CIT 701

NATIONAL OPEN UNIVERSITY OF NIGERIA

Foundation of Information & Communication Technology

Module 4

CIT 701 Foundation of Information and Communication Technology Module 4

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CIT 701Module 4

Module 4 Managing Information and Communication Technology Applications in the Enterprise

Unit 1 Creating Enterprise Applications

1.0 Introduction

In the last unit, you learnt about the origin of IT projects in business and how they are launched. This unit will introduce you to how the projects are manage and accessed within the enterprise level and the tools the system analyst use in developing an open shared system.

2.0 Objectives

At the end of this unit, you should be able to:

- identify the characteristics of shared systems

- describe the tools and techniques available to system analysts for collecting data and developing IT applications

- summarise the purpose and characteristics of unified modelling language (UML)

- discuss the use of a CASE tool.

3.0 Main Content

3.1 Developing Open Shared Systems

In an enterprise system, two or more users share computers, communication technology, and applications. The introduction of an enterprise system into an organisation affects everyone who interacts with the application or receives information generated by the system. For this reason, enterprise systems are not developed by individual staff members, but rather by the organisations information group known as the Management Information System (MIS) department.

3.1.1 Development Alternatives

The information technology group can take any of the three approaches to developing an application:

- build the application itself

- purchase a prewritten application

- contract out the application development.

3.1.2 Open System for Sharing

Open System is a software system that runs on different computer and communications hardware.

Interoperability

The perfect exchange of data and information in all forms (data, text, sound, and image, including animation) between the individual components of an application (hardware, software, and network).

3.1.3 Shifting Development

*   Craft Approach

*   Assembly Approach

*   Object: A component that contains data about itself and how it is to be processed.

3.1.4 Building IT with Components

Icon	Tool Name	Control Purpose on a Form or Report
↖	Select Objects	Select, move, size, and edit controls
A	Label	Display text, such as a title or instructions; an unbound control
ab	Text Box	Display a label attached to a text box that contains a bound control or a calculated control
▢	Option Group	Display a group frame containing toggle buttons, option buttons, or check boxes; can use Control Wizards to create
▭	Toggle Button	Signal if a situation is true (button is selected or pushed down) or false
⦿	Option Button	Signal if a situation is true (black dot appears in the option button's center) or false; also called a radio button
⊠	Check Box	Signal if a situation is true (X appears in the check box) or false
▯	Combo Box	Display a drop-down list box, so that you can either type a value or select a value from the list; can use Control Wizards to create
▤	List Box	Display a list of values from which you can choose one value; can use Control Wizards to create

Using the option tool in Microsoft Access allows the designer to create an option component for processing

Option Value
property set to 1

Option Value
property set to 3

Ship Via ⦿ Speedy   ◯ United   ◯ Federal

When you click this button, Microsoft Access sets the value of the Ship Via option group to 1 and stores this number in the underlying table.
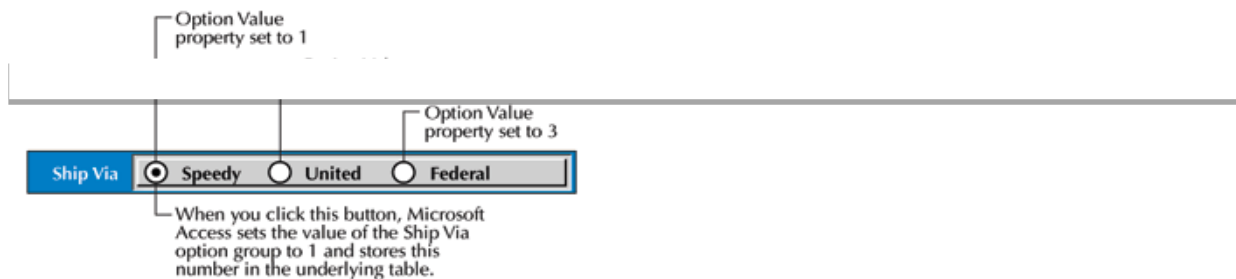
Fig. 19 .1: Object Design Tools and Option tool

Source**:**   Senn (2004)

3.2 System Analyst's Tools and Techniques

3.2.1 Data Collection Techniques

This is the process of collecting data relating to business transactions for processing by any appropriate means. This could be performed through the following methods:

Interviews

Structured Interview: An interview in which the questions are prepared in advance and each interviewee is asked the same set of questions**.**

Unstructured Interview: An interview in which the questions may be prepared in advance, but follow-up questions vary, depending on the interviewees' background and answer**.**

Questionnaire: A sheet of questions used to collect facts and opinions from a group of people.

Document Examination/Record Inspection: The review of company documents about a system or opportunity under investigation.

Observation: The process of watching an activity takes place to collect information about that activity.

Sampling: The process of collecting data and information at prescribed intervals.

3.2.2 Data Processing Tools

System Flowcharts: A graphical description of a business process or procedure using standard symbols to show decision logic.
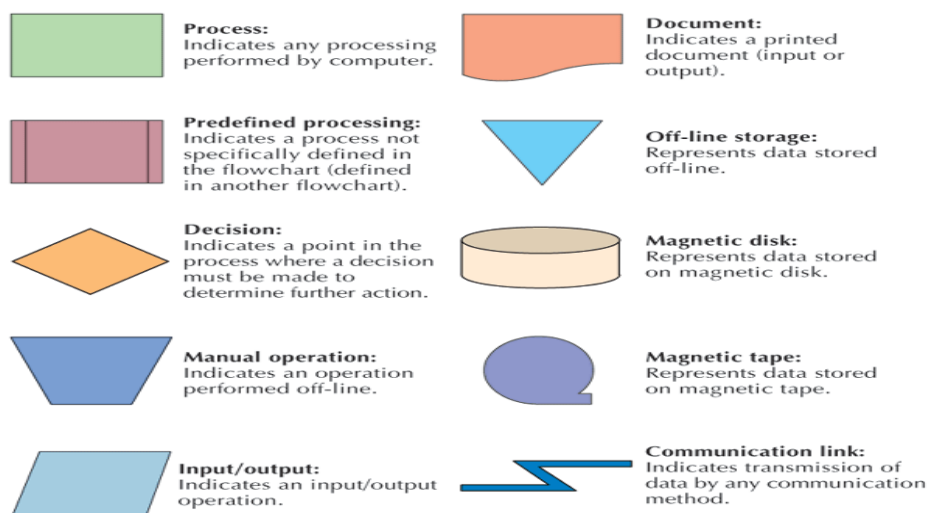
Fig. 19.2: Symbols Used in System Flowcharts

Source: Senn (2004)

Dataflow Diagram (DFD): A chart showing the movement of data through a system.

Levelling: The process of exploding processes in a dataflow diagram to show more detail.
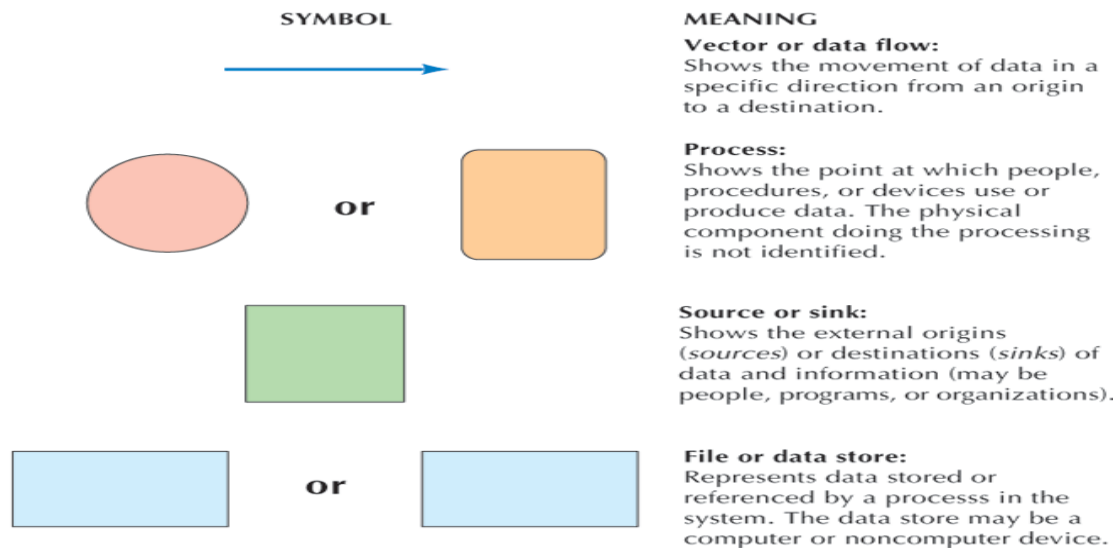
Fig. 19.3: Symbols Used in Dataflow Diagram

Source: Senn (2004)
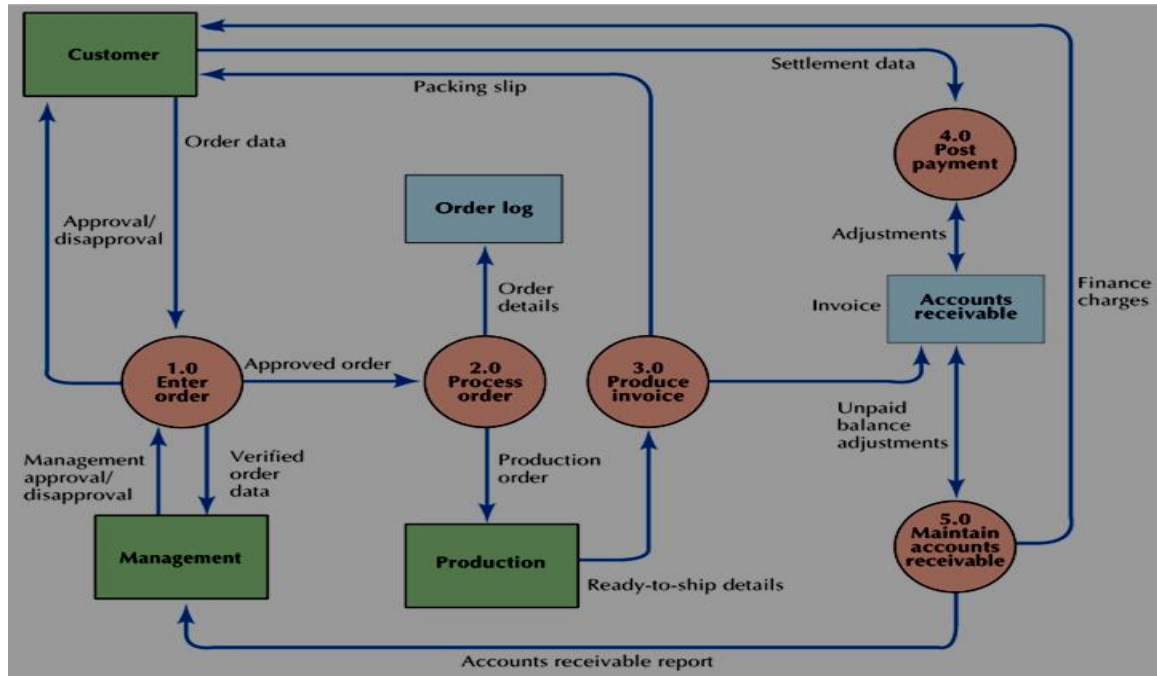
Fig. 19.4: Dataflow Diagram for Order and Invoice Handling at a Mail-Order Company

Source: Senn (2004)

Data Dictionary/Repository: A catalog that lists and describes all the types of data flowing through a system. Composed of data elements and a data structure.

