Freight Forwarders Training Courses
for Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Tajikistan, Turkmenistan, Ukraine, Uzbekistan

Module 12 ICT in Forwarding

Contents

12.1   Basic Understanding of Computer and its Environment

Learning objectives

The student should understand all basic concepts in respect to the hardware, software and operating systems.

The student should have knowledge about the different types of information processes in the business environment.

The student should further be aware of the different roles assumed by computing personnel, and that ethics of usage is an important element for both computer staff and users.

12.1.1   Hardware, software and operating systems

Learning objectives

The student should have knowledge about the main hardware components of a computer, and the different types of software.

The student should also understand what operating systems refer to, and be able to mention the main types of operating systems currently available and their applications on different computers.

Hardware aspects

Computer hardware describes the physical components of a computer system. The hardware of a computer is infrequently changed, in comparison with software and data, which are "soft" in the sense that they are readily created, modified or erased on the computer.

Most computer hardware is not seen by normal users. It is in embedded systems in automobiles, microwave ovens, electrocardiograph machines, compact disc players, and other devices. Personal computers, the computer hardware familiar to most people, form only a small minority of computers (about 0.2% of all new computers produced in 2003) .

A typical personal computer consists of the following main components:
- A case or chassis in desktop or tower shape
- Motherboard or system board, including Central processing unit (CPU), Random Access Memory (RAM), Basic Input-Output System (BIOS), and Buses

- Power supply
- Storage controllers that control hard disk, floppy disk, CD-ROM and other drives
- And others such as video display controllers, removable media writers

In addition, hardware can also include external components of a computer system. External components often seen are input devices and output devices.

Central processing unit (CPU)

A central processing unit (CPU) is the component in a digital computer that interprets instructions given in the form of computer programmes and processes data contained in computer programmes.

The form, design and implementation of CPUs have changed dramatically since the earliest examples, but their fundamental operation has remained much the same. CPU controls all of the computer's main functions and enables users to execute programmes or process data. The CPU is one of the necessary components found in computers of any era, along with primary storage and input/output facilities.

Since the mid-1970s, single-chip microprocessors have almost completely replaced all other types of CPUs. Today the term "CPU" usually applies to some type of microprocessor. Modern microprocessors are found in everything from automobiles to cell phones to children's toys.

Early CPUs were custom-designed as a part of a larger. Later this costly method of designing custom CPUs for a particular application has largely given way to the development of inexpensive and standardized classes of processors that are suited for one or many purposes. This standardization trend generally began in the era of discrete transistor mainframes and minicomputers and has rapidly accelerated with the popularization of the integrated circuit (IC). The IC has allowed increasingly complex CPUs to be designed and manufactured in very small spaces (on the order of millimeters). Both the miniaturization and standardization of CPUs have increased the presence of these digital devices in modern life far beyond the limited application of dedicated computing machines.

Random-Access Memory (RAM)

Random-access memory (RAM) refers to data storage formats and equipment that allow the stored data to be accessed in any order — that is, at random. In contrast, other types of storage devices (such as magnetic tapes, disks, and drums) can access data on the storage medium only in a predetermined order due to constraints in their mechanical design.

RAM is considered main memory or primary storage in a computer: the working area used for displaying and manipulating data. Memory is therefore used as a temporary means of storing data and instructions, which includes:

* Data awaiting processing
* Instructions used to process data or control the computer system
* Data or information that has been processed

While RAM as the primary storage in a computer can run very fast, and that all memory locations can be accessed at almost the same speed, it is in a sense also volatile. Most data stored in the RAM is in active use, and in an event of power loss, this data will be lost.

RAM in a computer is usually in the form of integrated circuits (IC). These are commonly called memory sticks or RAM sticks. Most personal computers have slots for adding and replacing memory chips. Adding more RAM is an easy way to increase system performance.

Storage devices

Storage devices provide means of storing data and programmes until they are required. Storage devices are developed for long-term use.

Various forms of storage, based on various natural phenomena, have been invented. A computer system usually contains several kinds of storage, each with an individual purpose.

Apart from the primary storage such as RAM, other storage devices include:

* Secondary storage: or external memory, is computer memory that requires using the computer's input-output channels to access information. Secondary storage is not directly accessible to the CPU. It is typically of higher capacity but slower than primary storage to store long-term persistent information. The data in secondary storage is not in active use, and is preserved in the event of power loss.

- Hard disk is used as second storage in computers.
- Tertiary storage: or tertiary memory, is a computer storage system consisting of one or more storage drives and an automatic media library, for example a tape library or optical disc jukebox. Tertiary storage is used for archiving rarely accessed information, since it is much slower than secondary storage. However, unlike off-line storage, a computer can access tertiary storage without human action.
- Tertiary storage is used in the realms of enterprise storage and scientific computing.
- Off-line storage: is a computer storage medium which must be inserted into a storage drive by the user before a computer can access the information stored on the medium. Examples include floppy disks, optical discs, and magnetic tape.
- Off-line storage media can also be easily removed from the storage device. Off-line storage is used for data transfer and archiving purposes.

In a very broad sense, the secondary storage devices can also cover the off line storage. In this case, the secondary storage will include hard disk, CD (CD-R, CD-RW), DVD, flash memory, floppy disk, magnetic tap, RAM disk etc.

Drive

A drive is a peripheral device attached to a computer to access the information stored on storage devices, such as hard disk, floppy disk, magnetic disk, and so on.

In some types of drive, the storage medium is permanently sealed inside the device. In others, the medium can be replaced with varying levels of difficulty.

BIOS

BIOS stands for Basic Input/Output System.

Input devices are hardware used to enter or capture data, information or instruction into the computer. Most data is held in human sensible format. Input devices convert data into a form that makes them machine-sensible. Examples of input devices are keyboards, mice, joysticks, and image scanners.

Output devices translate the results of processing – output – into a human-readable form. The output device may also transfer data requiring further processing to a storage device. Examples of output devices are such as printer, monitor, speakers and headset.

Software aspects

In comparison to hardware, software is less tangible. Software can be defined as a series of detailed instructions that control the operation of a computer system. Software exists as programmes which are developed by computer programmers.

There are two major categories of software: systems software and applications software.

Systems software

Systems software manages and controls the operation of the computer system as it performs tasks on behalf of the user. Systems software consists of three basic categories:

- Operating systems
- Development programmes
- Utility programmes.

The operating system is the software that interacts with the hardware of the computer in order to manage and direct the computer's resources.

Development programmes allow users to develop their own software in order to carry out processing tasks.

Utility programmes provide a range of tools that support the operation and management of a computer system.

Applications software

Applications software is a set of the programmes that enable users to perform specific information processing activities. It can be further divided into two categories: general-purpose and application-specific.

General purpose applications are programmes that can be used to carry out a wide range of common tasks.

Examples of general purpose applications are word processors, text editors, spreadsheets, databases, e-mails, web browsers. Such programmes help improve the efficiency of an individual.

Application specific software comprises programmes intended to serve a specific purpose or carry out a clearly defined task. An example of an application specific programme is software designed to carry out payroll processing or account management.

Applications software: Off the shelf versus custom made

Some application programmes are custom designed, but many are packaged. The majority of packaged applications are purchased off the shelf, and that's why it's called off-the-shelf software as well.

While custom-designed programmes are expensive to develop, they are often the only way a business can obtain a system that caters to its special needs. When an application is developed specifically for an organisation either in-house or by hiring a consulting firm, the specific programme goals and custom requirements are considered during the development process. The advantages of custom made applications are:
- Good fit to business needs
- Good fit to organisational culture
- Availability of special security measures, and smooth interfaces with other information systems
- Availability of dedicated maintenance

The greatest disadvantage of tailored applications is the high cost. It also has a long lead time to develop. The custom made software is also less likely to be compatible with other organisations' systems.

Costs of developing off-the-shelf applications are distributed over a large number of users. Numerous off-the-shelf business software is available these

days, ready-to-use. Many media and small companies can use off-the-shelf software for functions that are somewhat standardized across industries.

The most common off-the-shelf software is general-use office software, such as word processors, electronic spreadsheets, and database programmes.

Advantages of off-the-shelf applications are high quality and low cost. Many vendors offer various support programmes for registered users, and upgrades of the software is only charged at a low cost. Off-the-shelf products are also available immediately. The disadvantages of off-the-shelf products are that only a narrow spectrum of the specific organisation's business needs are addressed in the programme, and often, purchasers are paying for features they may not use at all.

Limitation of software

Because the target group is the mass market, off-the-shelf programmes cater to the lowest common denominator of the users' needs. For this reason companies may often find that ready-to-use software available from the market is not addressed to the company's specific needs.

Meanwhile the cost to develop custom made software in house, or via a third party, is sometimes daunting to small companies. Software development often takes a long time. For the abovementioned reasons, it may be concluded that the software available from the market to a certain company is limited, and its specific business needs may not be integrated into the software running in the company.

Operating systems

The operating system is software that is responsible for communication among the hardware components. The operating system is a primary factor in determining how the user deals with the machine.

Historically, each computer manufacturer created its own operating system tailored for that specific hardware. Proprietary operating systems caused many problems; in particular, changing vendors typically required purchasing new application software.

UNIX

In response to the disadvantage associated with proprietary operating systems, UNIX is the hardware-independent operating system developed by AT&T. UNIX was designed to work with computers from different manufacturers. UNIX is not a complete standard, and application software must generally be rewritten before it can function on different computers.

Today, UNIX is also available for personal computers. The original developer of UNIX - AT&T - essentially released the source code for UNIX to the public. Linux is the base version developed by Linus Torvalds which is an inexpensive and relatively popular version for personnel computers.

Apple computer adopted the UNIX foundation with its OS X operating system. Most mid-range computers and many servers also run an operating system derived from UNIX. Both Sun (Solaris) and IBM (AIX and Linux) focus on UNIX versions for their servers.

DOS

DOS (Disk Operating System) was one of the first operating systems for the PC compatible platform, and the first on that platform to gain widespread use.

DOS commonly refers to the family of closely related operating systems which dominated the IBM PC compatible market between 1981 and 2000: PC-DOS, MS-DOS, FreeDOS, DR-DOS, Novell-DOS, OpenDOS, PTS-DOS, ROM-DOS and several others. Of these, MS-DOS from Microsoft was the most widely used. These operating systems ran on IBM PC-type hardware.

Because of the long existence and ubiquity of DOS, DOS was often considered to be the native operating system of the PC compatible platform.

PC-DOS

PC-DOS is the operating system in all IBM-PCs, though PC compatible computers from nearly all other manufacturers were distributed with MS-DOS. In the early years, PC-DOS was almost identical to MS-DOS. More recently, free versions of DOS such as FreeDOS and OpenDOS have started to appear.

MS-DOS

MS-DOS is still common today and was the foundation for many of Microsoft's operating systems (from Windows V1.00 through Windows Me). MS-DOS 1.0 was released in 1981 for IBM computers and the latest version of MS-DOS is MS-DOS 6.22, which was released in 1994.

While MS-DOS is not commonly used by itself today, it still can be accessed from every version of Microsoft Windows by clicking Start / Run and typing "command" or by typing "CMD" in Windows NT, Windows 2000 or Windows XP. It is a command line user interface.

MS-DOS was later abandoned as the foundation for their operating systems.

DOS and Linux

It is possible to run DOS programmes under OS/2 and Linux using virtual-machine emulators.

Under Linux (running on x86-based systems) it's possible to run copies of DOS and many of its clones under dosemu (a Linux native virtual machine programme for running real mode programmes). There are a number of other emulators for running DOS and/or DOS-based software under various versions of UNIX, even on non-x86 platforms; one such emulator is DOSBox.

Windows

Microsoft Windows is so far the most widely used version of operating system for personal computers.

Early versions of Microsoft Windows were little more than a graphical shell for DOS. Later versions were launched under DOS but "extended" it by going into protected mode. Still later versions of MS Windows ran independently of DOS but included much of the old code. The latest versions of MS Windows are continually dropping ever more of the DOS ancestry.

Windows Me was the last Microsoft OS to run on DOS; operating systems in the Windows NT line (including the post-NT 4.0 versions, such as Windows 2000 and Windows XP, which aren't marketed as "Windows NT") are not based on DOS.

Popular operating systems

The following table gives the popular operating systems in the current market:

Name	OS author	Runs on
MVS	IBM	IBM mainframes
VMS	DEC (Compaq)	DEC minicomputers
OS/400	IBM	IBM AS/100 computers
MS-DOS	Microsoft	IBM and compatible PCs
Windows 3.x	Microsoft	IBM and compatible PCs
Windows NT	Microsoft	IBM and compatible PCs
Windows 95	Microsoft	IBM and compatible PCs
Windows 98/2000	Microsoft	IBM and compatible PCs
MacOS 8.X and other versions	Apple Computer	Macintosh computers
Solaris	Sunsoft Inc.	Sun workstations
Unix	ATT and others	different versions for different computers
Linux	Linus Torvald and others	IBM and compatible PCs

(Source: Management Information Systems, Effy Oz, Thomas Learning 2000)

Test Questions

1. Hardware in a computer includes the following parts, except

   a. CPU and RAM

   b. Storage devices

   c. Input-Output devices

   d. Operating systems

(d)

2. Random Access Memory is the primary storage in a computer. The following are all true characteristics of RAM, except

   a. RAM runs very fast

   b. Most data stored in the RAM is in active use and can be accessed at almost the same speed

   c. Data stored in the RAM will be stored when the power is off, so as to be used the next time when the power is on

   d. System performance can be easily increased by adding more RAM

(c)

3. If a company wants to buy the most widely used software programme of Word Processor for its office automation, what approach will the company take to obtain the software?

    a. Buy it from off the shelf

    b. Ask a software developing company to develop it together with its own staff so that the company's specific needs can be taken into consideration

    c. Search and buy some system software that may contain Word Processor

    d. None of the above

(a)

4. There are various operating systems available in the current market, each compatible for certain types of computers. Please indicate below which operating system matches which type of computer.

OS X operating system	Apple computers
UNIX	Sun and IBM servers
UNIX	Most midrange computers and many servers
MS-DOS	IBM and compatible PCs
Windows series	IBM and compatible PCs

12.1.2 Principles of information processing in business environment

Learning objectives
The student should understand what batch processing, online processing and offline processing means respectively, and their differences.

Batch processing

Batch processing is the execution of a series of non-interactive jobs all at one time.

The term "Batch" originated in the days when users entered programmes on punch cards. They would give a batch of these programme cards to the system operator, who would feed them into the computer.

Batch jobs can be stored up during working hours and then executed during the evening or whenever the computer is idle. Batch processing is

particularly useful for operations that require the computer or a peripheral device for an extended period of time. Once a batch job begins, it continues until it is done or until an error occurs. Note that batch processing implies that there is no interaction with the user while the programme is being executed.

An example of batch processing is the way that credit card companies process billing. The customer does not receive a bill for each separate credit card purchase but one monthly bill for all of that month's purchases. The bill is created through batch processing, where all of the data are collected and held until the bill is processed as a batch at the end of the billing cycle.

Batch processing has these benefits:
- Allows sharing of computer resources among many users
- Time-shift job processing to when the computing resources are less busy
- Avoids idling the computing resources without minute-by-minute human interaction and supervision
- It is used on expensive classes of computers to help amortize the cost by keeping high rates of utilization of those expensive resources.

Batch processing has historically been synonymous with mainframe computers. The term 'batch' has now become synonymous with the UNIX operating system, it has strong utilities within the Operating System that allow various computing tasks to be run in a controlled and orderly manner. Also, in DOS, Batch files have become commonplace.

Online and offline information processing

The opposite of batch processing is transaction processing or interactive processing. In interactive processing, the application responds to commands from the user. Interactive computer systems are programmes that allow users to enter data or commands. The most popular programmes such as word processors and spreadsheet applications, are interactive.

Transaction processing is a type of computer processing in which the computer responds immediately to user requests. Each request is considered to be a transaction. Automatic teller machines for banks are an example of transaction processing.

In a business environment, having a presence on the Internet or having access to the Internet when the information is processed separates online processing from offline processing. Online information processing is usually transaction based, and interactive, while offline information processing is executed at the absence of an Internet connection. Offline processing can be a transaction, interactive, or batch processing.

One example is the credit card processing. Credit card payment can be processed either online or offline. Online processing is the real time execution, where a third party "Payment Gateway" company is needed. The "Payment Gateway" company processes the details of the credit card transactions in turn with the bank. The bank either approves or declines the transaction and the message is sent back to the point of sale via the gateway company. This method is more expensive than the offline manual method but preferred by the bank, and suits companies that have a high volume of transactions.

On the other hand, credit card payment can also be processed offline. Manual processing of the credit card needs an EFTPOS terminal, like the one pictured.

Manual/Offline credit card processing is currently the most popular method. Most merchants already have such an EFTPOS terminal at their outlets.

Test Questions

1. Judge whether the understandings below about batch processing are true or false

- Batch processing processes jobs that are stored up during working hours all at once, which means it continues until it finishes or an error occurs (T)
- Batch processing is particularly useful for operations that require the computer or a peripheral device for an extended period of time   (T)
- Batch processing has interaction with the user while the programme is being executed   (F)
- Batch processing avoids idling the computing resources, and time shifts job processing to when the computing resources are less busy, it is

therefore used on expensive classes of computers to help amortize the cost by keeping high rates of utilization   (T)

- Batch processing is commonly found these days in UNIX operating systems, Windows operating systems and DOS   (F)

2. If an EFTPOS terminal, instead of a "Payment Gateway" company, is needed for the credit card processing, this type of information processing in credit card business is called

    a. Off line processing

    b. Online processing

    c. Batch processing

    d. None of the above

(a)

12.1.3 Tasks of computing personnel

Learning objectives

The student should be aware of the different roles assumed by computing personnel, including the system administrator and the end users, and that ethics of usage is an important element for both computer staff and users.

Role of the users and system administrator

Role of the users

Before 1980, the users' role in computing and system development was very small. The end users were practically disconnected from the development, which was carried out solely by information system professionals. In the 1990s, a new phenomenon started to take root: users assuming a greater role in leading organisational information system development projects.

The new phenomenon reflects a new concept: system development led by users (SDLU). SDLU reinforces the users' ownership of their new systems. The benefits of doing so are: 1) better design; 2) an increased willingness by business units to use the system, and 3) a more favourable attitude toward computer-based systems in general.

The greater role the users have in system development is very much related to another concept that has been incorporated since the 1990s: prototyping. Prototyping is a looser approach in developing information systems where

systems are developed through an iterative rather than a systematic process: the developers and users are constantly interacting, revising, and testing the prototype system until it evolves into an acceptable application. This is unlike the traditional step-by-step, computing professional led analysis and development process. The prototyping approach greatly saves the cost in system development, and significantly shortens system development time, as well as the time the users have to wait for a response to their requests.

Role of the system administrator

Despite the increasing role of the end users in system development, the role of the system administrator in computing does not become less. Apart from the involvement in new systems development, a great part of the system administrator's role is to maintain the system, provide user help and ensure that it can be operated to the satisfaction of the users. Maintenance consists of post-implementation debugging and updating such as making changes and additions. Updating is usually the greater part.

Maintenance of the system is an important task for computing personnel. While system development may take several months, the system is expected to yield benefits over many years. Surveys show that up to 80 percent of the computing budgets in the U.S. companies are spent on maintenance.

User help is another important task in computing personnel's daily job. The people who work at an organisation's help desk must be familiar with the system and other related IT issues so that they can provide advice and guidance to users.

Ethics of usage

In any society, ethics and morality are important. Laws do not always keep with changes in society. It is particularly true in the world with open information.

All science fields have some kind of ethics document, for professionals of that field to abide by. In this way, professional associations establish themselves as a Profession, and as a means to regulate their membership, to also convince the public that they deserve to be self-regulating. Unethical behaviour of its members can also be deterred.

Computing personnel

Computing personnel are in a difficult position when undertaking their work since there are a number of constraints affecting their behaviour, although these constraints may not necessarily conflict. The system administrator has the chance and access to all the information systems that may include private information such as personal data of employees, employee's records of online transactions and websites visited, and all the company's comprehensive commercial databases, some of them confidential.

Computers can automatically track all of the work done by each person. Some software available for local area networks enables managers to see exactly what every employee is doing – without the employees knowing they are being watched. Some employers can read their employee's e-mail messages.

Programmers have more responsibilities than many other employees. Software is used in many critical areas. If a programme attempts a job that is beyond his or her capabilities, crucial errors can be introduced. Along the same lines, programmers have an obligation to test everything they do.

Programmers would never get jobs if they could not be trusted. This trust is one of the most crucial requirements to being a programmer.

Users

Users encounter the ethics issue too in using the computer and information systems. First, they have an obligation to obey the laws that pertain to computers. One example is the illegal copy of software, called software piracy. European and US copyright laws prohibit the copying of software except for necessary backup. It is the responsibility of users to keep up with the changes in the laws and to abide by them.

Users of computer systems also have an obligation as part of computer ethics to customers and clients. Most information in computer databases is confidential. It should not be revealed to anyone except those authorized. Some nations have laws to protect this privacy.

Thirdly, users have an obligation to use the information provided by computer applications appropriately. The calculations in a spreadsheet for example must be tested and the information produced should always be checked that it's reasonable. All data should be verified.

Test Questions

1. Which one of the following is/are considered as the role of the system administrator in computing?

    a. Information system development

    b. System maintenance

    c. Users' help

    d. All of the above

(d)

2. True or false?

- Ethics of usage is applicable only to professionals, therefore users encounter no ethics issues in using the computer and information systems   (F)
- Ethics of usage requires computing personnel who has access to personal data in a company to properly use such data (T)
- Ethics of usage requires the end users not to illegally copy the software purchased (T)

12.2   Role of Information Technologies in Forwarding

Learning objectives

The role of information technologies in forwarding is profound and significant. The student should understand and be able to put into use in real life different applications of office automation, and the computerized control systems applied in forwarding.

The student should further understand that convergence of computing and communications is a major development in the ICT industry, that this trend of convergence will further continue, and that its impact on forwarding is fundamental and lasting.

The structure of international trade refers to the mechanisms in place for trading to take place. The freight forwarder will arrange for the transport of the goods by road, rail, air or sea or a combination of the above to the port of shipment.

The necessity that the goods be transported efficiently to the place of shipment across borders and that the transactions are completed successfully, has led to the use of new technologies (i.e. information technology and telecommunications) to support these actions and to provide additional value without increasing costs.

Beyond the obvious choice of information technology and computer hardware for basic back-office work (word processing, spreadsheets and accounting, client and resources record keeping), new technology (especially the convergence of information technology and telecommunications) has tremendously boosted electronic transactions (from ordering and billing, to shipment and even electronic payment), thereby minimizing errors and speeding up processes, while ensuring security, accountability and non-repudiation as with traditional paper-based methods.

12.2.1 Role of office automation

> **Learning objectives**
> The student should have knowledge about the major types of software used in Office Automation, and be able to use them in real business life.

Office Automation is the attempt to use new technology to improve a working environment and enhance the productivity. The most recent surveys indicate that more than 40 million people regularly use Microsoft Office to get their work done. Most users already have MS Office on their desktop.

Word processing

Word processing is the most widely used type of software at Office Automation, almost completely replacing the typewriter in the workplace.

Writing is done by typing on a keyboard, and copying, cutting, and pasting. With a little skill, the document can be formatted. The type fonts, type size and text colour can be changed with word processor.

Advanced word processors come with large dictionaries, enabling an effective spelling check. Many programmes can also help users employ richer language and avoid the duplication of words. Embedding of graphics within documents is possible. Along with high quality printers, books and pamphlets for publication can also be prepared with word processing programmes. Some word processors can even turn traditional text into HTML format, therefore immediately suitable for posting a web page on a web site.

Electronic spreadsheets

Spreadsheet programmes combine several tools into one computer-based application: a "sheet" divided into rows and columns that create "cells" for data; a calculator; and a way to enter information in cells. The user enters data by typing and performs calculation by entering an arithmetic formula in a cell. The programme displays the calculation's results in the cell that contains the formula. Whenever the value of any cell changes, the values of all cells with formulas that reference the changed cell are recalculated automatically.

There are more functions assumed by the spreadsheet:
1) Some spreadsheet applications allow linkage between cells that appear in several different sheets. This creates a three-dimensional spreadsheet.
2) Spreadsheets can be set up with formulas representing relationships among data so as to be used as a modelling tool. Values of a cell or several cells can be changed to see the results of the change in other cells.

3) Spreadsheet programmes provide graphical software that lets the user employ data contained in the spreadsheet to create two dimensional and three dimensional diagrams: bars, lines, pie charts, turtle-wire graphs and other types of representation. The programmes also provide an increasing number of scientific, statistical, and financial functions.

The most popular spreadsheet programmes are Excel and Lotus 1-2-3. Both are available in versions for the most popular PC operating systems running on IBM-compatible and Macintosh computers.

Emails

Emails are frequently used in daily office work, representing the most common method of daily communication between forwarders and other parties, replacing the phone calls and faxes of the early days.

Due to the popularity of Microsoft Windows in desktops, Microsoft Office is also the most popular office system application. Microsoft Outlook is the email programme within Office.

Microsoft Office Outlook 2003 SP2 Email Programme

Microsoft Office Outlook supports Windows 2000/3/XP, and works great together with other Office System applications. As an email/calendar combination, Outlook also shines as an email client with great organisational talent (virtual folders, versatile searching) and solid spam filtering. Outlook's intelligent use of virtual folders, message searching, flagging, grouping and threading make dealing with even large amounts of good mail a snap.

Microsoft Office Outlook has the following functions:

- Microsoft Office Outlook manages multiple POP, IMAP, Exchange, MSN and Hotmail accounts.
- Outlook offers powerful filters and ways to organize, label and find messages.
- By setting the filtering level to "high", the spam filters can be used effectively to sort out the junk emails and move the unsolicited spam to a "Junk E-mail" folder automatically.
- Outlook offers "Search Folders", which automatically contain all items matching certain criteria.
- Outlook can use Microsoft Office Word perfectly, integrating with MSN Messenger for message editing. There is one thing however that Outlook cannot: rewrap the text if the user prefers to write his email replies with the original message text indented.
- Outlook supports S/MIME email encryption and IRM access control (e.g. mail can't be forwarded).
- Outlook can display all mail in super-secure plain text only and doesn't download remote images in emails from unknown senders. Outlook can also identify and shield against tactics commonly used in phishing emails, which attempts to lure the user into giving away personal data.

Presentation

Microsoft PowerPoint is a powerful tool to create professional looking presentations and slide shows. PowerPoint allows the user to construct presentations from scratch. For starters, it is a good idea to use the Help Files that come with Microsoft PowerPoint. Further assistance is available at http://microsoft.com/office/powerpoint/default.htm.

PowerPoint offers AutoContent Wizard, where the system has created a new presentation that contains sample text, by prompting the user for information about content, purpose, style, handouts, and output. The sample text can be

easily replaced with other information. The same works for Design Template supplied by PowerPoint. User can change the information to his own.

Most times, a new presentation will be created up to the user's specific needs and taste. Here it comes then the first issue of the layout of the slides. It is not necessarily that each slide in the presentation follows the same layout. Instead, it often changes, depending on the contents of each slide. There are different types of slide layouts available.

Title Slide; Bulleted List; Two Column Text; Table; Text & Chart; Chart & Text; Organisational Chart; Chart; Text & Clip Art; Clip Art & Text; Title Only; Blank Slide (Pre-Designed Slide Layouts - Left to Right
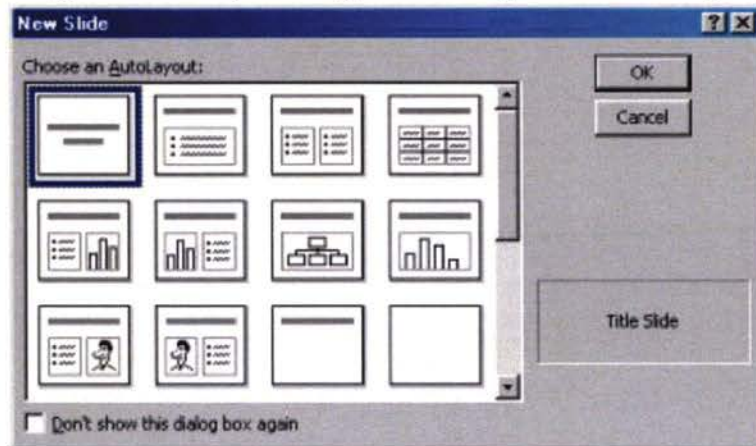
It is easy to choose one of the pre-designed layouts. Alternatively, a blank slide can always be chosen and items inserted as the user sees fit.

There are different views within Microsoft PowerPoint that allow looking at presentations from different perspectives. The following are the different types of views and the symbol it represents in the PowerPoint programme:

Normal View	Outline View	Slide View	Slide Sorter View	Slide Show View
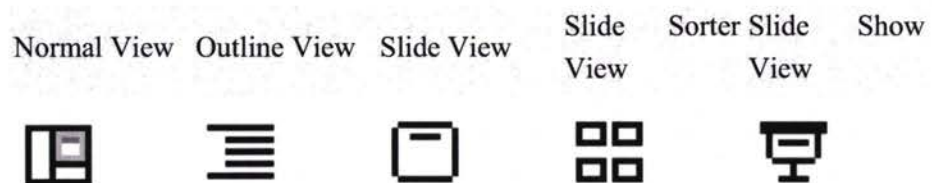
Microsoft PowerPoint also allows users to format a slide background, being it a background in colour, a picture, or a design template built into the PowerPoint. Clipart & Pictures can be inserted into any slide, from the

"Insert" menu. Basically anything else can be inserted too in a similar way, such as Objects, Movies, Sounds, and Charts.

