



## Using Information Technology

### Learning Outcomes

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

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

## Information Systems that Support the Supply Chain

Information technology backs up interior operations and it 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; and
- XML

### The Internet

The Internet is the worldwide data communications network that 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 with all computers and communication devices.

Now, with the Internet, diverse companies have a means to quickly and cheaply attach their computer systems. If required, extra data security and privacy can be provided by using technology to make Virtual Private Networks (VPNs) that use the Internet to generate very safe communication networks.

### Broadband

Basically, this implies any communications technology that provides high speed (faster than a 56Kb dial-up modem) entrance to the Internet with a link that is always on. Broadband technology is scattering and as it does, it becomes feasible for companies in a supply chain to simply and reasonably hook up with each other and swap large volumes of data in real-time.

### EDI

Electronic Data Interchange (EDI) is a technology that was invented to broadcast 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 discover that it is very cost effective to carry on these systems to correspond with other businesses. Standard EDI data sets have been described 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 extensible and once definite standards have been agreed upon, XML can also be used to converse 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 offer for recovery of data with the use of a typical language called structured query language.

## (SQL)

A database is a replica 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 hit a balance between highly collective data at one extreme and extremely detailed data at the other extreme. This equilibrium is arrived at by weighing the requirements and budget of a 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, talk, store, and recover data. The means that a system

manipulates and displays the data that flows through it is dogged 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; and
- Warehouse Management Systems (WMS)

## Enterprise Resource Planning

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

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

## Procurement Systems

Procurement Systems spotlight the procurement activities that happen between a business and its suppliers. The idea of these systems is to rationalize the procurement procedure and make it well-organized. Such systems typically substitute supplier catalogs with a product database that contains all the required information concerning products the company buys.

## Advanced Planning and Scheduling

Advanced Planning and Scheduling, which are also called APS systems, are highly logical applications whose 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 compute what amount of materials should be brought to what sites at what times. The systems allow people to evaluate different modes of transportation, diverse routes, and different carriers.

## Demand Planning

These systems employ particular techniques and algorithms to aid a company predict their demand. These systems take chronological sales data and information about designed promotions and other events that can influence customer demand, such as seasonality and market trends. They employ this data to produce models that assist predict future sales.

## Customer Relationship Management and Sales Force Automation

Systems of this kind computerize a lot of tasks connected to servicing existing customers and finding new customers. Customer Relationship Management (CRM) Systems follow buying patterns and histories of customers. They merge a company's customer-related data in a place where it is rapidly accessible to customer service and salespeople who make use of the data to better counter customer requests.

Sales Force Automation (SFA) Systems permit a corporation to better organize and monitor the activities of its sales force. These systems computerize a lot of tasks related to scheduling sales calls and follow-up visits and preparing quotes and proposals for consumers and prospects.

## Supply Chain Management

A SCM System could be an incorporated suite that contains superior planning and scheduling, transportation planning, demand planning, and inventory planning applications. SCM Systems rely on ERP or pertinent legacy systems to offer them with the data to support the study and planning that they do. These systems have the logical capabilities to maintain strategic level decision making.

## Inventory Management Systems

These systems support the activities that are part of inventory management such as tracking historical demand patterns for products, monitoring inventory levels for different products, and calculating economic order quantities and 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 and losing sales revenue because of that.

## Manufacturing Execution Systems

The emphasis is on carrying out the 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

alike 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 every day operational issues. A transportation scheduling system makes short-term transportation and delivery schedules that are consumed by a business.

## Warehouse Management Systems

These systems sustain daily warehouse operations. They offer capabilities to professionally run the continuing operations of a warehouse. These systems keep follow of inventory levels and stocking locations within a warehouse and they maintain the actions required to pick, pack, and ship product to load customer orders.

## New Trends in Supply Chain Technology

The demands of our worldwide economy are forcing businesses and whole supply chains to accept more flexible and receptive modes of operation. Both the interdependence of companies and economies, and the fast and often unanticipated pace of events call for responses from companies that are quicker and also more well thought out than what was needed in the past.

There are four gifted technologies that can be utilized to balance existing supply chain systems. These technologies do not restore existing systems. In fact they need that there be an existing infrastructure of systems to offer the foundation upon which they can be installed.

Once installed, these technologies offer ways to better gather data required by existing systems. They also offer better ways to share data among systems and to make that data observable and significant to people who want it. They also offer people with a way to plan well thought out and more efficient responses to challenges and opportunities.

These four technologies are:

1. Radio Frequency Identification (RFID);
2. Business Process Management (BPM);
3. Business Intelligence (BI); and
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 that allow these hardware devices to correspond with each other.

Passive RFID tags are by far the most extensively used. This is because their price and difficulty is much lower than that of active tags. Large companies, in particular in the consumer goods retail industry such as, Wal-Mart, are mandating that their suppliers should start using passive RFID tags on the products that they ship. Initially 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, about tracking data that evaluates the movement of the product through the supply chain. It makes logic 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 and not have to interpret it from one standard to another.

## **RFID Benefits and Problems –**

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

There are problems with RFID, as well. The technology itself is still enhancing and it can be hard at times to get it to work as predictable. As companies start 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 you comprehend that 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 an incessant stream of data that shows the movement of transactions through every step.

When used efficiently, BPM Software makes a business procedure evident to the people who are accountable for the well-organized operation of that procedure. When the people, who are involved in the process of a business course, see what is happening as it is happening, they can take effectual action to react to problems and to recover productivity.

## **Business Intelligence (BI)**

Because of the fast speed of change in markets and their supply chains, it is extremely significant for people and organizations to stay up to date with events as they occur and understand what these events signify.

Business intelligence or BI systems assist companies to appreciate what is happening within their own organizations and within the markets they serve. BI systems gather, store, and examine data.

Often the database is rationalized with new data on a permanent or real-time basis. When people access the data they utilize BI software tools that assist them study the data and display the results. BI software tools run the range from easy spreadsheets and charts to complex multivariable regression analysis and linear programming. The good mix of BI tools is determined by the requirements of the people in a state and their skill and training levels.

## Simulation Modeling

Simulation Modeling Software is a group of software, which is rising rapidly. Because of the fast pace of change in business, companies are faced with the requirement to make significant decisions more often and these decisions have important consequences on business operations and output.

Simulation Modeling Software allows people to make a replica of a factory or a supply chain or a delivery route and then, subject that model to diverse inputs and diverse situations and observe what happens. A design that might seem superior 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 experience.

## The Impact on Supply Chain Operations

Although every of these new technologies is interesting and helpful all by themselves, their accurate 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 see the probable impact of every process change. In this way people rapidly select the most effective changes and employ them with a high level of confidence that they will really deliver the desired results.

## E-Business and Supply Chain Integration

E-business encompasses the developing set of principles and practices that companies are utilizing to gain the benefits inborn in better supply chain integration.

Professors Lee and Whang proposes 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 entire 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 the demand forecasting and inventory replenishment scheduling. It also includes the mutual design, development, and bringing new products to the market.
3. **Work Flow Coordination** — This is the subsequent step after planning harmonization. It is the streamlining and computerization of continuing business activities across companies in a given supply chain. This includes activities like purchasing and product design.
4. **New Business Models** — This can appear as a consequence of Supply Chain Integration, made promising by the Internet. Roles of companies in a supply chain can be redesigned so that every company can really focus on the activities that are its core competencies. Non-core activities can be outsourced to other companies. New capabilities and efficiencies will become possible.

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 harmonization between companies as they execute various activities that force the supply chains they contribute in. As these electronic connections turn out to be more widespread and usual they are enabling a total new level of cooperation 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