Data Element: The component of a data dictionary that includes data names, alternate names, and length allowances.

Data Structure: The set of data elements used together and the name that collectively identifies the set.

3.3 Computer-Aided Systems Engineering (CASE)

Computer-Aided Systems Engineering/Computer-Aided Software Engineering (CASE*): is a set of tools used in systems development to improve the consistency and quality of the system while automating many of the most tedious and time-consuming systems tasks. The set of tools are the following:

*   charting and diagramming tools

*   centralised information repository

*   interface generators

*   code generators

*   project management tools.
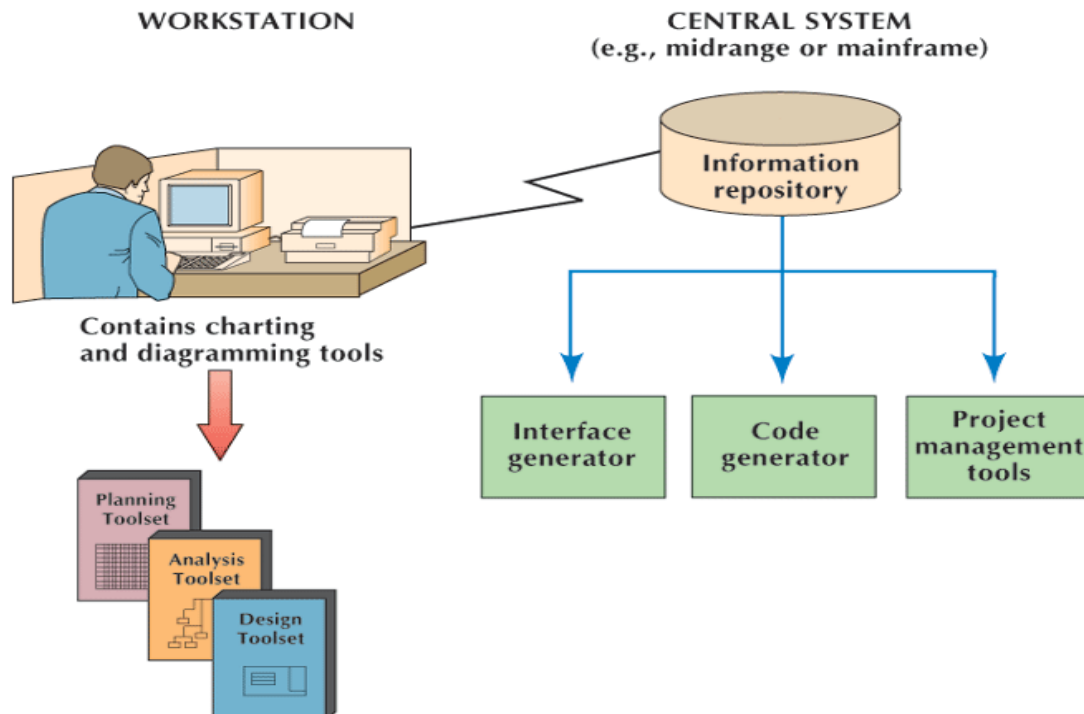
Fig. 19.5: CASE Tools Diagram

Source: Senn (2004)

Types of CASE Tools

Front-End CASE Tool: A CASE tool that automates the early (front-end) activities in systems development.

Back-End CASE Tool: A CASE tool that automates the later (back-end) activities in systems development.

Integrated CASE (I-CASE) Tool: It ia a CASE tool that automates the entire activities in the systems development life cycle.
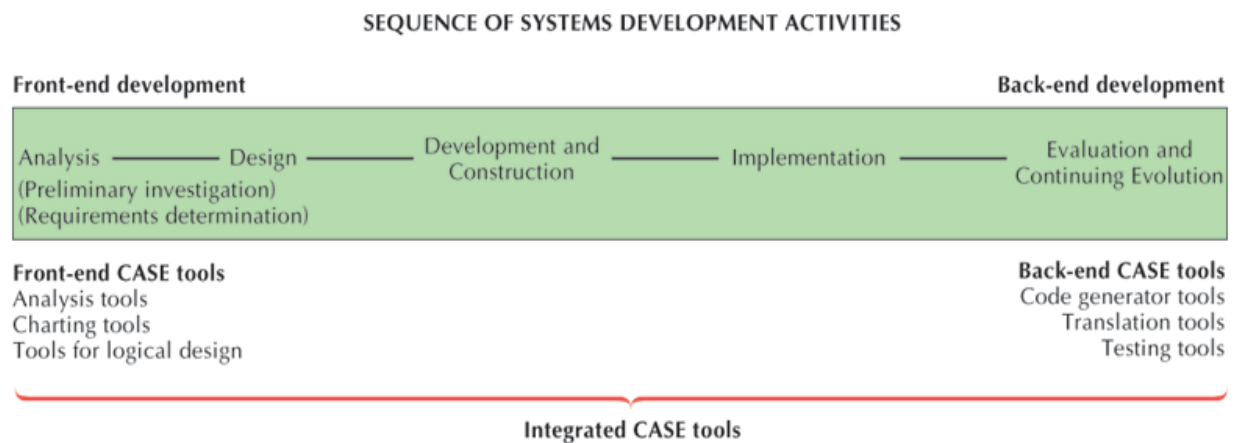
Fig. 19.6: Types of CASE Tools

Source: Senn (2004)

3.4 Unified Modelling Language (UML)

Unified Modelling Language (UML) is a standard method/technique for visualising, describing, and documenting the details of an IT application. It is used more extensively in industries to assist in systems analysis. The following are some unified modelling language:

Actor: Anyone or anything that will interact with the application.

Activity Diagram: Shows the flow of control in an application.
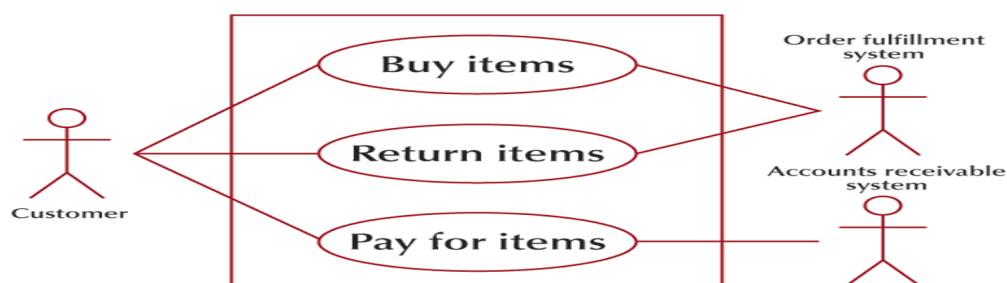
Fig. 19.7: Actors in Mail Order Use CASE

Source: Senn (2004)

Use Case Diagram: Provides context for the system, illustrating the actors, the use cases, and the flow or interaction between use cases and actors.Use Case identifies the sequence of activities performed for an actor.

Use Case Description: Describes the use case in ordinary language, including its identifying name and actors.

Customer transaction
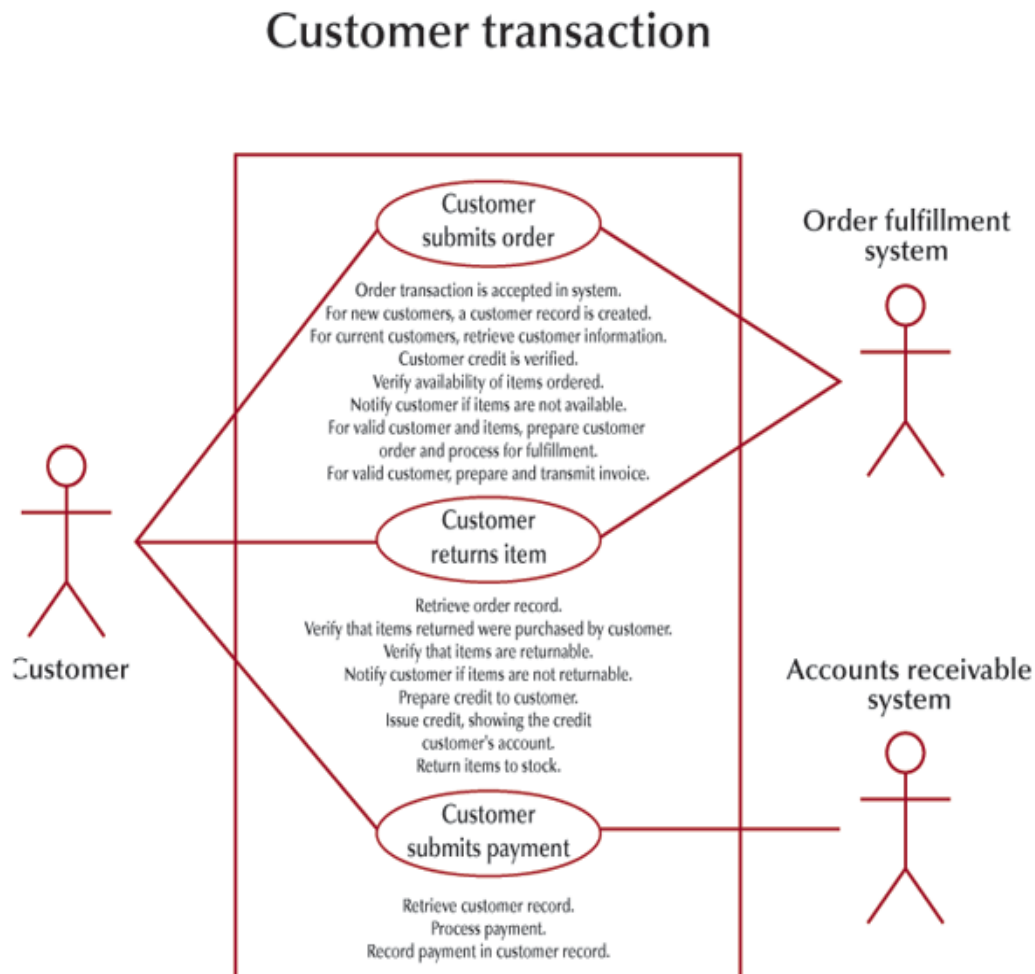
Fig. 19.8: Use CASE Description

Source: Senn (2004)

Class Diagram: Describes an object class, including the class name, attributes, and methods.