A distinctive feature of PowerPoint is the possibility to add customized transitions to a slide show that will make it come alive and become appealing to the audience. Order shall be chosen via Slide Transition on the Slide Show menu at the top of the screen. To view the transitions, on the Slide Show menu, click Animation Preview.

Images

Images give a vivid impression, and therefore are often used in business communications. Increasingly, business people and software developers are responsible for the graphics on their Web sites and for their presentations. The image software enables users to arrange, customize, and create on-screen images by featuring the use of images with shape.

There are a few software programmes available from the Microsoft family for images, including Microsoft Image Composer 1.5, Microsoft PhotoDraw 2000, Microsoft Photo Editor, Microsoft Office Picture Manager, and Microsoft Digital Image Pro.

Image Composer 1.5 is available with the FrontPage 2000 stand-alone version and is shipped with FrontPage 98. Using Image Composer 1.5 features the use of images with shapes, called sprites. Comparing to the traditional image editing applications which use rectangular images, sprites have transparency information built in, which means they can take the shape of the objects they represent. Sprites make perfect additions to a Web site. The traditional rectangular images can be difficult to work with.

Microsoft PhotoDraw 2000 combines powerful illustration and photo editing in one easy-to-use programme.

Microsoft Photo Editor was discontinued when Microsoft Office 2003 was introduced, and replaced by Microsoft Office Picture Manager as a Microsoft Office component. Picture Manager is primarily a file management tool, and not an editing tool. It does however have some image correction and editing features.

For a broad range of editing options when working with pictures, the best approach is to work with a photo editing programme, such as Microsoft Digital Image Pro.

Test Questions

1. If the calculations need to be done based on the existing data and different scenarios, the Office software to be chosen to perform this task should be

  a. Word processor

  b. E-spreadsheet

  c. Microsoft PowerPoint

  d. Photo editors

(b)

2. Microsoft Outlook has the following functions except

  a. Microsoft Office Outlook manages multiple POP, IMAP, Exchange, MSN and Hotmail accounts

  b. The spam filters can be used effectively to sort out the junk emails and move the unsolicited spam to a "Junk E-mail" folder automatically

  c. Outlook can use Microsoft Office Word perfectly, so as to rewrap the text if you prefer to write email replies with the original message text indented

  d. Outlook can display all mail in super-secure plain text only and doesn't download remote images in emails from unknown senders

(c)

12.2.2 Computerized Control System

> **Learning objectives**
> The student should have some knowledge about the computerized control systems widely in use in forwarding: the documentation systems and the warehousing and logistics systems.

Documentation systems (customs declaration, AWB, B/L)

Computerization of the forwarding business is best reflected in the documentation systems. Various documents are used in forwarding, transport and logistics, some being different standards among companies. This has caused not only a large amount of paper work in any individual company to create the documents, but also a huge work to coordinate among

companies, as well as the high probability of errors occurred in typing and creation of these documents.

The documentation system is therefore the first that applied the advanced computer and communication technology. Computer is used to generate documents, to make changes, and documents are transmitted between organisations using the network.

Customs declaration

Customs declaration is one of the earliest documents that have been computerized. One of the reasons was that the Customs face a large amount of documents in everyday business, and the documents might be in different format from all the parties related to the same shipment. Document standardization is of the utmost importance to reduce the huge amount of paper work.

The second reason was that computerisation of the Customs declaration largely improved the customs efficiency in work, so that documents would not be stuck in any node of the information chain, arriving at the destination later than the cargoes.

One distinctive benefit of computerization of the Customs declaration is that the shipper or consignee can send the documents and start the process in Customs before the cargo has physically reached the port. By doing so, a smooth cargo flow in the entire logistics chain can be achieved.

Most Customs declarations are sent via EDI messages. There are different EDI standards adopted by Customs in different countries. It remains a challenge to standardize the EDI formats among Customs on a worldwide basis.

Air waybill

Air waybill, like ocean bill of lading, is one of the transport documents that was computerized at an early stage, to save on the huge amount of paper waybills cost wise, and efficiency wise.

E-freight

In 2004, IATA launched a project, IATA e-freight, designed to eliminate the need to produce and transport paper documents for air cargo shipments by moving to a simpler, industry-wide, electronic, paper-free environment.

As IATA e-freight impacts the entire cargo supply chain, an Industry Action Group has been formed, including airlines, top freight forwarders represented by their association Freight Forward International and the World Customs Organisation. Together with IATA, this group will align industry stakeholders and help drive the project forward.

It is estimated that 100% simpler, electronic, paper-free air cargo shipping will save the industry US$ 1.2 billion per year:

- Average of 38 documents per shipment at a paper production and processing cost of US$30
- Paper used in processing shipments every year could fill 39 747-400 freighters
- 35 million MAWB (2004) ~ +6%/year
- 25 years ago it took 6.5 days on average to send a shipment internationally, today this average has not significantly altered

It is planned that by 2010, where viable, e-freight will be implemented 100%. E-freight pilot projects on key trade routes between five countries however, are scheduled for 2007 implementation.
(www.iata.org)

B/L

Like in the case of Customs declaration and air waybills, computerization of the sea bill of lading saved considerable costs from paper documents and manual work, streamlined the process, and increased the work efficiency enormously.

Major shipping lines in the world all have developed their respective bill of lading system to ease the space booking, import and export procedures, and coordination with other parties such as shippers, forwarders, shipping agents, and consignees. Taking a step further, when all the parties concerned are connected by the network, other web based applications can be achieved too, such as tracking and tracing, e-delivery and so on. Most of the bills of lading are transmitted between companies by EDI.

While the bill of lading itself is rather standardized in the international sea transport, the transmission standards of the document are yet to be uniformed. Due to the strong market position the large shipping lines take, proprietary EDI is what was frequently seen in the early years of EDI development. The proprietary EDI systems entailed the coordination among companies in order to reach a real standardized and efficient EDI transmission worldwide.

Warehousing and logistics support systems

Apart from the documents, computerization is also best integrated and reflected in the warehousing and logistics support systems.

Warehouse support systems

Warehousing companies are engaged primarily in operating warehousing and storage facilities for general merchandise and refrigerated goods. They provide facilities to store goods.

Modern warehousing support systems cover the following applications:

1) Distribution management

This includes automating pick, pack and ship of the goods. Beyond that, modern system also provides a complete solution for all distribution needs. This task of optimisation of the traditional distribution works is integral to all distribution processing, from raw materials, work-in-process management and finished goods processing, to postponement and value-added-services.

2) Order management

Order management system enables orders to be optimally sourced from multiple locations and suppliers to increase supply network flexibility and efficiency. The modern system can integrate multiple host order management and warehouse management systems across extended supply networks to determine the best location to fulfil each order or sub-order.

The system provides not only real-time visibility to current inventory across customers' extended supply chains, but also factors in expected receipts and production on a date-sensitive basis to allocate future inventory. It can be extended to take into account factors such as product aging and expiration dates, value added service requirements, workload balancing, dock door capacities and transportation costs.

3) Yard management

The system manages and records the arrival, placement, location, and status of trailers, containers, content and trucks within a yard. The check in and out capabilities at the yard entrance ensure that security is maintained. Quality control and brand protection may also be extended throughout the yard.

4) Integrated slotting

The system enables slotting to be done with less manual effort, so as to be more frequently, quickly tailoring pick face allocation to order profiles that change frequently. Advanced system can optimize the placement of items across pick faces based on a wide selection of user-definable criteria such as product pick velocity, product family groups, and weight and size considerations. For hazardous materials, the system can incorporate warehouse operational standards and other special storage requirements.

5) Combination of the above systems

The above-mentioned system functions can be also combined into one single product, therefore offering higher convenience to the users.

Logistics support systems

The deregulation of the trucking industry in the 1980s had encouraged many firms to add a wide range of customer-oriented services to complement the storage and warehousing services. This led to innovations in the distribution process and increasingly, the logistical services encompassing the entire transportation process. Firms that offer these services are called third-party logistics providers.

Logistical services manage all aspects of the movement of goods between producers and consumers. Among their value-added services are sorting bulk goods into customized lots, packaging and repackaging goods, controlling and managing inventory, order entering and fulfilment, labelling, performing light assembly, and marking prices. Some full-service companies even perform warranty repair work and serve as local parts distributors for manufacturers. Some of these services, such as maintaining and retrieving computerized inventory information on the location, age, and quantity of goods available, have helped to improve the efficiency of relationships between manufacturers and customers.

Along with the logistics services development, information technology played a main part. In correspondence to the evolvement of the logistics services, more features were added to the existing warehousing software

programmes geared to the needs of the logistics businesses. Alternatively, new software programmes are developed too.

Below are some examples of the logistics support systems' functions:

- Voice control software: allows a computer to coordinate workers through audible commands—telling workers what items to pack for which orders—helping to reduce errors and increase efficiency. Voice control software can also be used to perform inventory checks and reordering.

- Radio Frequency Identification Devices (RFID): to track and manage incoming and outgoing shipments. RFID simplifies the receiving process by allowing entire shipments to be scanned without unpacking a load to manually compare it against a bill of lading.

- Just-in-time: Just-in-time is a process whereby goods arrive just before they are needed, saving recipients money by reducing their need to carry large inventories.

Test Questions

1. Documentation system is one of the earliest that integrated computerization into the daily forwarding businesses. According to IATA, the IATA e-freight project is designed to

a. Eliminate the paper documents for air cargo shipments

b. 100% paper-free air cargo shipping is expected to save the industry USD 1.2 billion a year

c. Full implementation of e-freight will be in 2010

d. All of the above

(d)

2. Computerization in the warehousing and logistics support systems are reflected in the following changes, which largely increased the efficiency at work

a. Automating pick, pack and ship of goods

b. Real-time visibility to current inventory across customers' extended supply chain becomes possible, so do the optimal source from multiple locations and suppliers

c. A computer is able to coordinate workers through audible commands

d. All of the above

(d)

12.2.3 Convergence of computing & communication technologies

Learning objectives

The student should be aware that convergence of computing and communications is a major development in the ICT industry, that its impact in business and life is revolutionary, and that this trend of convergence will further continue.

Driven by the Internet and intelligent terminals, the convergence of computing and communications has accelerated. Due to advancing technologies, ample bandwidth, storage, and processing can be presumed wherever we want them, and at a reasonable cost.

Convergence occurs when firms and industries that were once independent become competitive, complementary (mutually dependent), or both. Often convergence is associated with industrial reorganisation (such as mergers and divestitures) as firms adapt to the changing realities.

As a result, the organisation of the vendor industry has been radically affected by this convergence, and the role of standardization changed irrevocably. The role of the service provider expands, offering new opportunity for telecommunications service providers, as well as the software developers.

It also results in a profound shift in applications, infrastructure, industrial organisation, and the role of standardization. Two industries - computing (especially software) and telecommunications - are being radically transformed by convergence.

Convergence examples

The convergence in the computer and communications industries, driven initially by the networking of computers by the Internet and by increased programmability of telecommunications terminals (which include desktop computers), has led to an explosion in networked applications and irrevocably adds communications as a major new application arena for computing.

According to Intel, the silicon-based technologies aim to accelerate convergence of computing and communications. Every piece of silicon inside PCs, PDAs, cell phones or other electronic device will include computing technologies but also connect to multiple wireless networks and

road between them. Some of these technologies include silicon radios and "context aware" computing. The "reconfigurable radio" would automatically identify and connect to a number of wireless networks, including 802.11, Bluetooth and Ultra Wideband, enabling any device powered by one of these chips to have wireless capabilities across many different networks.

Another example of product is the software applications "location-aware" by integrating technologies like global positioning system and wireless LAN. For example, context-aware application would allow consumers to get the latest information on weather and road conditions, and alter their plans or route instantly and wherever they are.

It is increasingly important to explore communications, computing and networking as a single system. This convergence is emerging as computers become more universal and integrated parts of networked environments, as communication becomes mostly digital, as distributed databases become networked, as the demand for interactive and on-demand multimedia services increases, and as on-demand remote computing becomes available. Overall, a number of issues arise from convergence, such as the appropriate new applications and the appropriate role for standardization. However, it is a time of exciting opportunity for industry, especially for end users and end-user organisations that will benefit from a diversity of new applications integrating the computing and communications.

Test Questions

1. Judge the following understandings about the convergence of computing and communication technologies are true or false

- Convergence is often associated with industry reorganisation such as merges and divestitures as firms adapt to the changing realities   (T)
- Convergence in computer and communications industries is driven initially by the Internet and intelligent terminals including desktop computers   (T)
- Though convergence emerges between the computing and communications, it is still desirable to explore and consider the communications, computing and networking as separate systems (F)
- An example of the convergence in products is the PCs, PDAs and cell phones produced by Intel for example will have the technologies to connect to multiple wireless network and road between them. (T)

12.2.4 Impact of information & communication technologies in the world of forwarding

Learning objectives

The student should have knowledge about the areas that information and communication technologies have significantly changed the traditional forwarding, as well as their respective applications; the student shall further be aware that the technologies will continue playing a role with the development of business practices in forwarding, transport and logistics.

Computerization and Information Technology have now become a crucial part of the freight forwarding industry. Only by coupling information technology and forwarding can the modern freight forwarder progress to new achievements. The companies that are able to take advantage of the potential of computerization certainly enjoy the advantages to thrive in the market.

Overview of ICT applications in forwarding

Many shipping and freight forwarding companies have been using electronic data interchange (EDI) and Internet-based networks to transmit information and documents among themselves and with traders. Traders are able to track the flows of their goods online. Advanced applications such as global positioning system (GPS) are used in warehousing, transportation, container management and other supply chain related activities.

On the shippers' side, documents related to trade and transport are standardized. In order to facilitate the transmission of the documents such as certificates of origin and trade declaration applications, mostly in EDI, electronic platforms are developed. The platform can also offer a number of value-added transaction management facilities including message checking, matching and validation, message authentication and security, electronic billing and payments, message archiving and audit trail services.

Applied mainly to transport companies, smart card is one of the major solutions in the ICT technology. The smart card contains detailed information in relation to the cargoes. It uses a kind of radio frequency identification technology. The card can be also used to pay transportation fee.

In the near future, a new type of electronic platform is expected in the forwarding and logistics industry, targeting to improve productivity by facilitating low-cost, reliable information exchange along the supply chains, which can also provide a platform to promote development of new business opportunities, such as logistics software development and value added services.

ICT products for forwarding and logistics

In the highly competitive freight forwarding industry, the ability to provide a superior level of customer service is vital to business growth and profitability. To deliver this level of service operational staff, customers and management must have easy and reliable access to the information they need.

Forwarding Software

While the name of the products from different vendors may vary, the functions of the system focus on the timely, accurate transmission and control of freight documentation. The software is designed to facilitate the flow of information through the shipment and billing cycles with minimum data entry, auto complete, zoomable fields and full auto rating facility.

Among others, the main business areas that can be covered by the forwarding software include:

- Space booking directly via the web
- Real time communications with importers, exporters, freight forwarders and customs brokers
- Connects supply chain
- Live updates from carriers e.g. Airlines & Shipping Lines
- Order process management
- Line/Part tracking

Depending on the specific software, core business modules of the software may cover export and import by air or ocean, Customs, and fully integrated financial applications such as EFT payment facilities.

Customs Software

Customs software are developed mainly focusing on handling the key functions related to Customs in international cargo transport, such as job registration, charging, entry preparation, landed costing and reporting.

Other software

Other software are all developed targeting at specific tasks concerned in the forwarding. Relational database technology for example facilitates minimum data entry and easy, flexible access to data. Systems may also be purchased for management reporting, where financials can be integrated to provide real-time transaction processing and instant access to the company's business information; or comprehensive sales and marketing reports can be generated offering easy access to customer profiles, prospect data and sales performance.

E-Business

As e-business continues to grow, the freight forwarding industry will see real opportunities for time and cost savings and improved services. Web enabling of specific business functionality allows information to be exchanged efficiently with customers, employees and partners.

Industry development and market outlook

A number of global trends are affecting the freight forwarding industry, including the globalisation of the supply chain, mass customisation, shortening of product lifecycles, low inventory, and quick response requirements. Under these new environments, managing supply chain effectively is complex and challenging. In order to concentrate on the core business, most of the manufacturers would prefer to dedicate a third party to take care of their logistic needs. This is how the third-party logistics (3PL) gets developed, which is expected to grow further in the coming years.

3PL providers not only provide the traditional transportation service, warehouse management and shipment consolidation, but also carry out light assembly and package, order fulfilment, inventory management, and door-to-door services by using multi-modal transportation.

A look into the future

The whole forwarding industry is changing. While 10 years ago the key success factor for a forwarder was moving a shipment successfully from one point to another, there are probably thousands of forwarders in one city who can handle such movement of freight now. There is little value in simply moving goods from Point A to Point B anymore. Value, needs to be created during the transport process.

The role of the forwarder has correspondingly totally changed. It's more about providing information and communication to the customer. Forwarders need to build that infrastructure while they deal with new challenges such as more complicated security issues, decreased capacity with commercial airlines, longer procedures at ports and shippers' demands for faster delivery.

Challenges

In a world that is increasingly compliance minded, correct and timely information is critical. Satisfying shippers' needs today and into the future will take more than track and trace capability. Track and trace is a reactive measurement, which tells what happened to a shipment, but that doesn't really help except with long-term planning and some root-cause analysis. What is truly needed is active monitoring.

Many forwarding companies don't have enough information from further up their supply chain. It is a disadvantageous position should they don't understand their commodity e.g. from an import compliance perspective. There is the need for involvement deeper into the supply chain.

Another challenge forwarders face comes from established third party logistics companies. Many have been adding trade services capabilities through acquisitions. However, only a few of the larger forwarders may have the means to add the supply chain management expertise in need through acquisition. While many are still focused on building or acquiring the information systems they need to meet current demands, it remains a continuing challenge for forwarding companies to further expand skills to include supply chain management and then earning the trust to enter that business.

Test Questions

1. Judge the following understandings about the impact of ICT in forwarding and logistics industry are true or false

- Seeing the importance of ICT to forwarding, it is believed that the companies that are able to take advantage of the potential of computerization can enjoy the certain advantage to outperform in the market (T)

- ICT application in forwarding are seen in EDI, cargo tracking, GPS in warehousing, smart card and etc.   (T)

- ICT can contribute to improve the customer service at a forwarding company which however is not vital to the business growth and profitability   (F)

- Third party logistics (3PL) appears to be the development direction for forwarding companies, but the competition from existing and large 3PLs are strong, particularly considering the small scale and capital base most of the forwarding companies have now (T)

12.3   Data Storage, Data Management and Databases

Learning objectives

The student should understand all the basic concepts in relation to data, databases, and database management.

The student should understand the various types of database backup and recovery techniques, and the pros and cons of each of them.

The student shall further understand database security is a major issue and be aware of the different ways of authorization for security.

The student shall have some knowledge about data warehousing and data mining.

12.3.1 Overview, Concepts and Definitions

Learning objectives

The student should understand the basic concepts of data, databases, database systems, and file systems.

The student shall further understand the peripheral concepts related to above basic concepts, as well as the main types of database systems and file systems currently in use.

Data and Database Basics

Database

On the surface, databases seem exceedingly complex, with lots of jargon, screens and reports. Actually databases are fundamental tools to allow people to organize and manipulate large amounts of data by using the power of the computer, and to quickly translate and deliver that information in a humanly readable format.

There are three main functions to any database application:
- A method for entering or editing data - usually data entry screens or import functions
- A data storage mechanism - a way of storing the data on the computer
- A report generator to extract and interpret information from the stored data

Data vs. Information

The first basic concept to understand about databases is the difference between data and information.

Data is a real collection of binary bits (literally ones and zeros) stored on a computer somehow. Data by itself is meaningless. Information is data organized in such a manner that it becomes meaningful. The database is the computer application that simply translates data into information. Therefore, essentially a database is nothing more than a tool to organize and access large amounts of data so that people can turn it into useful information.

For example, 12231997:AMEX:123400005678:23:45 as a piece of data is completely meaningless to the average human being. However, in a database record, if you knew that a colon separated each piece of data (or field) and that the left-most data was a date, followed by a credit card type, followed by a credit card number and, lastly, a dollar amount then you would have a useful piece of information. Of course without that knowledge or interpretation, the record could mean something entirely different. The leftmost field might be a random key, followed by a warehouse location, then SKU (Stock Keeping Unit) information and finally the item size. The point is, assigning a meaning to a given string of data is very important to the structure and use of any given database.

Data structure/Schemas: Tables, Records and Fields

The building blocks for creating databases, starting from the top level are called data structure or schema.

The data in an electronic database is organised by fields and records. A field is a single item of information such as a name or a quantity. A record is a collection of related fields. A table is a collection of related records. In order to identify a specific item of information within a database, all records must contain a unique identifier, normally called the key field.

Each data structure is made up of a series of records, and each record has a set of predefined fields. No matter if the database is built from scratch or bought from such as a $100,000 pre-packaged Enterprise Resource Planning (ERP) system, functionally they are all the same. They all have a data structure, records and fields.

Data storage

Data shall be stored in data storage devices, so that they can be retrieved and processed later in other times. One of the greatest benefits of using computers is their ability to store vast amounts of data and information. Computers store data both on devices that are internal to the machine and those that are external. The computer's internal memory stores data while processing them. The hard disk can preserve the data regardless of whether the computer is powered on or off. But for the purpose of a longer storage periods, data shall be stored in external storage devices such as magnetic and optical discs and tapes. Technically storing a library of millions of volumes on optical discs is possible.

Later with the development of telecom, data stored on a network came into being, which offers conveniences that other off-line storage devices may not have. Data stored on the web is safe, and accessible at anytime with an Internet connection, to anybody who is authorized to.

Data management

Data management comprises all the disciplines related to managing data as a valuable resource. The official definition provided by DAMA is that "Data Resource Management is the development and execution of architectures, policies, practices and procedures that properly manage the full data lifecycle needs of an enterprise." This definition is fairly broad and encompasses a number of professions which may not have direct technical contact with lower-level aspects of data management, such as relational database management.

Topics in Data Management include:
- Data modelling
- Database administration
- Data warehousing
- Data movement
- Data mining
- Data quality assurance
- Data security
- Meta-data management (data repositories, and their management)
- Data architecture

Database systems

Database systems, also called database management systems (DBMS) are the computer programmes that allow users to enter, store, organise, manipulate and retrieve data in a database. Today, database systems form the foundation of almost every business application.

DBMS

Database management systems (DBMS) altered the way in which data resources are managed. It begins with the premise that the most important aspect of the computer systems is the data that it stores. The purposes of a database management system are to provide shared access to the data, answer questions, and create reports from the data.

Early data processing systems were based around numerous files containing large amounts of data. Such database usually contains only one type of record or table, therefore self-contained. Data held in other database files

can't be accessed from another. Specialised computer programmes are needed to make use of such data, often at great expense.

Earlier DBMS in the 1980s include such systems as the network database system and hierarchical database system. They were largely replaced by relational database systems in the 1990s in business applications. These days the network or hierarchical model is used for some high-performance applications such as data warehouses.

The features of database programmes are that a range of general-purpose tools and utilities for producing reports or extracting data are introduced into the programme. Non-technical users can easily obtain access to the data. Data in a DBMS are still held separately from the programme that makes use of them.

All database programmes enable users to create and edit tables or record structures. Users can enter, modify, delete, sort and extract records. The majority of packages also enable users to print data in a variety of different formats. Other features in modern database programmes include:

- Creation of relational databases
- Link tables together automatically
- Create and modify data entry forms
- Sophisticated security features
- Generate a wide variety of reports, charts and graphs
- Handle other extremely complex tasks

RDBMS

Since the 1990s, the relational database system is the most widely used type of database. The relational database management system (RDBMS) can be seen as an extension of the DBMS approach. RDBMS makes it possible to share data across an organisation and combine data from several different sources. The goal of the RDBMS is to make it easy to store and retrieve the data needed.

In a relational database, data are stored within a number of different tables. Separate record designs can be used to store data dealing with different subjects. The tables are linked together using one or more record keys, called also the primary keys. If record keys are used in combination, i.e. a compound key, data from several tables can be retrieved at once.

What Databases are used for

The database is a powerful tool for a wide variety of information manipulation applications. Databases come in all shapes and sizes, from large applications that have millions of credit card transaction records to simple expense reports or customer lists. Obviously for a small business, the "mainframe applications" are a vast overkill, but there are large numbers of commercial off the shelf (COTS) or free database platforms like Access, MySQL or SQL Server.

For most small businesses, unless there is a very good reason to develop its own specialized database applications, there is probably some software vendor who is already selling something that will take care of 80 percent of the required functionality. On the other side of the spectrum, carefully select the database that you need. There are many systems that are far beyond the scope for the actual business requirements. It might seem like a good investment at the time, but the higher maintenance overheads and extra complexity can result in unnecessary long-term costs.

File organisation and Storage systems

File organisation

Prior to the introduction of electronic database systems, almost all of the information an organisation had in store was organised using manual filing systems. Typical methods included filing cabinets and card index records. Manual filing systems are still used widely today, complementary to the electronic databases.

In computing, file organisation is managed by file systems. A file system is a method for storing and organizing computer files and the data they contain. The file systems may use a storage device such as a hard disk or CD-ROM, or they may be virtual and may not make use of a storage device at all. The virtual file system exists only as an access method for data whether it be stored or dynamically generated (e.g. from a network connection).

File storage systems

Whether the file system has an underlying storage device or not, file systems typically have directories which associate file names with files. Directory structures may be flat or hierarchical, the latter contains sub-directories. In some file systems, file names are structured, with special syntax for filename extensions and version numbers. In others, file names are simple strings, and per-file metadata is stored elsewhere.

File system types can be classified into
1) disk file systems
2) network file systems, and
3) special purpose file systems.

Disk file systems

A disk file system is a file system designed for the storage of files on a data storage device, most commonly a disk drive, which might be directly or indirectly connected to the computer. Examples of disk file systems include FAT, NTFS, HFS and HFS+, ext2, ext3, ISO 9660, ODS-5, and UDF.

Database file systems

The concept of a database-based file system is new. The files are identified by their characteristics, like type of file, topic, author, or similar metadata. A file search can be formulated in natural speech. Examples include BFS and WinFS.

Transactional file systems

Transactional file system is a special kind of file system in that it logs events or transactions to files. Each operation involves changes to a number of different files and disk structures. In many cases, these changes are related, meaning that it is important that they all be executed at the same time.

Take for example a bank sending another bank money electronically. The bank's computer will "send" the transfer instruction to the other bank and also update its own records to indicate the transfer has occurred. If for some reason the computer crashes before it has had a chance to update its own records, then on reset, there will be no record of the transfer but the bank will be missing some money. A transactional system can rebuild the actions by re-synchronizing the "transactions" on both ends to correct the failure. All transactions can be saved, as well, providing a complete record of what was done and where. This type of file system is designed and intended to be fault tolerant and necessarily, incurs a high degree of overhead.

Network file systems

A "network file system" is a file system that acts as a client for a remote file access protocol, providing access to files on a server. Examples of network file systems include clients for the NFS, SMB, AFP, and 9P protocols, and file-system-like clients for FTP and WebDAV.

Special purpose file systems

A special purpose file system is basically any file system that is not a disk file system or network file system. This includes systems where the files are arranged dynamically by software, intended for such purposes as communication between computer processes or temporary file space.

File systems and operating systems

Most operating systems provide a file system, as a file system is an integral part of any modern operating system. It's worthwhile noting that the only real task of the operating systems in early microcomputers was file management - fact reflected in their names (see DOS and QDOS).

Test Questions

1. Judge whether the following understandings about data and databases are true or false

- Like information, data by itself is meaningful   (F)
- Data is a collection of binary bits (literally ones and zeros) stored on a computer   (T)
- Data in an database is organized by fields and records   (T)
- Database is the computer application that translates data into information which is meaningful to human readers   (T)

2. There are different types of database management systems available on the market, suitable for different purposes. If the tables in a database which deal with different subjects are linked together using one or more key fields, this type of database system is called

    a. Network database system

    b. Hierarchical database system

    c. Relational database system

    d. None of the above

(c)

3. True or false?

- The file systems may or may not make use of an underlying data storage device   (T)
- The file systems must use an underlying storage device   (F)
- File systems typically have directories which associate file names with files   (T)
- File system directory structure may be flat or hierarchy   (T)

12.3.2 Database Backup and Recovery

Learning objectives
The student should learn that database backup is essential in business, with different backup schemes that can be adopted, up to the specific business needs.
The student should have knowledge about onsite recovery and off-site recovery, and the differences between them.

Modern database and information systems are extremely complex. It cannot be guaranteed that they will work correctly all of the time. An innocent programming mistake could result in incorrect or destroyed data. Nature also poses physical threats that cannot be avoided: hurricanes, earthquakes, fires and so on. Often, the best we can do is to build contingency plans that enable the company to recover as quickly as possible. The most important aspect of any disaster plan is to maintain adequate backup copies.

Database backup

Most companies would not survive long if a disaster destroyed their databases. For this reason, all databases need to be backed up on a regular basis.

