.4.9. A MORE ORGANIZED WAREHOUSE:** An efficient warehouse with items organized based on demand, which items are often sold together and other factors reduces labour costs and speeds order fulfilment.

**4.4.10. BETTER CUSTOMER EXPERIENCE:** Customers that receive what they order on time are more loyal

#### **4.5. DISADVANTAGES OF INVENTORY MANAGEMENT**

The disadvantages of inventory management systems are the same as for other software. Solutions can be expensive, hard to learn and subject to hacks. However, simple safeguards can mitigate weaknesses

**4.5.1. EXPENSIVE FOR SMALL BUSINESSES:** The cost of inventory management software can seem daunting to a small business, but the investment often pays for itself in increased profits and improved customer loyalty. Additionally, cloud-based systems have made software that was once the domain of large enterprises available to smaller businesses.

**4.5.2. COMPLEX TO LEARN:** Business software is sometimes tricky to learn. However, managers can help by investing in online training to quickly bring users up to speed.

**4.5.3. RISK OF SYSTEM CRASHES:** Software does crash. However, you can remove the risk of data and productivity loss by using cloud based platforms

**4.5.4. MALICIOUS HACKS:** Malicious hacks are a risk to all businesses. The internet of things adds even more complexity. Cloud-based software typically has greater security than a single company would offer on its own because of the risk a breach would have on the vendor.

## **4.6. INVENTORY MANAGEMENT TECHNIQUES**

Managing inventory can be a daunting task, and if it isn't done properly it could cost company thousands of dollars. Inventory management grows more and more complicated with increase in sales volume and diversification of product assortment.

### **4.6.1. STOCK REVIEW**

Stock review is a regular analysis of stock versus projected future needs. This can be done through a manual review of stock or by using inventory software. Defining your minimum stock level will allow you to set up regular inspections and reorders of supplies. Make sure to take into account certain situations that can arise, such as vendors taking longer than average to replenish stock. This will aid you in using just-in-time ordering, where the inventory is held for a minimum amount of time before it moves to the next stage in the supply chain.

### **4.6.2. ABC ANALYSIS**

This is a popular way to analyse your inventory. Under this method, you classify the inventory into three categories, such as A, B and C. These categories are based upon the inventory value and cost significance. Also, the number of items and values of each category are expressed as a percentage of the total.

Items of high value and small in number are termed as "A"

Items of moderate value and moderate in number are termed as "B"

Items of small in value and large in number are termed as "C"

To manage each category separately: The nice thing about group C is that it can be fairly hands-off, while group A requires special attention. You can use ABC analysis in conjunction with the just-in-time technique to help you get your reorder timing just right

#### **4.6.3. VED ANALYSIS**

VED analysis represents classification of items based on criticality. The analysis classifies the items into three groups called Vital, Essential, and Desirable.

Vital category encompasses those items for want of which production would come to halt.

Essential group includes items whose stock outs cost is very high.

Desirable group comprises of items which do not cause any immediate loss of production or their stock-out entail nominal expenditure and cause minor disruptions for a short duration.

#### **4.6.4. SDE ANALYSIS**

SDE analysis is based on problems of procurement namely:

- Non-availability
- Scarcity
- Longer lead time
- Geographical location of suppliers
- Reliability of suppliers, etc.

SDE analysis classifies the items into three groups called 'Scarce', 'Difficult' and 'Easy'. The information so developed is then used to decide purchasing strategies.

#### **4.6.5. JUST IN TIME**

The objective of JUST IN TIME method is to increase the inventory turnover and at the same time reduce the inventory holding cost. JIT inventory system also exposes the unwanted or the dead inventory held by the retailer/ manufacturer

#### **4.7. FUNCTIONALITIES PROVIDED BY INVENTORY MANAGEMENT SYSTEM ARE AS FOLLOWS**

- Manage the information of inventory
- Editing, adding, and updating of records is improved which results in proper resource management of inventory data
- It tracks all the information of vendor, delivery, cost etc
- Shows the information and description of the inventory, product
- It deals with monitoring the information and transactions of cost
- To increase efficiency of managing the inventory, vendor

**CHAPTER-5**

**ROLE OF WMS IN LOGISTICS**

**SYSTEM**

Warehouse Management System (WMS) is the cornerstone of the logistics system. A WMS constitutes an internal system of the logistics companies, which is highly configurable to control and manage aspects of storage, distribution, others. A robust WMS is what an organization needs for efficient and productive operations, which includes inventory balance, manage materials, pickup process and auditing. If you are lacking an effective WMS, then it is impossible to achieve an extraordinary functioning logistic system. An effective WMS involves using a customized set of solutions for smooth workflow and not just the data or storage handling procedure.

