# UNIT-11

# Using Information Technology

## Learning Outcomes

**By the end of this unit the learner will be able to:**

- ✓ Understand the information systems that support supply chain.
- ✓ Explore enterprise resource planning systems.

# Unit 11

# Information Systems that Support the Supply Chain

Information technology backs up interior operations and also helps to connect companies in a supply chain.

All information systems are comprised of technology that carries out three main functions: data storage and retrieval, data capture and communication, and data manipulation and reporting.

# Data Capture and Data Communications

The first practical area is comprised of systems and technology that generate high-speed data capture and communications networks.

We look at:

- The Internet;
- Broadband;
- EDI;
- XML

## The Internet

The Internet is a worldwide data communications network, which utilizes what is known as Internet Protocol (IP) standards to shift data from one point to another. The Internet is the worldwide communications network that can join all computers and communication devices globally.

Now, with the Internet, diverse companies have the ability to quickly and cheaply connnect their computer systems. If required, extra data security and privacy can be provided by using technology to make Virtual Private Networks (VPNs), which use the Internet to create much safer communication networks.

## Broadband

Typically, this refers to any communications technology that provides high-speed (faster than a 56Kb dial-up modem) access to the Internet with a link that is always on. Broadband technology is expanding and as it does, it becomes possible for companies in a supply chain to quickly and easily connect with each other and swap large volumes of data in real-time.

## EDI

Electronic Data Interchange (EDI) is a technology that was invented to exchange general types of data between companies that do trade with each other. It was developed to mechanize back office transactions, like the sending and receiving of purchase orders.

A lot of companies have big existing investments in EDI systems and are finding that it is very cost-effective to use these systems to correspond with other businesses. Standard EDI data sets can be used for a large number of business transactions. Companies can make a decision which data sets they will utilize and which parts of every data set they will exercise.

## XML

XML (eXtensible Markup Language) is a technology that is being generated to broadcast data in flexible formats between computers, and also between computers and humans. XML is extendable and once definite standards have been agreed upon, XML can also be used to exchange a wide variety of diverse kinds of data and associated processing instructions between different computer systems. XML can also be used to converse between computers and humans, because it can drive user interfaces such as web browsers and react to human input. Unlike EDI, the precise data transactions and processing sequences do not have to be formerly defined.

## XML Standards

In the longer term, EDI will be completely used by XML, as XML standards are agreed upon and are established to spread. As these standards extend, they will facilitate extremely flexible communications between companies in a supply chain. XML will permit communications that are more impulsive and free-form, like any human language.

## Data Storage and Retrieval

The second practical area of an information system is made up of technology that stores and retrieves data. This action is performed by database technology. A database is a prepared grouping of data that is saved in an electronic format. The most general type of database uses what is called “relational database” technology. Relational databases store associated groups of data in individual tables and allow for recovery of data with the use of a typical language called ‘structured query language’.

## (SQL)

A database is a copy of the business processes for which it brings together and stores data. The model is explained by the level of detail in the data it gathers. The design of each database has to strike the right balance between large amounts of data at one extreme and extremely detailed data at the other extreme. This balance is achieved by weighing up the requirements and budget of the business against the rising cost linked with more and more thorough data. The balance is reflected in what is called the data model of the database.

## Data Manipulation and Reporting

Different supply chain systems are produced by combining processing logic to influence and show data with the technology essential to capture, communicate, store and recover data. The way a system manipulates and displays the data that flows through it is determined by the particular business operations that the system is intended to support.

Information systems hold the processing logic required by the business operations they support.

Chopra and Meindl describe a number of systems that maintain supply chain operations:

- Enterprise Resource Planning (ERP);
- Procurement Systems;
- Advanced Planning and Scheduling;
- Transportation Planning Systems;
- Demand Planning;
- Customer Relationship Management (CRM) and Sales Force Automation (SFA);
- Supply Chain Management (SCM);
- Inventory Management Systems;
- Manufacturing Execution Systems (MES);
- Transportation Scheduling Systems;
- Warehouse Management Systems (WMS)

## Enterprise Resource Planning

Enterprise Resource Planning (ERP) Systems collect data spanning numerous functions in a corporation. ERP Systems check orders, production schedules, raw material purchases and finished goods inventory. They carry a process-oriented overview of the business across a variety of functional departments.

ERP Systems come in modules that can be installed on their own or in conjunction with other modules. There are usually modules for finance, procurement, manufacturing, order fulfillment, human resources and logistics.