Other UML Diagrams

1. Sequence Diagram

2. State Transition Diagram

3. Component Diagram
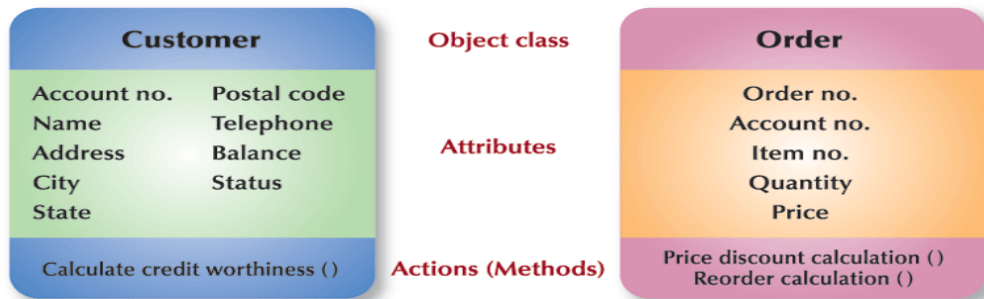
Fig. 19.9: Class Descriptions for Customer and Order Objects

Source: Senn (2004)

4.0 Conclusion

When creating an enterprise application, it is the responsibilities of the system analyst to use the required tools and techniques to make the software system to perform on different computer and communications hardware.

5.0 Summary

In this unit, you learnt that the system analyst uses the tools of computer-aided systems engineering/computer-aided software engineering (CASE) and unified modelling language (UML); and the techniques of interviews, questionnaire, document examination/record inspection, observation, sampling and dataflow diagram (DFD) to make an IT application accessible to end-users in an organisation.

6.0 Self-Assessment Exercise

1. In a DFD chart what does the arrow stand for?

2. What are the data collection techniques the system analyst uses?

3. State the two basic tools the system analyst uses when creating an ICT project.

4. What are the two types of interview conducted by a system analyst during analysis?

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

O'Leary, T.J. & O'Leary, L. I. (2004). *Computing Today.* New York, US: McGraw-Hill.

Senn, J. A. (2004). *Information Technology: Principles, Practices, Opportunities.* (3rd ed.). New Jersey, US: Pearson Prentice Hall.

Unit 2 Project Management

1.0 Introduction

In unit 1 of this module, you learnt about the tools used to make an ICT application available to end-users for easy sharing of resources. This unit will introduce you to the process involved in managing an IT project, from starting to completion.

2.0 Objectives

At the end of this unit, you should be able to:

- break a complex project into manageable sub-projects

- develop tasks schedule and assign owners to each task

- set reasonable milestones for the completion of major tasks

- develop and complete a project plan.

3.0 Main Content

Project management is the art of matching available resources (time, money and material) against the project's goals. To accomplish a goal one need time, money, and materials (human and machinery). One can think of a project as a process that involves inputs and outputs. Successful projects require doing the right things, with the right tools, and in the right way.

INPUTS

- **Goals**

- **Team Staff**

- **.N**

- **Time**

- **Equipment**

PROJECTS

OUTPUTS

- **Deliverables**

Fig. 20.1: Simple Project Management System

Source: Mitopencourseware (2008)

3.1 Managing a Project

3.1.1 Stages of a Project and how to complete them

Stage 1: Defining the Goals of the Project

Starting a project with the correct goal(s) definition makes it easy to accomplish the goal(s). This must be a team activity to ensure that everyone is given the opportunity to contribute and "buy-in" to what is going to happen. At the end of this stage, every team member should have an understanding of what must be accomplished.

This part of the project should end with a document that lists the goals with a short statement providing some detail about the success rate and a vital few requirements that define the goal(s) to be accomplished. It also prevents teams from performing unnecessary iteration and improvement on a goal(s) which has been sufficiently accomplished.

Stage 2: Define Project Tasks/Activities

Each goal or sub-set of goals should be matched to the tasks required to accomplish them. This is best done by listing the goals on the left side of a sheet of paper, then writing the tasks on the right. The **group** should agree that the specify tasks will accomplish the goals as specified in the definition of goals by the team.

Stage 3: Determine and Verify Resource Requirements

Resources are those things which are needed to accomplish the project goals. Resources may include, but are not limited to:

- people

- time

- money

- space

- computers

- software.

The most important component of determining resource requirements is to be realistic. One of the most common mistakes project managers make is to underestimate the amount and type of resources required. This leads to projects that run over budget and fall behind schedule. DO NOT attempt to do any of the following:

- squeeze a project into a shorter time frame to please your boss

- cut corners to minimise resource requirements

- plan on a best-case basis, i.e. "If everything goes correctly, we will finish on time."

Determine what you need to get the job done correctly, on time, and on budget. It is not a bad idea to build in a safety margin here. This is often referred to as "padding". For instance, one might increase the estimated time to complete a task/project by say 20% to allow for additional time to deal with unexpected occurrences. The amount of "padding" usually depends on the certainty one has as to how effectively the resources can be used. One should keep padding to a minimum.

Once the requirements have been set, it is important to verify that the team will have access to them.

Stage 4: Identify Risks and Develop Mitigation (Backup) Plans

Projects always involve a finite amount of uncertainty (risk) that may lead to problems and surprises during the project. Dealing with surprises requires more time, energy, and money than originally planned. Risk management can help reduce the likelihood and effects of risks. Risk management is important as it helps the team accomplish the project with as little trouble as possible.

As a professional scientist, engineer, or project manager, you will be required to help get the job done. Excuses (whether real or imaginary) generally do not buy any sympathy. For instance, in the event of a surprise problem which causes project delays, it is all too easy to deflect responsibility with victim phrases such as, "I did my part, but the other guy did not." or "We had an unexpected problem which caused us to fall behind schedule." Managers, professors, CEOs typically do not look favourably on people who invoke victim phrases. As a result, people who fall back on these types of phrases, even if they are true, typically do not go far in this world. You must learn how to deal with surprises and adversity, not be pushed around by them.

By becoming a member of a team, each member dedicates themselves to the success of the team. If you are waiting on a team member to accomplish a task and they are behind, it is your responsibility to help them in any way you can. If you cannot help them, you must make sure they get the help to accomplish their task. The victim phrase does not absolve you of any responsibility; rather it makes you look like you are not a team player.

Risk management can be a complex process, for our purposes. You may want to pay special attention to risks that are so great, that they could "kill" the whole project. A member of the group should be responsible for monitoring this risk throughout the project.

Stage 5: Develop a Schedule

A schedule is the arrangement of tasks, people responsible for these tasks, and a time line for a project. **Pert and Gant charts** are examples of useful tools used in scheduling activities. They allow the team to look at the architecture (structure) of the project and easily identify responsibilities. The charts can serve as a document that people use in their planning as a visualisation tool to see how tasks depend on each other.

The basic format of a Gant chart consists of a listing of tasks on the left hand side, followed by the start date, number of days to complete, and a finish date. Each task should be assigned one or more owners. To the right of the text listing is a graphical representation of the task duration in the context of the project time line.

After the chart is made, look for conflicts of resources. For instance, make sure that team members are not assigned too many tasks during a given time period. For instance, in the schedule below, Lisa appears to be busier than her team mates on July 2nd and 3rd. Also make sure that different tasks which require the same machines or rooms are not scheduled for use at the same time. Make the changes and obtain agreement from the group that this is the schedule that is to be followed. It might be wise to review the risks during this time and adjust parts of the schedule if it would help.

#	Task	Start	Days	Finish	Owner(s)	M 25-Jun	T 26-Jun	W 27-Jun	R 28-Jun	F 29-Jun	Sa 30-Jun	Su 01-Jul	M 02-Jul	T 03-Jul	W 04-Jul	R 05-Jul	F 06-Jul
1	Research	25-Jun	2	26-Jun	Mike	█	█										
2	Design	26-Jun	3	28-Jun	Bill		█	█	█								
3	Build	28-Jun	5	2-Jul	Joan				█	█	█	█	█				
4	Test	3-Jul	2	4-Jul	Tina & Lisa									█	█		
5	Document	25-Jun	12	6-Jul	Lisa	█	█	█	█	█	█	█	█	█	█	█	█
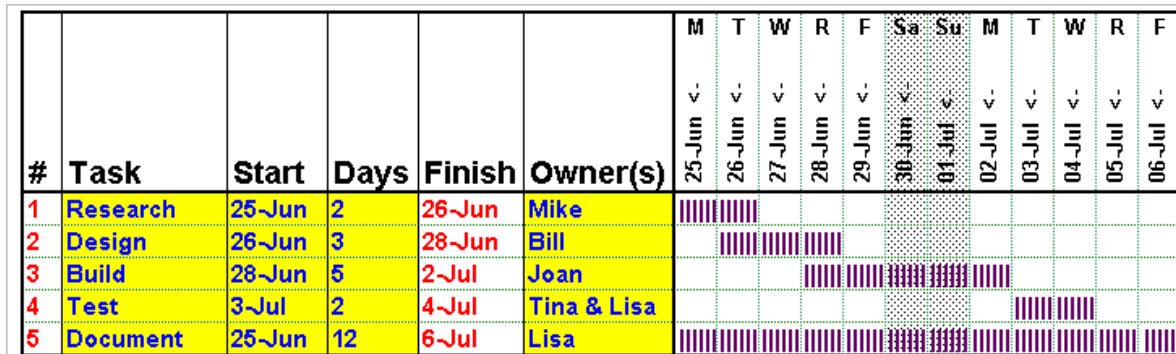
Fig. 20.2: **Gant Chart**

Source: Mitopencourseware (2008)

Microsoft project is also a project management tool. Project management usually follow the system development life cycle (SDLC) phases as discussed in unit 6 of module 3.

Stage 6: Execute the Schedule

Every team member should know what they have to do and should have the right resources to get the job done. They should know what the risks are and have back up plans in case of trouble. During this stage, the project manager is responsible for coordinating, though group members should communicate among themselves as required. If a group member feels he is going to go over time or budget, it is their responsibility to bring it up to the group as soon as possible. This way, resources can temporarily be shifted to help keep the team member on schedule.

Each group member should document their activities. This is important as human memory is shaky at best and it is likely that each team member will be required to recall details of their activity. There is nothing more frustrating to a manager than to hear an employee say, "I can't remember what I did." If one can't remember, how can the team trust that what they did was correct? Documentation is the responsibility of the team members and will often be a saving grace for them.

It is likely that surprises and conflicts may occur during the course of the project. It is important to remember that it is the team's responsibility to make the project happen. If there are problems, the team should help figure them out. If there are conflicts, the team should act together to resolve them. This can be facilitated by regular meetings (daily, weekly, monthly, e.t.c.) of the team. At the meetings the team should review the schedule and the status (complete or not complete) of the project goals. Once the goals are accomplished, the project is completed.