Technological advancements and digital platforms are covering their way into most industries. Transportation and logistics management systems have also witnessed a noteworthy transformation in daily operations. Execution of warehouse management software lets an organization improve its competitive advantage by minimizing labour costs, enhancing customer service, improving inventory tracking accuracy, increasing flexibility, competitive edge and responsiveness.

A warehouse management solution or an enterprise resource planning system for warehouse allows a firm to manage inventory in real-time, with data as existing as the latest order, shipment, or receipt and any movement in between.

Ever since the e-commerce industry started booming, warehouse and logistics chains have grown with a modern approach. The processes have become far more complex than it was a decade ago. The ever-advancing technology has also found its way into the warehouse management functions such as the logistics chain. It is popularly known as the warehouse management system (WMS). This software system helps a business to effectively manage the supply chain, the inventory, labour allocation, and cost of a warehouse.

## **5.1. THE LIST OF FUNCTIONS BELOW WILL EXPLAIN THE IMPORTANCE OF WMS IN THE LOGISTICS CHAIN**

### **5.1.1. PROVIDES ORDER MANAGEMENT**

Receiving orders is where the work for the logistic chain begins. Processing these orders includes maintaining inventory, accepting payments, handling documentation, etc. To ensure that no errors occur during this process, all customer data should be synchronised in one system. WMS ensures that all information is in one place, and a record is maintained for all deals and transactions

### **5.1.2. MANAGES INVENTORY**

Warehouse inventory management is a vital part of the supply chain. Receiving the goods, storing them, and keeping a track of each unit—businesses cannot afford to make errors in these processes. A WMS provides better management that keeps all data in one system. It enables better coordination within the organisation, and eliminates errors thereby ensuring timely deliveries. It helps to keep a record of the stock and also provides inventory reports. A WMS reduces the paperwork of the inventory management process of the business through automation.

### **5.1.3. INCREASES TRANSPARENCY**

As information is stored in a centralised system, managing a warehouse becomes easier. Managers and employees can access the system to monitor the real-time status of an order or delivery. The WMS thus, brings transparency in the process and also helps suppliers to plan their production.

#### **5.1.4. IMPROVES CUSTOMER RELATIONS**

A warehouse management system (WMS) effectively optimises the logistics chain right from manufacturing to shipment of goods. The receiving party, be it a business or an individual, can track the status of delivery, thereby enabling the customer to engage with your organisation. Customers are more trusting towards a business that keeps the delivery process transparent. These little factors play a vital role in enhancing customer relations.

#### **5.1.5. HELPS TO REDUCE COST**

WMS significantly helps to reduce the cost by providing various functions in a single software. This ensures better planning and analysing. There is less paperwork, efficient labour allocation, and space management. As the company saves a lot of capital by integrating every process into a WMS, businesses can invest their resources in growth and development.

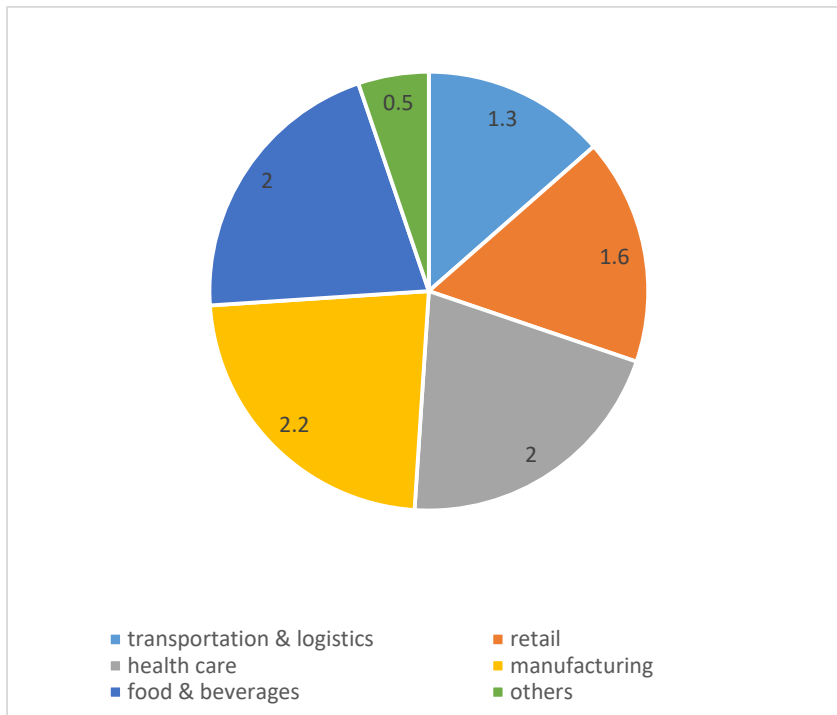
#### **5.1.6. IMPROVES PRODUCTIVITY**

With all the different functions of the warehouse, it gets difficult at times to coordinate and follow processes to the T. Thus, warehouse management systems provide integration of all business activities. This in turn helps the business to have a definite flow, which makes it easier for workers to ensure accuracy in the chain. A WMS enables you to identify glitches and gives clarity of the performance for better productivity.