How often this backup occurs depends on the importance and value of the data. It is possible to back up data continuously so that if one system is destroyed, the other one can be used to continue with no loss of information. For computer operations that absolutely must never be interrupted, a backup computer that is continuously running to maintain a complete copy of the daily operations is recommended. If problems arise with one machine, the second one takes over automatically. Specialty firms offer these data mirroring facilities.

It is expensive, though, to maintain duplicate facilities, with data maintained simultaneously at both locations. Many organisations choose to back up their data less frequently.

It is recommended that at least one current copy of the database be stored in a different location. This is to protect it from local disasters. A major disaster could easily wipe out everything stored in the same building. There are some private companies that for a fee will hold the backup data for others in a secure, fireproof building where the company can access its data any time of the day.

Database recovery

Due to the importance of the database to a company, the business needs a carefully defined disaster and recovery policy. Typically that means the databases have to be backed up every day. Sometimes, a company may keep continuous backup copies of critical data on separate disk drives at all times. Plans shall be made for things that might go wrong (fires, viruses, floods, hackers, etc.). If something does go wrong, data needs to be recovered.

There are many ways to plan for and recover data from disasters. A common method nowadays is to contract with a disaster recovery service provider. The service providers offer their commercial recovery facilities in the event of a disaster.

Off-site recovery
If the data is stored off-site, the recovery of data from such site is called off-site recovery.

One common level of support in off-site recovery is called a hot site. A hot site is an exact replica of the database at a separate location. Specific computer equipment is already installed and ready for immediate use. When a disaster is declared, the backup tapes will be installed on the hot-site computers and use telecommunication lines to run the day-to-day operations.

An alternative is called cold site, which provides fully functional computer room space, without the computer equipment. When a disaster occurs, either the company or the disaster recovery services provider can arrange for the necessary equipment to be shipped to the cold site. There might be a delay of several days before the new data centre will be operational.

On-site recovery

Since databases deal with such large volumes of data, the number of tapes generated and moved by off-site back-up procedures can be very large. Recovery from a disaster in this fashion may take a long period of time, up to a week or longer depending on the level of service contracted with the off-site provider. Cold site recovery usually takes longer than hot site recovery.

Particularly for small and partial data loss, on-site recovery is usually preferred offering a more expedient solution. This can be done by the technical staff in the company. Sometimes the complete loss of a database can be recovered on-site using database recovery techniques. In general, if the separate back-up of the database is stored on-site, this is called on-site recovery too.

With the web development there is a new channel of data storage and recovery from on-site, which is network-based storage. Today's applications for network-based storage involve different techniques for disaster protection and recovery as well as improved access to information over the network. Each technique or application involves different elements of software, networking and peripherals, depending on individual requirements and budget. (http://www.drj.com/drworld/content/w2_051.htm)

Business case off-site

A New Jersey, USA accountant had his office in a building that also housed a small trucking firm. The accountant had dutifully made electronic backups of his clients' tax returns and put another copy in his filing cabinet along with the rest of his important documents. He also arranged with another accountant to hold additional copies of each other's files. Unfortunately, the trucking firm had a fire that wiped out most of the building and caused the accountant to lose both the electronic and physical copies of all his records. He was able, however, to maintain his business only because he had provided for another copy to be stored off-site.

(Source: Reported to Internet Security Alliance while researching the Common Sense Guide to Cyber Security for Small Businesses, February 2004)

Test Questions

1. Database back up can be done at different frequencies depending on the specific business needs. Which of the statements below are the true characteristics if data is backed up continuously? Which are not?

- If one system goes down the other can take over automatically and continuously with no loss of information(T)
- It is expensive to maintain data copy simultaneously (T)
- Since data is backed up continuously, there is no need to store a copy of the database in a different location (F)
- There are specialized firms that can offer data backup services on a simultaneous basis (T)

2. There are different ways to recover data from disasters. If an exact copy of the database is kept at a separate location, and computer equipment installed and ready for use once a disaster is declared, this type of data recovery is called

    a. On-site recovery

    b. Hot site recovery

    c. Cold site recovery

    d. None of the above

(b)

12.3.3 Database security and authorization

Learning objectives

The student should be aware where the threats to security can come from, and have some knowledge about the different methods of authorization used in real life.

Database security threats

Many potential threats exist to data that an information system holds. The complicated aspect is the fact that the biggest threat is observed from legitimate users and developers. Careful design, testing, training and backup provisions may detect and prevent some of the problems.

Employees and consultants

Although almost all employees are honest and diligent, there is always the chance that an employee will use the company's data to misappropriate resources. A more complicated problem arises with MIS employees.

Consultants present the same potential problems as employees. It is even harder to monitor the consultant's work since they are generally hired for a short time for specialized jobs, and the firm may know less about the consultant than about regular employees.

In general, the best way to minimize problems from employees stems from typical management techniques. Hire workers carefully, treat employees fairly, have separation of jobs, use teamwork, and maintain constant checks on their work.

Business partners and outsiders

The issue of partnership becomes more important as companies are increasingly giving their partners access to the company's computer networks, in order to realize the data exchange, just in time supply, inventory refurbishment and so on. Threat from outsiders is either by accident, or by those who have the malicious intentions, such as hackers.

Database security and authorization

The key to protect the security of data lies in providing people with just the level of access they need. There are many ways to give authorization to the database. For example, the database administrator can determine who has access to each part of the data and specifies what changes users are allowed to make. Many organisations also provide passwords and encrypt the data to minimize the threats from different resources. Users need to type in the user name and password to get access to certain databases. Only authorized users are given the user name and password.

Below some of the common security measures based on the principle of authorization are introduced.

Passwords

Account name and password are known only to the computer and the user. If the correct name and password are entered, the computer assumes it must be the user. This method is cheap, fast, and does not require too much effort by the user. The downside of the passwords is that there is always a chance that someone could guess the password.

Biometrics

Biometrics attempts to identify people based on biological characteristics. The most promising devices are fingerprint and handprint readers. These systems work with a simple camera that can be installed cheaply.

The advantage of biometric security is that the user does not have to remember anything or carry keys around. They are reasonably accurate and difficult to fool by an unauthorized person. As costs decline, the biggest drawback to biometric security devices is a lack of standards.

Access control

The common access controls available are read, write, execute, and delete. The owner of the database can give other users exactly the type of access they need. For example, the accounting department could allow mangers to see the accounts payable data, but not to modify the data and write new checks.

The creator of the database can also set aside different directories for each group of users and assign permissions to each directory. The main choice is which users should be able to read the data, and which ones need to be able to change it.

Other security measures and authorization

A fundamental issue in computer security is that logical controls are never enough to protect the computer. To be safe, some standard business policies are recommended too such as:

- Physical access
- Monitoring: monitor access to all of the data. Track is kept of every change to every file. The computers can keep a log of who accesses each file, every time someone incorrectly enters a password etc.

Test Questions

1. Many potential threats exist to data in an information system. But the biggest threat is discerned from legitimate users and developers. Among the following groups which statement about their possibilities to be the source of security threat is true, which not?

- Since the company investigates the employees' credibility on recruitment, there is no need to worry about employees to inappropriately use the company's data (F)

- It is hard to monitor a consultant's work since they are generally hired for a short time for specialized jobs, but the consultant remains a potential threat as employees since they get the access to the company's database too (T)

- By giving access to the company's computer networks, partners in business are becoming a threat to company's database security   (T)

- In general, the best way to minimize problems from employees include: Hire workers carefully, treat employees fairly, have separation of jobs, use teamwork, and maintain constant checks on their work   (T)

2. The key to protect the security of the data lies in providing people with the right level of access. The following are often used measures to give authorization:

    a. Username and password

    b. Biometric security

    c. Access control as assigned by the database administrator

    d. All of the above

(d)

12.3.4 Data warehouse and data mining

Learning objectives

The student shall understand what data warehousing and data mining refer to, and their respective applications in different environments.

Data Warehouse

When the data amount grows and comes with several gigabytes or even terabytes, the popular relational databases becomes relatively slow. It will be a daunting job trying to integrate and clean data from all of the company's

transactions and systems at such a level. One solution to that is to use the data warehouse.

Data warehouses are large database system containing detailed data. Large database management systems have specific tools and data storage methods to create data warehouses, for example Metadata is used to describe the source data, identify the transformation and integration steps, and define the way the data warehouse is organized.

In most cases, a data warehouse in a company is a static copy that is refreshed on a daily or hourly basis. Data warehouse is relatively easy to use for end users, but it is less flexible than using a database management system. Users may be unable to get additional data or to compare the data in some previously unexpected way. The success of a data warehouse therefore depends on how well the user's needs have been anticipated and integrated into the system.

Data warehouses form a category of business intelligence software that has been adopted by many companies for analysis of transactions to help improve their competitiveness. Due to their popularity, the data warehouse has to a great extent displaced EIS (Executive Information Systems) in software purchases for strategic and tactical decision making.

EIS or Executive information systems provide senior managers with a system to assist them in taking strategic and tactical decisions. Their purpose is to analyse, compare and highlight trends to help govern the strategic direction of a company.

EIS are intended as decision support tools for senior managers. Since these strategic decisions are based on a wide range of input information, they always need to be well integrated with operational systems in a business.

Data mining

Data mining consists of a variety of tools and techniques to automatically retrieve and search data for information. As the flood of data increases, more companies are turning to automated and semi-automated tools to help search databases and make it easier to visualize patterns.

Data mining of data warehouses is an attempt to identify a relationship between variables. Data mining is used to identify patterns or trends in the data in order to assist decision making.

The tools used in data mining are slightly different from the traditional statistical methods. It involves statistical techniques such as multiple linear regressions. Particular data mining techniques include:

- Identifying associations – market basket analysis

> Identifying associations is one of the classic data mining tools, also called market basket analysis. A classical example is that a convenience store, with the help of data mining, found that on weekends people often purchase beer and diapers together. The reaction to that result might be to stock the two items near each other to encourage people to buy both; or to place them at opposite ends of an aisle so as to force people to walk past the high-impulse items such as chips.

- Identifying sequences – shows that sequence in which actions occur, e.g. path or click stream analysis of a web site.
- Classifications – patterns, e.g. identifying groups of web site users who display similar visitor patters.
- Clustering – finding groups of facts that were previously unknown.
- Forecasting – using sales histories to forecast future sales.

Test Questions

1. Judge whether the following descriptions about data warehouse are true or false

- Data warehouses are large database system containing large amount of data (T)
- Data warehouses form a category of business intelligence software that has been adopted by many companies   (T)
- Metadata is used in data warehousing to describe the source data, identify the transformation and integration steps, and define the way the data warehouse is organized (T)
- The use of data warehouse system is as flexible as a normal database management system like RDMS for managers   (F)

2. Data mining consists of a variety of tools and techniques to identify patterns or trends in the data in data warehouses. Such techniques and tools include

    a. Identifying associations and sequences

    b. Classifications and Clustering

    c. Forecasting

    d. All of the above

(d)

Reference reading:

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Choose a Database -
Storage and Small Business

By Drew Robb

Market

Over the past year or so, vendors have issued a steady stream of press releases announcing their dedication to the small business market. HP, EMC , Network Appliance (NetApp), Computer Associates (CA) and many others have released SMB (small and mid-sized business) or SME (small and mid-sized enterprise) versions of existing storage products, or products dedicated to smaller environments. Despite this greater storage availability, however, most small businesses appear to have remained interested in the very simplest of the available storage architectures. Known as Direct-Attached Storage (DAS), this involves having the storage contained within a server, or having a tape drive plugged into a server for backup.

Most SMBs appear to content themselves with a server and perhaps a simple backup structure. But some may venture into Network Attached Storage (NAS) or even a Storage Area Network (SAN). NAS is the less complex option. It entails the addition of another server that is dedicated to file and print. This works well when a business has moved beyond one or two servers. The NAS box stores all company files, leaving the other servers to deal with core business applications. Such an arrangement tends to improve file access times, increases storage capacity and raises application performance. When it comes to SANs, though, it is rare indeed for a business of less than a 100 staff to harness this technology. Why? A full-blown SAN requires dedicated IT staff and a high initial cost. Fortunately, the price of SANs has been brought down considerably by the introduction of storage networks that run on Internet Protocol (IP) i.e., the type of network commonly used today in small businesses to connect to the Internet. As a result, an IP SAN can be deployed by small businesses without having to import another layer of technical complexity. IP SAN's are gaining momentum for small and medium enterprises. The technology is easy to use, costs less than a traditional SAN and offers sufficient performance for many certain types of applications.

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Recommendations

Let's take a look at specific, existing vendor offerings and what types of businesses can benefit from using them.

Fewer Than 20 People

Generally speaking, businesses with less than 20 people don't need much in the way of storage. Direct attached storage (DAS) dominates and backup is typically accomplished on an individual basis. Basic backup is the primary application for 20-user sites. Backup should be supplemented by some effective means of data protection. Software for data protection such as anti-rirus software however, can be cumbersome to manage in any business that lacks a dedicated IT person or staff — it has to be updated to keep up with new threats and new versions have to be installed.
An integrated data protection tool, CA Protection Suite, that combines backup, antivirus, anti-spyware and data migration capability. It has a Web-based management console that lets one person easily manage the office software from one screen. Pricing for the Desktop, Server and Business Protection Suites ranges from $325 to $1099 for a five-user license.

Another technology that may be of interest to businesses with fewer than 20 employees is Continuous Data Protection (CDP). Instead of backing up files daily or weekly, it checks for new files to backup (or make changes to existing files) every minute or two. While CDP can be very expensive, Lasso CDP by Lasso Logic of San Francisco, Calif., (recently acquired by SonicWALL), is designed and priced specifically for the small business market because continuous protection is important. Backup systems won't protect data if a virus causes a network/computer crash before the data is backed up at the end of the day. Several product versions are available starting at around $500.

20 to 100 People

Companies with more than 20 employees could certainly benefit from the tools named above. But they may also need additional help. Network Attached Storage (NAS), for example, could be the answer for companies that are always running out of disk space.

Firms that store a lot of data on a daily basis might find it more efficient to buy a NAS appliance, also known as a storage server, rather than trying to keep that information on existing desktops and servers. NAS boxes have tons of capacity and employees can leave their desktops empty (thereby greatly improving performance) and store all their files on the central NAS server.

NAS is a great fit for all environments, but especially in small businesses where IT staffing is limited or non-existent. More NAS information can be found at HP's Web site.

Another possibility for companies in the 20- to 100-person category is the Rapid Recovery System by Unitrends. The programme offers basic disaster recovery capabilities that help small businesses quickly regain access to vital information. The price starts at around $5,000.

Unitrends is first and alone in producing a comprehensive system that delivers the full range of business systems continuity benefits with the speed, security and simplicity that SMEs demand today. Within minutes, the system recovers entire computer systems including operating systems, applications and application data. It includes CDP capabilities and enhanced data encryption, and works without constant attention from IT staff.

More Than 100

Once a company expands beyond 100 employees, it is likely that it has at least one full-time IT person. Such firms may benefit by looking at some higher-end areas of the storage landscape. While traditional Storage Area Networks (SAN) may be expensive overkill, IP SANs could prove cost-effective.

Companies of 100 users or more should look at implementing an IP SAN. If IT can hook some PCs and servers onto a network, they can deploy an IP SAN. The LeftHand SAN comes in a box that costs about $12,400. Other companies also offer IP SANs. Elliot of HP suggests that firms with five or more ProLiant servers should move to an IP SAN arrangement using an external HP StorageWorks disk array. Similarly, EMC has introduced the $6,000 CLARiiON AX10 for the small business market. The AX10 acts as the central storage repository in an IP SAN.

For those with more heavy-duty needs, Hitachi Data Systems has introduced its TagmaStore Workgroup Modular Storage (WMS100). Many small and medium businesses have seen their storage requirements expand and now face challenges similar to large enterprises. The WMS100 provides a 5-Terabyte IP SAN with pricing starting at under $20,000.

Invest in What You Need

With the large variety of storage offerings on the market, small businesses need to research what will work for them and come to a clear realization of what to implement given their available resources. Some "small business" tools are actually enterprise products relabelled or scaled down a little in a misguided attempt to "service" the lower end of the market. But some vendors are now introducing tools tailored to small business needs.

Far from being stripped-down versions, the latest batch of low-end storage tools are built to meet the needs of the small business community.

The products named above do not necessarily fit easily into handy pigeonholes such as "less than 20 people" or "more than 100." Some would be quite at home in either category, while the deployment of others is largely dependent on the type of business you own. A financial services firm of 15 people, for example, could be handling a portfolio of hundreds of millions of dollars and might not think twice about purchasing Hitachi's WMS100. By the same token, any small business that is heavily IT-centric is likely to see the benefits of higher-end storage despite having only a handful of employees.

There are a few organisations of 20 people that have major storage requirements. These are extremely specialized companies and, with such a high dependence on IT and data storage, they usually have SAN capabilities.

(Source: http://www.smallbusinesscomputing.com/testdrive/article.php/3574106
http://www.smallbusinesscomputing.com/testdrive/article.php/3574646)

12.4   Principles of Networking and Data Sharing

Learning objectives
The student should understand the meaning of networking and data sharing.
The student should understand the basic types of network topologies, and the network components in general.
The student should understand the different types of networks, and in particular the client/server architecture.
The student shall be further aware of the latest technology development in regard to networks, esp. the digital network and wireless network.

Until more recently, most communications have been over the phone or in person. When computers and telecommunications are integrated, they can provide many advantages.

The objective of a network is to connect computers transparently. The network provides access to data on central computers and other computers. It can also create shared access to fax machines, modems, printers, scanners and other specialized hardware. The Internet expands these capabilities across the world, while wireless makes the services available to users wherever they travel in major cities.

Networks are vital to a business. They can facilitate new ways of working, save cost and improve communications that arise from an internal network.

They also help a business to reach out and connect with its customers, suppliers and collaborators.

12.4.1 Principles of networking and data sharing

Learning objectives
The student should understand the meaning of networking, TCP/IP, and data sharing.

Networking

A primary goal of networking is to allow users to retrieve data from a mainframe computer, a server, or other computer and use it on their desktop computer. The computer network can be defined as a communications system that links two or more computers and peripheral devices which enables transfer of data between the computers.

The links between computers and other hardware form a computer network for the purpose of information transfer. The computer network can be constructed on different scales.

Most companies did not seriously begin installing networks until the early 1990s. The Internet expanded into the commercial world in the mid to late 1990s.

Networking standards (TCP/IP)

Standards are important with networks. If everyone follows the standards, equipment can be connected, data can be shared, and the computer can be connected to the network. Without standards there is no way to connect computers or networks produced by different vendors, whom each may have its own standards.

TCP/IP is the data transmissions standards of the Internet, as part of a larger set of standards known as the open systems interconnection (OSI) model. We can understand the IP protocol as the addressed envelope that is used to address a message to the appropriate IP address of the receiver. It is concerned with routing messages to the appropriate location. As for TCP (transport control protocol) it is responsible for dividing the application data into packets and providing logical connections to the network. TCP supports

multiple applications at the same time by creating numbered ports. It sends data packets to the specified port on the desired machines, and monitors the packets to see if any are lost in transmission.

Data sharing

Sharing data is one of the most obvious uses of a network and it can make profound changes to a business environment. A network facilitates the use of teams. Managers can see customer and marketing data immediately as it is collected. Employees in one department can easily share data with other departments.

Data sharing is important in business transactions, decision making and searches. Sharing data is also often seen in the messages (e-mails), world wide webs, newsgroups, chat rooms, calendars and scheduling, teamwork and joint authorship, and backups.

Test Questions

1. Standards are important with networks, which enable the equipment to be connected, and data shared. The data transmission standards of the Internet is called

    a. TCP/IP

    b. OSI

    c. Packet-switched

    d. Circuit-switched

(a)

2. A network

    a. Is a communication system that links two or more computers and peripheral devices for the purpose of information transfer

    b. Is to share data

    c. Helps a business to reach out and connect with its customers, suppliers and collaborators

    d. All of the above

(d)

12.4.2 Overview of network topologies and components

Learning objectives

The student should understand the basic types of network topologies, and the differences between them.

The student shall understand what the network components are in general.

Network topology

The physical layout of a LAN is known as a network topology. In comparison with this physical network topology, logical topology means the way the data passes among the nodes in the network.

Network topologies are categorized into the following basic types:
- bus
- star
- ring
- tree
- mesh

More complex networks can be built as hybrids of two or more of the above basic topologies.

Bus Topology

In bus topology, all devices are connected to a central cable, called the bus or backbone. At each end of the cable is a terminator. A signal is passed back and forth along the cable past the workstations and between the two terminators.

The "bus" carries a message from one end of the network to the other. As the bus passes each workstation, the workstation checks the destination address on the message. If the address in the message matches the workstation's address, the workstation receives the message. If the address doesn't match, the bus carries the message to the next workstation, and so on.

Ethernet bus topologies are relatively easy to install and don't require much cabling compared to the alternatives. 10Base-2 ("ThinNet") and 10Base-5 ("ThickNet") both were popular Ethernet cabling options years ago. However, bus networks work best with a limited number of devices. If more

than a few dozen computers are added to a bus, performance problems will likely result. In addition, if the backbone cable fails, the entire network effectively becomes unusable.
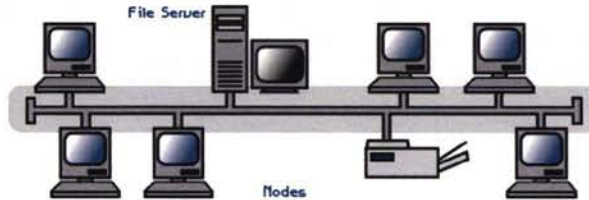
Advantages:

- Easy to connect a computer or peripheral to a bus
- Failure of a single workstation doesn't affect the entire LAN
- Requires less cable length than a star topology

Disadvantages

- Cable break can affect large number of users
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution in a large building.

Star Topology

In star topology, all devices are connected to a central hub that may be an actual hub or a switch. Nodes communicate across the network by passing data through the hub. Devices typically connect to the hub with Unshielded Twisted Pair (UTP) Ethernet. Hubs however, may be connected together to extend the network.

Compared to the bus topology, a star network generally requires more cable, but a failure in any star network cable will only take down one computer's network access and not the entire LAN. If the hub fails, however, the entire network also fails. Many home networks use the star topology.

The protocols used with star configurations are usually Ethernet or LocalTalk.
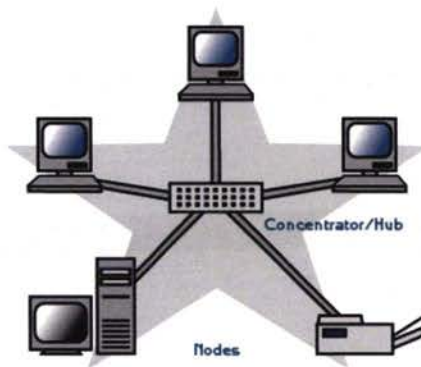
Advantages:

- Easy to install and wire, and to add new computer
- No disruptions to the network when connecting or removing devices
- Easy to detect faults and to remove parts

Disadvantages:

- Requires more cable length than a linear topology
- If the hub or concentrator fails, nodes attached are disabled

Ring Topology

In ring topology, all devices are connected to one another in the shape of a closed loop, so that each device is connected directly to two other devices, one on either side of it.

All messages travel through a ring in the same direction (effectively either "clockwise" or "counter clockwise"). A failure in any cable or device breaks the loop and can take down the entire network.

To implement a ring network, one typically uses FDDI, SONET, or Token Ring technology. Rings are found in some office buildings or school campuses.
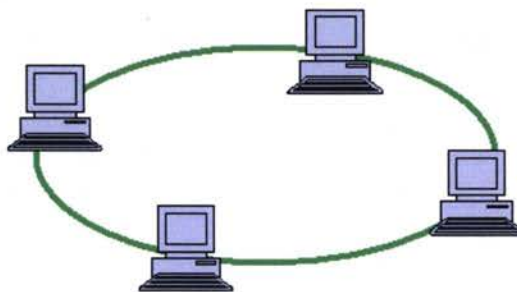
Advantages:

- very little signal degradation occurs: Each node on the ring acts as a repeater and duplicates the data signals before passing it on

Disadvantages:

- A break in the ring can disable the entire network. Extra cabling is therefore often incorporated in many ring designs
- Networking devices are more expensive, since each node must have the capability of functioning as a repeater.

Token-ring topology

Developed by IBM, Token Ring is standardized to IEEE 802.5. Although the name token ring implies a ring, Token Ring uses a star topology though electrically a ring. Workstations are centrally connected to a hub called a Media Access Unit (MAU) and are wired in a star configuration. Internally, the MAU contains wiring that allows information to pass from one device to another in a circle or ring. The Token Ring protocol uses a star-wired ring topology.
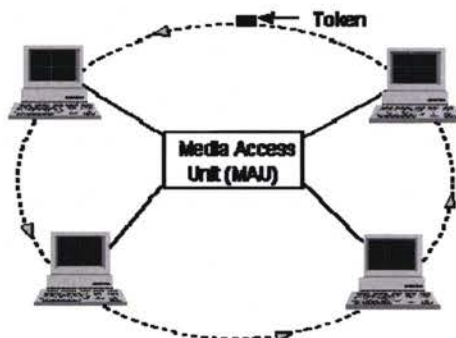
Token-ring networks use a data token passed from computer to computer around the ring to allow each computer to have network access. The token comes from the nearest active upstream neighbour (NAUN). When a computer receives a token, if it has no attached data and the computer has data for transmission, it attaches its data to the token then sends it to its nearest active downstream neighbour (NADN). Each computer downstream will pass the data on since the token is being used until the data reaches its recipient. The recipient will set two bits to indicate it received the data and transmit the token and data. When the computer that sent the data receives the package, it can verify that the data was received correctly. It will remove the data from the token and pass the token to its NADN.

Advantages:

- Cable failures affect a small number of users
- Equal access for all workstations
- Graceful performance degradation as the size of the network grows

Disadvantages:

- Costly wiring and connections

Tree Topology

Tree topology is a hybrid topology. Groups of star-configured networks are connected to a linear bus backbone.

Tree topologies integrate multiple star topologies together onto a bus. In its simplest form, only hub devices connect directly to the tree bus, and each hub functions as the "root" of a tree of devices. This bus/star hybrid approach supports future expandability of the network much better than a bus (limited in the number of devices due to the broadcast traffic it generates) or a star (limited by the number of hub ports) alone.
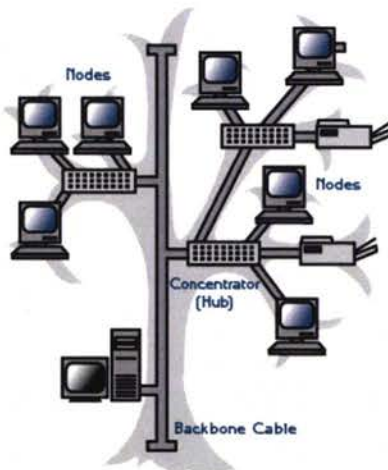
Advantages:

- Point-to-point wiring for individual segments
- Supported by several hardware and software vendors

Disadvantages:

- Overall length of each segment is limited by the type of cabling used
- If the backbone line breaks, the entire segment goes down
- More difficult to configure and wire than other topologies

Mesh topology

Mesh topologies involve the concept of routes. Unlike each of the previous topologies, messages sent on a mesh network can take any of several possible paths from source to destination. In contrast to ring, although two cable paths exist, messages can only travel in one direction.

Some WANs, like the Internet, employ mesh routing.

Distributed topology

The phrase of distributed topology is used as opposed to centralized topology. While in a central topology, most or all major system components and processes are located at one site, most or all system components and processes in a distributed topology are distributed across multiple sites, usually at each remote site. Distributed topology is usually seen in the wireless networks.

The following figure shows a distributed topology.
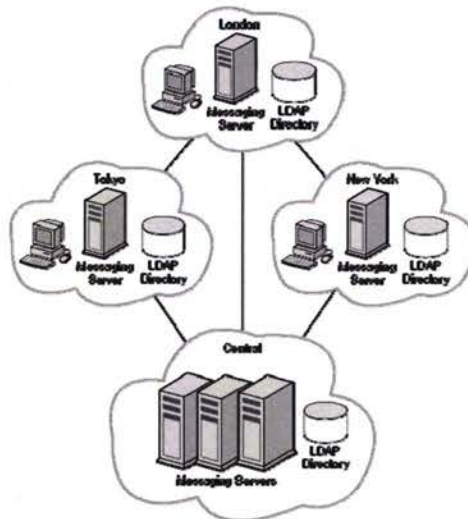
Advantages:

- Users at regional sites have faster access to the main networks since they do not have to retrieve data over the WAN, as the case in centralized topology
- Messages sent within a regional location incur less traffic than in a central topology

Disadvantages:

- higher hardware costs: more hardware at more locations
- higher support costs: complexity of the distributed topology
- failover in a distributed topology is more difficult to implement than in a central topology
- slower to initially deploy servers because there are multiple servers spread across multiple sites

Conclusion

Topologies remain an important part of network design theory. Understanding the concepts behind it gives a deeper understanding of important elements like hubs, broadcasts, ports, and routes. The topology choice and the media used to implement it also affects the network cost and performance.

Network component

As networks have become more important, the components are increasingly built into the machines. The basic elements of a network include:

- Computers
- Transmission medium
- Connection devices.