Stage 7: Finish the Project and Assessing Performance

After the goals have been achieved, it is a good practice to evaluate the performance of the project team. This is where a good deal of learning and experience is gained. It will help prevent similar problems in future projects.

4.0 Conclusion

Project management provides the basic skills and knowledge needed to effectively manage a group project through project scheduling, understanding and handling risk. Project management can be managed by either an IT staff or a specialist with management skills or by software (Microsoft project).

5.0 Summary

In this unit, you learnt that:

- project management is a team work

- responsibilities should be shared among team members

- project managers are expected to schedule, plan, and control project resources

- pert charts and Gant charts are tools used in scheduling activities

- having a vision, setting a goal and working towards achieving it reduces missing target.

6.0 Self-Assessment Exercise

1. In the project management steps, which step is the most important? And why?

2. Why do you need a back-up plan(s) in project management?

3. What do you consider to be the basic inputs in a project?

4. What are those things to avoid in planning a project?

7.0 References/Further Reading

Massachusetts Institute of Technology, MITOPENCOURSEWARE. (2008). Retrieved August, 2009, from http://ocw.mit.edu/courses/electrical-engineering-and-computer-science

Smith, J. (2009). *Jan's Web Work and Experiments*. Retrieved August 15, 2009, from http://www.jegsworks.com.

Retrieved August 8, 2009, from http://www.webopedia.org

Retrieved August 8, 2009, from whttp://www.wikipedia.org

Unit 3 Web-Based Applications

1.0 Introduction

In unit 4 of module 3, you learnt about the WWW, in unit 1 of this module, you were introduced to how applications are made open to users at the enterprise level. This unit will introduce you to how an emerging trend, however, it is to free users from owning and storing applications by using Web-based applications.

2.0 Objectives

At the end of this unit, you should be able to:

- distinguish between the purposes of XML in Web-enabled applications

- identify the six advantages of XML

- explain the potential benefit of Web services to enterprises IT applications

- identify how Web-based applications work.

3.0 Main Content

Application Service Provider (ASPS)

Special Websites, called Application Service Providers (ASPs), allow access to their application programs. To use one of these Web-based applications, you would connect to the ASP, copy the application program to your computer system's memory, and then run the application. Most ASPs provide access to a wide range of application programs and charge a fee for their services.

3.1 How Web-Based Applications Work

Step 1: Connect

The user connects to a Website known as application service provider (ASP). While some ASPs are free, most charge a fee to access and to use their applications. These applications may be general purpose application such as Microsoft Office application or specialised applications such as Web authoring programs. The user then requests a specific application to use.

Step 2: Download

The application service provider downloads or sends a copy of all or part of the requested application to the user. This copy is stored unto the user's hard disk drive and is ready to be run. The copy will remain their either for a specific period of time or until the user runs and then exits the program.

Step 3: Run

The user runs the application form his hard disk drive. For example a user might download Microsoft Word document and use it to create a document.

Step 4: Save and Exit

When the user has completed work with the application, the created files can be saved on the user's computer system and/or at the ASP. The user then exits the application program.

Step 5: Remove Application

Once the user has exited the program, the program is automatically erased from his/her hard disk and is not available to be run again. If the user wants to run the program again he/she must start again with step 1.

3.2 Procedures for Using Web-Based Applications

Registration: several ASP sites exist on the Web and some of their services are free. One of the best known sites is WebOS. Its only requirement is that you register for its services.

Accessing Applications; each time you connect to the WebOS site and log in, your Web-based desktop will appear. It will display numerous icons that can be used to access Web-based applications. These include notes, personal information manager, calendar, and a variety of games.

Web-Based Desktop: the Web-based desktop looks and operates like the traditional windows desktop. It consist of a variety of icons that are used to load and run applications.

3.3 Forces behind Web-Enabled Systems

Web-enablement is the tendency of systems developers to incorporate features of the Internet in enterprise systems. Factors that encourage Web enablement are as follows:

Widespread Use of Browsers

- New computers shipped with Web browsers

- Large installed base of browser users

- Browsers appearing on other IT devices

Flexibility

Plug-ins: Software programs that extend the capabilities of your Internet browser, giving it added features.

Universal front-end application

Legacy System

Legacy System: Refers to many mainframe, midrange, client/server or PC applications that are used to manage business functions.

Interconnected Enterprises

Interoperability: The perfect exchange of data and information in all forms (data, text, sound, and image, including animation) between the individual components of an application (hardware, software, and network).

Heterogeneous Applications: May be written in different programming languages, run on different types of computers, and use varying communications networks and transmission methods.

3.3.1 Extensible Mark-Up Language (XML)

Developers can design their own customised mark-up languages for describing data.

Structure of XML

```
<?xml version="1.0"?>
 <reservations>
  <flight number="DL56">
   <date>"10122004"</date>
   <origin>Tokyo</origin>
   <destination>Atlanta</destination>
   <passenger>Migel Gutierrez</passenger>
   <frequent flier>"3116545682"</frequent flier>
   <ticket class>first class</ticket class>
   <seat assignment>4F</seat assignment>
  </flight number>
 </reservations>
```

Fig. 21.1: Sample XML Code for Airline flight Reservation

Source: Senn (2004)

Advantages of XML

- Web-based

- Extensible

- Computer and software platform independent

- Facilitates end-to-end application integration

- A public, license-free standard

- Has widespread vendor support

Document Type Definition (DTD)

This defines the vocabulary (or standard) to make the data easily understandable and useable.
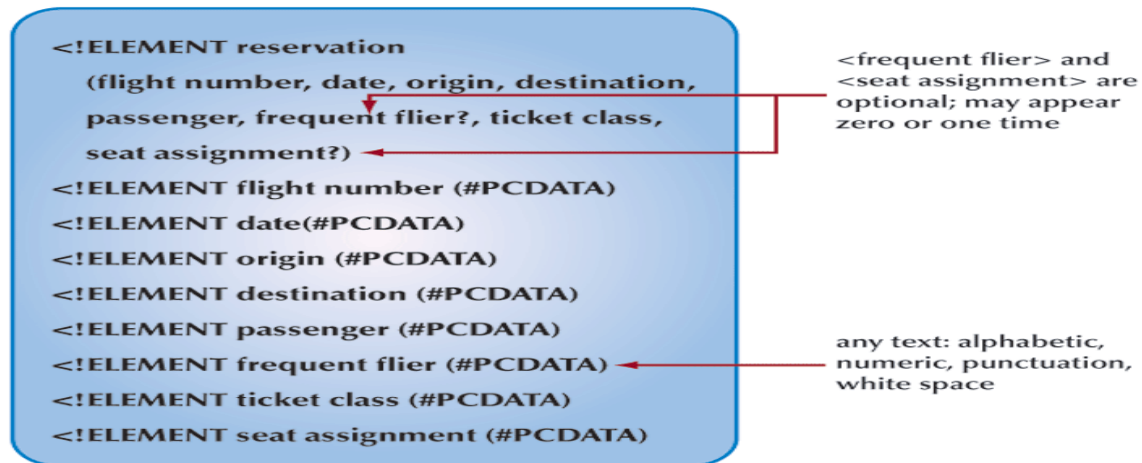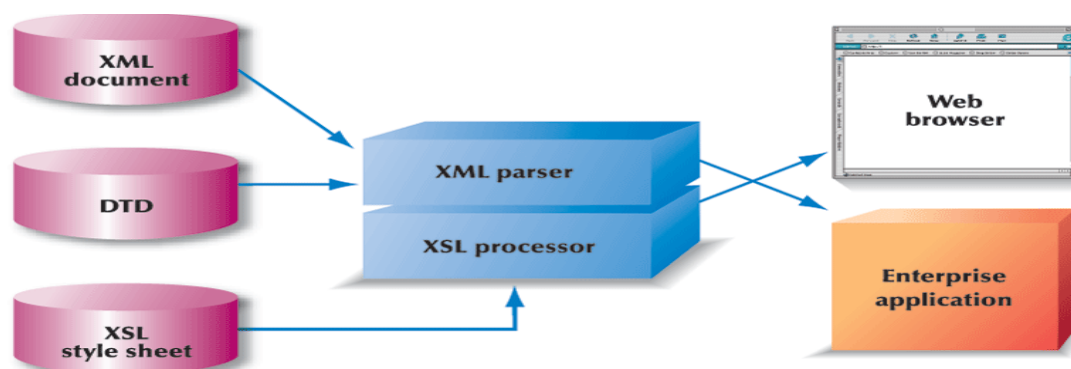

Fig. 21.2: Sample Document Type Definition (DTD)

Source: Senn (2004)

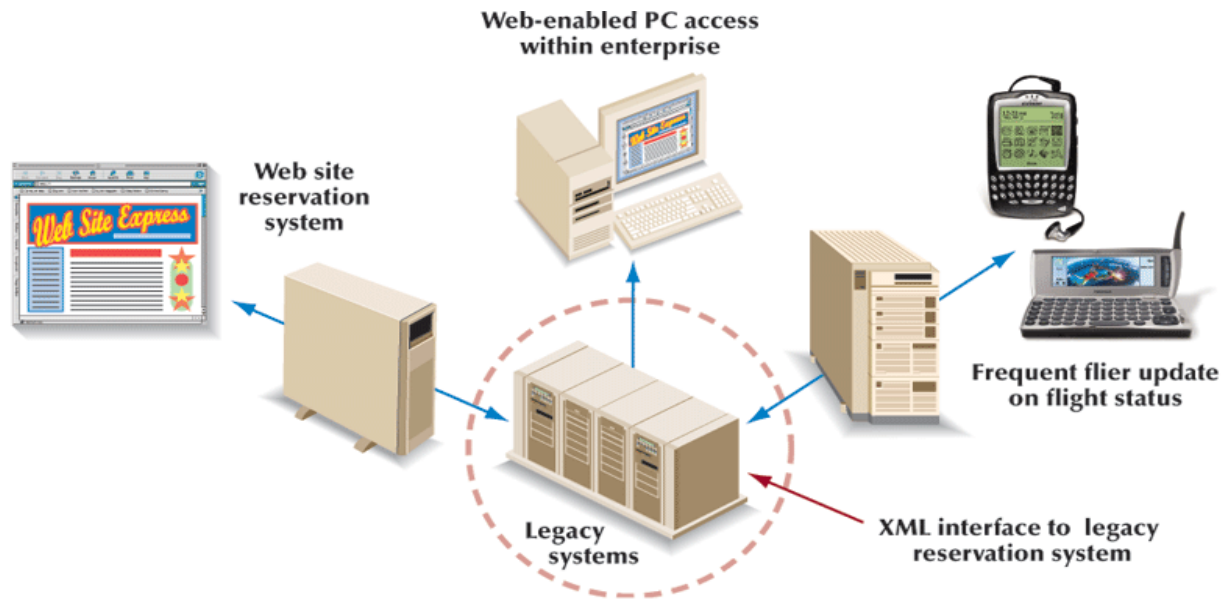## Presentation Using XML Style Sheets

XML style sheet language (XSL) is created by developers or publishers of XML data to manage the display and presentation of information in a document.