The technology has spread its roots in almost every sector. A WMS transforms the traditional ways of functioning into modern, streamlined, and automated processes. Such systems can be customised for unique business requirements. As this software processes, controls, and automates the warehouse operations, it can overcome multiple challenges faced by a business enterprise.

**CHAPTER-6**  
**DATA ANALYSIS**

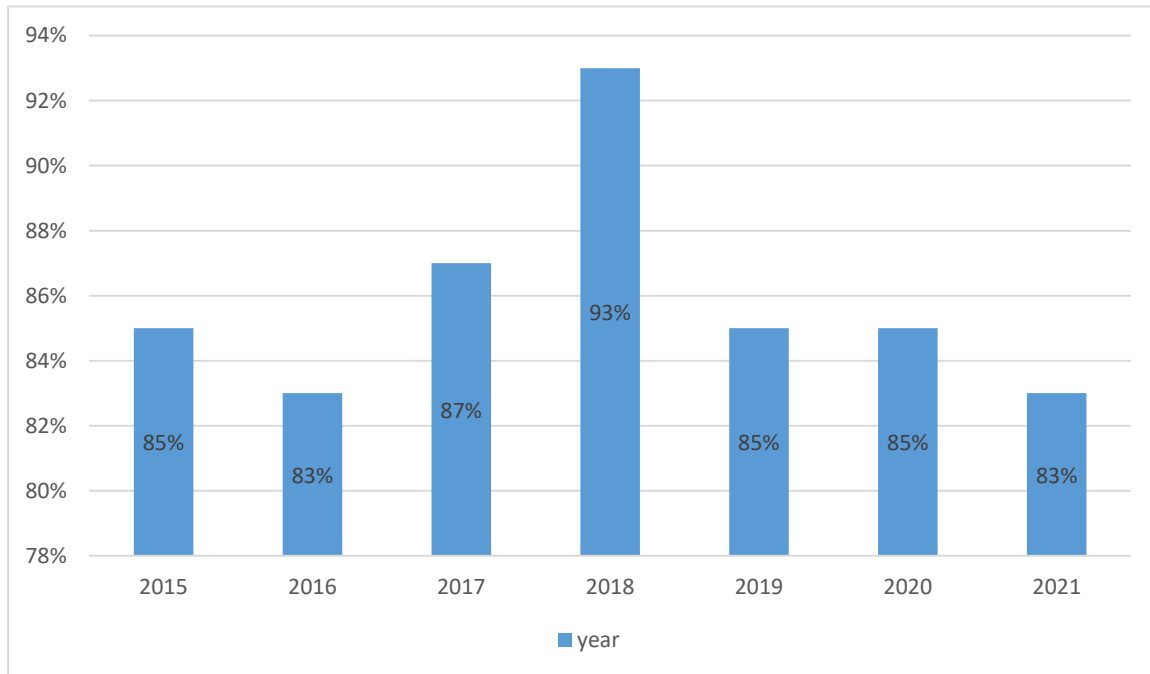
## 6.1. GLOBAL WAREHOUSE MANAGEMENT SYSTEM MARKET



The global warehouse management systems market size was valued at USD 2.94 billion in 2021 and is expected to expand at a compound annual growth rate (CAGR) of 16.1% from 2022 to 2030. Growing economies across the globe have propelled various sectors such as healthcare, manufacturing, and retail to achieve highly efficient operations in order to increase their output and meet consumer demand. In an attempt to address growing demands, logistics companies are continuously progressing to overcome challenges created by fluctuating product markets and shipping schedules.

