UNIT 9  LOGISTICS INFORMATION SYSTEM*

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9.0 OBJECTIVES

After reading this Unit, you should be able to:
- Explain the concept and importance of Logistics Information System;
- Examine the role of Logistics Information System;
- Know its requirements and components; and
- Acquaint with the technologies and applications of Logistics Information System.

9.1 INTRODUCTION

Logistics concerns the flow of goods and services facilitated by information support. In present time machines and robots have to a large extent eliminated manual work. With advances in information technology, business-to-business (B2B) transactions or business-to-customer (B2C) deals are done through the internet. Presently logistics uses the information resources of the enterprise and creates a database specifically for its needs consisting of elements like data source, users, etc. Information Systems is an applied science for the processes of the creation and operation of systems that manage information.

Business Process Analysis methodologies are used for the modelling of logistic processes and their information flows that assist in understanding and clearly describing the information relationships between parties and authorities and in defining improvements to the logistic systems. Logistics Information System (LIS) is implementation of solutions for a system of records and reports which may be paper based or electronic. This is a specialised area in logistics that can handle location, work management, and data management in organisations. It mainly includes coordination of demand, supply, movement, and control of material or finished goods.

* Contributed by Col. (Dr.) Rajive Kohli, Management Consultant, New Delhi
This Unit acquaints the learners with the concept and role of LIS. It brings out the requirements and components of LIS. The technologies involved in it are analysed.

9.2 ROLE OF LOGISTICS INFORMATION SYSTEM

Logistics Information System (LIS) is a system of records and reports whether paper-based or electronic, used to aggregate, analyse, validate and display data from all levels of logistics system that can be used to make logistics decisions and manage the supply chain.

The role of LIS can be understood from the following:

a) LIS ensures the transformation of logistics functional operations into a process with the goal of pursuing customer satisfaction at the lowest cost. It facilitates planning and control of logistics activities related to order fulfilment.

b) LIS provides information on goods and tracks the delivery, by giving their status.

c) Logistics systems depend on outside information and international standards to comply with regulations and use laid down ways of sharing logistic information with others.

d) The manufacturers and traders monitor the actual products to know whether they will arrive on time and in proper condition at the delivery places, and to be able to take prompt action in case of any lapse.

e) Transporters focus on the progress and status of the means of transport. In case of any delays or exigencies, transporters can report these to their customers who can consider the impact.

f) Customs authorities and those responsible for ensuring the safety and security of goods during transportation are given details about the content of goods and their means of transport.

LIS is part of logistics management to manage, control and measure the logistical activities within the organisation and across the supply chain, achieving logistics efficiency and effectiveness. Within an organisation, LIS achieves the following:

a) Customer satisfaction at the lowest total cost.

b) Enables planning and control of the logistical activities related to order fulfilment.

c) Fosters better tactical and strategic decisions for the benefit of the firm and its customers.

d) Gives information to customers regarding product availability, order status, and delivery schedules.

e) Enables resource planning thereby reducing the requirements of inventory and human resources.
Logistics Management: Components

f) Provides information to top management to formulate strategic decisions by interface with marketing, financial, and manufacturing information systems.

g) Links the operations of the business, such as manufacturing and distribution, with the supplier’s operations and the customers.

h) Facilitates ‘virtual’ inventory management or electronic inventory management by managing dispersed inventories through information technology. Inventory management becomes centralised and decisions on replenishment and other quantities are taken based on a single stock.

The benefits of implementing LIS are:

a) Improvement in customer service and satisfaction.
b) Establishing communication within the logistics chain.
c) Reduction in stock levels and costs particularly of transportation and storage.
d) Synchronising the processes of supply, production, and distribution.
e) Handling the problems caused by shortage of materials for production.
f) Improvement of delivery schedules and lessening probable orders errors.
g) Reduction of documentation required in supply chain management.

The main activities of LIS are:

a) Data flow from external sources.
b) Processing and storage of information within companies.
c) Transmission of data for storage/processing to the decision maker in form of reports.
d) Communication of decisions to customers and their feedback.

9.3 LOGISTICS INFORMATION SYSTEM: REQUIREMENTS AND COMPONENTS

There are three types of information systems that serve different organisational levels. These are operational level systems, management-level systems, and strategic level systems. Converting logistics data to information, representing it in a manner useful for decision making and interfacing the information with decision-assisting methods are at the core of LIS. There are certain requirements which are:

a) Organisation decisions: It relates to the decisions to be made at each level of organisation. While designing information system, it must be ensured that the concerned person is entitled to get required information needed for decision making.

b) System requirement: After arriving at the decision on collecting information, next requirement is identification of source of information, the volume and quality of information. A suitable channel of communication will have to be designed to satisfy various requirements.
c) **Control requirements.** Based on guidelines given by the management, system should be able to aid in decision making, minimising delays, and increasing efficiency. Control is required to ensure that no errors are made.

d) **System input and output data.** To satisfy the demand of a customer, several activities are undertaken by organisation which need proper coordination. Action reports are made for the purpose of undertaking activities based on generated information.