Computers

Computers attached to networks tend to perform one of two functions: servers or clients. Servers are computers that store data to be used by other computers in the network. Clients are computers used by individual people. Sometimes a computer is used as both a client and a file server.

A wide range of servers exists today, from a simple PC to huge, expensive specialized computers. In choosing a server, the main questions are the operating system and the issue of scalability. Scalability is the ability to easily move up to greater performance, without having to require all of existing applications.

Client computers can be any type of machine. The client computers need to access the network and be able to send information to at least one other computer. In order to do so, a network interface card (NIC) (or LAN card)

needs to be installed in each computer. These cards are connected together by a transmission medium such as cable. In addition, client computers may have to be configured to connect to the network and set security parameters.

Client computers today include desktops, laptops, and PDAs that can be connected with wireless networks to enable a mobile working environment. Many of the mobile devices have limited capabilities though. They essentially run browsers, e-mail and calendars, while most of the processing is done on the server.

Transmission medium

Common transmission media include electric wires, light waves and radio waves. Each method offers certain advantages and disadvantages, as they are designed for specific applications.

Electric cables: twisted pair (the oldest form of electrical wiring), simply pairs of plain copper wires. Disadvantages: cannot carry much information at one time. Data transmitted on unshielded wires is subject to interference from other electrical devices.

Coaxial cables (coax): designed to carry more information than twisted pairs with lower chance of interference. Coax consists of a central wire surrounded by a nonconductive plastic, which is surrounded by a second wire. The second wire is actually a metallic foil or mesh that is wrapped around the entire cable to provide shielding and to minimize the interference from outside sources.

Fibre optics: a relatively recent invention (early 1970s) in communications which uses light instead of electricity. A fibre-optic cable consists of a glass or plastic core that is surrounded by a reflective material. Fibre-optic cable provides the advantages of high capacity with almost no interference. The limitation is the higher cost of the cable and the cost of the connectors and interface cards that convert computer electrical signals into light.

Radio, Micro, and Infrared waves: these communications are called broadcasts, and do not require cables. The major advantage of broadcast methods is portability. Broadcast media have two primary drawbacks. First it is more important to provide security for the transmissions. Second, broadcast transmissions carry a limited amount of data.

All governments allocate the frequency spectrum for various uses, such as radio, television, cellular phones and garage door openers.

Connection devices

A small network can connect to a larger network such as the Internet by a link to a hub, switch, or router. The interconnection device is then linked to the backbone, which is typically a fibre-optic line.

Hubs are the simplest connection devices. They essentially act like a giant junction box. All devices connected to a hub share the lines with the other devices. Routers and switches examine every packet that passes through them and decide where to send each packet. Routers improve performance by choosing the path of the message and segmenting large networks into smaller pieces. Switches perform a similar task but isolate communications down to one line. So the communication via the switches would have full use of a line for a period of time. They are actually specialized computers that can be programmed to identify network problems and intelligently route traffic to the fastest route.

All the above mentioned three connection devices do not plan the entire route of the message, but rather direct it to the next router or hub that seems most appropriate given the destination and current network traffic. Manufacturers for the devices are, for example: Cisco and 3Com.

Network structure

Packet-switched network (e.g. Internet): TCP/IP is used as its protocol. As the messages or packets are sent, there is no part of the network that is dedicated to them.

Circuit switched network: the line is dedicated to the user for the duration of the transmission of data.

Test Questions

1. If it is required that the failure of a single workstation shall not affect the entire network, the network topology chosen can be all the others but

   a. Bus topology

   b. Star topology

   c. Ring topology

   d. Tree topology

(c)

2. In wireless network, which network topology is often used?

    a. Centralized topology

    b. Distributed topology

    c. Token-Ring topology

    d. Mesh topology

(b)

3. Network components include

    a. Computers like desktops, laptops and PDAs

    b. Transmission media such as electric wires, optical cables, light waves and radio waves

    c. Connection devices such as hubs, routers and switches

    d. All of the above

(d)

4. This connection device examines every packet that passes through, while the transmission of such packets does not occupy the full use of a line for a period of time. This connection device is called

    a. Hub

    b. Router

    c. Switch

    d. Router or Switch

(b)

12.4.3 Networks

Learning objectives

The student should have knowledge about the major three types of networks constructed on different scale levels: LAN, WAN and Peer-to-peer networks.

Computer networks can be constructed on different levels. Small-scale networks within a workgroup or single office are known as local-area networks (LAN). Larger-scale networks which are national or international are known as wide-area networks (WAN). The internet is the best known example of a wise-area network.

Local-area networks (LAN)

A local-area network (LAN) is a computer network that spans a relatively small area. Most LANs are confined to a single building or group of buildings. It can serve as few as two or three users (for example, in a home network) or as many as thousands of users. A single printer connected with several computers to perform printing tasks from those computers is also a LAN.

Most LANs connect workstations and personal computers. Each individual computer in a LAN has its own CPU with which it executes programmes, but it also is able to access data and devices anywhere on the LAN. Users can also use the LAN to communicate with each other, by sending e-mail or engaging in chat sessions.

A LAN may have a single server if the company is of fewer than, say, 20 people. Larger companies with hundreds of employees are very likely to deploy computer central servers and possibly even departmental servers.

There are many different types of LAN technologies such as Ethernet, Token Ring and FDDI. Ethernets is by far the most common for PCs. Most Apple Macintosh networks are based on Apple's AppleTalk network system, which is built into Macintosh computers.

Wide-area networks (WAN)

One LAN can be connected to other LANs over any distance via telephone lines, cables, radio waves and other transmission media. A system of LANs connected in this way is called a wide-area network (WAN). Geographically, a WAN generally covers a large area. Internet is a best example of WAN on the largest scale.

WAN connects businesses in different parts of the same city, different parts of a country or even different countries. The WAN connects many servers at each site. As far as a company is concerned, if the WAN enables communication across the whole company, it is referred to as the "enterprise network".

Often the network used to connect remote sites is the public networks such as the telephone system. Companies may also lease private or dedicated lines

from a telecommunications supplier to connect sites, or can set up links using microwave or satellite methods, which is usually expensive though.

Peer-to-peer networks

Networks where many of the machines operate as both clients and servers are called peer-to-peer networks, in which each workstation has equivalent capabilities and responsibilities. Peer-to-peer is often referred to simply as peer-to-peer, or abbreviated P2P. Peer-to-peer network is usually used to share files and peripherals among connected PCs, a simple type of LAN.

Peer-to-peer networks are generally simpler, but they usually do not offer the same performance under heavy loads. Peer-to-peer network is particularly appropriate for small workgroups where central control from a server is less necessary. A user in a peer-to-peer network can share a file stored on another user's hard disk across the network. Files can also be transferred between PCs as long as the PCs are connected with a serial cable using the serial ports on each machine.

Test Questions
1. Internet is the best example of a
>   a. Local area network (LAN)
>   b. Wide area network (WAN)
>   c. Peer-to-peer network
>   d. Neither of the above

(b)

2. A network which is made up of a single printer connected with several computers to perform printing tasks from those computers is a
>   a. Local area network (LAN)
>   b. Wide area network (WAN)
>   c. Peer-to-peer network
>   d. Neither of the above

(a)

3. Which understanding of peer-to-peer network is incorrect?
>   a. Peer-to-peer network is a type of LAN
>   b. There is one machine operating as server only in the peer-to-peer network
>   c. Peer-to-peer network is suitable for small workgroups where central control from a server is not necessary

d. Files can be transferred between PCs in a peer-to-peer network as long as the PCs are connected with a serial cable using serial ports

(b)

12.4.4 Client/server architecture

Learning objectives

The student shall understand that client/server architecture is the popular network structure in modern businesses. The student shall understand the major components in the client/server structure.

The client/server architecture has been popular in modern networked information systems, adopted by most of the businesses. The client/server model consists of a series of client computers such as PCs sharing resources stored on more powerful server computers. Processing can also be shared between clients and servers.

Components of client/server model

In the client/server architecture, on the client side are typically desktop PCs, which are the access points for end-user applications. The PCs are then connected to a more powerful PC or a server computer via a LAN or WAN. The network is made up of both telecommunications processors to help route the information and the channels and media which carry the information.

In detail, the components of a client/server network include the following:

- Servers: network servers run the network operating systems and are often used to store large volumes of data.
  (A server is a powerful computer used to control the management of a network. It may have a specific function such as storing user files or a database or managing a printer.)
- End-user computers or terminals: access points for users. Each client must have physical connection to the network e.g. network interface card, and networking software such as Novell Netware or TCP/IP installed.
- Data communications equipment or telecommunications processors: such as modems, hubs, bridges and routers, repeaters, data service units and channel service units.

- Telecommunications channels: guided media (such as wires, cables, *twisted-pair, or co-axial,* fibre-optic) or unguided media (such as satellite, microwave, wireless or wireless infra-red)
- Transmission methods: analogue or digital signal, in synchronous or asynchronous communication
- Network operating systems: a system software to control the access to and fro of information around a network. The most widely used NOS for a PC-based LAN are Novell Netware and IBM LAN Manager.
- Middleware: a specialised type of software which allows different software applications to communicate. It provides translation services between incompatible software running on different types of computer systems in different locations or companies.

Advantages of client/server architecture

The client/server model represented a radically new architecture compared to the traditional, centralized mainframe structure. The new model gives the opportunity for various tasks to be shared between a central server and clients. With arrays of user terminals, the large mainframes are downsized. This gives the potential for faster execution, and a huge cost saving seeing that PC-based servers are much cheaper than mainframes.

Another advantage of client/server is that there are many choices for sharing the workload between resources. The system designers can decide to distribute data and processing across both servers and client computers.

Test Questions

1. Client/server architecture represents a new trend in the network systems with lower cost and shared tasks. The descriptions below about the client/server architecture are correct except

    a. On the client side it is typically desktop PCs

    b. On the server side it is a more powerful PC or UNIX server

    c. Between the client side and the server side it is the network of either LAN or WAN, including telecom processors, channels and media

    d. Workload cannot be shared between the end users on the client side and the server

(d)

12.4.5 Latest technologies (Wireless network, digital network)

> **Learning objectives**
> The student shall have knowledge about the latest technologies applied in networks, especially the digital network and wireless network.

The latest technologies in networks lie in the development of new transmission media. Based on the original analogue media such as phone lines, faster digital media e.g. integrated service digital network (ISDN) technology and more recently asynchronous digital subscriber line (ADSL) are introduced. Beginning with cell phones in the 1990s, people and business have become fascinated with wireless communication too, and the concept of wireless network has been developed since then opening thousands of new possibilities.

Wireless network

Wireless transmission media are called broadcasts, including such media as Radio, Micro, and Infrared waves. These communication media do not require cables.

Wireless technology is different from the traditional network in two ways:

- The transmission medium is microwave radio, and
- The client devices are smaller with smaller screens and less computing power. It can be anything from enhanced cell phones to PDAs and digital tablets.

The major advantage of broadcast methods is portability. For example, computers can be installed in delivery vehicles to receive information from corporate headquarters. On a smaller scale, individuals can carry around laptops and PDAs and remain connected to the network.

Broadcast media have two primary drawbacks. First it is more important to provide security for the transmissions. Because it is a broadcast method, the signals sent by one computer can be received by any other computer within range. There is no way to prevent other computers from physically receiving the signal. One solution to this problem is to encrypt the wireless transmissions.

The second drawback is that broadcast transmissions carry a limited amount of data. This problem arises because only a small number of radio frequencies can be used to carry data. Most of the radio and television frequencies are already being used for other purposes. In this aspect, all governments in the world allocate the frequency spectrum for various uses, such as radio, television, cellular phones and garage door openers.

Wireless connections are not yet as fast as broadband connections. It is substantially less expensive though to reach people with wireless connections.

Digital network

Digital network refers to purely digital media as the transmission method, in comparison with the original analogue media. It features the digital telephony and data-transport services in better quality and higher speed than available with analogue systems. As a more marketing-friendly term, xDSL (Digital Subscriber Line) is often used, representing the family of technologies that provide digital data transmission over the wires of a local telephone network.

Faster data transmission is realized in digital networks, which permit voice, data, text, graphics, music, video and other source material to be transmitted over existing telephone wires. High-speed image applications (such as Group IV facsimile), additional telephone lines in homes to serve the telecommuting industry, high-speed file transfer, and videoconferencing are all the new application of the digital network.

Typically, the download speed of xDSL ranges from 128 to 24,000 kilobits per second (kbit/s) depending on xDSL technology and service level implemented.

ISDN

The early version of xDSL is Integrated Services Digital Network (ISDN), a type of circuit switched telephone network system, designed to allow digital transmission of voice and data over ordinary telephone copper wires. ISDN can deliver at minimum two simultaneous connections, in any combination of data, voice, video, and fax, over a single line. Multiple devices can be attached to the line, and used as needed. That means an ISDN line can take care of most people's complete communications needs, without forcing the purchase of multiple analogue phone lines.

The emergence of ISDN represents an effort to standardize subscriber services, user/network interfaces, and network and internet capabilities.

Voice service is an application for ISDN. In a videoconference, ISDN provides simultaneous voice, video, and text transmission between individual desktop videoconferencing systems and group (room) videoconferencing systems.

ADSL

Asymmetric Digital Subscriber Line (ADSL) is a form of DSL, a data communications technology that enables faster data transmission over copper telephone lines than a conventional modem can provide.

The distinguishing characteristic of ADSL over DSL is that the volume of data flow is greater in one direction than the other, i.e. it is asymmetric. ADSL is usually marketed as a service for people to connect to the Internet in a relatively passive mode: able to use the higher speed direction for the "download" from the Internet but not needing to run servers that would require bandwidth in the other direction. Therefore, the upload speed of ADSL is lower than download speed.

Older ADSL standards can deliver 8 Mbit/s over about 2 km (1.25 miles) of unshielded twisted pair copper wire. The latest standard, ADSL2+, can deliver up to 24 Mbit/s, depending on the distance from the DSLAM.

DSL vs. Cable modem

Telephone companies started promoting xDSL when cable television companies began marketing broadband Internet access and VoIP (Voice over IP) telephony. The proliferation of cable modems, along with DSL technology, has ushered in the age of broadband Internet access worldwide. To date, xDSL is the principal competition of cable modems for providing high speed Internet access to home consumers.

A cable modem is a unique type of modem that is designed to modulate a data signal over cable television infrastructure. Cable modems are primarily used to deliver broadband Internet access, taking advantage of unused bandwidth on a cable television network.

The difference between cable modem and xDSL lies in the choice of the transmission media. While xDSL is a system offered by phone companies using the twisted-pair phone lines, cable modems provides connections offered by the cable television company on a channel of the coaxial cable. The term cable Internet access (or simply cable) therefore refers to the delivery of Internet service over this infrastructure. Furthermore, the cable modem connection is usually shared, for example with the neighbours, but the xDSL is not shared with others.

Test Questions

1. Judge the understandings below about wireless network are true or false

- Wireless transmission media does not require cables; examples are such as Radio, Micro, and Infrared waves. These communication media are called broadcasts too. (T)
- The major advantage of broadcast methods is portability (T)
- Broadcast media offer better security for the transmissions than the cables or telephone lines   (F)
- Comparing to the wire networks, broadcast transmissions carry a limited amount of data   (T)
- Wireless connections are not yet as fast as broadband connections, but less expensive   (T)

2. ADSL is one version of xDSL. However, ADSL is distinctive from the others in xDSL family in the aspect(s) of

a. Data transmission by ADSL is much faster than any other forms of DSL

b. The volume of data flow in ADSL is asymmetric, i.e. greater in one direction than the other

c. The transmission medium is the cable television infrastructure instead of telephone lines

d. The transmission media is purely digital

(b)

12.5   Telecommunication and Its Application

Learning objectives

The student should have basic understanding of the current status of telecom industry, the challenges and opportunities that telecom companies face, the new telecom products applying the latest telecom technologies, and the development trends of telecom technologies in the coming future.

Business firms are becoming more dependent on international markets. The internationalization increases the demands on the telecommunications system. The international transmission of data is becoming part of the daily business routine.

Basic understanding of the currently available technologies from telecom companies

Telecommunications are the method by which data and information are transmitted between different locations. It enables a business that operates from different locations to run as a single unit, while information can be managed centrally and control maintained from a central location. On a national or global scale, telecommunications technologies such as satellite and microware transmissions are important in linking business. Telecommunication systems that companies create to transfer information electronically, both externally and internally, consist of both the hardware and the software necessary to set up these links.

Telecom industry

By many observers, telecommunications is acknowledged to be the hottest industry segment in the early twenty-first century. After the booming period though, the telecommunications industry is facing new technological pressures from the phenomenon of convergence.

The competition pressure comes mainly from two major forces. One is the proliferation of the transmission media, coupled with the trend of the whole telecom industry shifting to the wireless network. Since all major forms of communication are now transmitted primarily with digital technology, it is a relatively small matter for any of the network types –CATV, telephone, or computer – to carry any type of information. Furthermore, despite the efforts and success in their Internet capabilities, most of these companies' core products are still based on proprietary telecom gear. It is hard to imagine these days a new network will be built on the circuit-switched networks of old.

The other competition pressure comes from the newly emerged competitors not only from alternative network providers, such as cable systems, but also fast growing companies in developing countries such as China. As a result, the emerging markets remain difficult for large telecom companies to enter, while in the home markets, the competition from others are cut-throat.

As many of the functions of the old telephone exchanges can now be done by software, and that software is not coming from the traditional vendors, the telecom industry has been seeing the entry of new, but strong players from innovative Internet firms and software vendors from the PC world such as Intel and Microsoft. Both Microsoft and IBM are currently making major forays into the telecommunications space.

Intel CEO Craig Barrett once made a remark to the telecom industry. He spoke of the telecommunications sector moving to standard building blocks, much like the PC industry did years ago. However, the telecom sector's transition will be more disruptive. A lot of these so-called building blocks will be in the form of middleware software.

Under this influence, the telecom equipment vendors are undergoing fierce competition and some even the structural and organisational changes, particularly the big ones like Alcatel, Lucent, Ericsson, Motorola Nortel, and Siemens. Some industry analysts said it is a difficult time for the telecom companies, and predicted that the market would undergo structural

reshuffling, with some companies going out of the market, or selling off of business units. The recent merger in 2006 between Alcatel and Lucent illustrates this market trend.

Telecom companies

The traditional big players in the telecom industries include such companies as Alcatel, Lucent, Ericsson, Motorola Nortel, and Siemens. In 2006 Alcatel and Lucent merged. In addition to these traditional players, companies originally from the software and PC industry are entering the market including Intel and Microsoft. Microsoft has already significant telecom software including operating systems for mobile phones and PDAs. Apart from such new players, telecom companies from emerging markets such as Asia are also growing rapidly and occupying their home markets.

Each with specific niche segments and core products, nearly all the large telecom companies serve the same, and all telecom segments, offering similar products and services. The companies deliver various choices of voice, data and video applications to their customers and employees, in the form of hardware, networks, systems, services and software. Depending on the core products, targeting groups of such companies cover a wide range too, from home users, enterprises, communications service providers and governments.

Telecom products

Telecom products cover a wide range of transmission media, connection devices, as well as above related services and systems, providing network capabilities and solutions to different customers, from government, enterprises to home users.

The core competency and products of telecom companies lie in the operation of infrastructure and applications. However, with the convergence of computing and communications, and facing the competition from new entries originated from the computing industry, telecom companies have been also expanding the product lines to the fields of software and applications.

Some examples of the latest telecom products are listed below:
- **Internet telephone (VoIP, FoIP)**: Deliver voice and fax over IP network, phone to phone connection, probably the most cost-effective long distance calls alternative.

- **Internet video conference** (station and phone): a PC computer is not required, it's a simple, stand-alone, small and powerful device. It's ready to conduct real-time video conferencing by simply plug it into the existing network.

- **Phone video**: add video to the phone without additional cost or special wiring or equipment

- **Mail server, web server, ftp server, file server**: Individual servers or server package, including hardware, software and backup functions

- **Remote Monitoring System + Video Camera**: Web remote monitoring and recording system via Dynamic IP address. With this system the distance sites like factory, office, retail shop and home can be monitored.

- Digital Surveillance System (DVR): digital video recording system.

- CCTV Cameras and CCTV Equipments: both for domestic and professional CCTV users

- **GPS Vehicle Tracking System**: Track and locate where the vehicles have been; provides solution to the challenge of fleet management for transport and logistics.

New development trends in telecommunications

The communications industry is at the beginning of a significant transformation of network technologies, applications and services, one that is projected to enable converged services across service-provider networks, enterprise networks and an array of personal devices.

The new trend is largely dependent on the user's demands and technology development. The following areas are predicted to be the focuses in the coming future in telecommunication industry:

1. 3G and WiMAX

3G (third-generation) technology is usually used in the context of cell phones. The services associated with 3G provide the ability to transfer both voice data (a telephone call) and non-voice data (such as downloading information, exchanging email, and instant messaging). Video telephony is often seen as the flag-ship application for 3G.

3G wireless networks are the evolution of wide area cellular telephone networks which hope to incorporate high-speed internet access and video telephony to these networks. By May 2004, FOMA clients from NTT DoCoMo reached 4 million while H3G clients increased to 2 million. It is expected that the commercial application of 3G will be still increasing in the future.

Along with 3G, it is WiMAX (Worldwide Interoperability for Microwave Access). WiMAX technology is based on IEEE802.16 standards, wireless MAN technology, enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL. WiMAX has a range of up to 30 miles. One of its promoted uses is for PDAs.

2. Transmission media - Broadband

a. xDSL

There are various versions currently available in the xDSL family: HDSL, ADSL, RDSL, and VDSL. ADSL is expected to develop towards higher speed VDSL. Also DSLAM infrastructure will move from currently based ATM infrastructure to IP. The main driving force is the video (phone) business.

b. Wireless broadband

Wireless broadband is becoming particularly popular with the development of Internet, portable machine, PDA (personal data assistant), and other intelligent mobile terminators. It is compatible with Wireless LAN (WLAN) which is complementary to 3G.

Advantages of WLAN over cable/phone line broadband are:
- mobile
- fast, simple and flexible equipment installation, without complicated cable or line
- extensive outreach where cable may not go economically
- cost saving from cable
- scalability to involve more clients

Current applications of wireless broadband are mainly in hospitals, schools, finance services, manufacturing, service industry, companies, and so on.

3. NGN (next generation network)

NGN (Next Generation Networking or Next Generation Network Architecture/NGNA), is a packet-based network able to provide services including Telecommunication Services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. (ITU-T definition). It is the networks that natively encompass data and voice (PSTN) communications, as well as (optionally) additional media such as video.

NGN's architecture allows decoupling the network's transport and service layers. This means that whenever a provider wants to enable a new service, they can do so by defining it directly at the service layer without considering the transport layer - i.e. services are independent of transport details.

NGS offers unrestricted access by users to different service providers. It will allow consistent and ubiquitous provision of services to users.

4. VoIP

Voice service can be realized using PSTN (Public Switched Telephone Network), Internet or cable. If the routing of voice conversations is over the Internet or through any other IP-based network, it is called the Voice over IP or VoIP.

VoIP traffic can be deployed on any IP network, including LAN. Phone service via VoIP is in general free or costs less than equivalent service from traditional sources such as telephone line or cable. A huge market is predicted for the VoIP in the coming years, but the reliability of the voice quality is yet to be improved comparing to the phone service.

5. IPv6

IPv6 represents Internet Protocol version 6, a network layer IP standard used by electronic devices to exchange data across a packet-switched internet work. It follows IPv4 as the second version of the Internet Protocol to be formally adopted for general use.

IPv6 increases enormously the number of addresses that can be registered for networked devices. While IPv4 supports 4.3×109 (4.3 billion) addresses, which is inadequate for giving even one address to every living person, IPv4 will support 3.4×1038 addresses, or 5×1028(50 octillion) for each of the roughly 6.5 billion people alive today, allowing for example each cell phone and mobile electronic device to have its own address.

Test Questions

1. Judge whether the statements below about the telecom industry and telecom companies are true or false

- From the phenomenon of convergence of computing and communications, the competition structure in the telecom industry remains the same   (F)
- Large software companies like Microsoft and hardware companies like IBM are offering products in the market which used to be only for the telecom companies   (T)
- Wireless network presents a challenge to the original telecom companies as the products from the telecom companies used to be based on the circuit-switched networks (T)
- It is safe to say that telecom equipment vendors are undergoing competition and some may result in structural changes   (T)

2. The core competency and products of telecom companies lie in the operation of infrastructure and applications. Facing the new development in the telecom and computing industries however, telecom companies have been expanding the product lines to the fields of software and applications. The followings are examples of the telecom products in the latest market:

a. Video phone, Internet phone (VoIP)

b. GPS vehicle tracking system

c. CCTV cameras and VVTV equipments

d. All of the above

(d)

3. Next Generation Network (NGN) is

a. A packet-based network that decouples the network's transport and service layers, encompassing data, voice and video communications

b. Transmission media like wireless broadband

c. New Internet Protocol version that enables larger number of Internet addresses to register

d. Wireless networks like 3G and WiMAX

(a)

12.6   Electronic Data Interchange and Value-Added Network

Learning objectives

The student shall understand what EDI stands for, its technical components, and its application in forwarding and logistics.

The student shall also understand the role of VAN in EDI transmission, and the benefits of using VAN.

The students shall have some knowledge about EDIFACT as the EDI standards promoted by the UN, and the major types of EDIFOR messages in goods transport.

The student shall finally have basic understanding of the new media for storing and transmitting data – XML, and the application of the new model of XML EDI.

12.6.1   What is Electronic data interchange (EDI)

Learning objectives

The student shall understand what EDI stands for, how it works, and the benefits of using EDI.

Understanding of EDI

Electronic Data Interchange (EDI) is the computer to computer exchange of information between companies, using an industry standard format. EDI trading partners exchange business data between their respective computer systems, rather than through other conventional communication means (i.e., mail, fax, and overnight delivery), etc. According to DTI (2000), the EDI is the computer-to-computer exchange of structured data, sent in a form that allows for automatic processing with no manual intervention.

EDI can be understood as the replacement of paper-based documents with electronic equivalents. The types of documents exchanged by EDI include business transactions such as purchase orders, invoices, delivery advices and payment instructions as part of EFT (electronic funds transfer). There may also be pure information transactions such as a product specification, for example engineering drawings or price lists.

The following characteristics demonstrate EDI's unique attributes:

- EDI is independent of trading partners' internal computerized application systems.
- EDI interfaces with internal application systems rather than being integrated with them.
- EDI is not limited by differences in computer or communications equipment of trading companies.

In the 1960s, EDI and EFT over secure private networks became established modes of intra- and inter-company transaction. The idea of standardized document exchange can be traced back to the 1948 Berlin Airlift, where a standard form was required for efficient management of items flown to Berlin from many locations. This was followed by electronic transmission in the 1960s in the US transport industries.

(Source: Gerald Post, David Anderson, Management Information Systems: solving business problems with information technology, 4th edition, McGraw-Hill Irwin 2006)

Benefits of using EDI

An increasing number of companies are using EDI, transmitting a substantial percentage of their transaction volume via EDI.

One of the major goals in creating EDI was to reduce the large volume of business paperwork and clerical tasks involved in processing paper documents. Substantial productivity improvements and/or direct cost savings in company operations have resulted from the use of this technology.

In short, the benefits of using EDI can be summarised as the following:

1) Reduction of paperwork: One-time data entry
- Reduced errors, improved error detection
- On-line data storage
- Faster management reporting
- Automatic reconciliation
- Reduced clerical workload

2) More timely communications
- Rapid exchange of business data
- Elimination of mail charges, courier services
- Reduced inventory safety stocks
- Improved production cycle

3) Standard communications
- Customers
- Suppliers
- Banks and financial institutions

4) Fewer errors in data entry and less time spent on exception handling in business.

How EDI works

The essence of EDI is the ability to transfer documents in a form of automated data between computers from different companies. Two basic methods can be used to accomplish this transfer: (1) send the data directly from one computer to the other or (2) send the data to a third party that consolidates and/or converts the data and sends it to the proper location. In both methods, there are two important considerations: establishing the physical links and transferring data in a format compatible to all users.

EDI physical links

Early EDI implementations were based on direct connections as individual firms experimented with the technology. This is often called specialist EDI networks. The proprietary networks enable a safe and efficient transmission of EDI messages, but expensive.

Solutions to the expensive yet proprietary EDI implementations are called value-added networks (VANs) and later on, the Internet EDI. In comparison to VAN, the Internet EDI uses the same EDI standard documents but using lower cost transmission techniques through virtual private networks (VPNs) or the public Internet. Internet EDI is the use of EDI data standards delivered across non-proprietary IP networks.

VPNs (virtual private networks) are similar concepts to VANs. These are data networks that make use of the public telecommunications infrastructure and Internet, but information remains secure by the use of what is known as a "tunnelling protocol" and security procedures such as "firewalls".

Communication standards

For EDI to work, each company must translate the data into a form that can be understood by the other companies. If each customer uses different EDI definitions, a company will have to have a conversion system for each link, which is usually complicated and expensive. Like the proprietary EDI networks, early EDI was created by the firms using proprietary standards. Proprietary standards involve the hassles of providing data in a proper format for each existing and potential customer, should the latter adopt EDI messages in different standards.