Processing XML

Fig. 21.3: Processing of XML Components

Source: Senn (2004)

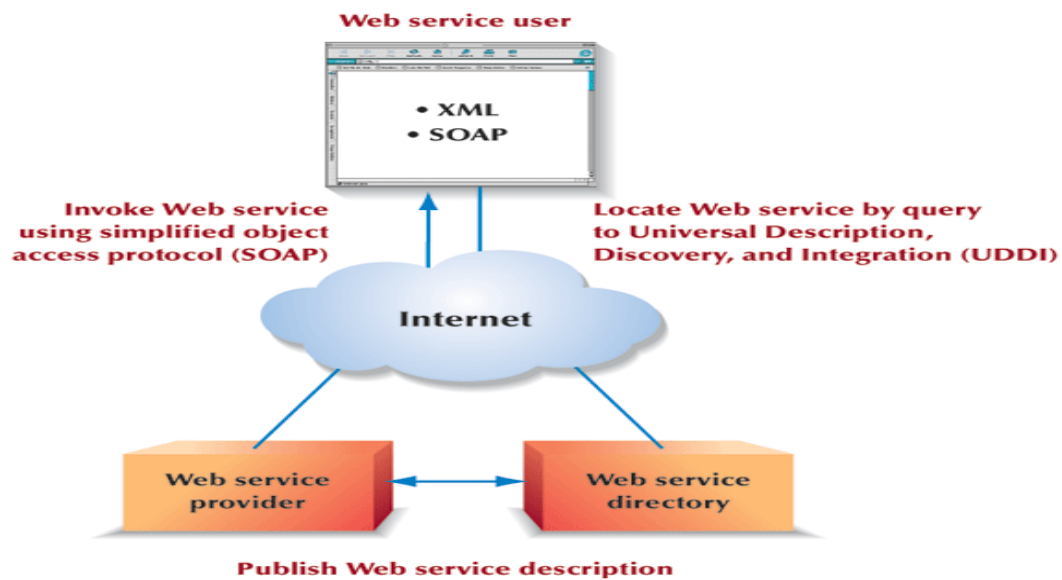**Fig. 21.4: XML Interface for Web-Enabled Legacy System**

Source: Senn (2004)

3.3.2 Web Services

Web services are modular Internet applications that perform a very specific function or task.

Simplified Object Access Protocol (SOAP): The protocol used by an application to invoke a Web service located on another computer.

Fig. 21.5: Interplay between Web Services Participants

Source: Senn (2004)

Web Services Description Language (WSDL): Describes the capabilities offered by a specific Web service as well as the protocols and formats the service uses.
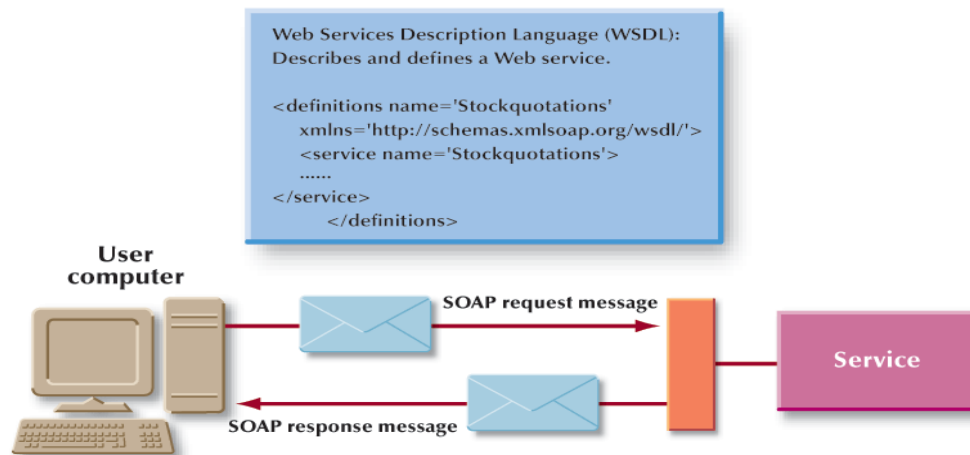
Fig. 21.6: Web Services Description Language (WSDL)

Source: Senn (2004)

Universal Description, Discovery, and Integration (UDDI): A worldwide directory for registering, finding, and using Web services.

      a.   Yellow Pages: Describe the services offered by UDDI.

      b.   Green Pages: Describe how an application can use the Web services.
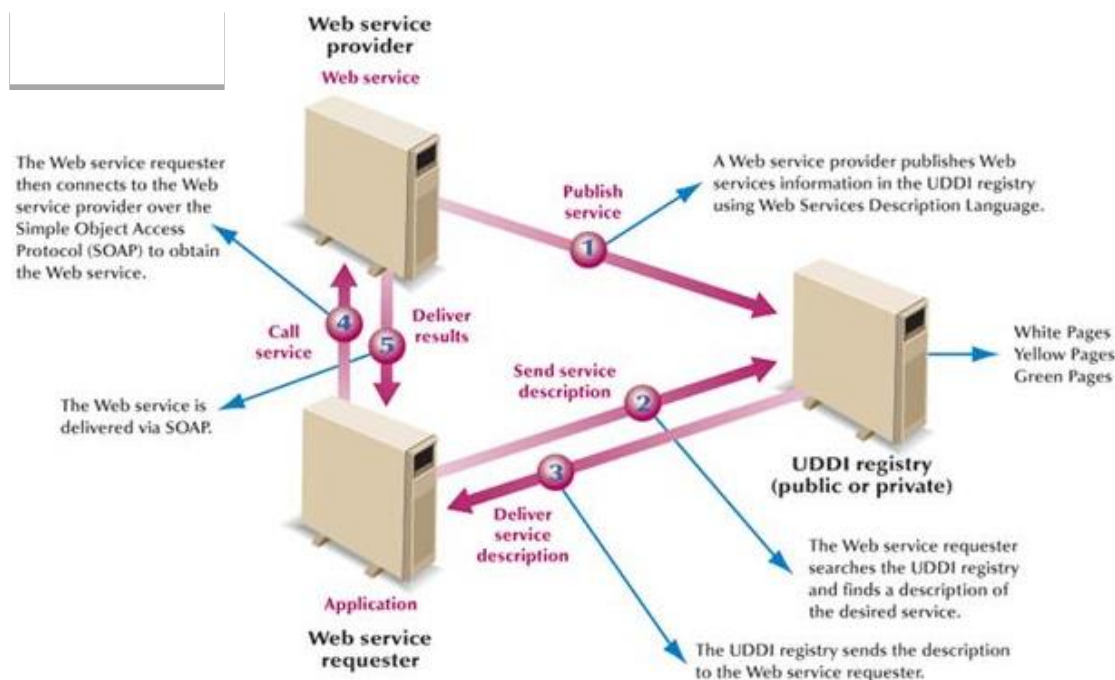
Fig. 21.7: Universal Description, Discovery, and Integration (UDDI)

Source: Senn (2004

Table 21.1: Technologies of Web Services and Principles

S/No.	Technology	Acronym	Function
1	Extensible Mark-up Language	XML	XML is a set of rules for creating tags that describe the layout and content of Web data.
2	Simple Object Access Protocol (sometimes known as Services Oriented Architectural Protocol)	SOAP	Protocol for invoking remote Web services objects using XML
3	Universal Discover, Description and Integration	UDDI	XML-based public directory services that provides information about available Web services
4	Web Service Description Language	WSDI	Protocol that describe the capabilities of a Web service object

Source: Senn (2004)

4.0 Conclusion

Some suggest that Web-based applications may replace traditional application software sometime in the future. They point out that Web-based applications offer advantages beyond universal access to software and to data. One advantage is that user may no longer need to upgrade software on their hard disk when a new version becomes available. One challenge of the Web-based applications relates to privacy and security of personal data stored as an ASP.

5.0 Summary

In this unit you learnt that the concepts of Internet and World Wide Web brought a lot of opportunities, where you can exchange documents and use applications on the fly.

Web-based applications provide solution to the high cost of maintaining software and ICT department of most organisations. One basic challenge relates to privacy and security of personal data stored as an ASP. Therefore, to use Web application you need to register, access the application and the Web-based desktop.

6.0 Self-Assessment Exercise

1. What is the different between Web-based application and personal/enterprise applications?

2. What are heterogeneous applications?

3. What are the basic technologies of Web services and their Principles?

4. What are the advantages of XML?

7.0 References/Further Reading

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Unit 4 Information Systems in the Enterprise

1.0 Introduction

In module 1 you learnt about how data is being processed, module 2 how data is housed, and module 3 how data is distributed. This unit will introduce you to the flow of data in a business organisation to achieve an optimum goal.

2.0 Objectives

At the end of this unit, you should be able to:

- state types of information system and their characteristics

- enumerate generic competitive strategies in business

- discuss the strategic role of IT

- analyse enterprise resource planning system.

3.0 Main Content

Information system *is* a system in which data and information flow from one person or department to another.

3.1 Enterprise Information Systems

Enterprise Information System/Business Information System*:* Used to refer to the family of IT applications that underlies the activities of running and managing a business.

Transaction-Processing System (TPS): A shared business information system that uses a combination of information communication technology and manual procedures to process data and information and to manage transactions.

3.1.1 The Transaction-Processing Sequence and TPS Output and Reports

Action Document: A document designed to trigger a specific action or to signify that a transaction has taken place.

**Detail Report/Transaction Log:** A report describing each processed transaction.

Summary Report: A report that shows the overall results of processing for a period of time or for a batch of transactions and includes a grand total for all listed transactions and the average transaction amount.

Exception Report: A report that lists unusual, erroneous, or unacceptable transactions or results.

Updated Master Data: An adjustment of all records in a system in response to a processed transaction.

Characteristics of TPS

- Processes high volume of similar business transactions.

- Supports multiple users in routine, everyday transactions.

- Use relatively simple procedures to control processing and to ensure accuracy.

- Produces documents and reports.

- Updates files and databases.