**Key Components of LIS**

LIS is designed to manage the flow of materials and information within and between organisations and their business environment. Globally information technology is a critical enabler of the logistics supply chain networks that businesses use to acquire, produce, and deliver goods and services. The key components include:

a) Logistics Information Portal  
b) Logistics Computing and Simulation  
c) Decision Support System  
d) Database  
e) E-Logistics and E-Commerce  
f) Software applications relating to Customer Relations Management (CRM), Enterprise Resource Planning (ERP), Radio Frequency Identification (RFID) Tags, Transport Management System (TMS), and Warehouse Management System (WMS)

**Check Your Progress Exercise 1**

**Note:** 1) Use the space below for your answers.  
2) Check your answers with those given at the end of the Unit.

1) State the benefits of LIS.

2) Describe the requirements of LIS and its components.
9.4 LOGISTICS INFORMATION SYSTEM: CONCEPTS & TECHNOLOGIES

The effectiveness of LIS is based on real-time accurate information enabling a reliable accurate forecast from the raw material suppliers to the ultimate consumer with a large geographical spread. Managing this information is possible only with the use of various systems continuously evolving which need ingenuity for adaption in the LIS.

**Information Network:** The traditional elements of logistics are integrated by a web of IT networks, and integrated management systems, with virtual and network companies within an information grid. This LIS incorporates all information relating to plans, implementation, and control, for efficient and effective flow and storage of goods and services.

**Electronic Data Interchange (EDI):** IT plays an important role in providing real-time information for proper forecasting and planning of manufacture or for supply of finished products to the end users. EDI can link suppliers, manufacturers, customers, and intermediaries. IT as the key component facilitates speeding up delivery time by transmitting information to the warehouse directly triggering an order for immediate shipment. In global context, EDI links exporters with customs, ports, and transporters for quick processing of customs documents thus speeding up the deliveries.

**Supply Chain Management Software (SCMS):** These software modules complete supply chain transactions and manage supplier relationships for controlling the business processes. It can identify the activities that can reduce and eliminate non-value-added activities. It can deliver and market better quality products and services more quickly and cost-effectively to gain an advantage over less efficient competitors. Effective supply chain management systems help businesses to improve the entire supply chain network by reducing waste and shipping delays. SCMS reduces overhead expenses by enabling effective demand planning, improving inventory management, and relationships with vendors and distributors etc.

**Enterprise Resource Planning (ERP):** It encompasses software technologies in supply chain, bringing together the information from within the firm and from different geographical areas, integrating all businesses of the firm together for efficient use of resources. It is a process used by a company to manage and integrate important parts of its business. It refers to the software and systems to plan and manage all the supply chain, manufacturing, services, financial and other processes of the organisation.

**Inventory Management Module:** Inventory management being a key component of logistics, firms should manage their inventories efficiently as huge cost is involved in the inventories piling up. Therefore, an IT module for finished goods, semi-finished goods, raw materials, and work in progress inventories is convenient in ordering, based on suppliers or customers’ demands.

**Just-In-Time (JIT) System:** JIT concept was introduced by Toyota in Japan and Maruti Suzuki in India. Generally, inventory carrying cost in terms of warehousing is extremely high due to large capital expenditure involved in
building and maintain warehouses. Thus, suppliers are required to supply components or raw material when the demand is just placed at 24-hour notice, saving cost of transportation and warehousing. The required components or raw material are supplied just-in-time when needed by the factory.

**Transportation Management System:** Transportation is a key element of logistics being an important dimension as third-party intermediaries, to link together the suppliers and manufacturers to final consumers. A range of services are available starting from factory door pick up, custom freight station, rail transportation using high speed wagons from container depot to ports and further movement if needed by sea to port of discharge and again hinterland transport. In these activities, communication technologies, satellite tracking, bar coding applications, EDI, automated material handling systems etc., are employed.

**Data Mining:** Data mining is a process used of extracting usable data from a larger set of raw data by companies to turn it into useful information through understanding a pattern and determine customers’ behaviour for repeat sale. By using software to look for patterns in large batches of data, businesses can learn more about their customers to develop effective marketing strategies, increase sales and decrease costs. It implies analysing data patterns by using one or more software. Accordingly, based on the feedback obtained from dissatisfied customers, services for such customers can be fine-tuned and customised to meet their requirement.