Efforts were made to make the EDI communication forms unifrom. Two primary standards exist for EDI messages: The UN's EDIFACT; and the ANSI X 12 definition from the American National Standards Institute of the United States.

EDI transmission process

EDI transmission typically involves the following process:
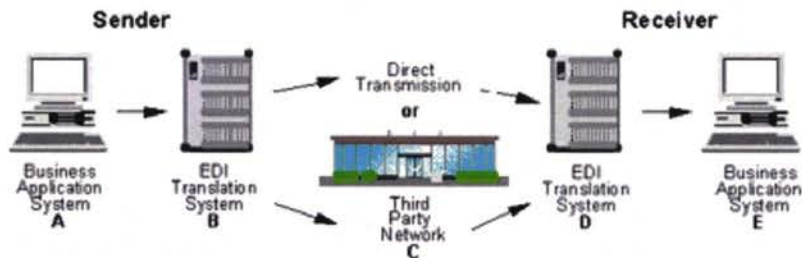
A. The sender assembles the data using its own business application system

B. This data is translated into an EDI standard format (i.e. transaction set)

C. The transaction set is transmitted either through a value added network (VAN) or directly to the receiver's EDI translation system

D. The transaction set, in EDI standard format, is translated into files that are usable by the receiver's business application system

E. The files are processed using the receiver's business application system

Message standards include many different transaction sets that have replaced common business paper transactions. Below is a listing of commonly used transaction sets:

- Purchase Order
- Price Change
- Functional Acknowledgment
- Statement
- Remittance Advice
- Promotion Announcement
- Invoice
- Item Maintenance
- Electronic Funds Transfer

Test Questions

1. The understandings below about EDI are correct except

a. EDI stands for Electronic Data Interchange, and is the computer to computer exchange of information, replacing the paper based documents, between companies using an industry standard format

b. EDI is independent of the internal computerized application system that a company uses, but limited by differences in hardware such as computers and communications equipment

c. The physical links that are needed to transfer EDI can be either a proprietary network, or via a third party such as VAN and even public network such as Internet

d. For EDI to work the EDI standards between the two companies shall be either the same, or convertible

(b)

2. Judge the following descriptions of the benefits of using EDI are true or false.

- Reduction of the great volume of business paperwork: One-time data entry   (T)
- Rapid   exchange   of   business   data   leads   to   more   timely communications   (T)
- Standardized communications with partner companies, such as customers, suppliers and banks and financial institutions (T)
- Fewer errors in data entry and less time spent on exception handling in business   (T)

12.6.2 Benefits of using VAN

Learning objectives

The student shall understand that VAN can be used as an alternative to proprietary EDI network, and the benefits of using VAN in EDI transmission.

What is VAN

VAN in telecom

In constructing a network, the telecommunications channels used to connect remote sites can be either guided media such as wires, cables (twisted-pair, or co-axial), and fibre-optic, or unguided media such as satellite, microwave, wireless or wireless infra-red. In WAN, public phones are often used. In business, private or dedicated lines from a telecommunications supplier are also often seen in lease to connect sites in order to secure the speed and security in data transmission. The cost of doing so is nevertheless high.

In order to minimise the investment in wide-area communications while still receiving all the benefits the WAN can bring, one alternative is the Value-added networks (VAN). VANs give a subscription service enabling companies to transmit data securely across a shared network. The cost of setting up and maintaining the network is borne by the service provider, which then rents out the network to a number of companies. This works out more cheaply than if a company had leased its own point-to-point private lines, but it is not as secure.

VAN in EDI transmission

Electronic communication between trading partners may occur via direct communications, or a value added network (VAN).

VANs are often the most practical solution to EDI communication needs. VANs offer the physical links instead of direct communications which the EDI senders and receivers would otherwise have to invest to establish. VANs can provide additional services too, e.g. to transform files to the proper EDI message standards.

Transmissions from the sending trading partner are sent to the VAN and ultimately received by the receiving trading partner.

Value Added Network (VAN)

| Sender | Value Added Network | Receiver |

Interconnect Transmission

A variation of the VAN is via an interconnect between two VANs. This situation occurs when trading partners subscribe to different VANs.

Direct Transmission

EDI communications may be transmitted directly from the sending trading partner to the receiving trading partner. Direct communication requires each partner to manage traffic, provide audit trails, and provide security.

In comparison to VAN, using direct transmission is far more economical when exchanging a large volume of data. Direct transmission also provides a means of communication for trading partners not using a VAN.

Why use VAN

As mentioned earlier, the physical network to transfer EDI messages can be either specialist EDI networks, which is proprietary, safe, fast yet expensive, or non-proprietary IP networks such as Internet and VAN.

Using VAN gives all of the benefits of using EDI, but limits the disadvantages by using Internet EDI. Some of the important benefits of using a VAN for EDI communications include:

- The VAN acts as a clearing house to send and/or receive data
- Data transmission can be stored by the VAN and delivered on demand
- Data can be archived and delivered a second time if necessary without retransmission from the sender
- The data transmission is secure, and VANs may also provide messages for tracking transmission success.

Test Questions

1. The statements below about VAN are correct except

    a. Value Added Network

    b. VAN is often used in EDI transmission by companies who do not want to set up or lease its private network

    c. VANs give a subscription service enabling companies to transmit data securely across a private network

    d. If two parties subscribe to different VANs, there will be the interconnect between two VANs

(c)

2. Judge the following descriptions of the advantages of using VAN is true or false.

- Using VAN is cheaper than using other telecommunication channels including the proprietary EDI network and the Internet   (F)
- The VAN acts as a clearing house to send and/or receive data   (T)
- Data transmission can be stored by the VAN and delivered on demand (T)
- Data can be archived and delivered a second time if necessary without retransmission from the sender (T)
- The data transmission is secure, and VANs may also provide messages for tracking transmission success   (T)

12.6.3 EDI standards and messages types

Learning objectives

The student shall understand the importance and necessity to deploy EDI standards to facilitate the wide usage of EDI in business.

The student shall understand the UN's initiative in standardization of EDI messages, and have some knowledge about the international EDIFACT standards. The student shall be further aware of the major types of EDIFOR messages as applied in the field of goods transport.

At its origin, EDI was usually carried out over specialist EDI networks. The proprietary networks led to not only a dedicated network, but also the proprietary standards for document formats. Since each EDI link tended to be set up specifically for a single customer, multiple EDI links bring in potentially multiple standards of documents. EDI solutions as such were expensive to implement.

As a result, the ideal situation will be the standards for all EDI connections, everyone conforming to one type of data definition. Some progresses have been made in this area, but to note, converting existing data format may involve both the hardware and the types and format of data, in which the firms may be reluctant to spend money.

Two primary standards exist for EDI messages. The EDIFACT (Electronic Data Interchange for Administration, Commerce and Transport) standard is a joint initiative from United Nations/European committee to facilitate international trading. There is also a similar X12 EDI standard developed by the ANSI (American National Standards Institute).

Development of UN/EDIFACT - International EDI standards

There are two steps in rationalization aiming at the use of automatic data processing and transmission. One is to develop the agreed standards for the representation of data used to service international trade movements. The other is to develop the methods whereby the exchange of data between data processing systems would be made possible without the need for costly and error-prone re-transcription.

Common language

When data are interchanged between trade partners by means other than paper documents, e.g. by teletransmission methods including direct exchange between computer systems, a common "language" should be used with an agreed mode of expressing it, i.e. common protocols, message identification, agreed abbreviations or codes for data representation, message and data element separators, etc. If a universally-accepted standard is not used, the "language" has to be agreed bilaterally between each pair of interchange partners. Taking into account the large number of parties exchanging data for an international trade transaction and the ever increasing number of potential users of teletransmission techniques, it is obvious that such a bilateral approach is not viable.

Uniform rules of communication

Besides using compatible systems, interchange partners should follow uniform rules in respect of communication procedures which include the types of messages acceptable, identification of parties, reference to previously-agreed protocols or agreements on character set, language, transliteration and interchange structure (specification of the various parts of the message, identification of the data elements, codes used).

Development history of the EDIFACT syntax rules

International co-ordination in the development of uniform communication protocols for various types of communication networks (both private and public) was firstly ensured through such specialized international bodies as the International Telecommunication Union (ITU), International Telegraph and Telephone Consultative Committee (CCITT), ISO TC 97/SC 6 "Data Communication", etc. Reference should also be made to the Basic Reference Model for Open Systems Interconnection (OSI), ISO 7498.

The next stage in the work towards a common universal set of interchange rules for trade data was a reconciliation, carried out by a joint European/North American ad hoc Group, known as UN-JEDI, commissioned by the Working Party on Facilitation of International Trade Procedures, to bring together the enhanced GTDI and a set of standards for Electronic Business Data Interchange developed in the United States. The recommendations of the UN-JEDI Group were agreed by the Working Party at its September 1986 session. They led to the development of the United Nations Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT) syntax rules, which are incorporated in Part 4 of the present Trade Data Interchange Directory (UNTDID).

At its meeting 1990-03, Working Party 4 agreed on the definition of UN/EDIFACT.

Background Information

Understanding of UNEDIIFACT – role of UNCEFACT in EDIFACT

The United Nations, through its Centre for Trade Facilitation and Electronic Business (UN/CEFACT), supports activities dedicated to improving the ability of business, trade and administrative organisations, from developed, developing and transitional economies, to exchange products and relevant services effectively. Its principal focus is on facilitating national and international transactions through the simplification and harmonisation of processes, procedures and information flows, to contribute to the growth of global commerce. This is achieved by:

- Analysing and understanding the key elements of international processes, procedures and transactions and working for the elimination of constraints;
- Developing methods to facilitate processes, procedures and transactions, including the relevant use of information technologies;
- Promoting both the use of these methods, and associated best practices, through channels such as government, industry and service associations;
- Coordinating its work with other international organisations such as the World Trade Organisation (WTO), the World Customs Organisation (WCO), the Organisation for Economic Co-operation and Development (OECD), the United Nations Commission on International Trade Law (UNCITRAL) and the United Nations Conference on Trade and Development (UNCTAD);
- Securing coherence in the development of standards by co-operating with other interested parties, including international, intergovernmental and non-governmental organisations. In particular, for electronic business standards, this coherence is accomplished by cooperating with the International Organisation for Standardization (ISO), the International Electrotechnical Commission (IEC), the International Telecommunication Union (ITU) and selected non-governmental organisations (NGOs) in the context of the ISO/IEC/ITU/UNECE Memorandum of Understanding (MoU). These relationships were established in recognition that UN/CEFACT's work has broad application in the areas beyond global commerce and that interoperability of applications and their ability to support multi-lingual environments, are key objectives.

(Source: UN/CEFACT vision paper, www.unece.org.)

UN/EDIFACT -United Nations rules for Electronic Data Interchange For Administration, Commerce and Transport

United Nations rules for Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT) comprise a set of internationally agreed standards, directories and guidelines for the electronic interchange of structured data, and in particular that related to trade in goods and services between independent, computerized information systems.

Recommended within the framework of the United Nations, the rules are approved and published by UN/ECE in the United Nations Trade Data Interchange Directory (UNTDID) and are maintained under agreed procedures.

Background Information

UNECE List of Recommendations

While there is no "agreed" definition of trade facilitation, it generally encompasses the simplification and standardization of procedures and associated information flows required to move goods internationally from seller to buyer and to pass payment in the other direction. This covers Customs, other regulatory agencies, transport, ports, customs brokers, freight forwarders, finance, insurance, legal issues, etc. It is based on internationally accepted standards, norms and practices and involves improvement of physical infrastructure and facilities and the harmonisation of applicable laws and regulations.

It also includes UNECE's Recommendations and international standards supporting electronic data interchange (EDI), the most important of which is the UN Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT), the global standard for EDI.
(Source: www.unece.org.)

EDIFOR

EDIFOR (EDI for the Forwarding Industries) is a subset of UN/EDIFACT, the sector specific standards for goods transport,. EDIFOR is developed by FIATA in order to use EDI messages based on UN/EDIFACT for all FIATA transport documents.

Types of EDIFOR messages

EDIFOR messages include the following as examples:

- Forwarding Order

Based on EDIFACT Standard IFTMIN (International Forwarding and/or Transport Message Instruction)

- Cargo Manifest

Based on EDIFACT Standard IFCSUM (International Forwarding and/or Transport Message Consolidation Summary)

- Unloading Report

Based on EDIFACT Standard IFTSTA (Multimodal Status Report Message)

- Status Report

Based on EDIFACT Standard IFTSTA (Multimodal Status Report Message)

- Forwarding Invoice

Based on UN/EDIFACT message invoice INVOIC.

Test Questions

1. EDIFACT is an initiative from UN and a set of international EDI message standards. EDIFACT has provided a common language in transmission of documents between computer systems. The common language refers to

a. Common protocols

b. Message identification, message and data element separators

c. Agreed abbreviation or codes for data representation

d. All of the above

(d)

12.6.4 XML (Extensible markup language)

> **Learning objectives**
> The student shall have basic understandings of the new medium for storing and transmitting data – XML, as well as the application of the new model of XML EDI.

What is XML?

Extensible markup language (XML) is a medium for storing and transmitting data, developed in the last couple of years to provide better Internet support for EDI. XML is a data description language that allows documents to store any kind of information more, offering more flexible method of sharing data.

An XML document created using one application can be used with other programmes without the need to convert it or process it in any other way.

XML and HTML share SGML (standard generalized markup language) as a common ancestor. The XML has the ability to create new language elements using standard XML elements. XML is intended to serve a wider variety of applications while HTML is used primarily for the creation of WWW pages.

Among other things, XML supports a version of a style sheet to define and share the structure of the document i.e. the tags. All of the data within an XML document is in a specified format and tagged so that a computer programme can quickly read the data and its purpose. This becomes therefore also the main advantage of XML, that each message contains a description of the purpose of the data as well as the data itself. Hence, the receiving programme can evaluate and understand what was sent.

As its foundations, XML is a tag-based document that contains data. The tags indicate the type of data contained within the document. The document can have a hierarchical structure similar to the EDI standards. Many software packages can read and write XML document, so companies can use diverse hardware and software and still communicate easily.

Several industry groups have created XML definitions for sharing data specific to their industry, which will make it easier for companies to share data, and easier for programmers to develop applications that automatically send and receive the data. Several companies including IBM and Microsoft are developing technologies to use XML to make it easier to share data across companies.

XML applications

XML is ideal for applications that require information to be shared between business organisations. Due to that fact that it's easily transferred between operating systems and applications software, XML is being used in applications that include web portals, E-commerce, E-procurement, M-commerce, mobile Internet, group work and database development.

XML is supported by a wide range of existing applications such as all the modern web browsers, and development packages, such as Visual Basic, Front Page. XML can work with a wide range of processors and operating systems. The flexible data structure allows XML to work with any existing data, or to create a new feature and add it to the existing core language.

XML EDI

XML EDI model allows transactions to be transmitted between trading partners using XML for digitized information delivery and formatting. Presenting documents is one of XML's strengths. When compared with traditional EDI, XML/EDI simplifies the translation of documents because new browsers can parse XML documents into structures called Document Object Model trees (DOM trees) which can be manipulated easily. XML documents are easily converted to other XML documents simplifying backend integration. Additionally, XML separates the data from the presentation style. This allows the presentation to be tuned to a wide variety of output devices, including computer screens, a cell phone displays, or audio (text-to-speech) devices.

Test Questions

1. True or false?

- XML is a medium for storing and transmitting data, developed in the last couple of years to support better Internet EDI   (T)
- Many software packages can read and write XML document so companies can use diverse hardware and software at the same time and still communicate easily   (T)
- An XML document created using one application can be used with other programmes after conversion   (F)
- XML is being used in applications including web portals, E-commerce, E-procurement, database development and so on   (T)

2. Compared to traditional EDI, XML EDI has the following advantages

a. XML EDI simplifies the translation of documents to make it readable to the receiving machine

b. XML documents can be easily converted to other XML documents

c. Each XML EDI message contains a description of the purpose of the data as well as the data itself, so that the receiving programme can evaluate and understand what was sent

d. All of the above

(d)

12.7 Bar-coding and RFID

Learning objectives

The student shall understand the basics about bar-code, how it works, and the main symbols used in bar-codes.

The student shall have a basic understanding of the roles played by EAN and UCC, and the composite EAN/UCC bar-codes.

The student shall be aware of the bar-code application in transport labels, particularly the IATA air freight label and the Multi-industry Transport Label.

The student shall understand the new development in RFID, how it works and its application.

Automatic ID technologies were first introduced in the 1960's to help logisticians identify products in the supply chain. Along this line bar-codes, touch memory, multi-dimensional bar-codes and radio frequency identification (RFID) have been developed.

12.7.1 What is a Bar-code

Learning objectives

The student shall understand the basics about bar-codes, and how it works.

The student shall have some knowledge about the application of bar-codes in EDI transmission.

Bar-code basics

A bar-code is the small image of lines (bars) and spaces that is affixed to retail store items, identification cards, and postal mail to identify a particular product number, person, or location. The code uses a sequence of vertical bars and spaces to represent numbers and other symbols. A bar-code symbol typically consists of five parts: a quiet zone, a start character, data characters (including an optional check character), a stop character, and another quiet zone.

Bar-codes and readers are most often seen in supermarkets and retail stores. They are also used to take inventory in retail stores; to check out books from a library; to track manufacturing and shipping movement; to sign in on a job; to identify hospital patients; and to tabulate the results of direct mail

marketing returns. Very small bar-codes have been used to tag honey bees used in research.

Striped Morse code

Consider bar-codes as a printed version of the Morse code. Different bar and space patterns are used to represent different characters, similar to the combination of long and short sound or light signals in Morse, which represent the alphabet. Every bar-code begins with a special start character and ends with a special stop character. These codes help the reader detect the bar-code and figure out whether it is being scanned forward or backward.

Narrow-Wide-Narrow-Narrow-Wide-Narrow-Wide-Narrow-Narrow
010010100
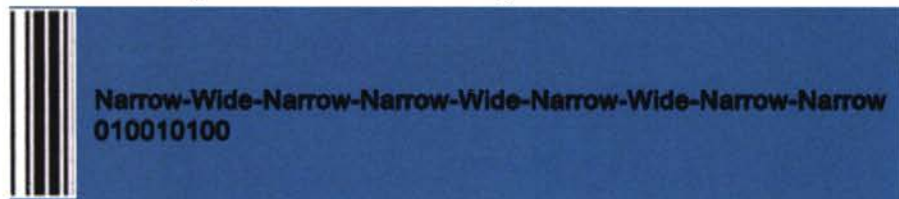
These printed bar-codes can be "interpreted" by a reader or scanner in a uniform way and be translated back into an identification number (ID). This reference ID does not contain descriptive data (such as price or origin) but is used by a computer to locate "records", which contain descriptive data linked to this ID and other pertinent information.

This mechanism allows the automation of tasks which are based on an ID in diverse fields, ranging from stock management, shipping, pricing of goods to inventory picking, library automation and utility meter reading. Often these ID's are printed as numerical characters underneath the bar-code, to allow manual data entry in case a bar-code becomes damaged (e.g. the checkout clerk in a supermarket will occasionally type these ID numbers into her register, instead of scanning it with a bar-code reader).

Bar-code EDI

Since bar-code can contain kilobytes of information in a single symbol and unlimited data in multiple symbols, there is the test in recent years whether bar-code can be used as the medium to carry information and transmitted via EDI. In transport, one big advantage of considering encoding delivery information in bar-code is that this way its transmission can be synchronous with the delivery of goods. The bar-code can be stick to the goods, and whenever the goods arrive, a bar-code reader can obtain and convert all the information stored in the bar-code to a human readable version.

Alternatively, the bard code symbols can be printed on the normal human readable paper delivery docket.

Technically, it is possible that 2D bar-code could be used to transmit structured business information in a machine readable form from application to application, i.e. as a medium for EDI. It is also practically and organisationally feasible. Case studies indicated that there was a clear business advantage in using the technology both in push and pull type replenishment systems. Despite all the feasibilities, the commercial use of bar-code in EDI is still yet to come.

Readers

A bar-code reader is used to read the code. The reader uses a laser beam that is sensitive to the reflections from the line and space thickness and variation. The reader translates the reflected light into digital data that is transferred to a computer for immediate action or storage.

Readers may be attached to a computer (as they often are in retail store settings) or separate and portable, in which case they store the data they read until it can be fed into a computer.

- **Fixed readers or scanners**
  remain attached to their host computer and terminal and transmit one data item at a time as the data is scanned.
- **Portable batch readers**
  are battery operated and store data into memory for later batch transfer to a host computer.
- **Portable wireless readers**
  are battery operated and transmit data real-time, on-line. More importantly, the real-time, two-way communication allows the host to instruct the operator what to do next based on what just happened.

How the bar-code works

When a bar-code reader is passed over the bar-code, the light source from the scanner is absorbed by the dark bars, but it is reflected by the light

spaces. A photocell detector in the scanner receives the reflected light and converts the light into an electrical signal.

This way the scanner creates a low electrical signal for the spaces (reflected light) and a high electrical signal for the bars (absorbed light); the duration of the electrical signal determines wide versus narrow elements. This signal can be "decoded" by the bar-code reader's decoder into the characters that the bar-code represents. The decoded data is then passed to a computer as an ID in a traditional data format.

Test Questions

1. There are different types of readers to read the bar-codes. They include

    a. fixed readers or scanners

    b. Portable batch readers

    c. Portable wireless readers

    d. all of the above

(d)

2. Bar-code is widely used in diverse fields where the task is based on an ID. The commercial applications of bar-code are seen in the following fields except

    a. Cargoes in shipping

    b. Stocks in warehouse

    c. EDI transmission

    d. Pricing of goods to inventory picking

(c)

12.7.2 Bar-codes standards and symbologies: 2D and 3D concepts

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Learning objectives

The student shall have a basic understanding of the main types of bar-code standards existing in the world, and the main types of symbologies used in bar-codes.

Bar-code standards

There is no one standard bar-code; instead, there are several different bar-code standards called symbologies that serve different uses, industries, or geographic needs.

The following table summarizes the most common bar-code standards.

Bar-code Standard	Uses
Uniform Product Code (UPC)	Retail stores for sales checkout; inventory, etc.
Code 39 (Code 3 of 9)	Identification, inventory, and tracking shipments
POSTNET	Encoding zip codes on U.S. mail
European Article Number (EAN)	A superset of the UPC that allows extra digits for country identification
Japanese Article Number (JAN)	Similar to the EAN, used in Japan
Bookland	Based on ISBN numbers and used on book covers
ISSN bar-code	Based on ISSN numbers, used on periodicals outside the U.S.
Code 128	Used in preference to Code 39 because it is more

	compact
Interleaved 2 of 5	Used in the shipping and warehouse industries
Codabar	Used by Federal Express, in libraries, and blood banks
MICR (Magnetic Ink Character Recognition)	A special font used for the numbers on the bottom of bank checks
OCR-A	The optical character recognition format used on book covers for the human readable version of the ISBN number
OCR-B	Used for the human readable version of the UPC, EAN, JAN, Bookland, and ISSN bar-codes and for optional human-readable digits with Code 39 and Interleaved 2 of 5 symbols
Maxicode	Used by the United Parcel Service
PDF417	A new 2-D type of bar-code that can encode up to 1108 bytes of information; can become a compressed, portable data file (which is what the "PDF" stands for)

(Source: http://searchcio.techtarget.com/sDefinition/0,,sid19_gci213536,00.html; contribution, Ziad Mallah)

Symbology

The rules that determine the way that bar-code data is encoded into bars and spaces are collectively called a "symbology". A bar-code symbol is a sequence of printed lines, or bars, and intervening spaces. The number and width of the spaces is determined by a specification for each symbology.

There are many types of bar-code symbologies, each having their own special characteristics and features. Most symbologies were designed to

meet the needs of a specific application or industry. Technically, bar-code symbologies are one of two types:

- Linear
- Two-Dimensional

Linear bar-codes (One-dimensional bar-code)

Linear bar-code is the traditional bar-code technology, sometimes referred to as one-dimensional bar-code.

There are two types of linear bar-code symbologies: discrete and continuous. Discrete bar-codes start and end with a bar, and have an inter-character gap, or spaces between characters. Continuous bar-codes have no inter-character gap, start with a bar, and end with a space.

Two-dimensional bar-code (2D-code)

This bar-code technique involves reading the symbol both vertically and horizontally in order to interpret all the data content. Standardization is taking place to define different two-dimensional bar-codes. The best known are PDF 417 and MaxiCode.

Thanks to the ability to encode a large amount of data into a very small space, two-dimensional (2D) bar-codes have grown tremendously popular in recent years. This makes them extremely useful for marking small parts, products and packages. The trade off is that 2D bar-code scanning equipment is usually more expensive than equipment used to scan linear bar-codes.

There are two types of 2D bar-codes currently in use: stacked codes and matrix codes. Stacked codes are arranged in horizontal layers to create a multi-row bar-code, like Code 49 or Code 16K. Matrix codes are made up of a pattern of cells that can be square, hexagonal or circular in shape, like the MaxiCode symbology.

Stacked

Matrix
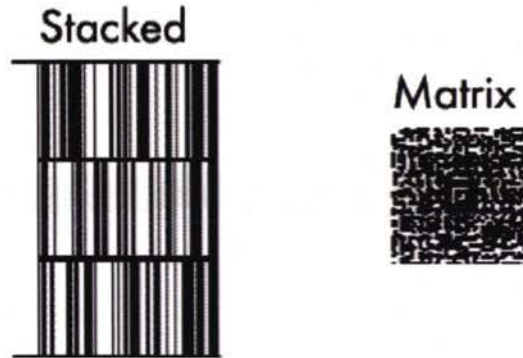
Yet another type of bar-code that is placed under the 2D category is the composite symbol. With composite bar-codes, two different symbols that contain linked data are actually printed together in close proximity to each other. The "host" symbol is usually a linear bar-code and the other symbol is either a multi-row or matrix bar-code.

Test Questions

1. There are two types of 2D bar-codes currently in use: stacked codes and matrix codes. Which features the stacked codes?

a. Stacked codes are arranged in horizontal layers to create a multi-row bar-codes

b. Stacked codes are made up of a pattern of cells

c. Two different symbols that contain linked data are printed together in close proximity

d. Stacked codes start and end with a bar

(a)

2. True or false?

- 2D bar-codes can encode a large amount of data, more than in linear bar-code   (T)

- Scanning equipment for 2D costs similar to the one for linear bar-codes   (F)

- The linear bar-code can be either discrete and continuous bar-codes   (T)

- Symbology is the rules that determines the way how bar-code is encoded into bars and space   (T)

12.7.3 EAN/UCC

Learning objectives
The student shall have a basic understanding of the roles played by EAN and UCC, and some knowledge about the composite EAN/UCC bar-codes.

EAN

The European Article Numbering system, or EAN, is a superset of the UPC symbology that was introduced in 1978. EAN was developed by Joe Woodland, the inventor of the first bar-code system. EAN allows for an extra pair of digits to the UPC standard bar-code and therefore became widely used. It is seen in retail applications around the world. EAN scanners can decode both UPC and EAN bar-codes, but UPC scanners built before 1978 may not be able to decode EAN.

EAN-13

EAN-8

UCC

The UCC takes a global leadership role in administering and promoting electronic communication standards and the mapping of standards with business processes to increase the efficiencies of supply chains and other business transactions in multiple industries.

Dedicated to a worldwide system for the unique identification of products, shipping units, assets, locations and services, the UCC is a not-for-profit standards organisation with nearly 240,000 member organisations and global trading requirements in over 140 countries.

EAN/UCC composite symbology

Each EAN.UCC Composite symbol consists of a linear component and a multi-row 2D Composite Component. The linear component is to encode the item's primary identification. The 2D Composite Component is to encode supplementary data, such as a batch number or expiration date. The Composite symbol always includes a linear component so that the primary identification is readable by all scanning technologies, and so that 2D imagers can use the linear component as a finder pattern for the adjacent 2D Composite Component. In the meantime the Composite symbol always includes a multi-row 2D Composite Component, for compatibility with linear- and area-CCD scanners, and with linear and rastering laser scanners.

The 2D Composite Component is printed above the linear component at a specified location relative to the linear component and with the same X dimension as the linear component, to facilitate image processing when the Composite symbol is scanned by a 2D imager.

The linear component is either of the below:
- a member of the EAN/UPC symbology (EAN-13, EAN-8, UPC-A, or UPC-E), or
- a member of the Reduced Space Symbology family, or
- UCC/EAN-128.

The choice of linear component determines the name of the Composite symbol, such as an EAN-13 Composite symbol, or a UCC/EAN-128 Composite symbol.

The 2D Composite Component (abbreviated as CC) is chosen based on the selected linear component and on the amount of supplementary data to be encoded. The three EAN UCC 2D Composite Components, listed in order of increasing maximum data capacity, are:
- CC-A, a variant of MicroPDF417, designed for efficient encoding of supplemental application identifier data,
- CC-B, a MicroPDF417 symbol with a codeword of 920 in the first data codeword position as a linkage flag, and denoting EAN.UCC data compaction, and
- CC-C, a PDF417 symbol with a codeword of 920 in the first data codeword position as a linkage flag, and denoting EAN.UCC data compaction.

EAN.UCC Symbol examples

Figure 1 - An RSS Limited Composite symbol

Figure 1 illustrates an RSS Limited Composite symbol which utilizes a 4-row CC-A component as its 2D Composite Component. The CC-A component in Figure 1 encodes the expiration date and lot number (as "1701061510A123456") for the product identified by the RSS Limited component as "0113112345678906". The human-readable interpretation of the data in the symbols would be shown, if present, as "(17)010615(10)A123456" and "(01)13112345678906" respectively.