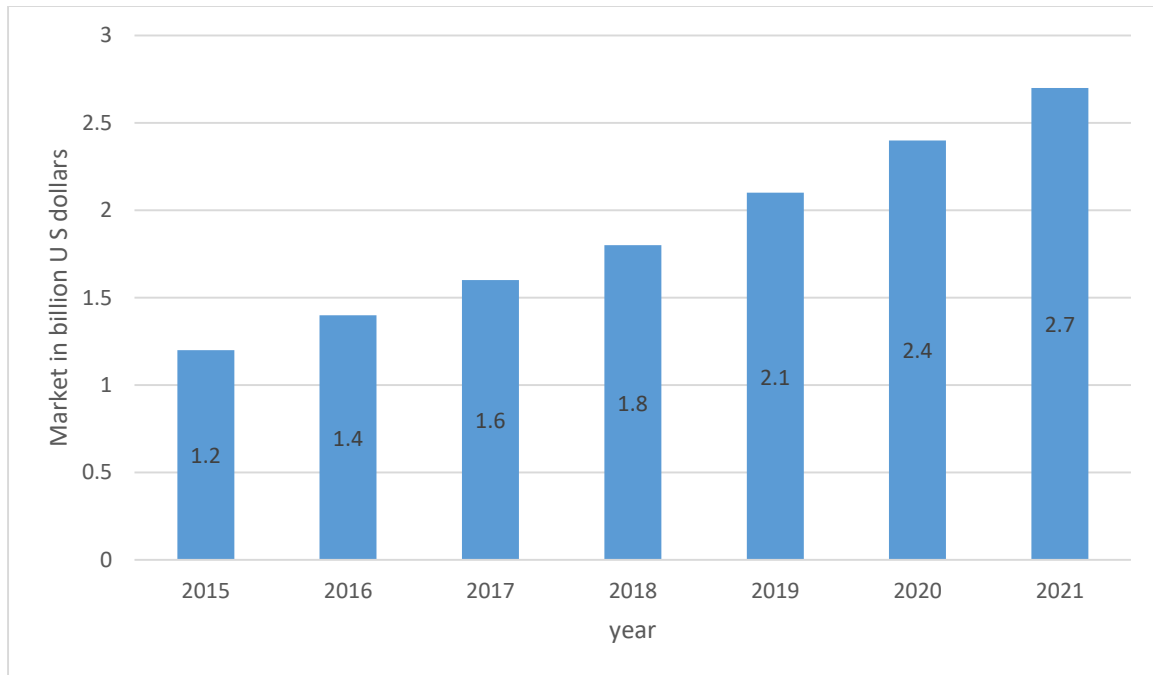
A warehouse management system helps reduce lead time, increase product delivery speed, and minimize distribution costs. The software is designed to cater to complex, sophisticated warehouse operations

## **6.2. SHARE OF WAREHOUSING AND LOGISTICS PROVIDERS IN THE UNITED STATES USING A WAREHOUSE MANAGEMENT SYSTEM (WMS) FROM 2015 TO 2021**



This statistic depicts the share of warehousing and logistics providers using a warehouse management system (WMS) in the United States between 2015 and 2021. During the 2021 survey, 83 percent of respondents reported using a WMS.

### **6.3. SIZE OF THE WAREHOUSE MANAGEMENT SYSTEMS (WMS) MARKET WORLDWIDE, FROM 2015 TO 2021**



The graph displays the size of warehouse management systems (WMS) market worldwide, from 2015 to 2021. In 2015, the global warehouse management system was valued at 1.2 billion US dollars

**CHAPTER-7**  
**FINDINGS & SUGGESTIONS**

## **FINDINGS**

### **7.1. BELOW ARE THE REASONS TO CONSIDER A WMS**

#### **7.1.1. INVENTORY CONTROL & MANAGEMENT**

Designed to control all of your warehouse activities, WMS allows you to track every unit down to the lowest level of detail for improved order fulfillment and inventory accuracy

#### **7.1.2. CUSTOMER SERVICE AND TRACKING**

WMS also makes organizing and tracking shipments easier through automation. Worker assignments, shipment routes and put always are all easily managed and tracked

#### **7.1.3. COMPANY PRODUCTIVITY**

Workers are able to generate more work in less time because they have what they exactly need at the right time

#### **7.1.4. RETURN ON INVESTMENT**

The right warehouse management system can improve your sales and increase profits not simply by helping you sell more but by selling faster and more accurately to happy customers

### **7.2. WMS IMPACT ON DATA ACCURACY**

Data inaccuracies can affect every level of the supply chain from manufacturer to consumer. For example, out-of-stock scenarios caused by bad data can result in up to 8.3% revenue loss for businesses such as grocery stores. By selecting industry leading technology such as WMS and automated data collection (ADC) devices these businesses could save up to 10 to 30% in holding costs and avoid the revenue loss associated to out of stock scenarios.

These devices also help to further reduce manual data entry where many errors occur.