**Data Warehousing:** A data warehouse is built by integrating data from multiple sources that support analytical reporting, and decision making. Data warehousing is the process of constructing and using a data warehouse, being the electronic storage of a large amount of information by a business or organisation. These are solely intended to perform queries and analysis and often contain large amounts of historical data. It combines information from several sources into one comprehensive database. For example, in the corporate world, a data warehouse might incorporate customer information from a company’s sales systems, website, mailing lists etc.

**Customer Relations Management (CRM):** It is a technology used to manage interactions with customers by merging practices, strategies and technologies used by companies. Data mining and data warehousing are two important elements of CRM technologies. CRM systems compile customer data across different channels, or points of contact, between the customer and the company, that include the company’s website, telephone, live chat, direct mail, marketing tools and social networks. CRM systems can provide the staff dealing with the customers, a detailed information on customers’ personal information, purchase history, buying preferences and concerns. CRM technology creates various value-added services for customers, making the interaction more accurate, timely, responsive, and reliable. The basic CRM system could be enhanced by automation of marketing, sales force, contact centre and workflow; location-based services, human resource management, etc. The usage of CRM depends on a company’s business needs, resources and goals, as each has different costs associated with it as can be seen by the undermentioned examples:
a) **Contact Centre.** The sales and marketing teams procure data and update the system with information relating to customers and revise customer history records through service calls and technical support interactions.

b) **Social Customer Relations Management:** To add value to customer interactions on social media, businesses use various social CRM tools that monitor social media conversations, to determine their target audience. Other tools are designed to analyse social media feedback and address customer queries and issues. They capture customer sentiments, such as the likelihood of recommending products and overall customer satisfaction, to develop marketing and service strategies.

c) **Mobile Customer Relations Management:** Mobile CRM apps take advantage of features that are unique to mobile devices, such as GPS and voice recognition capabilities, to give sales and marketing employees access to customer information from anywhere.

### 9.5 LOGISTICS INFORMATION SYSTEM: TECHNOLOGY APPLICATIONS

The three types of important information in an inventory, which can be source of errors if not recorded accurately, are (i) part description/number, (ii) quantity and (iii) location. Identification systems are for the codification of packages inside the warehouse by means of codes that can be scanned by automatic devices and these are of fundamental importance for the computerised management of the warehouse. Some of the technology applications for LIS are described below.

**Bar Codes**

Bar codes are the optical conversion of a numerical or alphanumerical code which are used to identify a package. This optical conversion is represented by means of an alternating sequence of vertical bars and spaces. Bar codes are read using a laser light, which pick up the reflection from the bars and spaces on the label and is usually read from a short distance, although in present times the distance range is improving with new designs.

The codes are standardised by industry and usually printed on a paper label or tag. They generally contain a unique identifier, such as part number, which can be referred to a database for required information, such as price or description. The automotive industry requires labels designed to their specifications for layout and the type of code used and include, in addition to the product code, the manufacturer, date of manufacture, and so forth.

The use of bar codes improves the speed of data entry and the accuracy of the data retrieved. These can reduce errors as they are machine readable symbols and are widely used to gather information at all levels of retailing, distribution, and manufacturing. The error rate for this method is extremely low compared to human error, which is estimated to be as high as 3% for repetitive entries.

Technologically there are two kinds of bar code scanning devices:

a) **Optical scanners** use a light source that illuminates the surface of the code enabling a suitable sensor to record the variations of the reflected ray.
b) **Laser scanners** repeatedly explore the encoded surface at each passage, taking a series of pictures that allow a greater accuracy of scanning. This allows scanning at high intensity and on moving packages.

**Radio Frequency Identification (RFID) Tags**

Smart tags are automatic identification system based on radiofrequency technology that work in a way like bar codes. It uses reflected radio waves from a small device or tag to receive its information. It is activated by means of an electromagnetic field generated by the scanner (reader), which is the electronic device used for the exchange of information with the tag itself. The readers can be portable and are used by operators or are installed on vehicles, integrated with an antenna.

RFID tags are generally more expensive than printed bar codes, but the price is falling rapidly, promoting their wider applications. Hence major retailers are using this method of gathering information.

An RFID tag can be active or passive.

a) Active tags are provided with an internal battery that powers them and enables large transmission distance (over 400m in the open for some models). They are equipped with an overly complicated electric system that allows the application to be customised based on individual requirements.

b) Passive tags are more economical and widespread being made of an aluminium or copper antenna, a memory microchip, and a support for the protection of this chip. They do not have a battery and require no maintenance.