Figure 2 - A UCC/EAN-128 Composite symbol

Figure 2 illustrates a UCC/EAN-128 Composite symbol which utilizes a 5-row CC-C component as its 2D Composite Component. The CC-C component in Figure 2 encodes the lot number and deliver to location number (as "10ABCD123456<FNC1>4103898765432108") for the product identified by the UCC/EAN-128 component as "0193812345678901". The human-readable interpretation of the data in the symbols would be shown, if present, as "(10)ABCD123456(410)3898765432108" and "(01)93812345678901" respectively.

(Source: http://www.aimglobal.org/standards/symbinfo/composite_overview.asp)

Test Questions

1. True or False?

- EAN stands for European Article Numbering system, and is a superset of the UPC symbology (T)
- UCC is an organisation taking a global leadership in administering and promoting electronic communication standards and the mapping of standards with business processes to increase the efficiencies of supply chains and other business transactions in multiple industries (T)
- EAN symbology is used in retail applications around the world (T)

- EAN and UCC, being two different sets of systems, cannot work together   (F)

12.7.4 IATA & MITL labels

Learning objectives
The student shall have some knowledge about the IATA Resolution 606 B with regard to labels.
The student shall be aware of the detailed requirements set forth on bar-coded labels in air freight as well as multi-industry transport labels.

Resolution 606 B of IATA

For the carriage of air cargo, identification labels in the form of a bar-coded label may be used and attached to each package. If not a bar-code label, then a non-bar-coded label shall be used. In either case, the label shall be adjacent to the consignee's name and address where space permits.

Resolution 606 B of IATA sets out the detailed requirements and technical specifications in the use of bar-coded label.

Detailed explanation of 606 B Labels
According to IATA resolution 606, labels must be at least 4" x 5" (102mm x 128mm) in size.

The bar-coded labels shall contain the following mandatory information:
- Airline name
- Air waybill number
- Destination
- Primary bar-code

Bar-coded labels may also contain optional information.

For detailed explanation of 606 B Labels, including the information to be mandatory and optionally contained, as well as the layout of the bar-code, please refer to the reference reading "IATA Resolution 606 B" at the end of this chapter.

Multi-industry transport labels

CEN, "Comité Européen de Normalisation", administers the common standardisation work in Europe. During 1995 – 96, CEN decided on several standards that regulate the design of the Multi Industry Transport Label (MITL). The most important standards decided by CEN are listed below:

EN 1573..............Multi Industry Transport Label ("the MITL standard")

EN 1572.............. Rules for unique package identity (Licence Plate)

EN 1571...............Rules for data identifiers

EN 799................ Symbology Code 128

EN 800.................Symbology Code 39

EN 1635............Test specification for bar-codes

EN 12646.............Test specification for readers and decoders

EN 12648..............Test specification for printers

EN 12647...........Test specification for verifiers

The designation "transport label" is a direct translation of the concept MITL (Multi Industry Transport Label). It corresponds most closely to "address label", although the new transport label includes more functions than simply providing an address. It should facilitate automatic data capture of package numbers when tracking packages. It is also intended to be used for automatic sorting at transport terminals. Under certain conditions it should also be possible to use it as a complete set of instructions for a transport consignment, both for domestic and for international transport.

The transport label is intended for use together with EDI so that the transfer of the total information mass is done electronically. In practice, however, it has been proven that the necessary communication channels for EDI are not always available. There might therefore be a need for an independent means of transferring data, e.g. using bar-codes, to enable automatic data capture.

Label format, practical limitations

According to the MITL standard, two alternatives for label width are recommended - 105 mm and 148 mm. when a lot of information needs to be printed, the width of 148mm should be chosen. The label can vary in length. In practice, there is a maximum length that should not be exceeded. This length is determined by, among other things, the size of the package, the application method, etc. Experience shows that the practical maximum length is between 200 mm and 250 mm.

Layout in principle – information blocks

The information content of the transport label may be described according to the six blocks below. The blocks should be in the stated order:
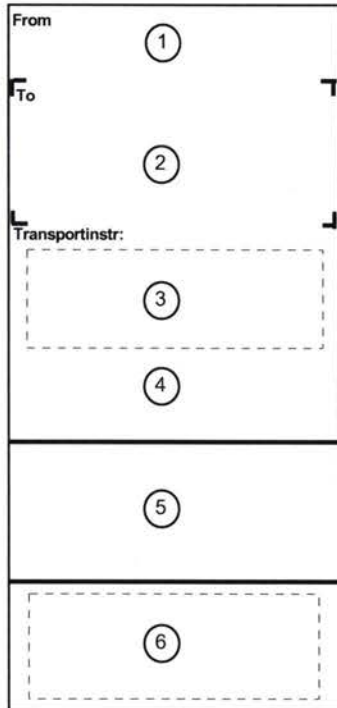
1. The From - block (mandatory)
2. The To - block (mandatory)
3. Transport instructions for automatic data capture conditional)
4. Transport instructions in "plain text" (conditional)

The line above block 5 is recommended.

5 Article data block (according to the issuer's choice)

There shall be a line above block 6.

6. Bar-code block (mandatory)

Test Questions

1. According to IATA Resolution 606B, the label's size is

    a. 102mm x 128mm

    b. 4" x 6"

    c. 100mm x 120mm

    d. Not specified

(a)

2. The multi-industry transport label

    a. Was intended for use together with EDI

    b. Is for automatic data capture for sorting at transport terminals

    c. Is limited to the width of wither 105mm or 148mm

    d. All the above is true

(d)

12.7.5   RFID Radio frequency identification technology

Learning objectives
The student shall understand what RFID is and how it works as a new identification technology.

What is Radio Frequency Identification (RFID)?

Radio frequency identification (RFID) is a relatively new introduction of the AIDC technology in the field of logistics that keeps track of almost everything, especially for those assets that moves with the cargo.

The acronym RFID refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less. RFID can take the form of a portable memory device that contains a microchip. This inexpensive microchip can be embedded in any object and can store basic information concerning the item. With an inexpensive scanner working within a range of a few feet (2 to 5 feet), one can read the information stored in these microchips. Currently this stored information is static but is expected that in future such information can be modified and restored.

RFID components
RFID employs Radio Frequency Communications to exchange data between the memory microchip and a host computer. An RFID system typically consists of a "Tag/Label/PCB" containing data storage, an Antenna to communicate with the Tag, and a Controller to manage the communication between the Antenna and the PC.

Until recently, Radio Frequency Identification (RFID) tags and labels were considered too costly and difficult to implement for mainstream item tracking purposes in the supply chain.

The big change over the past 3 years has been the collaborative work - via the Auto-ID Center — of a number of companies and universities to develop the standards and designs for a new range of simple passive tags that can be manufactured in bulk and eventually reduce the cost per tag down to the 10 cents range. At the same time, this research work generated designs for simpler reader technology and for a global structure to enable a simple passive tag holding a serial number to be linked to the company database that holds the history and attributes of the specific item that the tag is attached to.

This concept allows the tag to hold little more than a unique UPC number (albeit one that is specific to a unique item rather than a product type) with the complex changing information about that item held in remote databases. The readers that gather information for a tag will, in practice read that tag many times, and so a rationalization of the data is required. RFID Middleware, takes that role, and uses some of the bits from the tag to look-up, via a system of ONS servers, the location of the latest data on that tag. The data can be held in the original manufacturer's systems, or in databases belonging to the numerous companies that may have handled that item during its track through the supply chain. The integration of these various elements of data is what makes an full implementation complex but ultimately very rewarding.

(Source: http://www.rfidexchange.com/rfid101.aspx)

How it works

The RFID technology process starts with a "tag", which is made up of a microchip with an antenna, and a reader with an antenna. The reader sends out radio-frequency waves that form a magnetic field when they join with the antenna on the RFID tag. A passive RFID tag creates power from this magnetic field and uses it to energize the circuits of the RFID chip. The chip in the radio frequency identification tag sends information back to the reader in the radio-frequency waves. The RFID reader converts the new waves into digital information. Semi-passive RFID tags use a battery to run the circuits of the chip, but communicate by drawing power from the RFID reader.

An advantage of RFID devices over bar-code is that they do not need to be positioned precisely in front of a scanner. The situation of checkout clerks having to manually input a bar-code could soon be history.

Test Questions

1. What is RFID?

    a. Radio Frequency Identification

    b. A small devices that consists of small chip and an antenna

    c. An RFID system includes not only RFID, but also a controller managing communication between the Antenna and the PC

    d. All of the above

(d)

2. The main advantage of RFID over bar-code is

    a. RFID is cheaper

    b. Clerk does not need to position the RFID device precisely in front of the tag to scan it

    c. RFID sometimes needs manual input of data contained in the tag to the system

    d. RFID chip contains more information than bar-code

(b)

Reference reading:

IATA Resolution 606 B

Source: European Air Cargo Programme Handbook, launch edition, effective 1 May 2004, International Air Transport Association and International Federation of Freight Forwarders Associations.

Please insert the file "IATA Resolution 606 Text"

RESOLUTION 606*
BAR CODED LABEL

CBPP(08)606   Expiry: Indefinite

                                       Type: B

RESOLVED that:

Section 1 — General

1.1 For the carriage of cargo, identification label(s) in the form of a bar coded label may be used and attached to each package, adjacent to the consignee's name and address where space permits. In certain cases, more than one label may be required, such as when shipments have labels applied by different parties, e.g. shippers, forwarders, airlines, or when the amount of optional information does not fit onto the label stock in use.

1.2 For purposes of this Resolution, a bar coded label is one containing bar code(s). The label may be printed automatically on demand, or preprinted.

1.3 A bar code may be primary or secondary. A primary bar code is one which contains the master air waybill and piece number. Secondary bar codes contain other information and may also be included on the same, or separate, label(s).

1.4 Bar coded labels shall contain the following mandatory information:

1.4.1 airline name;

1.4.2 air waybill number;

1.4.3 destination;

1.4.4 primary bar code.

1.5 Bar coded labels may contain optional information; for example:

1.5.1 airline insignia;

1.5.2 transfer points;

1.5.3 piece number;

1.5.4 weight of this piece;

1.5.5 total number of pieces;

1.5.6 total weight of this shipment;

1.5.7 handling information;

1.5.8 house waybill number;

1.5.9 house waybill piece number;

1.5.10 origin;

1.5.11 total number of house waybill pieces;

1.5.12 total weight of house waybill pieces;

1.5.13 product name;

1.5.14 other information;

1.5.15 secondary bar code.

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* This Resolution is in the hands of all IATA Cargo Agents.

1.6 Bar coded label quality should be of a type with equal or better characteristics than commonly used in preprinted cargo labels. These specific characteristics include:

1.6.1 adhesion holding power;

1.6.2 service temperature range;

1.6.3 moisture resistance.

Section 2 — Technical Specifications

2.1 The layout and minimum dimensions of bar code labels are defined in Attachments 'C' and 'D' of this Resolution.

2.2 Bar coded information shall be in accordance with Recommended Practice 1600t and as shown in Attachments 'A' and 'B' of this Resolution.

2.3 Notwithstanding the provisions of this Resolution, carriers and their customers who use the bar coded labels of different dimensions may continue to use them, provided the data encoding requirements specified in Attachments 'A' and 'B' of this Resolution are met.

Section 3 — Completion

3.1 The circled numbers to the right of the titles below, correspond with the numbers in the boxes of the specimen label illustrated in Attachment 'C' of this Resolution.

3.2 Completion of the mandatory boxes on the labels shall be as shown below:

3.2.1 Airline Name ①

The airline name.

3.2.2 Air Waybill Number ②

The airline code and air waybill number of the shipment. The serial number may be shown as two groups of four digits.

3.2.3 Destination ③

The IATA three-letter code of the airport of destination. When the airport code is unknown or the city is served by more than one airport the IATA three-letter city code may be used.

3.2.4 Primary Bar Code ⑤

The primary bar code contains all data elements described in Attachment 'A' of this Resolution. Whenever more than one bar code is printed on a label containing the primary bar code, the primary code must appear first.

3.3 When used, completion of the optional information on the labels shall be as follows:

3.3.1 Airline Insignia ①

The airline insignia.

3.3.2 Transfer Points ⑥

The IATA three-letter code of the airport(s) of transfer. When the airport code is unknown or the city (cities) is (are) served by more than one airport the IATA three-letter city code may be used.

3.3.3 Piece Number ⑥

The air waybill piece number.

3.3.4 Weight of this Piece ⑥

The weight of the specific package to which the label is attached, together with the unit of weight (K or L).

3.3.5 Total No. of Pieces ④

The total number of pieces comprising the shipment.

3.3.6 Total Weight of this ⑥ Shipment

The total weight of the shipment, together with the unit of weight (K or L).

3.3.7 Handling Information ⑥

Any information which pertains to the handling of the shipment.

3.3.8 HWB No. ⑥

The house waybill (HWB) number.

3.3.9 HWB Piece No. ⑥

The house waybill (HWB) piece number.

3.3.10 Origin ⑥

The IATA three-letter code of the airport of origin. When the airport code is unknown or the city is served by more than one airport the IATA three-letter city code may be used.

3.3.11 Total No. of HWB Pieces ⑥

The total number of pieces comprising the shipment being shipped under this house waybill.

3.3.12 Total Weight of HWB ⑥ Pieces

The total weight of pieces represented by the house waybills, together with the unit of weight (K or L).

3.3.13 Product Name ⑥

The marketing name associated with the type of freight movement.

3.3.14 Other Information ⑥

Information which may be added at the user's discretion.

3.3.15 Secondary Bar Code ⑤

The secondary bar code(s) is printed in box 6 of Attachment 'C' of this Resolution whenever a primary bar code is included on the label; otherwise it may be printed in box 5. The secondary bar code(s) contains data elements identified in Attachment 'B' of this Resolution.

RESOLUTION 606

Attachment 'A'

Primary Bar Code (Air Waybill/Piece Number Information)

A primary bar code, of sixteen continuous numeric characters, in which the encoded data shall comprise the following fields:

= the three-digit numeric airline prefix;

= the eight-digit numeric air waybill number;

= a single digit separator (shall always be zero);

= a four-digit numeric unique piece number, indicating each individual piece in a multi-piece shipment. If this field is not used, it shall comprise four zeros;

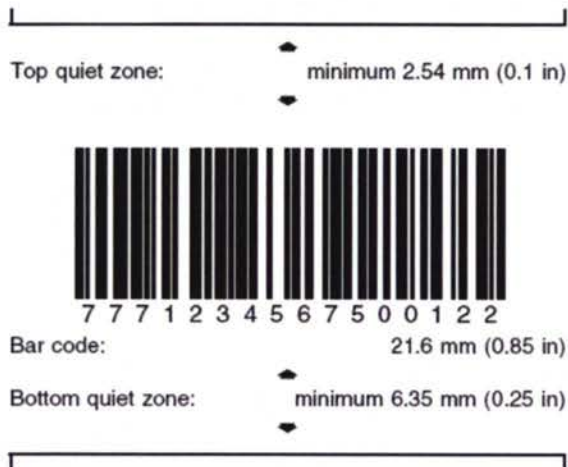*Note:* *The bar code may have human readable translation of all digits in the field.*

Examples:

(a.) air waybill 777-12345675, piece number 3:
7771234567500003

(b.) air waybill 777-76543213, piece number 122:
777654321300122

(c.) air waybill 777-32176546, pieces field not used:
7773217654600000

The primary bar code shall be printed on the cargo label as indicated in Attachments 'C' and 'D'. There should be no box around the bar code in order to maximise reading efficiency.

The bar code shall be printed in Code 128 with a minimum width of the narrow bar ($\times$ dimension) of 0.5 mm (0.02 in). The bar code shall be printed vertically (picket fence) with a minimum bar height of 21.6 mm (0.85 in).

The bar code includes the following top and bottom quiet zones:

Top quiet zone: minimum 2.54 mm (0.1 in)

7 7 7 1 2 3 4 5 6 7 5 0 0 1 2 2

Bar code: 21.6 mm (0.85 in)

Bottom quiet zone: minimum 6.35 mm (0.25 in)

The side quiet zones shall be as specified in Recommende Practice 1600t.

The optical characteristics of the bar code shall be such a to be readable:

= using a contact scanner (wand reader);

= at a distance of up to 1.80 m (6 ft) using a non-conta scanner;

= using a fixed scanner on a conveyor moving at speec of approximately 1.80 metres per second (6 feet pc second) and a depth of field ranging from 12.7 to 803 mi (½ to 32 in).

RESOLUTION 606

Attachment 'B'

Secondary Bar Code

Where more than one secondary bar code is printed on a label, the bar code containing the house waybill number shall be printed as the first of these secondary bar codes.

The secondary bar codes can be variable in length, depending on the fields used. One-character field identifiers will be used as specified below. Printing characteristics of the secondary bar code, including narrow bar dimensions, quiet zones and optical characteristics, shall be the same as specified for the primary bar code. The industry standard (AIM) check digit will be the last character in the bar coded string of data.

Symbology

The secondary bar code shall be printed using CODE 128 and using the standard described in Recommended Practice 1600t.

Specifications

Field Identifier

The field identifier shall consist of a single alpha character as defined below:

Field	Identifier	Format (Cargo-IMP Standard)
Destination	D	aaa
Total No. of Pieces	P	n[...4]
Transfer Points	C	aaa
Weight of this Piece	W	n[...7]p
Total Weight of this Shipment	T	n[...7]p
Handling Information	B	t[...38]
Origin	O	aaa
HWB No.	H	m[1...12]
HWB Piece No.	Y	n[...4]
Total No. of HWB Pieces	S	n[...4]
Total Weight of HWB Pieces	A	n[...7]p
Carrier/Customer Specific Information*	Z	t(l...65)
Unique Piece Identifier	J	t(l...35)

*Encoding of carrier-/customer-specific information must be the last data encoded.

Field Delimiter

The delimiter shall be the Plus Sign (+).

Remarks: A, W and T fields to include K or L as the last character to denote kilograms or pounds.

Bar Code Format

The format shall consist of the field identifier immediately followed by the field data. The field delimiter immediately follows. This sequence is repeated until all data is encoded. The industry standard (AIM) check digit will be the last character in the bar coded string of data. As with the primary bar code, the check digit will not be printed in human-readable format. There is no continuation character. If the amount of data to be coded is too great to fit on the label in one secondary bar code, then another bar code must be used. Each bar code will contain complete information for the data fields specified by the field identifier.

Examples:

(a.) HWB No.: CHZH8-1234567

(b.) Destination: ABY, Number of HWB Pieces: 99.

This data will not fit onto a 4 in (102 mm) label, so two bar codes are used. The data strings are formatted as follows:

Bar Code No. 1
HCHZH81234567

Bar Code No. 2
DABY+S0099

Bar Code Examples:

Example Number One:

H C H Z H 8 1 2 3 4 5 6 7

Example Number Two:

D A B Y + S 0 0 9 9

RESOLUTION 606
Attachment 'C'

BAR CODED LABEL
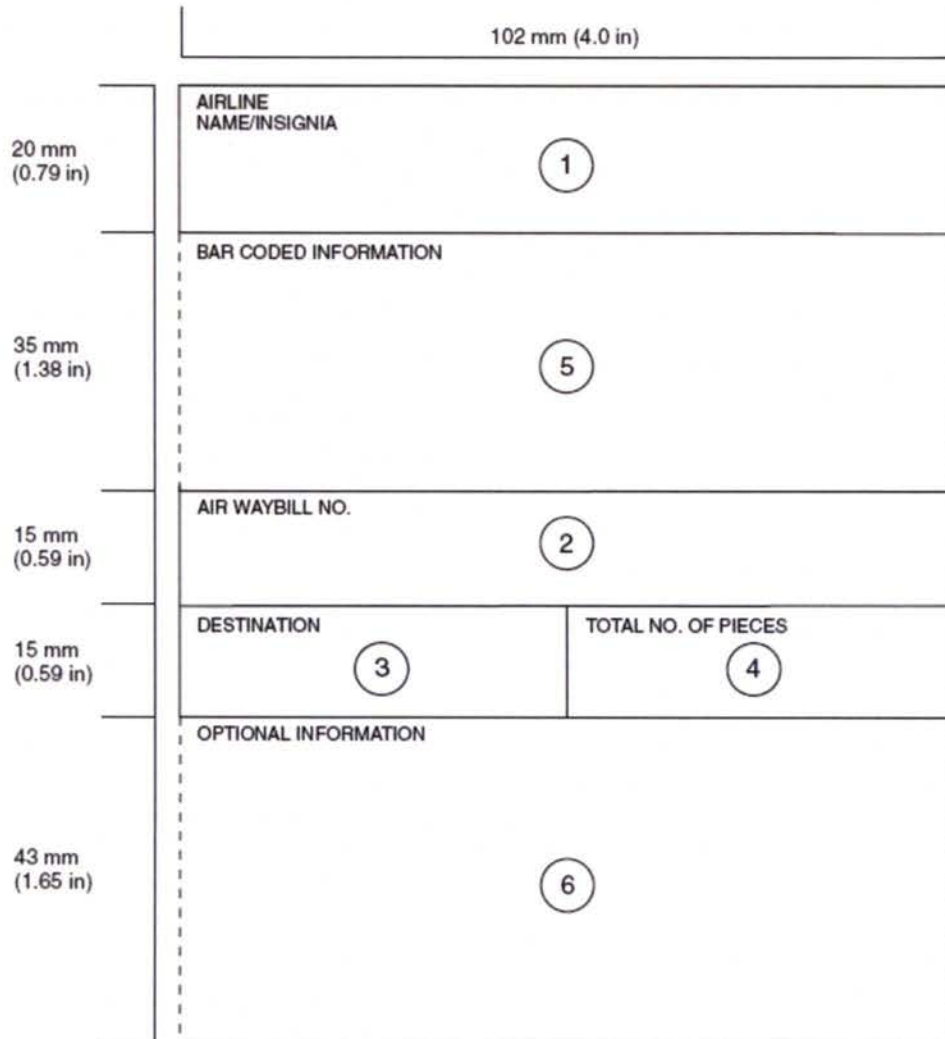
102 mm (4.0 in)

	AIRLINE NAME/INSIGNIA
20 mm (0.79 in)	(1)

BAR CODED INFORMATION

35 mm (1.38 in) — (5)

AIR WAYBILL NO.

15 mm (0.59 in) — (2)

DESTINATION	TOTAL NO. OF PIECES
15 mm (0.59 in) — (3)	(4)

OPTIONAL INFORMATION

43 mm (1.65 in) — (6)

Note: Boxes containing human readable information must be titled.

BAR CODED LABEL

102 mm (4.0 in)

128 mm
(5.0 in)

Layout and dimensions of
individual boxes at
user's discretion

OPTIONAL
INFORMATION
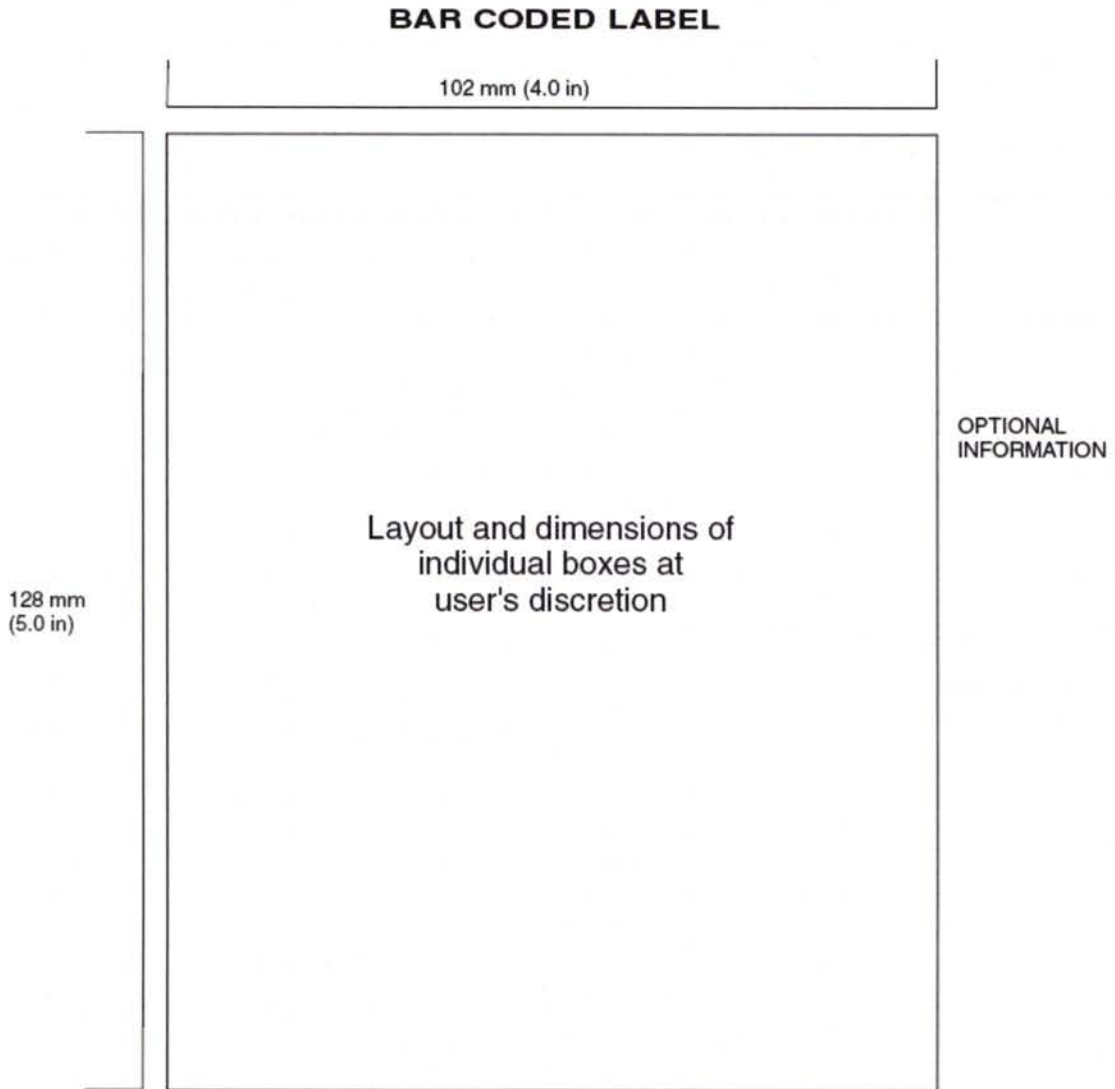
: *Boxes containing human readable information must be titled.*

RESOLUTION 606
Attachment 'D'

BAR CODED LABEL

102 mm (4.0 in)

20 mm (0.79 in)	Airline **Air France**
35 mm (1.38 in)	0 5 7 2 2 2 2 2 2 2 0 0 0 0 1
15 mm (0.59 in)	Air Waybill No. **057 – 2222 2222**
15 mm (0.59 in)	Destination **JFK**	Total No. of Pieces **2**
43 mm (1.65 in)	Optional Information

Note: *Boxes containing human readable information must be titled.*

BAR CODED LABEL

102 mm (4,0 in)

Agent	**Panalpina**

20 mm
(0,79 in)

35 mm
(1,38 in)

H C H Z H 8 1 2 3 4 5 6 7

OPTIONAL
INFORMATION

House Waybill No.

CHZH8 - 1234567

15 mm
(0,59 in)

Destination	Total No. of HWB Pieces
ABY	**99**

15 mm
(0,59 in)

43 mm
(1,65 in)

D A B Y + S 0 0 9 9
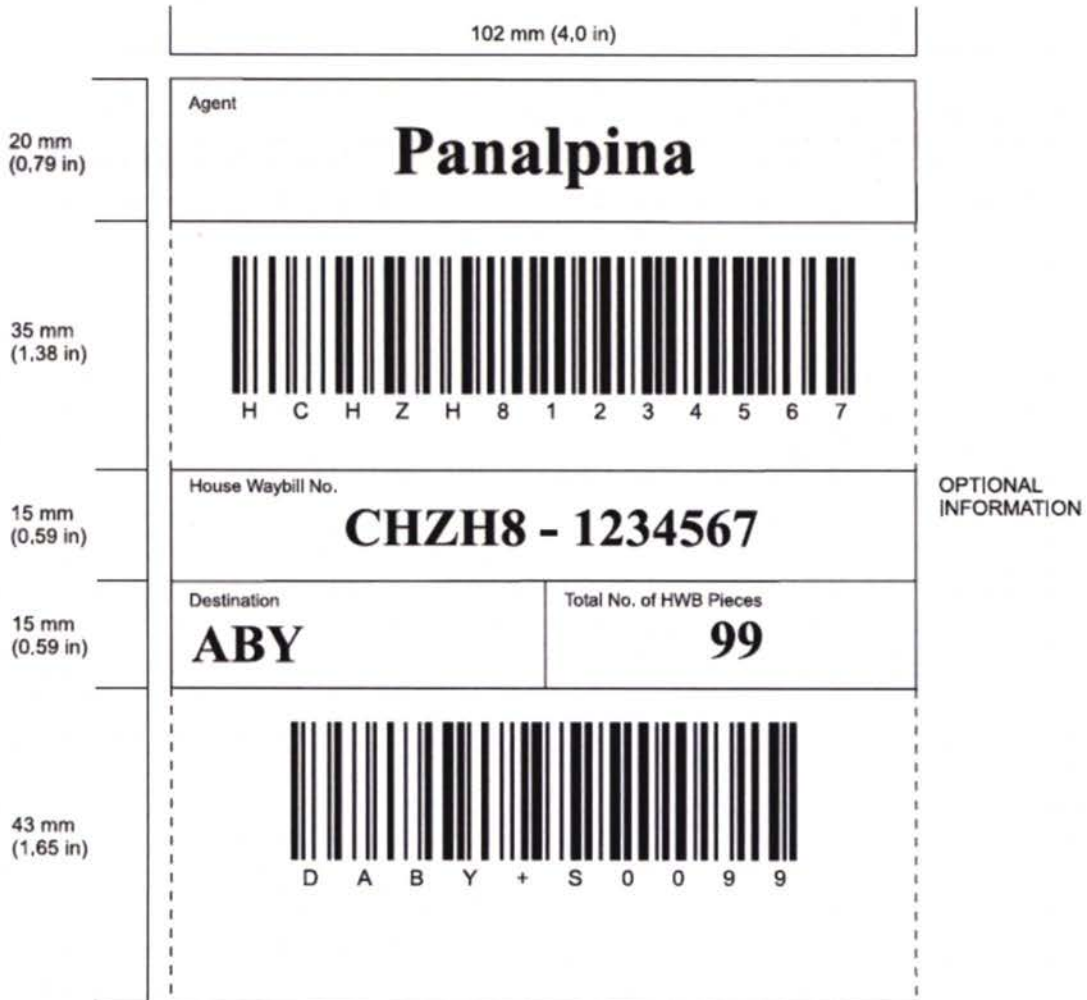
Boxes containing human readable information must be titled.