## Procurement Systems

Procurement Systems highlight the procurement activities that happen between a business and its suppliers. The purpose of these systems is to simplify the procurement procedure and make it as well-organized as possible. Such systems typically replace supplier catalogs with a product database that contains all the required information regarding the products the company buys.

## Advanced Planning and Scheduling

Advanced Planning and Scheduling, which is also referred to as APS systems, are highly logical applications where the idea is to review plant capacity, material accessibility and customer demand. These systems then make schedules for what to make in which plant and at what time.

## Transportation Planning Systems

Transportation Planning Systems are systems that work out what amount of materials should be brought to which sites at what times. The systems enables people to evaluate different modes of transportation, diverse routes and different carriers.

## Demand Planning

These systems utilize specifc techniques and algorithms to aid a company predict demand. These systems take chronological sales data and information about planned promotions and other events that can influence customer demand, such as seasonality and market trends. They use this data to produce models that can help predict future sales.

## Customer Relationship Management and Sales Force Automation

Systems of this kind computerize many tasks related to servicing existing customers and finding new customers. Customer Relationship Management (CRM) Systems follow buying patterns and histories of customers. They bring together a company's customer-related data in a central location where it is quickly and easily accessible for customer service and salespeople, who make use of the data to better handle customer requests.

Sales Force Automation (SFA) Systems enable a business to better organize and monitor the activities of its sales department . These systems computerize a lot of tasks related to scheduling sales calls, organizing follow-up visits and preparing quotes and proposals for customers and prospects.

## Supply Chain Management

An SCM System is an incorporated system that includes superior planning and scheduling, transportation planning, demand planning and inventory planning applications. SCM Systems rely on ERP or pertinent legacy systems to provide them with the data they require to carry out their duties. These systems have the logical capabilities to maintain strategic level decision making.

## Inventory Management Systems

These systems support activities that are part of inventory management, such as tracking historical demand patterns for products, monitoring inventory levels for different products, calculating economic order quantities and determining the levels of safety inventory that should be held for each product.

These systems are used to find the right balance for a company between the cost of carrying inventory and the cost of running out of inventory, ultimately losing sales revenue as a result.

## Manufacturing Execution Systems

The emphasis is on carrying out manufacturing activities in a factory. This type of system is less investigative than an APS. It creates short-term production schedules and assigns raw materials and production resources within a single manufacturing plant. A Manufacturing Execution System (MES) is similar in its operational focus to an ERP system, and often MES software is produced by ERP software vendors.

## Transportation Scheduling Systems

Systems in this group are related to ERP and MES applications in that they are less investigative and more focused on everyday operational issues. A transportation scheduling system makes short-term transportation and delivery schedules that are followed by the business.

## Warehouse Management Systems

These systems support daily warehouse operations and have the ability to contribute to quality ongoign operations of a warehouse. These systems keep a watch over inventory levels and stocking locations within a warehouse, while directing the actions required to pick, pack and ship products to fulfil customer orders.

## New Trends in Supply Chain Technology

The demands of the globa economy are forcing businesses and entire supply chains to adopt more flexible and receptive modes of operation. The interdependence of companies and economies along with the fast and often unanticipated pace of events is creating the requirement for companies that are quicker and more logical/efficient than those of the past.

There are four available technologies that can be utilized to balance existing supply chain systems. These technologies do not, however, restore existing systems. In fact, it is necessary for there to be an existing infrastructure of systems in place, to provide the foundation upon which they can be installed.

Once installed, these technologies provide the business with the means to more effectively gather the data required by existing systems. They also offer better ways to share data among the systems and to make the data observable and accessible to those who need it. They also provide workers with a way to plan effective, intelligent and efficient responses to challenges and opportunities alike.

These four technologies are:

1. Radio Frequency Identification (RFID);
2. Business Process Management (BPM);
3. Business Intelligence (BI);

4. Simulation Modeling

## Radio Frequency Identification (RFID)

## RFID Technology –

RFID technology is comprised of hardware such as RFID tags and radio frequency scanners and antennas, which allow these devices to communicate with each other.

Passive RFID tags are by far the most extensively used. This is because their price and complexity is much lower than that of active tags. Large companies, in particular in the consumer goods retail industry like Wal-Mart, are requiring their suppliers to start using passive RFID tags on the products that they ship. Typically, these tags are necessary only at the pallet and case level.

## RFID Information –

RFID information is comprised of expressive data, which is about the product itself and also tracking data that records the movement of the product as it passes through the supply chain. It is logical for there to be a single universal standard for this information, so that people all over the world in diverse companies and countries can interpret the data simply, arather than having to translate/convert it from one standard to another.