**Logistic Labels**

The logistic labels record information, both in legible format (characters, numbers, and graphic elements) and in the form of a bar code. With the help of the labels, a logistic unit can be traced throughout the supply chain. For example, a logistic label the SSCC (Serial Shipping Container Code) facilitates tracing of the physical path of the individual packages together with the information flow associated with it. The scanning of the SSCC, facilitates checking of the transport documents transmitted in electronic format, the shipping and delivery of the products.

The labels contain both human-readable text and scannable symbols giving supplier details, product description, carton quantity, batch no, etc.

**QR Code**

QR (Quick Response) code is a matrix or two-dimensional barcode which is a machine-readable optical label that contains information about the item to which it is attached. It consists of black squares arranged in a square grid on a white background containing data for a locator, identifier, or tracker that points to a website or application. A QR code uses four standardised encoding modes i.e. numeric, alphanumeric, byte/binary, and kanji (Chinese character) to store data efficiently. It has become popular due to its fast readability and greater storage capacity compared to standard barcodes.
**FASTag**

FASTag is an electronic toll collection system in India, operated by the National Highway Authority of India (NHAI) employing RFID technology for making toll payments directly from the prepaid or savings account linked to it or directly to the toll owner. It is affixed on the windscreen of the vehicle and enables to drive through toll plazas without stopping for transactions. With emphasis on implementing an effective and efficient electronic toll collection framework, FASTag has become popular enabling an efficient, fast, and cashless payment option for collection of toll charge. The integration of FASTags with the electronic way billing (E-way billing) system is an achievement toward a globally approved business and logistics hub. Connecting the electronic way bill (E-way bill) with FASTags can provide better operational efficiencies, making it simple to track the movements of goods by SMS alert especially at each toll plaza.

**Check Your Progress Exercise 2**

**Note:**
1) Use the space given below for your answers.
2) Check your answers with those given at the end of the Unit.

1) Elaborate on the technologies for adoption of LIS.

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2) Describe the technology applications for LIS.

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**9.6 CONCLUSION**

LIS caters to the specific information needs for decision making in the areas of logistics management. The appropriate software designed for the installed system makes it possible to generate reports for users in the required formats. Non value-added activities may be identified and taken out of the system to reduce investment cost. Integrating Logistics and Information Systems results in better awareness on various aspects of logistics. LIS is designed to provides the necessary skills to manage the flow of materials and information within and between organisations and their business environment. It focuses on the use of information technology as a critical enabler of the supply chain networks that businesses use to acquire, produce, and deliver goods and services all over the world.
9.7 GLOSSARY

**Electronic Data Interchange:** It is a standard way to electronically transfer data between software applications in logistics companies and their business partners. It speeds up important logistics processes in supply chain.

**E-logistics:** It is application of internet-based technologies to traditional logistics processes or web-based applications and services dealing with the efficient transport, distribution, and storage of products along the supply and demand chain.

**E-way Bill:** It is Electronic Waybill. It is a unique document/bill which is electronically generated for specific consignment/movement of the goods from one place to another, either inter-state or intra-state and for goods of value of more than INR 50000, required under current rules.

**Serial Shipping Container Code (SSCC):** It is an 18-digit number used to identify shipments/cartons/logistics units as they travel through the supply chain.

**Warehouse Management System:** It is a software application designed to support and optimise functioning of warehouse and management of distribution centre.

9.8 REFERENCES


9.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

1) Your answer should include the following points:
   - Customer service improvement
   - Increasing trust and confidence through communication within the
logistics chain

- Synchronisation of the processes of supply, production, and distribution
- Cost reduction particularly of transport and storage
- Reducing the documentation

2) Your answer should include the following points:

The requirements for LIS to be covered under:

- Organisation decision
- System requirement
- Control requirements
- System input and output data

The components of LIS include:

- Logistics information portal
- Logistics computing and simulation
- Decision support system
- Database and data mining
- E-logistics and e-commerce
- Software applications that include CRM, ERP, RFID, TMS, WMS

Check Your Progress Exercise 2

1) Your answer should include the following points:

- Information Network
- Electronic Data Interchange
- Supply Chain Management Software
- Enterprise Resource Planning
- Inventory Management Module
- Just-In-Time Systems
- Transportation Network
- Data Mining
- Data Warehousing
- Customer Relations Management

2) Your answer should include the following points:

- Bar codes
- RFID tag
- Logistic labels
- QR code
- FASTag