12.8 Internet and Web-Based Technology

Learning objectives

The student shall have a basic understanding of the technical concepts behind the Internet and the role of ISP in the Internet network.

The student shall have some knowledge about the Internet-access software applications, and in particular, a deeper understanding of the use of web browsers for World Wide Web, as well as the use of emails.

12.8.1 Overview of internet

Learning objectives

The student shall have a basic understanding of the technical concepts behind the Internet.

The student shall be aware of the wide use and application of Internet in business, and be able to list a few of popular end-user software applications over the Internet.

No one knows how many computers or networks are currently connected by the Internet. The numbers have been increasing exponentially since the early 1990s. In January 1993, there were 1.313 million host computers. By 2004, over 500 million people worldwide had access to the Internet.

What is Internet?

Internet is defined by a set of standards that allow computers to exchange messages, and Internet itself is just a communication system for computers. It is a method of connecting computers together.

There is no single person or group in charge of the internet. Anyone who wishes to connect a computer to the internet simply agrees to pay for a communication link – via an Internet service provider (ISP) – and to install communications hardware and software that supports the Internet standard protocols. Participation in the Internet is voluntary, and there are few rules, just standard practices and agreements.

On connecting to the Internet, the person or company is given a base address that allows other computers to identify users on the new computer. Standards

of Internet are defined by a loose committee, and addresses are controlled by another small committee. The committees are convened purely for the purpose of speeding up the process; all decisions are up to the organisations connected to the network.

Networking concepts behind the Internet

Internet is a large-scale client/server network system, a best example of Wide Area Network (WAN). It can be described as a global network system made up of smaller systems, millions of individual network systems distributed across the world.

How Internet has developed

The Internet has existed for around 30 years. The history of the Internet as a business however, took a relatively long time to become an essential part of business. It is only since the early 1990s when the web browser was first widely adopted that the use of the Internet by business has grown dramatically.

Internet-access software applications

Over its lifetime, a variety of end-user tools have been developed to exchange information over the Internet, to help find, send and receive information across the Internet. Below is a list:

- Electronic mail (e-mail)
- Internet relay chat (a synchronous communications tool that allows a text-based chat between different users who are logged on at the same time)
- Usenet newsgroups (a widely used electronic bulletin board used to discuss a particular topic such as a sport, hobby or business area; traditionally accessed by special newsreader software, can now be accessed via a web browser from www.google.com)
- FTP file transfer (the file transfer protocol is used as a standard for moving files across the Internet)
- Gophers, Archie and WAIS (important before the advent of the web for storing and searching documents on the Internet. Have largely been superseded by the web)

- Telnet (allows remote access to computer systems, e.g. a retailer check to see whether an item was in stock in a warehouse using a telnet application)
- Push channel (information is broadcast over the Internet or an intranet and received using a web browser or special programme for which a subscription to this channel has been set up.
- World Wide Web (medium for publishing information on the Internet in an easy-to-use form; representing the interlinked documents on the Internet made up of pages containing text, graphics and other elements.)

Among the above mentioned tools, most have either been superseded by the use of the World Wide Web or are of less relevance from a business perspective. The most widely used and best known are web browsers and emails.

Test Questions

1. What is Internet?

    a. Internet is a communication system for computers

    b. Internet is the largest Wide Area Network

    c. There is no individual or organisation in charge of Internet

    d. All of the above

(d)

2. A variety of end-user tools have been developed to exchange information over the Internet. Which one is/are so far the most widely used and most popular application?

    a. E-mails

    b. FTP file transfer

    c. Internet chat

    d. World Wide Web

(a & d)

12.8.2 Internet service provider (ISP)

> **Learning objectives**
> The student shall understand the role ISP plays in the Internet network.

The Internet has a hierarchy of service providers. The client PCs within homes and businesses are connected to the Internet via local internet service providers (ISPs) which, in turn, are linked to larger ISPs with connection to the major national and international infrastructure or backbones.

Each connection is made over a communication link. Local links are typically made over telephone wires or coaxial lines from the cable companies. A few companies provide satellite connections or wireless services. At the second level, the ISPs connect to larger ISPs (often it is NSP, network service provider) utilizing either phone company lines, or increasingly the dedicated, full-time lines the ISPs lease to provide faster service. The largest NSPs provide backbone service. They route communications over fibre-optic lines, which are often owned by them.

> **Using Your ISP for Web Space**
> When you subscribe to Internet connection services through an Internet Service Provider (ISP) you will usually receive a certain amount of space to host Web pages. You don't pay extra for the hosting as long as you don't go over the space and traffic limitations set by your ISP. Unlike using free sites to host a Web page there will be no third-party advertisements running on your Web pages, unless of course, you choose to run advertisements on the pages yourself.
>
> The amount of space you get from your ISP varies from one service provider to another. Generally, you can expect to have up anywhere from 2MB up to 5MB for your Web pages. As value-added services, your ISP may also provide you with code that you can freely use on your Web page such as code to implement a hit counter or guestbook. It is important to check with your ISP beforehand to find out what services they provide with your Internet account.
>
> *(Source: http://www.smallbusinesscomputing.com/webmaster/article.php/3496211)*

Test Questions

1. Which one of the following understanding about ISP is incorrect?

    a. Internet service providers are structured in a hierarchy way

    b. Local ISPs are connected to larger ISPs which may be the national service provider (NSP)

    c. The largest NSP provides backbone services, which is made over telephone wires or coaxial lines

    d. Some communication links are made over satellite connections or wireless services

(c)

12.8.3 Web browsers and other applications

Learning objectives

The student shall understand how web browser works both at the technical level and at the application level for end users.

Web browsers

Web browsers are software used to access the information on the WWW that is stored on web servers. At heart, browsers are simply software display devices. Browsers read incoming files, recognize the data type, and display the data as instructed. The data could be text, images, sound or video.

The main web browsers are Microsoft Internet Explorer and Netscape Navigator or Communicator. Browsers display the text and graphics accessed from web sites and provide tools for managing information from web sites.

Via web browsers, information from the WWW is accessible. WWW or web in short, is a medium for publishing information on the Internet. WWW pages all use a standard document format known as HTML (hypertext mark up language). Many web browsers provide facilities that allow users to construct their own WWW pages using the special authoring language of HTML. The HTML offers hyperlinks which allow users to readily move from one document to another, known as "surfing".

Hyperlinks: highlighted words or phrases in HTML document, which links to other documents or sections of the same document. Clicking the mouse above one of the links causes it to be activated. A link can be used to move to another document, transfer a file, view a section of video, listen to a sound file or carry out a number of other actions.

All web browsers provide users with a variety of tools that enable them to navigate through complex collections of WWW pages. Some of the most common tools include:

- Navigation buttons: to move backwards and forwards through the list of pages previously viewed. Other command buttons include: Stop; Home; Search
- History: a list of pages previously viewed by the user
- Address bar: place to enter the location of a WWW page or file

All web browsers allow users to maintain a directory of WWW sites. The directory enables users to add, edit, delete and organise addresses in the form of bookmarks.

As users move through a hypertext document, their actions are recorded automatically by the programme being used.

The process by which web browsers communicate with web servers can be briefed as follows:

A request from the client PC is executed when the user types in a web address, clicks on a hyperlink or fills in an online form such as a search. The request is then sent to the ISP and routed across the Internet to the destination server using the mechanism "protocols". The server then returns the request web page if it is a static page, or if it requires reference to a database, such as a request for product information, it will pass the query onto a database server and will then return this to the customer as a dynamically created web page. Information on all page requests is stored in a transaction log file which records the page requested, the time, and the source of the enquiry.

Test Questions

1. Web browsers have lots of functions. Judge whether the below statements about the web browser's functions are true or false.

- To make it simple, browsers are just software display devices, to display the text and graphics accessed from web sites   (T)
- All web browsers provide tools to navigate through the web pages, to stop or to go back to the home page   (T)
- All web browsers provide the History tool to list the pages previously visited, and to maintain a directory of WWW sites   (T)
- The user's actions through a hypertext document will not be recorded by the programme being used automatically   (F)

2. The standard document format used for WWW pages is known as:

a. HTML

b. Hyperlinks

c. XML

d. SGML

(a)

3. The main web browser software is:

a. Microsoft Internet Explorer

b. Netscape Navigator

c. Netscape Communicator

d. Any of the above

(d)

12.8.4 Email and other services

Learning objectives

The student shall be aware of the benefits Emails bring over the use of the Internet, and know how to use web Emails.

Email is a well-known method of sending and receiving electronic messages over the Internet. It has been available across the Internet for over 20 years.

Advantages of email include the fast speed, low cost, multiple copies, possibility of auditing, data sharing and group work. The latest email packages include multimedia too.

In order to enable e-mails to be written and read, a special mail reader programme used to be needed. This programme can be part of the groupware package, such as those for large companies; it can be also contained in the free mail programmes such as Microsoft Outlook Express, Eudora or Pagasus. A third alternative however does not need any special software other than the web browser, i.e. the free web e-mail. The web-emails do not need special software to access them but available through web browsers across the WWW, for example the Hotmail (www.hotmail.com) and Yahoo!Mail (www.yahoo.com) services.

E-mail management involves developing procedures and using systems to ensure that inbound and outbound e-mails are processed efficiently.

In a business organisation, e-mail can be used to support both internal and external communications. Internally, many organisations use e-mail instead of internal memos or telephone calls. Messages can be stored automatically until the user comes to access them. A great deal of information can be also included in the message automatically. Besides, e-mails enable people to stay in contact with clients, colleagues and employers, which make working at home feasible, such as tele-working.

Test Questions

1. In order to enable e-mails to be written and read, special software shall be installed. This software can be:

    a. A programme that is part of the groupware package

    b. Mail programmes such as Microsoft Outlook Express, Eudora or Pagasus

    c. Web browser for web emails

    d. Any of the above

(d)

12.9 E-Commerce

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Learning objectives

The student should understand what E-commerce pertains to, and the E-commerce components from both commercial and technical point of views.

The student should learn the main applications of E-commerce in forwarding and logistics.

The student shall be further aware of the pending legal issues in relation to the E-commerce applications, and other concerns in the development of E-commerce.

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12.9.1 Understanding of E-commerce

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Learning objectives

The student should understand what E-commerce pertains to, and the E-commerce components from both commercial and technical point of views.

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What is e-commerce?

A major factor in the evolution of the Web is Electronic Commerce: the ability to buy, sell, and advertise goods and services to customers and consumers.

A broad definition of e-commerce is used by the UK government (E-cmmerce@its.best.uk, 1999): "E-commerce is the exchange of information across electronic networks, at any stage in the supply chain, whether within an organisation, between businesses, between businesses and consumers, or between the public and private sector, whether paid or unpaid."

It shall be noted that e-commerce involves much more than electronically mediated financial transactions between organisations and customers. From a service and online perspectives, E-commerce is not solely restricted to the actual buying and selling of products, but also covers pre-sale and post-sales activities across the supply chain. From a communications perspective, e-commerce is also the delivery of information, products/services or payment by electronic means.

Concerns in E-commerce development

The potential for global electronic commerce is immense; much of this potential is and will be realized by the continued development of Web

technologies. During this process, some concerns are raised which have drawn much of the attention.

One concern in the development of Electronic Commerce on the Web is the trust that can be placed in the provenance, reliability, security and privacy of information available from or transferred over the internet. Another concern is the need for low friction commerce transactions allowing quality and ease of use for consumers, a key factor of the future of Electronic Commerce.

Components of E-commerce

E-commerce is an online trading mechanism in which all the business activities are carried out exclusively on the internet through a secure and reliable web site. Since internet is the fastest medium for businesses regardless of their localities, more people prefer to use E-commerce mechanism to expand their business and to buy and sell product online.

The e-commerce components are features that are very essential for the success of this mechanism of trade and business. E-commerce cannot survive and propagate without managing these critical components.

Components from commercial perspectives

The e-commerce critical components include:

1. The website. Website is the medium through which the online client interacts with the e-commerce. If the web site is built professionally and have an authenticated look more people are attracted. However if the website is poorly designed it would repel the clients from the e-commerce mechanism no matter how strong it is. Therefore it is very necessary that the website is designed exclusively with utmost importance given to the design and pattern of the web site designs.

2. Merchant account. A merchant account is the one in through which all the cash transaction activities take place through e-commerce. It is vital for e-commerce to get a merchant account before starting this mechanism. Failure to get a merchant account would result in failure to initiate an e-commerce business as the cash transaction process could not take place. There are two options for merchant account. First is an Internet-ready merchant account to accept credit cards. Second is a secure payment gateway system.

3. The software. The software records the orders, the processing of the order and the cash transaction mechanisms. It is important that the software is professionally built incorporating the entire essential requirements of e-commerce to carry out a feasible and reliable e-commerce trade mechanism.

4. The server. It is important that the e-commerce sites are affiliated with well known servers to ensure security and avoid listing links to servers that might direct unsafe material and traffic to the site.

5. Shopping cart. Shopping carts are especially design software that allows online viewers to buy and purchase products on a website. The shopping carts provide a user friendly interface which enable online customers to buy products without much difficulty.

6. Security. This concerns security protocols and digital signatures. These are encryption techniques to secure the e-commerce websites from hackers and virus attacks. Security protocols should be developed using the latest programming techniques to ensure maximum security.

What are shopping carts?

There are several businesses being run on the internet today that facilitate online shopping. These businesses have implemented several mechanisms for the online buyers to purchase goods online. One such popular mechanism is referred to as shopping carts. These are now being used on almost all the online shopping sites. Having shopping carts has resulted in an increase in online shopping.

Shopping carts are especially designed software that is used in e-commerce to enhance a customer online shopping experience. This software keeps the track of customer's orders and maintains tables and queues keeping the record of the place order. Shopping carts could be considered as a virtual shopping store where all the real world shopping facilities are provided.

The shopping cart software could be design at a low scale budget and if a business can afford much expense then enhanced version of online shopping cart can be created which incorporates advance storefront designs and international investment.

Some of the feature of shopping carts includes the following:

- The shopping carts have a friendly and easily manageable interface, to ensure fast and easy shopping options. Usually a server is maintained at the backend where all the orders are stored and viewed. The orders are allocated index numbers and are stored in a queue. This mechanism of the shopping carts ensures that there would be no misplacement of orders placed online.

- The cash transaction mechanisms of online shopping carts are made more secure using the latest encryption and coding techniques.

- The shopping cart is designed to incorporate all shopping features that enable the shopping carts to manage the products, list down the products price, maintain the orders etc. The shopping carts include all the real time shopping operations and also facilitate real time credit card processing.

- Many additional features can be added to the shopping carts such as customer's feedback, testimonial pages and online interaction mechanism to directly communicate with the online buyers to better understand their needs.

(Source: http://www.smallbusinessbible.org/what_shoppingcarts.html)

Components from technical perspectives

From a technical point of view, the E-commerce business simply covers the following components:

1. Database
2. Dynamic HTML
3. Document Object Model
4. Security
5. Payment processing

A database is needed to store customer information as well as information about all of the product and services offered such as product description, picture, availability/on-hand quantity, shipping costs, shipping time and etc. The database further needs to tie into the physical product systems for processing and shipping of orders, either through a direct link or by importing and exporting the data.

Dynamic HTML is needed to give the website special effects, interactivity and access to the database.

Back-end support

To successfully running an e-commerce business, the back-end of the system, i.e. the physical product system shall be also in place and work

seamlessly. The back-end support includes elements such as securing products or services, order fulfilment and customer service. Most dot.com businesses that failed didn't have a good, solid back-end.

Test Questions

1. True or false?

- E-commerce is a major development and application in the evolution of the Web   (T)
- E-commerce is the exchange of information only between businesses, and between businesses and consumers   (F)
- E-commerce involves much more than financial transactions   (T)

2. E-commerce as a mechanism of trade and business cannot survive without successfully managing its critical components. The following are all critical components to e-commerce:

a. The website

b. The software and the server

c. A merchant account and security

d. All of the above

(d)

12.9.2 E-commerce applications

Learning objectives

The student should have knowledge about the E-commerce applications in forwarding in general and in particular, the applications in space booking, tracking and tracing, and EDI messages.

The revolution of E-commerce has been broadly divided into two categories: Business-to-Consumer (B2C) and Business-to-Business (B2B). The impact of E-commerce in the forwarding and logistics businesses is significant. The substitution of an electronic transaction for an in-person, telephone, or mail-order transaction has streamlined the work process to some degree, increased efficiency, and has contributed to the increase in small package movement. These are, in many cases, "new" logistics activities using commercial assets (a UPS shipment) to accomplish something previously handled with a personal asset (an individual's car).

Both carriers and shippers alike are pursuing opportunities to expand the use of electronic communications for logistics applications, though the bulk of current activities are not transactional, but rather informational.

Common logistics applications of E-commerce in business include freight space booking or load matching (either directly or via a 3PL), tracking and tracing, and EDI messages.

Space booking

Most carriers, particularly in international shipping and airfreight, have integrated the latest information technology into their original booking system, and have moved it online. The online website offers interactive booking, on a real time basis. Besides, it allows customers to retrieve the latest news affecting international shipping and air carriage, request a quote on line, track and trace shipment from origin to destination, as well as review the very latest sailing or flight schedules

Tracking and tracing

The tracking and tracing capability allows shippers see the status of any given shipment in real time. Some systems also feature an online pickup request which refers to the traditional cargo tracking features, giving the full status of any consignment (both cargo and mail) on request.

The tracking and tracing capability increased considerably the freight visibility. Freight views into the shipment can be done in near real time. Critical information about the shipment can be displayed or downloaded therefore giving the customers the tools to make time sensitive decisions.

EDI messages

EDI messages are another feature that E-commerce brings to modern forwarding and logistics businesses. The EDI messages standardize the original paper documents, convert the documents into formats readable by machines, and therefore greatly enhanced the fast, accurate, safe and efficient transmission of documents in business.

Neuro-Logistics

The expanding application of information technology to the logistics model has resulted in the evolution of a new style of logistics process – the so-called "neuro-logistics" model. "Neuro-logistics" fuses information systems with physical logistics processes to create more responsive and leaner supply and distribution networks. Information is substituted for inventory in its role of managing stock-out risk.

Test Questions

1. E-commerce applications in forwarding and logistics business include the following:

> a. Space booking
> b. Tracking and tracing
> c. EDI messages
> d. All of the above

(d)

12.9.3 Some legal issues relating to E-commerce

Learning objectives
The student shall be aware of the pending legal issues in relation to the current application of E-commerce in business and transactions.

While Internet has emerged as one of the most successful promotion tools of the world, E-commerce has proven to be a thriving standard for any trade mechanism. E-commerce has progressed to a point that a majority of businesses in the world are being marketed through this standard.

However, the change in behaviour of the parties in transactions, in association with the proof of evidence, from a conventional and physical world to the virtual environment, necessitates a great deal of legal issues.

The development of electronic commerce poses a number of legal and consumer challenges. Industry and government recognise that legal protection for consumers and businesses that use electronic commerce will assist in the development of consumer confidence in this new way of doing business.

Consumer issues

Major consumer issues raised by Internet transaction systems include:

- Security
- Privacy
- Terms and Conditions
- Access
- Dispute Resolution
- Fees and Charges
- Fraud

Legal issues

There are a number of purely legal issues associated with E-commerce, some having been discussed for some time with responsive solutions adopted in some countries, while the other are still vague in terms of its legal interpretation and implications.

Two common legal issues involved in e-commerce are:

- Jurisdiction: what law shall govern the E-commerce transaction, and which court shall have the jurisdiction to hear the case?
- Rules of Evidence: what can be used as an evidence for the legal actions? This is in particular an issue when it comes to the formation of a contract.

There are of course, other issues that would provoke discussions in terms of its legal meaning regarding the transactions conducted in an E-commerce environment.

International legal dimensions in E-Commerce

It is important to be aware of the importance of the international aspects of E-commerce. E-commerce is not restricted by any border. There exists the access to a broader customer base than ever anticipated, both businesses and consumers, across the world.

There are many international legal dimensions including:

- EU directives that apply to electronic consumer transactions and purported consumer contracts
- Trans-border data flow issues
- Local language requirements for consumer transactions
- Export controls, particularly in the U.S. with respect to software with encryption features

For example in the United States, the Clinton Administration July 1, 1997 report on electronic commerce recommended that E-commerce over the Internet should be facilitated on a global basis, so that, to the greatest extent possible, the legal and commercial framework for transactions is consistent and predictable regardless of the jurisdictions in which buyers and sellers reside.

As electronic commerce expands, international conventions will also gain popularity and become more widely used in international commercial agreements, e.g. United Nations Convention for the International Sale of Goods. There is the need to learn the details of such conventions therefore, instead of national legislations only.

Formation of the E-contracts

The software industry is an ever expanding user of electronic commerce and is a pioneer in electronic contracting issues, particularly the so-called "click" license. Web sites for software vendors make available trial versions and even full featured versions of software products in some cases. More and more of these web pages are in multiple languages. Many virtual stores and malls have also adopted such contracting practices. When, where and whether the contract can be considered as formed is becoming an important legal issue.

Web marketing

On the Web, there appears to be a rapid transition to heavy marketing, which however has very few mandatory legal features. For example, the terms of use or license are optional to be viewed rather than required to be viewed by a customer. There are also many variations because vendors want to avoid legal clutter as a practical business matter.

Legal requirements on online sales catalogue

While most Web commerce transactions are consumer transactions, it is worthwhile to note that many countries have laws which protect consumers in a sales environment, particularly in the U.S. and Europe. This raises the issue whether online sales catalogue shall meet the requirements of such laws, particularly considering that the consumer protection provisions of particular country will usually override any choice of law, consent to jurisdiction, warranty disclaimer and limitation of liability provisions for public policy reasons.

Catalogue sales in the U.S

In the U.S., consumer protection regulations require specific disclosure requirements for catalogue sales. Catalogue sales are defined as any offer for sale or any solicitation for an order for a consumer product with a written warranty, which includes instructions for ordering the product which do not require a personal visit to the seller's establishment. On-line vendors using a catalogue to sell goods should fall within this definition.

California has amended its catalogue sales law to specifically make it applicable to electronic commerce. The provision extends existing regulations on telephone, mail order and catalogue sales to on-line sales.

Test Questions

1. The change of parties' behaviours in E-commerce transactions has brought new legal issues to the new business model. The followings are the discerned legal issues so far in E-commerce:

> a. Jurisdiction: What law to govern the e-commerce transaction?
>
> b. Rules of evidence: What can be considered as the evidence to form a contract e.g. in the case of "click" license in software purchase on line?
>
> c. What are the laws regulating the marketing on the web?
>
> d. All of the above

(d)

12.10 Web-Based Applications and E-Marketplace

> **Learning objectives**
>
> The student should understand what ASP is, its functions and the pros and cons of using ASP.
>
> The student shall understand how E-marketplace works as a major web based application.
>
> The student shall be fully aware of the opportunities and risks in exploring the E-commerce businesses, by learning the examples from two companies ARIBA and Commerce-One.

12.10.1 Application service providers (ASP)

> **Learning objectives**
>
> The student should understand what ASP is, its functions and the pros and cons of using ASP.

An application server provides a business application on a server remote from the user. An application server can be considered to be a relatively new application of a three-tier client-server approach consisting of a graphical user interface server, an application or business logic server, and a database or transaction server.

Application service providers (ASPs) offer great potential for reducing the cost of administering information systems. Traditionally, companies have employed their own information systems support staff to manage different types of business applications such as email. An applications service provider offers an alternative where the email application is hosted remotely or off-site by a server operated by an ASP.

Examples that are outsourced to an ASP include such elements as the management of Microsoft Exchange (e-mail and groupware) package, Microsoft Office or accounting packages. It can be also the operational systems from a food chain store such as Pizza Hut, including labour, inventory management, supplier ordering and performance reporting, as well as IS infrastructure and monitoring of customer activity on company's web site, and etc.

Advantage and disadvantage of using an ASP

Increasingly, firms are providing services over the Internet – where the software and data reside on a service provider's web site. The ASP processes all of the customer's needs on its Web site.

The main advantages of an ASP are that
1) Experts set up and run the site so that the clients do not have to hire specialists
2) Storing the data on the Web, accessible to employees wherever they have Web access
3) The client can start small and scale up to a reasonable size without hassles.

A potential drawback of ASP is that all of the client's financial data is stored on a site run by someone else. As a client, it is recommendable to investigate the ASP credibility and the ASP security procedures.

Test Questions

1. The following descriptions about ASP are correct except:

a. ASP uses and processes business transactions on a server remote from the user

b. ASPs offer potential for reducing the costs of administering information systems at the user's end

c. ASP gives the possibility to access to data stored on the web at any time

d. ASP always offers better security and credibility than in-house storage of data

(d)

12.10.2 Overview of E-marketplaces

Learning objectives
The student shall understand how E-marketplace works as a major web based application.

Electronic marketplaces are a new development in the application of web based services. E-marketplace is becoming an important player in several industries because it can greatly improve economic efficiency, reduce margins between price and cost, and speed up complicated business deals. The services they provide will expand many companies' purchasing and selling abilities, and will make prices more dynamic and responsive to economic conditions.

E-marketplaces are fascinating to the IT industry too because they present serious technical challenges. Several vendors (including IBM) offer software and services to support them, but requirements are expanding and shifting as markets develop. E-marketplaces are sensitive to business details, and small changes in the rules of engagement can profoundly alter a marketplace's attractiveness and profitability.

How the E-marketplaces work

The marketplace identifies and qualifies the participants — individuals and organisations acting as buyers, sellers, auditors, information vendors, finance providers, and other intermediaries — and maintains data such as reputation, credit-worthiness, and experience. It thus enables potential buyers and sellers to locate one another. The marketplace controls who can do what, and although the rules may be public, many transaction details are kept private.

The E-marketplace also provides information on products, prices, availability, and current and past activities, as well as keeping records required by regulators and auditors.

Marketplaces can manage and present information about goods and trading status in different ways. Commodity markets typically offer a limited array of products, each described by a few parameters such as a stock name or a product grade. Other goods demand more extensive descriptions. On eBay, for example, there are usually more than four million different items for sale at any one time, and each is described by a few lines of text and perhaps a picture. A piece of fine art at a specialty auction, on the other hand, might be accompanied by a scholarly article or a monograph.

Despite the promising prospects, technological solutions that satisfy all parties' needs in E-marketplaces are very challenging. Moreover, a lot of money will be made and business relationships will shift radically in the emerging e-market economy, in ways that are important but unpredictable.

How will electronic marketplaces evolve?

E-marketplaces will almost certainly expand to support ever more complicated scenarios. Even today, multi-round auctions, Request for Proposals (RFPs), and negotiations are the norm for expensive procurements. Technological advances will permit the use of E-marketplaces for larger numbers of smaller deals. Processes will be increasingly automated, using sophisticated analysis techniques and large scale computation. In time, E-marketplaces will include richer collaboration and information-management facilities, and will grow to combine the capabilities usually associated with portals and content sites with those of advanced exchanges.

Test Question

1. True or false?

- E-marketplace is essentially a type of web based application, using an application server from ASP　　　(T)
- E-marketplace can not only provide information such as on products and prices, but also it facilitates and clears transactions　(T)
- E-marketplace involves parties such as buyers and sellers, finance providers and information vendors, but it cannot enable potential buyers and sellers to locate each other　(F)
- E-marketplace provides a platform to conduct business transactions, but it doe not control who can do what on the web.　　(F)

12.10.3 ARIBA, Commerce-One, etc

Learning objectives

The student shall be fully aware of the opportunities and risks in exploring the E-commerce businesses, by learning the examples from two companies ARIBA and Commerce-One.