-
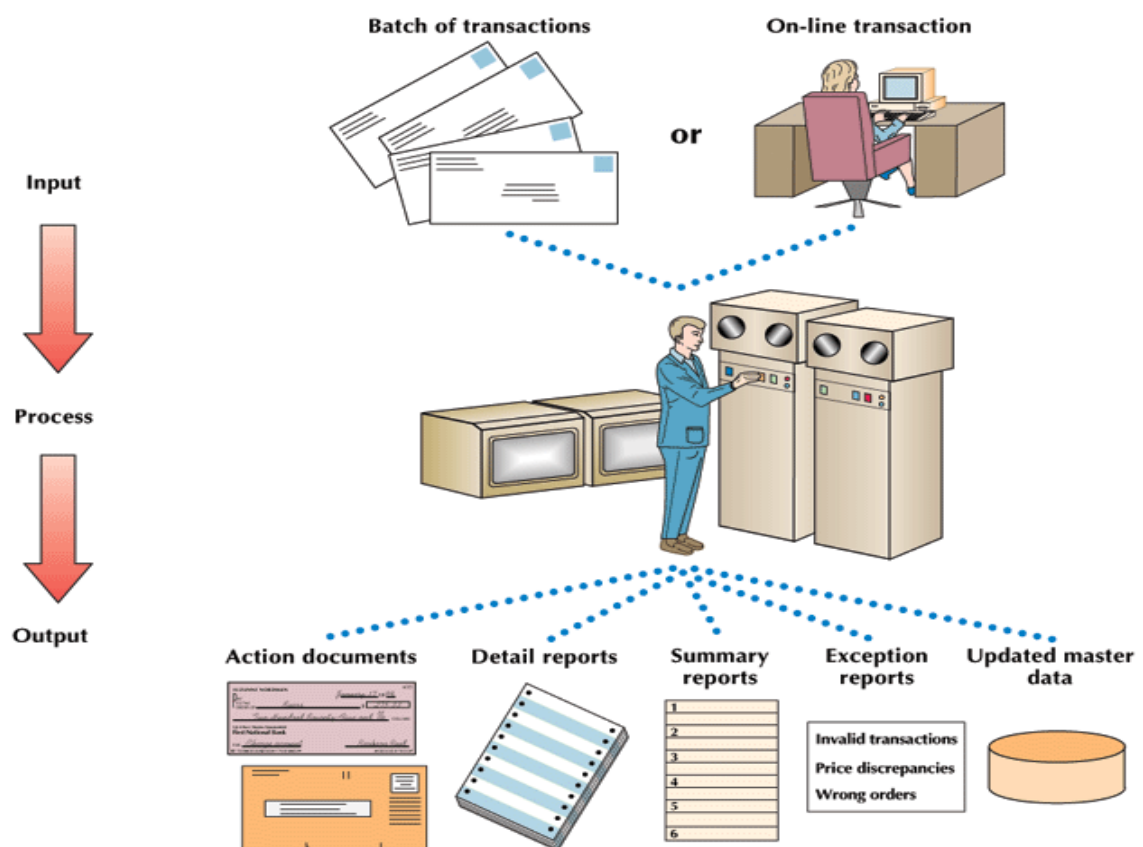
Fig. 22.1: The Transaction-Processing Sequence and TPS Output

Source: Senn (2004)

3.1.2 Management Information System (MIS)

Management report system/management information system is a business information system designed to produce the information needed for successful management of a structured problem, process, department, or business.

Characteristics of MIS

- Uses data captured and stored as a result of transaction processing.

- Reports data and information rather than details of transaction processing.

- Assist managers in situations, evaluating conditions, and determining what actions need to be taken.

- Supports recurring decisions.

- Provides information prespecified reports formats, either in print or on-screen.

3.1.3 Decision Support System (DSS)

A business information system designed to assist in decision making where the decision process is relatively unstructured and only part of the information needed is structured in advance.

Characteristics of DSS

- Assist people who make decisions where information requirements are not known in advance.

- Support problem solving and decision making where the situation is only partly structured.

- Provides information needed to define and solve the problem.

- Works both with files and database, as well as with people working online with the system.

- Provides information in a format determined by the recipient at the time of need.

3.1.4 Group Support System (GSS)

It is a business information system that permits people to process and interpret information as a group, even if they are not working face-to-face.

Characteristics of GSS

- Supports situations that are not fully structured.

- Assists in analysing the problem under consideration.

- It is used by group or team rather than individuals.

- Emphasises communication and generation of ideas and information.

- Permits communication among team members at different locations, who participate through communication networks.

- Involves a facilitator who keeps the group focused on the problem at hand and draws ideas out of group members.

- Generates a database of the group's questions, comments, and ideas rather than a traditional report.
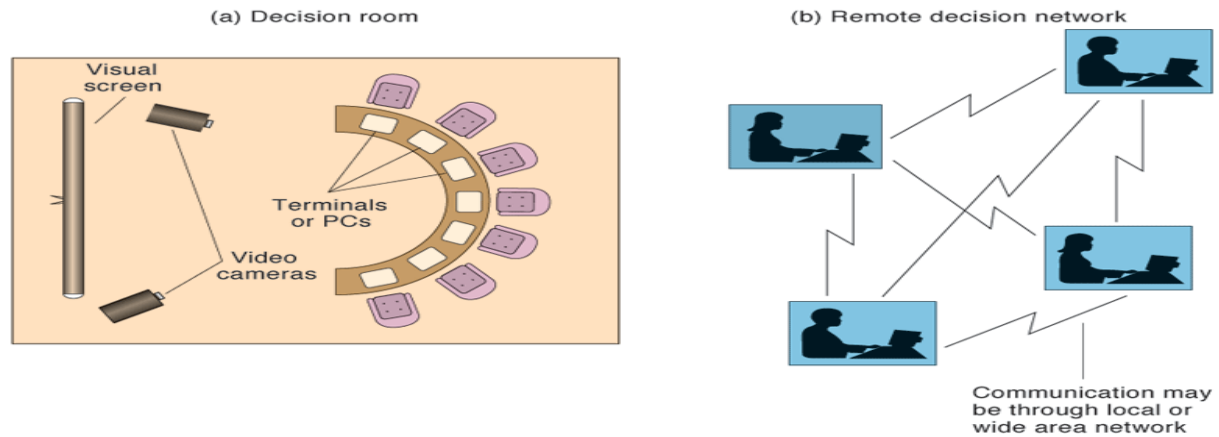
Fig. 22 .2: Group Support System (GSS)

Source: Senn (2004)

3.1.5 Executive Support System (ESS)

Executive Support System (ESS)/Executive Information System (EIS) is an interactive business information system designed to support executives that is capable of presenting summary information on company and industry activities.

Characteristics of ESS

- Offers quick, concise updates of business performance.

- Permits scanning of data and information on both internal activities and the external business environment.

- Highlights significant data and information in summary form.

- Allows the user to access data supporting the summary information.

3.1.6 Expert Support System

Expert support system or expert system *is* a business information system that uses business rules, regulations, and databases to evaluate a situation or determine an appropriate course of action. A database of rules in an expert system is known as rule base/knowledge base.

Characteristics of Expert Support System

- Diagnoses problems and may recommend a cause of action.

- Computes data and applies the expertise of a human specialist to a situation.

29 - downloaded for free as an Open Educational Resource at oer.nou.edu.ng

- Has a limited scope of application.

- Relies on rule base.

- Processes data entered by people interacting with the system as well as details retrieved from other information systems.
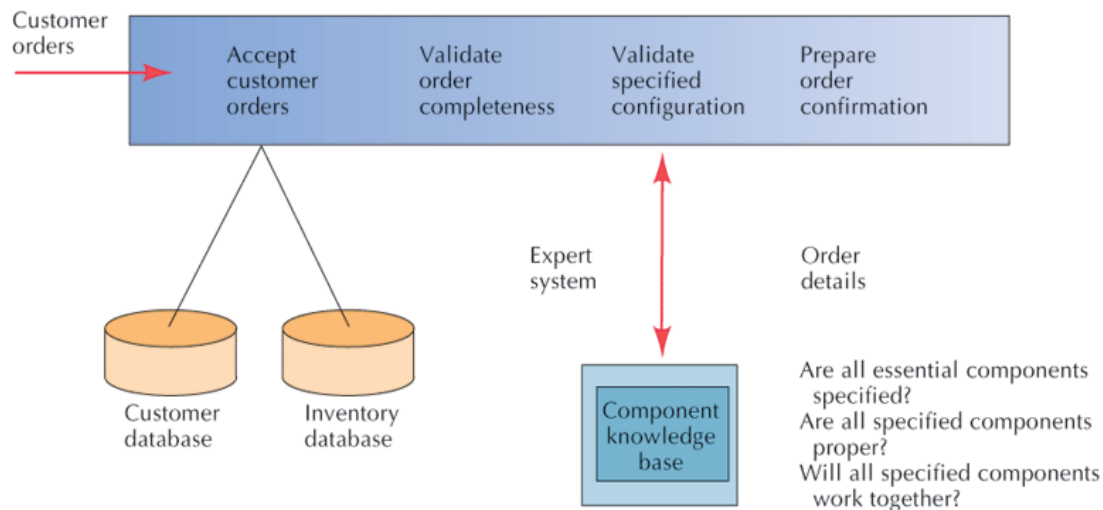
Fig. 22.3: Expert System Embedded in Order Entry Portion of an Auto Manufacturing System
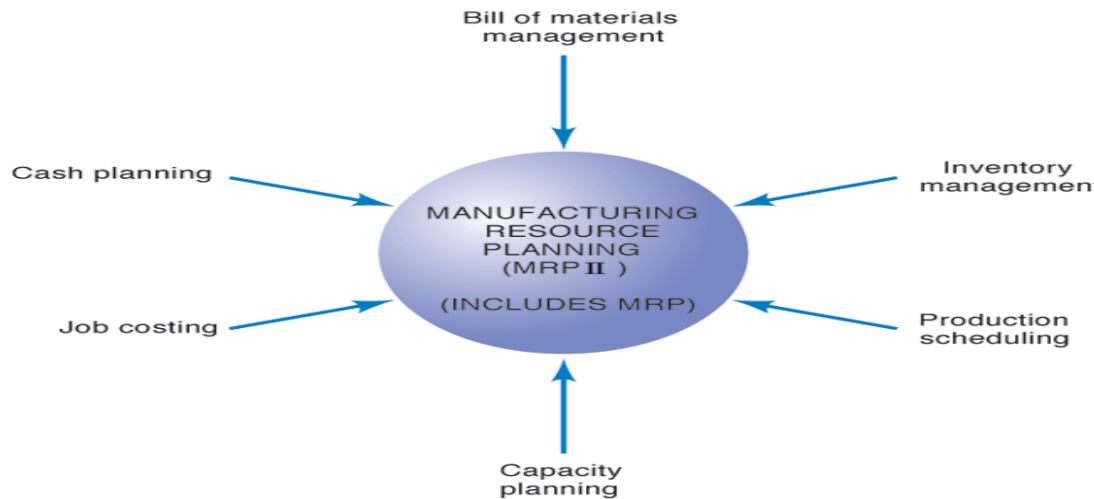
Source: Senn (2004)

3.2   IT for Manufacturing, Automation and Control

Computer-Integrated Manufacturing (CIM): A manufacturing system that uses computers to link automated processes in a factory to reduce design time, increase machine utilisation, shorten the manufacturing cycle, cut inventories, and increase product quality.

Manufacturing Cell: A group of machines working together in computer-integrated manufacturing.