## RFID Benefits and Problems –

The benefits of RFID are important. To begin with, it offers a much more cost-effective way of recording data about products and their movements through a supply chain. The data that is captured is also more precise and it go into huge levels of detail. This enables much more inventory visibility and better product flows in supply chains. The increased visibility makes it possible to create supply chains more professionally, ultimately leading to lower costs.

There are however problems with RFID, as well as benefits. The technology itself is still developing and it can be hard at times to get it to work as expected. As companies begin using the technology, they discover that it takes time to set up systems of RFID tags and radio scanners, so that there is a high enough read rate on the data readers.

## Business Process Management (BPM)

A procedure is a series of steps that lead to the delivery of a particular product or service. When you think about it, business processes themselves are assets of an organization, just as much as the organization's products, people and information.

The business defines the steps in a procedure and uses BPM Software to gather and display a constant stream of data, which shows the movement of transactions through every step.

When used efficiently, BPM Software makes business procedures clear to the people who are accountable for the efficient operation of that procedure. When the people who are involved in the process of a business proceduce see what is happening *as* it is happening, they can take effectual action to react to problems and to improve productivity.

## Business Intelligence (BI)

Because of the rapid pace of change in markets and their supply chains, it is extremely important for people and businesses alike to stay up to date with events as they occur and understand what these events signify. Business intelligence or BI systems help companies keep track of what is happening within their own organizations and within the markets they serve. BI systems gather, store analyse examine data.

Often, the database is expanded with new data on a permanent or real-time basis. When people access the data, they utilize BI software tools that help them study the data and display the results. BI software tools range from simple spreadsheets and charts to complex multivariable regression analysis and linear programming. The appropriate mix of BI tools is determined by the requirements of the people using them, along with their skill and training levels.

## Simulation Modeling

Simulation Modeling Software is a category of software which is rapidly increasing in important and use. Because of the fast pace of change in business, companies have to make important decisions more often, and these decisions have significant consequences on business operations and output.

Simulation Modeling Software allows the business to construct a virtual replica of a factory, supply chain or delivery route, after which it can subject that model to various inputs and diverse situations and observe what happens. A design that might seem outstanding on paper could very well turn out to have problems that are not apparent, until the design is modeled and its performance is simulated under a variety of different conditions. It is much faster and cheaper to find this out through simulations than to find out the hard way, through real-life working experience.

## The Impact on Supply Chain Operations

Although all of these new technologies are interesting and helpful individually, their full potential is realized when they are utilized in conjunction with each other.

Then, by using simulation systems, they can model potential supply chain procedure changes and show the probable impact of every process change. This way, the business can quickly select the most effective changes, ultimately implementing them with a high level of confidence that they will actually deliver the desired results.

## E-Business and Supply Chain Integration

E-business involves developing aset of principles and practices that the company uses access the benefits of better supply chain integration.

Professors Lee and Whang propose four key dimensions of the impact of e-business on supply chain integration. These four dimensions make a series of greater and greater incorporation and coordination among supply chain participants. This series culminates in the formation of entirely new ways to perform business. The four dimensions are:

1. **Information Integration** — This is the skill to share applicable information among companies in a supply chain. This includes data like sales history and demand forecasts; inventory status; production schedules; production capacities; sales promotions and transportation schedules.
2. **Planning Synchronization** — This refers to the combined contribution of companies in a supply chain in demand forecasting and inventory replenishment scheduling. It also includes the mutual design, development and bringing of new products to the market.
3. **Work Flow Coordination** — This is the subsequent step after planning synchronization. It is the streamlining and computerization of ongoing business activities across companies in a given supply chain. This includes activities like purchasing and product design.
4. **New Business Models** — This can occur as a resul of Supply Chain Integration, made even more possible by the Internet. Roles of companies in a supply chain can be redesigned so that every company can focus on the activities that are its core competencies. Non-core activities can be outsourced to other companies. New capabilities and efficiencies will, as a result, open up.

The Internet has made it possible for businesses in a supply chain to make and maintain electronic connections with one another for various purposes, such as, exchanging information about the products they sell. These connections also facilitate close synchronization between companies as they carry out the various activities that create the supply chains they contribute to. As these electronic connections continue to become more widespread and normal for businesses at all levels, they are allow for an entirely new level of cooperation - one that leads to superior business efficiency and receptiveness.

**Further Reading:**

- ✓ Qingyu Zhang, (2007), E-supply Chain Technologies and Management
- ✓ David L. Olson, (2012), Supply Chain Information Technology
- ✓ Sameer Kumar, (2007), Connective Technologies in the Supply Chain