The emergence of E-marketplaces has seen the ebbs and flows of E-companies with business largely dependent on the web. To capitalize on the growth of wide-scale electronic networks, or e-marketplaces, new companies established to conduct business over the Internet in 1990s. By using such business-to-business trading networks, proponents argued, companies could save money on the cost of purchasing or selling materials.

Despite early success in generating interest in E-marketplaces, it remains doubtful whether the sector has ever truly met expectations. While some companies become successful, many other B2B companies shut down after failing to get customers to fully embrace electronic trading hubs and finding that getting different companies' computing systems to communicate and exchange data was harder than originally predicted.

ARIBA and Commerce-One are two examples. While ARIBA survived and continues thriving ahead, Commerce-One, as one of the pioneering E-companies, faded away.

ARIBA

Company Overview

ARIBA is a software and information technology services company headquartered in Sunnyvale, California, USA, with a number of sales, support, and consulting offices worldwide (**www.ariba.com**). It is publicly traded at NASDAQ. The focus of ARIBA's products and services is cost savings in procurement via electronic commerce, also known as spend management.

ARIBA applications currently operate on nearly four million desktops around the world. Among the Fortune 100 companies, ABN AMRO, BMW, Chevron, Cisco Systems, Hewlett-Packard, and Unilever are the clients of ARIBA.

Company business

As the leading provider of E-procurement, ARIBA helps companies analyze, understand, and manage their corporate spending to achieve increased cost savings and business process efficiency. ARIBA's E-procurement comprises a unique, comprehensive blend of domain expertise, operational services, and technology that accelerate each customer's journey toward an improved bottom line.

ARIBA delivers sourcing, procurement and commodity expertise that enables organisations to optimize their E-procurement and supplier relationships. It can leverage a broad technology platform that makes the company's solution benefits repeatable in the long term.

Recently ARIBA acquired Softface, a provider of spend analytics, to strengthen its visibility solution, and FreeMarkets to strengthen its position in sourcing solution. Visibility solutions lets one build a data-warehouse of spend data and analyze the spending pattern. It can reveal opportunities for saving costs through strategic, tactical or operational level decisions. Sourcing solutions on the other hand, lets one plan and manage sourcing at a low cost. It comes with features like supplier evaluation, supplier selection, auctions and reverse auctions.

Commerce One

Company history overview

Commerce One used to be one of the pioneering e-commerce companies. Based in San Francisco, Commerce One was founded in 1994, aiming to capitalize on the growth of E-marketplaces where companies would conduct business over the Internet.

With a high-flying e-business applications developer in the late 1990s with heavy backing from software giant SAP AG - the German software company owned 20 percent of Commerce One - the company faltered around the turn of the millennium. After several missteps, it began to focus its efforts on XML and the VEO technology, developing a new platform that focused on business process management, transaction management and B2B integration. The idea was for Commerce One to provide an open enterprise hub that customers could utilize to connect and adapt applications, using Web services to support changing business processes.

In 2001, the company acquired Veo Systems from Pakistan-born Asim Abdullah for $300 million. One of the company's technologies was SOX, an XML schema technology that influenced the development of the W3C's XML Schema language. It was a move that then Chairman and CEO Mark Hoffman hoped would pull the company out of its doldrums. With fierce competition from industry giants like Microsoft Corp. and ironically SAP itself, Commerce One's efforts failed.

Commerce One declared bankruptcy in September 2004. In December 2004, its patent portfolio was sold by a bankruptcy court to JGR Acquisitions, a subsidiary of Novell, Inc., for $15.5 million. Commerce One formally announced on February 7, 2006, that it has been acquired by Perfect Commerce – a provider of On-Demand Supplier Relationship Management (SRM) Solutions and The Open Supplier Network.

Perfect Commerce is the largest provider of On-Demand SRM solutions and provides connectivity to trading partners via The Open Supplier NetworkSM (The OSNSM). The company is the leading On-Demand SRM solutions provider with more than 500 clients (101 in the Fortune 500), 165,000 users and 11,500 suppliers.

Company business

Commerce One provided software that helped companies purchase supplies and negotiate contracts with suppliers via the web.

In an effort to revive its fortunes, Commerce One attempted to move into Web services, a technology arena that promises many of the same benefits of E-marketplaces. However, the strategy was unsuccessful, and the company's new business software, called Conductor, failed to take off. By October 2003, the company began cutting its remaining employees as its revenue again failed to meet expectations.

Whereas rival ARIBA was able to jump into Web services relatively quickly, it was too hard for Commerce One to change perceptions. As Bruce Hudson, a Meta Group analyst said, Commerce One's Web services strategy never gained momentum because people associated the company so closely with electronic marketplaces. "The technology concept behind exchanges remains strong and will continue to grow through Web services architecture," he said. "But Commerce One never got the attention it needed to survive. And after (former partner) SAP had essentially sucked the company dry of intellectual property, (Commerce One) had lost too much time and too many people to make a comeback."

Test Questions

1. The two cases of ARIBA and Commerce-One have revealed that:

    a. E-marketplace is an evolving concept of business without established rules or processes

    b. Company strategy shall be able to adjust to the perceived customer demands

    c. Both of above

    d. Neither of above

(c)

12.11 Security

> **Learning objectives**
> The student should understand what security really means to a company in the computer and information world, and be aware of the issues related to security of data and message transmission.
> The student shall be aware of the main types of virus, how it damages the computer and data system, and knows how to tackle this problem by using the current virus protection programmes available.

12.11.1 Understanding of security

> **Learning objectives**
> The student should understand what security really means to a company in the computer and information world, and be aware of the issues related to security of data and message transmission.

Many potential threats exist to information systems and the data they hold. Purely by accident, a user may enter incorrect data or delete important information. Minor changes to a frail system could result in a cascading failure of the entire system. Criminals from outside of networks may be constantly trying to attack the system, or steal important information and confidential data.

It is important to determine the potential threats to computer security. Some tools have made it easier for outsiders to attack companies over the Internet, but by far the biggest issues, as the industry perceives, remain the people inside the company and viruses.

Security policy of the company/organisation

Every organisation, regardless of size, is recommended to have documented security policies. It is not enough that the organisation has a position or policy on security, and it just may not be written down anywhere.
Security policies of a company can largely determine how secure or insecure the company's network is, how much functionality the network can offer, and how easy the network is to use. An effective security policy forms the

foundation of the company's entire approach to security. It also gives the base to successfully implement security related projects in the future. With a clear and comprehensive security policy, standards can be established for IT resource protection by assigning programme management responsibilities and providing basic rules, guidelines, and definitions for everyone in the organisation. Policy thus helps prevent inconsistencies that can introduce risks.

What is security policy?

The security policy is basically a plan, identifying the rules and procedures that all persons accessing computer resources in an organisation must adhere to, in order to ensure the confidentiality, integrity, and availability of data and resources of the organisation. In another words, security policy puts into writing an organisation's security posture, describes and assigns functions and responsibilities, grants authority to security professionals, and identifies the incident response processes and procedures.

A good and well developed security policy will address some of the following elements:

- How sensitive information must be handled
- How to properly maintain user's ID and password, as well as any other accounting data
- How to respond to a potential security incident, intrusion attempt, etc.
- How to use workstations and Internet connectivity in a secure manner
- How to properly use the corporate e-mail system

Types of security policy

There are basically two types of security policy at a company/organisation level: programme-level and issue-specific. Programme-level policy is aimed at establishing a security programme, assigning programme management responsibilities, state the organisation wide IT security goals and objectives, and provide a basis for enforcement. Issue-specific policies are geared to specific areas of concern, where security measures need to be developed too.

Security policy development

Development of a security policy should be a collaborative effort with security officials, users, management, and those who have a thorough understanding of the business rules of the organisation. The policy shall be kept current and accurately reflect company's security posture, and in harmony with the demonstrated business practices. Ideally, policy will be also flexible enough to accommodate a wide range of data, activities, and resources.

The development (and the proper implementation) of a security policy is highly beneficial as it will not only turn all of your staff into participants in the company's effort to secure its communications but also help reduce the risk of a potential security breach through "human-factor" mistakes. These are usually issues such as revealing information to unknown (or unauthorised sources), the insecure or improper use of the Internet and many other dangerous activities.

Additionally the building process of a security policy will also help define a company's critical assets, the ways they must be protected and will also serve as a centralised document, as far as protecting Information Security Assets is concerned. *(Source: www.windowsecurity.com)*

Security policy implementation

Implementation of a company's security policy involves a process, just like the policy formulation and drafting. Policy implementation begins with the formal issuance of policy. Policy cannot merely be pronounced by upper management in a one-time statement or directive with high expectations of its being readily accepted and acted upon.

During the process of policy implementation, one important step to note is the policy documentation. Once security policy has been approved and issued, it is highly recommended to document the policy.

Issues related to security of data, message transmission

The Internet is not a single network, but a worldwide collection of loosely connected networks. There are many ways to access these networks by individual computer hosts, including gateways, routers, dial-up connections, and Internet service providers. The Internet is easily accessible to anyone with a computer and a network connection. Individuals and organisations

worldwide can reach any point on the network without regard to national or geographic boundaries or time of day.

However, along with the convenience and easy access to information come new risks. Among them are the risks that valuable information will be lost, stolen, corrupted, or misused and that the computer systems will be corrupted.

Data and messages transmitted via the web encounter the web related risks. If information is recorded or transmitted electronically on networked computers, it is subject to a great deal of risks and in a sense, more vulnerable than if the same information is printed on paper or exchanged by post or in person. Intruders can steal or tamper with information without touching a piece of paper or a photocopier. The intruders may even reside in a different country. New electronic files can be copied; while the intruders can run their own programmes meanwhile hide evidence of their unauthorized activity.

Phishing and Pharming

Phishing attacks use both social engineering and technical subterfuge to steal your consumers' personal identity data and financial account credentials. Social-engineering schemes use "spoofed" e-mails to lead consumers to counterfeit websites designed to trick recipients into divulging financial data such as credit card numbers, account usernames, passwords and social security numbers. Your company may be Phished or Pharmed if you have a website (e-commerce or strictly informational) or if you contact your customers through e-mail, or phone. Any of these communication methods can be faked and used to solicit sensitive information.

There appear to be three possible goals of this type of subterfuge:

1. By hijacking the brand names and logos of banks, e-retailers and credit card companies, phishers often convince recipients to respond.

2. Technical subterfuge schemes plant crimeware onto PCs to steal credentials directly, often using Trojan keylogger spyware.

3. Pharming crimeware misdirects users to fraudulent sites or proxy servers, typically through DNS hijacking or poisoning.

(Source: Anti-Phishing Working Group, http://www.antiphishing.org/Phishing-dhs-report.pdf)

Test Questions

1. True or false?

- Security policy is important to a company. Whether it is a documented policy or not, however, does not make much difference as long as the company takes a strict and proper security position. (F)
- Security policy describes and assigns functions and responsibilities, grants authority to security professionals, and identifies the incident response processes and procedures. (T)
- Programme-level and issue-specific security policies are the two types of policy at a company/organisation level, serving for different purposes. (T)
- Formulation and implementation of security policy is a once-for-all activity. It does not entail a continuing process. (F)
- Security policy development is a collaborative effort. (T)

12.11.2 Virus and their propagation

Learning objectives

The student shall be aware of the different types of virus that are known to current technology.

The student shall be further aware of the damages the different viruses can do to the computer and the system, and know what methods to take when such a virus is detected.

Viruses, worms and others

Virus and worms

Viruses and worms are self-replicating, malicious codes that attach to an application programme or other executable system components and leave no obvious signs of their presence. They may arrive via e-mails or downloads.

If, the virus programme simply replicates itself but is not designed to cause any damage, for example to delete files, or send files to servers, such a virus programme is called a worm.

> Microsoft Office software presents a major point of vulnerability because the tools support a macro programming language i.e. Visual Basic for Applications. This language enables other people to automate many tasks, such as synchronizing calendars and contact lists with multiple devices, it can be also used to create virus programmes that steal or destroy data.

Virus propagation

A virus can be picked up from many sources. E-mail attachment is the prevalent method today.

If an attachment is opened, the macro programme runs and the virus tends to do two things:

1) It sends itself to everyone in your contact list using your name
2) It attaches itself to other files in your computer

The nastier viruses can delete all of the files in the system or send files to a Web server.

Spyware

Viruses are often distributed with a Trojan horse. Spyware is a similar concept, but instead of destroying files, the spyware takes residence inside the computer. The spyware then captures all of the computer activities, such as Web sites visited, passwords entered, and credit card numbers. Periodically, the spyware software sends the information to a Web site, where it is collected by a company or a hacker.

Malware

Viruses, worms, Trojan horses, and spyware are often called malware, which are designed to do bad things to computer systems. Spyware tools are particularly dangerous on public computers – such as those at Internet cafes, print shops or libraries. Entering passwords and credit card data on computers that are shared with the public shall be particularly avoided.

What to do with viruses?

What impact may viruses and worms have on your business?

A virus or worm will slow down the company's systems and productivity as resources need to be dedicated to remove it. Other impacts might be stolen information (yours or your customers'), increased spam, denial of service, or deleted files.

How do you know your computer is infected?

Unfortunately, there is no particular way to identify that the computer has been infected with malicious code. Some infections may completely destroy files and shut down your computer, while others may only subtly affect your computer's normal operations. Be aware of any unusual or unexpected behaviour. If you are running anti-virus software, it may alert you that it has found malicious code on your computer. The anti-virus software may be able to clean the malicious code automatically, but if it can't, you will need to take additional steps.

What can you do if you are infected?

Minimize the damage - Contact your IT department or consultant immediately. The sooner they can investigate and clean your computer, the less damage to your computer and other computers on the network. If you are on a home computer or a laptop, disconnect your computer from the Internet. By removing the Internet connection, you prevent an attacker or virus from being able to access your computer and perform tasks such as locating personal data, manipulating or deleting files, or using your computer to attack other computers.

Remove the malicious code - If you have anti-virus software installed on your computer, update the virus definitions (if possible), and perform a manual scan of your entire system. If you do not have anti-virus software, you can purchase it at a local computer store. If the software can't locate and remove the infection, you may need to reinstall your operating system, usually with a system restore disk that is often supplied with a new computer. Note that reinstalling or restoring the operating system typically erases all of your files and any additional software that you have installed on your computer.

(Sources: National Cyber Alert System Tip: Recovering from Viruses, Worms, and Trojan Horses)

Test Questions

1. True or false?

- Virus arrives via E-mail attachments or downloads   (T)
- Virus will send itself to everyone in the computer's email contact list using your name, and attach itself to other files in the computer, or delete all of the files in the system   (T)
- Spyware is very dangerous to passwords, credit card numbers and so on, but it does not make difference whether it's a private computer or public computers such as at Internet Cafes.   (F)
- It's not easy to identify that the computer has been infected by virus. But if it happens, one measure to minimize the damage is to disconnect the computer from Internet.   (T)

12.11.3 Virus protection programmes

Learning objectives
The student shall have knowledge about the currently available virus protection programmes, and the types of virus that a specific programme targets to.

There are many software programmes available in the market to protect the computers and network from virus attacks. Antivirus software will search the computer for known viruses. Different antivirus software may target specific types(s) of virus, but majority offer a package service.

Antivirus software can be purchased from the specialised software companies. Some are available freely online.

Existing virus protection programmes

GRISOFT: AVG Anti-Virus
AVG Anti-Virus is from GRISOFT. GRISOFT is a leading provider of antivirus, firewall protection and security solutions for consumers and SMEs, established in 1991. GRISOFT specialises in the areas of virus analysis and detection, software development, and antivirus support. www.grisoft.com

The latest version of AVG Anti-Virus is Anti-spyware 4.0. The 4.0 version provides comprehensive protection against a wide array of security threats. This new version is the first of kind to offer combination of features such as

generic unpacking of compressed malware, true memory scanning, heuristics, and use of binary signatures.

Anti-spyware 4.0 also provides extended analysis tools that allow users to manually inspect their computers for suspicious activities by tracking running processes, start-up entries, current Internet connections, and detection of browser plug-ins. It also supports Fast User Switching - a feature of Windows XP – that allows several users to be simultaneously logged onto a workstation without compromising security.

The new Anti-spyware version 4.0 goes beyond AVG antivirus and firewall to provide comprehensive malware protection against rapidly growing threats like spyware, adware, dialers, keyloggers, trojans and worms.

McAfee

McAfee is the largest dedicated security company in the world, offering a series of security products and solutions. Most of its products are award winners. The latest products from McAfee include:

- McAfee Secure Messaging Gateway: With the anti-spam module, this product can effectively block 97% of spam, meanwhile not to block good emails by mistake.
- Enterprise McAfee SpamKiller for Microsoft Exchange Small Business: This programme addresses business-critical problems with robust spam defence for email servers. The programme can detect spam with a success rate of 95% straight out of the box. It scans incoming email as it reaches the server and deletes the spam directly without users to manually deleting them from inboxes.
- McAfee VirusScan Enterprise 7.0
- Anti-spyware: McAfee Secure Web Gateway (SWG); and McAfee Secure Internet Gateway
- Anti-virus: McAfee VirusScan Enterprise v8.0i, v7.1; and McAfee VirusScan Enterprise
- All-in-one solution: McAfee Total Protection for enterprises and SMEs

Symantec: Norton AntiVirus

Symantec was founded in 1982, based in California of the United States. Symantec offers a variety of antivirus and security products -- everything from virus definitions and removal tools to trialware, white papers, and more. It has a worldwide presence in respect of facilities, security operation centres, security response labs and support centres.

Symantec's main product is Norton AntiVirus. Norton AntiVirus is the world's most trusted antivirus solution. The latest version Norton AntiVirus 2007 offers new features and improvements based on previous versions. It can remove viruses and security risks automatically, heuristically detect spyware threats, detect and block Internet worm attacks, and protect email.

Free Downloads Antivirus programmes

Apart from the specialised antivirus programmes from specialized companies, there are also a variety of antivirus software available online for free downloading.

For a good reference reading with respect of anti-virus overview, software, online services and guidelines, including free downloading of some of the anti-software and utilities, please go to: http://www.firewallguide.com/anti-virus.htm.

The following websites also provide good information regarding antivirus programmes and protections, and/or offering free software programmes:

- http://dir.yahoo.com/Business_and_Economy/Business_to_Business /Computers/Software/System_Utilities/Virus_Protection/: Yahoo website, to browse computer virus protection software developers, offering antivirus programmes to keep users safe from worms, Trojan horses, spyware, and other Internet threats
- http://www.freebyte.com/antivirus/: free anti-virus software, free firewalls, free email protection software, free virus prevention software, tests of anti-virus programmes, links to specialized anti-virus sites, information about virus prevention, useful evaluation versions of anti-virus software, etc.
- http://www.firewallguide.com/anti-virus.htm
- http://nl.bitdefender.com/bd/site/virusinfo.php?menu_id=4: software company's websites who develops anti-virus programmes

- http://www.avast.com/eng/avast_4_home.html: for home users and non-commercial use

Virus protection for users

The best way to stop a virus is to avoid running software acquired from the Internet and to never open script attachments sent by e-mail – even if they appear to come from a friend. Some attachments that appear to be pictures are actually virus scripts.

Windows Task Manager can show you what processes are currently running on the computer. If a malware tool is recognized, you can stop the process and shut it down. Be careful though as the computer may be running many processes at the same time.

Ultimately, the most important step with viruses is to make certain that you always have current backup files. Then, even if a virus deletes your files, you can recover the data, run an antivirus software package, and remove the virus.

Test Questions

1. Virus protection programmes are available from:
   a. Specialized software companies against certain fees
   b. Downloads from Internet for free
   c. Either of above
   d. Neither of above

(c)

2. True or false?

- The best way to stop a virus is to avoid running software acquired from the Internet   (T)
- The best way to stop a virus is not to open script attachments sent by e-mail – even from a friend's address   (T)
- An important step with viruses is to make certain that there are always current backup files   (T)

Reference reading:

Cyber Security

Preparing your company

Being prepared for all eventualities is essential in business. Unfortunately, most small businesses have limited resources and find it challenging to prioritize to meet this ever-changing need.

The widespread availability of computers and connections to the Internet provides everyone with 24/7 access to information, credit and financial services. These recommended cyber security practices highlight that using a set of practices that include Internet habits as well as technology solutions can limit the harm cyber criminals can do.

- Protect your personal information. It's valuable.
- Know who you're dealing with online.
- Use anti-virus software, a firewall, and anti-spyware software to help keep your computer safe and secure.
- Be sure to set up your operating system and Web browser software properly, and update them regularly.
- Use strong passwords or strong authentication technology to help protect your personal information.
- Back up important files.
- Learn what to do if something goes wrong.

Prepare Your Employees

Your employees are your greatest allies in keeping your information and systems secure. The recommendation is to perform changes to your written procedures and trainings so that cyber security becomes second nature to your staff.

Prepare Your Systems

System upgrades seem to be a constant outlay of your precious resources. This will help you understand what needs to be done so you can make smart decisions and plans.

Prepare Your Customers

This collection of communications will help you communicate to your customers. By helping them understand vulnerabilities and your aggressive stance to keep them safe, you will help build trust and keep all parties safe in cyber space.

Building trust with your customers is key to having them return and purchase from you again. One key concern of consumer's on the Internet is their privacy. The most fundamental principle of customer privacy is notice. Consumers should be given notice of an entity's information practices before any personal information is collected from them. Without notice, a consumer cannot make an informed decision as to whether and to what extent to disclose.

12.12   Electronic Fund Transfer and E-Payments

Learning objectives

The student should understand what Electronic Fund Transfer is and how it works, and its applications in daily businesses.

The student shall be also aware the security and legal issues in relation to electronic fund transfer and E-payments in current situations.

12.12.1 Overview of Electronic Fund Transfer (EFT)

Learning objectives

The student should understand what Electronic Fund Transfer is, how it works, and the benefits of using EFT.

What is EFT?

EFT stands for "Electronic Funds Transfer". It provides for electronic payments and collections. It is a system of transferring money from one bank account directly to another without any paper money changing hands. It represents the way businesses can receive direct deposit of all payments to the company bank account.

One of the most widely used EFT programmes is Direct Deposit, in which payroll is deposited straight into an employee's bank account. EFT also refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, Fedwire and point-of-sale (POS) transactions. It is used for both credit transfers, such as payroll payments, and for debit transfers, such as mortgage payments.

For payments, funds are transferred electronically from one bank account to the billing company's bank, usually less than a day after the scheduled payment date. In the U.S., transactions are processed by the bank through the Automated Clearing House (ACH) network, the secure transfer system that connects all U.S. financial institutions.

EFT is safe, secure, efficient, and less expensive than paper check payments and collections. EFT also means that the money will be confirmed in the bank account quicker than if waiting for the mail, deposit the check, and wait for the funds to become available.

Benefits of using EFT

EFT payments are safer and easier than the conventional ways of payment such as writing checks each month. The benefits of EFT include:

- EFT payments are easy and convenient
- EFT payments facilitate on-line banking at your bank or credit union
- Reduction to the amount of paper in the office; reduced administrative costs
- simplified bookkeeping; valuable time savings for staff and avoidance of hassle associated with going to the bank to deposit checks; increased efficiency
- EFT payments are safer than checks, and should eliminate millions annually in forged, counterfeit, and altered checks
- EFT payments are faster than checks, with funds available on the date the payment is due
- greater security; EFT eliminates lost or stolen checks.

Test Questions

1. What is EFT?

    a. Electronic Funds Transfer

    b. A system of transferring money from one bank account directly to another without involvement of any paper money

    c. Used for both credit transfer such as payroll payments and debit transfer such as mortgage payments

    d. All of the above

(d)

2. The benefits of EFT include all the following except:

    a. EFT payments are easy, convenient and faster than the conventional ways of payment

    b. Less security and safer because EFT exposed the transfer to the Internet security threats

    c. Reduction to the amount of paper in the office; reduced administrative costs

    d. Simplified bookkeeping; valuable time savings for staff and avoidance of hassle associated with going to the bank to deposit checks; increased efficiency

(b)

12.12.2 Legal and security issues

> **Learning objectives**
> The student shall have knowledge about the remaining security and legal issues in relation to electronic fund transfer and E-payments in current situations.

What are the concerns?

One of the obstacles to developing and implementing new payment methods such as electronic funds transfer is the uncertainty as to how they would be regulated and how disputes regarding their use would be governed.

Promoters of electronic payment methods argue against imposing any regulations until the market for the new systems has developed further. Law enforcement officials on the other hand, claim that they do not want to inhibit the evolution of the electronic payments industry by imposing regulation. However, clarifying the rights, obligations, liabilities, and risks borne by consumers, merchants, and issuers would probably facilitate the growth and acceptance of the new payment methods.

> There are many national and foreign laws potentially applicable to the payment element of electronic commerce transactions. In the U.S., consumer credit transactions are governed by the Truth in Lending Act and Federal Reserve Board (iFRBi) Regulation Z. Consumer electronic funds transfer transactions are governed by the Electronic Funds Transfer Act and FRB Regulation E. Commercial electronic funds transfers are governed by UCC Article 4A and Electronic Data Interchange (EDI) rules, among other rules.

The new electronic payment methods raises many concerns for law enforcement officials. Jurisdiction, for example, may be difficult to determine for crimes committed on the Internet. The anonymity that some electronic payment systems seek to achieve may facilitate illegal activities such as money laundering and tax evasion. On-line fraud schemes may be difficult to track and close down.

Finally, in addition to the problems and regulation related dilemma as mentioned above, some payment systems legal issues arise whether or not electronic commerce is being used. Many of these issues are fairly fundamental but are difficult to deal with.

Legal and security issues in EFT

Security

Security remains an issue with regard to all transactions conducted electronically online. Security breaches on the Internet and in private computer systems happen with alarming frequency. For EFT to be widely accepted on a commercial basis by consumers, merchants, and issuers, the systems must provide reasonable security against fraud and theft.

Encryption is an important aspect in terms of security. Encryption scrambles data that are to be transmitted electronically, thus protecting the information from being tampered with or intercepted and also authenticating its source and content. Encryption remains so far the most popular measure for security.

Privacy

The anonymity and privacy of financial transactions are a concern for many e-payment users. An anonymous transaction is one in which the customer does not reveal his or her identity; privacy refers to protection from unauthorized access to information about the customer or the transaction. Of the current payment methods, only cash is anonymous. Checks, electronic fund transfers, and credit cards all generate a record of a transaction.

Individuals' concerns about protecting their privacy from intrusions increase as more and more information is created, transmitted, and stored electronically. There are two main issues involved:

- Who keeps and has access to transaction records and personal information?
- Who owns the personal data?

While some laws may give protection to the users against government officials, other entities involved with electronic payments – for example, Microsoft and Netscape – may not bound by that law. It is also wise to note that laws protecting the financial privacy of consumers will be always balanced by statutes that help law enforcement officials' combat illegal financial activities. Illegal activities include such as money laundering and tax evasion, and more recently, the activities related to terrorist attacks.

Money Laundering

Most illegal activities involving money use currency because of the anonymity it provides. However, logistically it is difficult to transport bulky currency from one place to another. The e-payment systems on the other hand, provide an opportunity and incentives to launder money online. It will be increasingly difficult to track down the real persons involved behind the electronic transactions should no record of such transactions be kept and information of such is held strictly private.

Tax Evasion

Avoiding income tax and sales tax is another illegal activity that electronic payment methods may expedite, particularly in systems that allow person-to-person or computer-to-computer transfers of value. Income tax may be difficult to determine and collect if payments come from anywhere in the world directly to a taxpayer's computer. Sales tax jurisdiction may also be difficult to determine even in legitimate on-line transactions, because the relevant taxing jurisdiction may not know that a sale has occurred.

Fraud

In the "virtual" on-line world, consumers cannot make rudimentary assessments of the trustworthiness of the merchants they encounter, as they can in person. This may expose consumers to fraud over the Internet through the misrepresentation of goods or services offered. Additionally, the same

factors that make it difficult to establish jurisdiction may also hinder the tracking of criminals who use the Internet.

Antitrust Issues

Applying traditional antitrust analysis to a network industry such as electronic payment systems is not straightforward. While in traditional production industries, antitrust law ensures that firms remain independent and are not involved in collusion, extensive alliances of firms in e-commerce industry is conditional to the businesses' success.

Two mains issues will arise in the aspect of anti-trust laws. The degree of market power that incumbents hold and the difficulty new firms face in entering the market will need thoughtful evaluation. A careful analysis of the products and markets in which the payment systems compete will be required before any decision can be made. Determining whether a particular business merger creates net benefits or harms consumers can be difficult.

Test Questions

1. The fast, safe and convenient EFT brings new security and legal issues. Which below is/are such discerned issues in EFT?

    a. Money laundering and fraud

    b. Tax evasion

    c. Privacy and security

    d. All of the above

(d)

2. The need to develop the electronic payment methods meanwhile to keep it secure has brought many difficult situations facing the industry and the government. Judge whether the statements below are true or false.

- Since one of the obstacles to developing and implementing electronic funds transfer is uncertainty as to how they would be regulated, it is always good if new regulations can simply come out the earliest.　(F)

- Privacy is an utmost concern in a free and protected country; therefore any laws shall take privacy as the paramount concern and conditions in developing new methods of e-payment.　(F)

- The adoption of electronic fund transfer caused new problems and criminal activities online such as fraud and tax evasion.　(T)

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