Material Requirements Planning (MRP): A system that tracks the quantity of each part needed to manufacture a product; essentially, an important component of MRP II.

Manufacturing Resource Planning (MRP III): An advanced MRP system that ties together all the parts of an organisation into the company's production activities.

Fig. 22.4: The Components of Manufacturing Resource Planning

Source: Senn (2004)

Computer-Aided Design (CAD): A system that uses a powerful computer graphics workstation to enable product designers and engineers to draw design specifications on a display screen.

Computer-Aided Manufacturing (CAM) System: A system that relies on IT to automate and manage the manufacturing process directly.

Flexible Manufacturing: A manufacturing system that automatically sets up machines for the next job, thus reducing setup time and making smaller job runs feasible.

Concurrent Engineering: A design and manufacturing method in which team members work across their departmental functions to evaluate the activities of many departments and manage the product development process.

Robot: A computer-controlled device that can physically manipulate its surroundings.

Computer Vision System: A system that uses computer sensors to detect shapes, images, and varying levels of detail.

3.3   Enterprise Resource Planning System

It is a large scope, unified application programs that integrates many transaction processing and information systems application features.
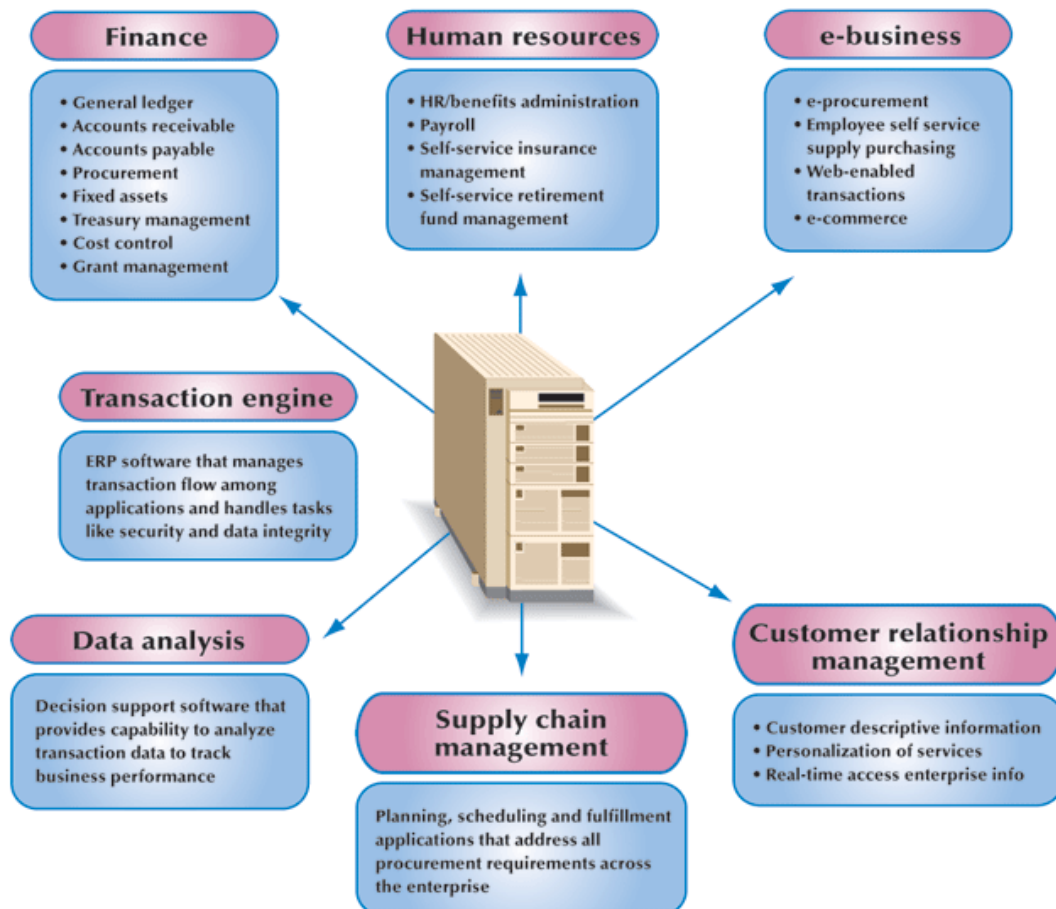
Fig. 22.5: Enterprise Resource Planning System Integrates Functions

Source: Senn (2004)

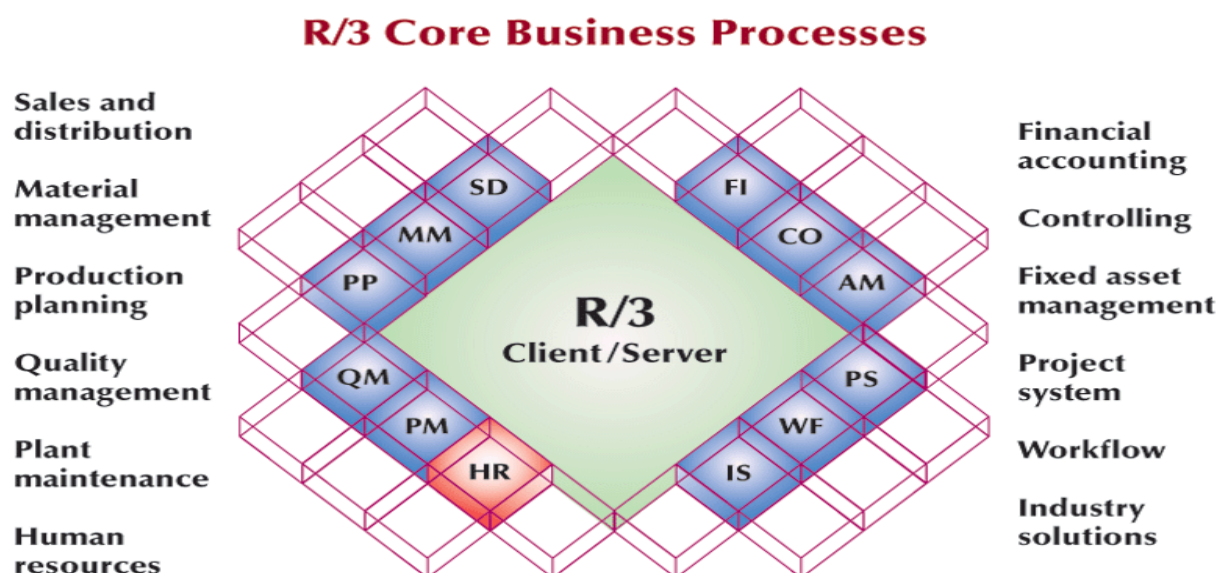**Fig. 22.6: Modular Structure of SAP's R/3 ERP Software**

Source: Senn (2004)

3.4 Strategic Roles of ICT

Strategic Information System: Information technology application that changes the way a firm competes, providing a capability so valuable that it enables the firm to gain a substantial competitive advantage against its competitors.

Competitive Advantage: Occurs when an enterprise has the ability to outperform rivals on a primary performance goal – often profitability – or some other dimension.

3.4.1 Competitive Strategy

The means by which a firm seeks to gain an advantage over its competitors.

Low-Cost Leadership

This strategy offers an enterprise great flexibility in dealing with any suppliers that raise their prices to the firm, as well as buyers seeking to drive down the prices they pay.

Product Differentiation

It is the act of coming up with a product that is perceived by customers as having unique features in comparison to competitive items.

Focus on a Market Niche

Market Niche is a focal point for a product or service; it is a subset of the entire industry or segment of the market.
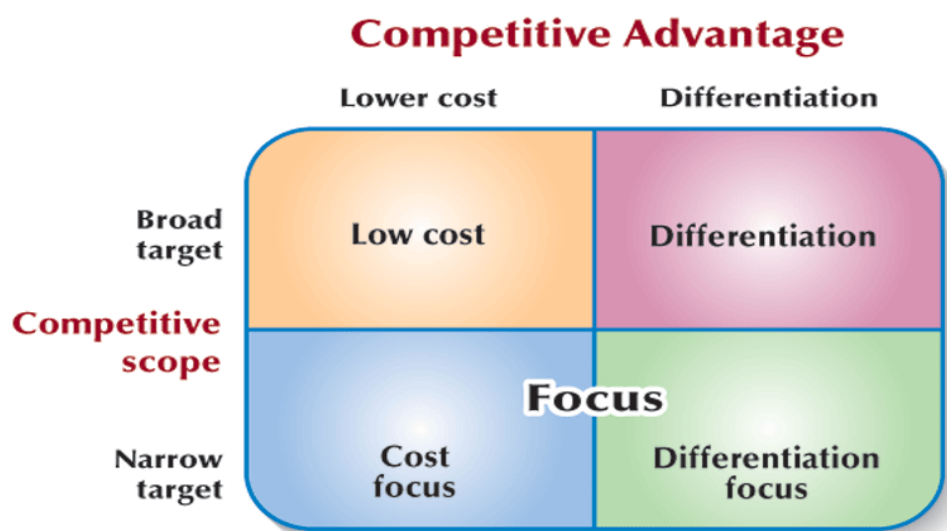
Fig. 22.7: Three Generic Competitive Strategies

Source: Senn (2004)

Table 22.1: Generic Competitive Strategies in Business

| Strategy	Description
Low Cost Leadership	i. Outperform other firms in the industry by providing products or services at a lower cost than competitors while sustaining or exceeding quality and services levels they provide. ii. Provides competitive advantage when dealing with suppliers and buyers, and when offering substitute products or services.
Product Differentiation	i. Provides a product or services that is generally recognised as distinct from competitors. ii. Results in brand loyalty and avoids the necessity to take a low-priced position; also effective in competing against substitutes.
Focus on a Market Niche	i. Identify and compete in a market segment in which competitive advantage may be gained by concentrating on a specific buyer group, product line, or geographical area. ii. Provides advantage of better service to customers, often at lower costs, while producing better customer loyalty.