### **7.3. SITUATION PRIOR AND POSTERIOR TO THE DEPLOYMENT OF WMS**

Factors	Prior to the deployment of WMS	Posterior to the deployment of WMS
Traceability of materials and information	Low traceability and low inventory accuracy	Total traceability of the logistic operations
Picking route	Random. The operator chooses the route, leading to excessive and repeated displacements and movements	Route planes by the system according to the location of the items, optimizing the displacements and movements
Delivery performance	Delayed deliveries caused by failures in the process and lack of inventory accuracy	On time in full deliveries
Quality of the Logistics operations	low	High
Organization and standardization	low	High

### **7.4. EMPLOYEE PERFORMANCE AFTER THE IMPLEMENTATION OF WMS**

The application of WMS is known to help companies improve the performance and productivity of their employees. The system can help all employers provide

complete information to all employees regarding the work they have to do while in the warehouse. The increase in work performance was noted as a result of implementing the WMS, as well as changes in the spatial organization of a warehouse and completion techniques. Gained more productivity after the implementation of WMS. Labour productivity improved than prior to the implementation of WMS.

### **7.5. HOW ASSETS ARE IDENTIFIED AND MAINTAINED IN THE INVENTORY SYSTEM**

Organizations will be able to maintain ideal stock levels by using reliable management software. The multi-featured programme allows for maintenance tracking at various intervals. This means that when an asset needs to be upgraded or maintained, notifications can be delivered via the AIM system. These alerts can be established by looking at historical data on asset performance, making it easy for the management team to keep track of the assets.

### **7.6. FACTORS AFFECTING THE LEVEL OF INVENTORY SYSTEM**

**7.6.1 INVENTORY TURNOVER:** Inventory turnover refers to the amount of inventory which gets sold and the frequency of its sale. It has a direct impact on the amount of inventory held by a business concern.

**7.6.2. NATURE OF TYPE OF PRODUCT:** The product sold by the business may be a perishable product or a durable product. Accordingly, the inventory has to be maintained.

**7.6.3. ECONOMIES OF PRODUCTION:** The scale on which the production is done also affects the amount of inventory held. A business may work on large scale in order to get the economies of production.

## **7.7. SUGGESTIONS**

Through the implementation of the WMS it is understood that how the logistics sector was able to bring about a major change. It is clear how effective warehouse actions have been through the implementation of the WMS.

Employee efficiency could be further improved. Therefore, implementing the right WMS can make warehouse operations more efficient. Likewise it should be after reaching a clear understanding what kind of WMS should be installed. When preparing to establish a WMS, it is important to understand to which factors it is giving more priority. As well as be aware of its modes of action. Also a detailed study will be better to understand what changes that it had been made after the WMS are established

**ORGANIZE WORKSTATIONS:** organizes workstations increases efficiency by eliminating the need for workers to look for tools or equipment. To keep your workstations as organized as possible, use the 5s concept from lean manufacturing. Sort, set in order, shine, standardise and sustain are all approaches for reducing clutter, reducing errors, and improving safety and organization

**OPTIMISE LABOUR EFFICIENCY:** analyse your material usage trends and group high volume items near the warehouse's entrance to reduce journey time. Also keep products that are commonly sold together in the same place.

**RIGHT WMS:** after conducting a proper system analysis and process study and keeping in mind about the long term plan for the organization, correct decision making is required about which WMS need to be implemented in the organization

Opt for flexible customizable and value additions possible in line with requirements, growth plans and the process of the organization.

# **CHAPTER-8**

# **CONCLUSION**

## **8. CONCLUSION**

The study helps to understand the factors that influence the implementation of a WMS. The necessity of WMS implementations has been recognised by providers due to the ever-changing customer and company requirements. The goal of this research was to better understand how a WMS system is implemented in a logistics and supply chain service provider and to assess the important aspects that contribute to its effectiveness. The important variables that have contributed to a successful WMS installation have been detailed out in this evaluation. And identified the changes that took place before and after the implementation of the WMS. Also the study helped to understanding what change a warehouse or logistics field could bring through the implementation of the WMS. It is clear that the provider has begun to reap the benefits of increased productivity, cost savings, and employee satisfaction following the successful implementation of the WMS system.

A proper Inventory Management System must be used to manage stocks. All inventory management has to do is to keep accurate records of items that are ready for shipment. Interdependence exists between inventory and logistics systems. Inventory management is required for logistics management to function, and a successful logistics system can help to improve the warehouse environment and operational activities. Inventory is a key part of the logistics system, and its operations can be found throughout the process. A sophisticated logistics strategy cannot fully utilise its potential unless Inventory is linked to other logistical activities.

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