Source: Senn (2004)

Competitive Forces
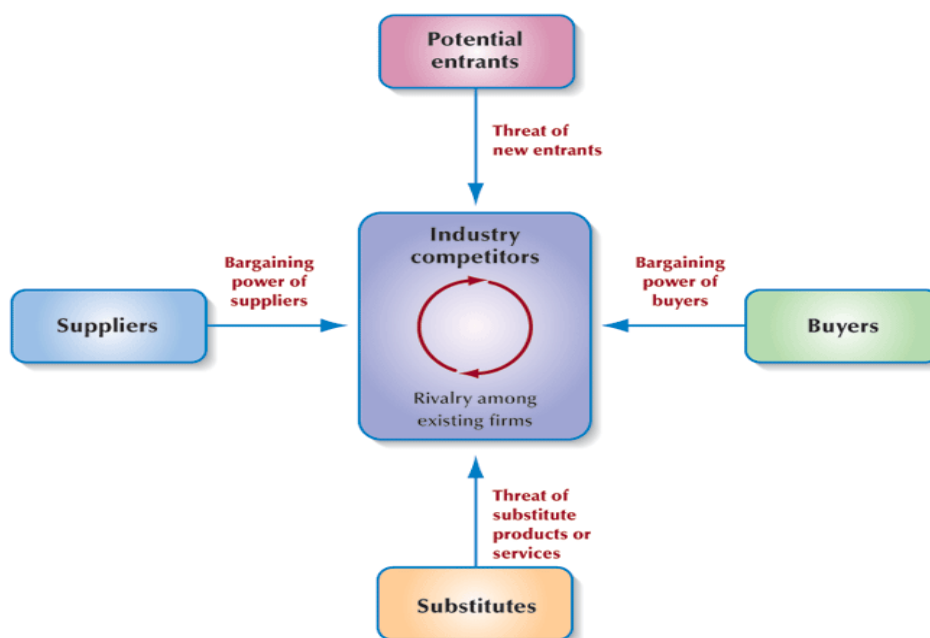
Fig. 22.8: The Five Forces Influencing the Advantage a Firm Can Gain

Source: Senn (2004)

3.4.2 Value Chain

Value Chain is a set of activities that is relevant to understanding the bases of cost and potential sources of differentiation of a firm.

Primary Value-Chain Activities

They are the basic business processes fundamental to any industry. These are:

- inbound logistics

- operations

- outbound logistics

- marketing and sales

- service.

Support Value-Chain Activities

These are those activities that occur to facilitate the primary activities:

a. Procurement.

b. Technology Development.

c. Human Resource Management.

d. Firm Infrastructure.
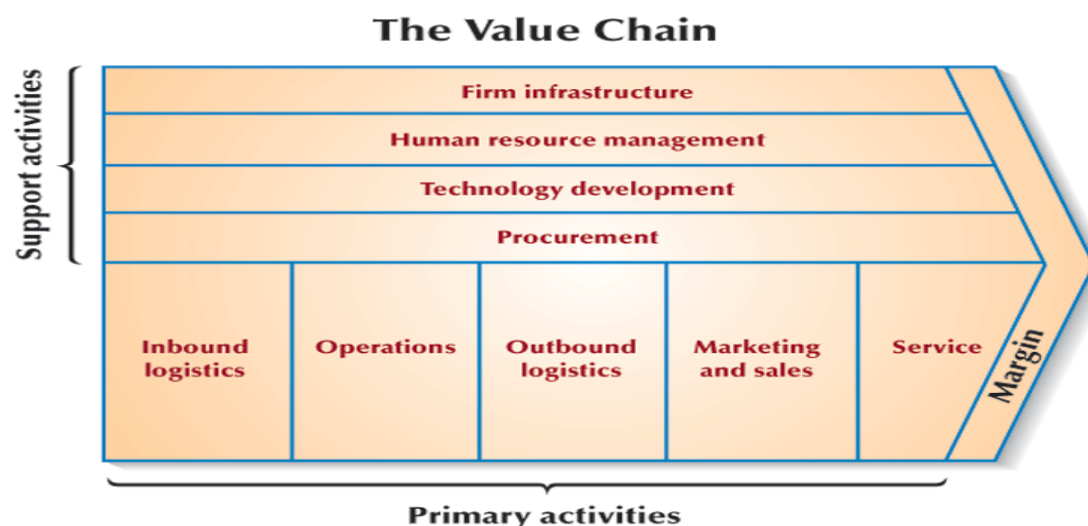
Fig. 22.9: The Value Chain

Source: Senn (2004)

3.5 Creating a Strategic Role for Information Systems

To determine whether information technology can be developed to serve a strategic role, ask the following five questions:

- Can the basis of competition be changed?

- Can barriers to new entrants be built?

- Can switching costs to customers be built?

- Can a firm's power in dealing with suppliers be strengthened?

- Can new products or services be generated?

4.0 Conclusion

Managing a business information system requires providing technical resources and generating the information that the business needs to run effectively and efficiently. This is achieved by making data and information to flow in the organisation through functional areas and between management levels.

5.0 Summary

Shared business information system uses a combination of information communication technology and manual procedures to process data and information and to manage transactions.

It should be noted that business information system permits people to process and interpret information as a group; it allows the use of business rules, regulations, and databases to evaluate a situation or determine an appropriate course of action; it also helps to establish set of activities that are relevant to understanding the bases of cost and potential sources of differentiation of a firm; and to gain an advantage over competitors.

6.0 Self-Assessment Exercise

1. What are the characteristics of the management information systems?

2. What are the technologies used in the manufacturing industry?

3. Define value chain.

4. What are the questions asked when creating a strategic role for an information system

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

O'Leary, T.J. & O'Leary, L. I. (2004). *Computing Today.* New York, US: McGraw-Hill.

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Unit 5 Issues in Information Technology

1.0 Introduction

In all the previous units you learnt about the merits of ICT. This unit will discuss about the demerits and the measures put in place to overcome them.

2.0 Objectives

At the end of this unit, you should be able to:

- identify the types of security breaches, sources of security breaches, and ways to protect a system against intrusion

- enumerate the importance of ethics in the use of information technology

- explain the concern over piracy of digital content

- discuss the reliability of IT systems.

3.0 Main Content

3.1 Security

Security is the means of safeguarding and protecting an enterprise's information technology assets, that is by keeping it from criminals, natural hazards, and other threats, while a breach is a breakdown in security.

Types of Security

- Site Security

- Resource Security

- Network Security

- Service Security

Security Program

The policies and protective measures that will be used, the responsibilities of individuals involved in maintaining security, as well as the responsibilities of those who abide by established security policies.

Harden

This simply means designing a security program to a potential IT target, making the level of effort greater than the value of breaking into a system, network, or facility.

3.1.1 Types of Security Breach

Intrusion: Forced and unauthorised entry into a system.

Interception: It is the capture of data and information transmitted over an enterprise network or other communications link.

3.1.2 Results of Security Breach

- Destruction of Resources

- Corruption of Data and Applications

- Denial of Services

- Theft of Services

- Theft of Resources

Denial-of-Services Attack

Depriving, usually intentionally and temporarily, an enterprise or its users of the services they would normally expect to have, usually involving a network service (such as e-mail) or access to a location on the network (such as a Web site).

Internet Scam

These are fraudulent or deceptive acts or operations designed to trick individuals into spending their time and money with little or no return. Common scams include identity theft, chain letters, auction fraud, vacation prizes, and advance free loans. Almost all Internet scams are carried out through mass e-mails.

Malicious Programs

These are also known as malware (malicious software), examples are viruses, worms, and Trojan horses.

Viruses migrate through networks and operating systems and most attached to programs and databases.

Worms are special viruses that self replicate to slow or stop a computer's operation

Trojan Horses are programs that come into a computer system which disguise as something else. Though not a virus, Trojan horses deposit viruses into unsuspecting computer systems.

3.1.3 Sources of Security Breach

Employees

This is the largest category of computer and enterprise criminals where an employee (insider) who gains access to certain records or files without prior permission in order to tamper (manipulate figures, steal records or damage files).

Identity theft is a loss of personal identity through a security breach.

Computer Viruses

Virus is a hidden program that alters without the user's knowledge, the way a computer operates or that modifies the data and programs stored on the computer.

Hacker and Crackers

Hackers gain access to a system illegally for fun and challenge while crackers do it for malicious purpose.

Organised Crime

These are activities relating to counterfeiting and forgery.

Terrorist

This is someone who conducts a premeditated, politically- motivated attack against information, computer systems, computer programs, and data, which results in violence against non-combatant targets by sub-national groups or clandestine agent. A terrorist usually causes potential crime to satellites and wage economic warfare. Terrorist attack on computer facilities in companies that rely on IT to produce their services is called **cyber terrorism.**

3.1.4 Security Measures

Security involves keeping enterprise hardware, software, data and programs safe. Some measures are encrypting messages, restricting access through passwords and firewalls, anticipating disasters (hot sites are emergency facilities; cold sites are empty shells), backing up data and storing the data in a safe remote location.

The general Security Policies and Procedures are:

- change access passwords frequently

- restrict system use

- limit access to data

- set up physical access controls

- partition responsibilities

- encrypt data

- establish procedural controls

- institute educational programs

- audit system activities

- log all transactions and user activities.

Virus Protection Software/Antivirus

- Norton

- Bit defender

- Kerpersky

- Avast

- Panda

- PC Cillin

Digital Signatures

Digital signature encryption relies on a mathematical coding scheme designed to foil a virus' attempt to attack programs and data.

Encryption
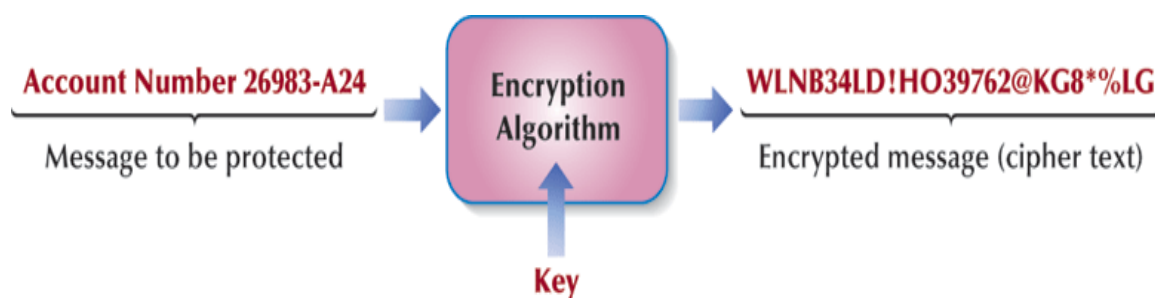
Fig. 23.1: Encryption Procedure for Protecting Data and Messages

Source: (Senn, 2004)

Methods of Encryption

Public Key Infrastructure (PKI): A public key is made available in a directory that all parties can search. Thus a sender wishing to transmit a secured message searches a digital certificate directory to find the recipient's public key, using it to encrypt the message.

Secure Electronic Transaction (SET): An adaptation of public key encryption and the digital certificate (which the industry calls an electronic wallet) for securing financial transactions over the Internet.

Pretty Good Privacy (PGP): A program used to encrypt and decrypt e-mail and to encrypt digital signatures, so that the recipient knows the transmission was not changed along the way.

Virtual Private Network (VPN): A way to use a public telecommunication infrastructure, such as the Internet, to provide secure communication between individuals or client computers at remote locations and an enterprise network.

Virtual Private Network

Tunnelling Protocols: By encrypting data at the sending end and decrypting it at the receiving end, the protocols send the data (and if an enterprise chooses, the originating and receiving network addresses as well) through a tunnel that cannot be entered by data that is not properly encrypted

Firewall

A special-purpose software program located at a network gateway server.

Proxy Server

Act as an intermediary between a PC and the Internet, separating an enterprise network from an outside network.
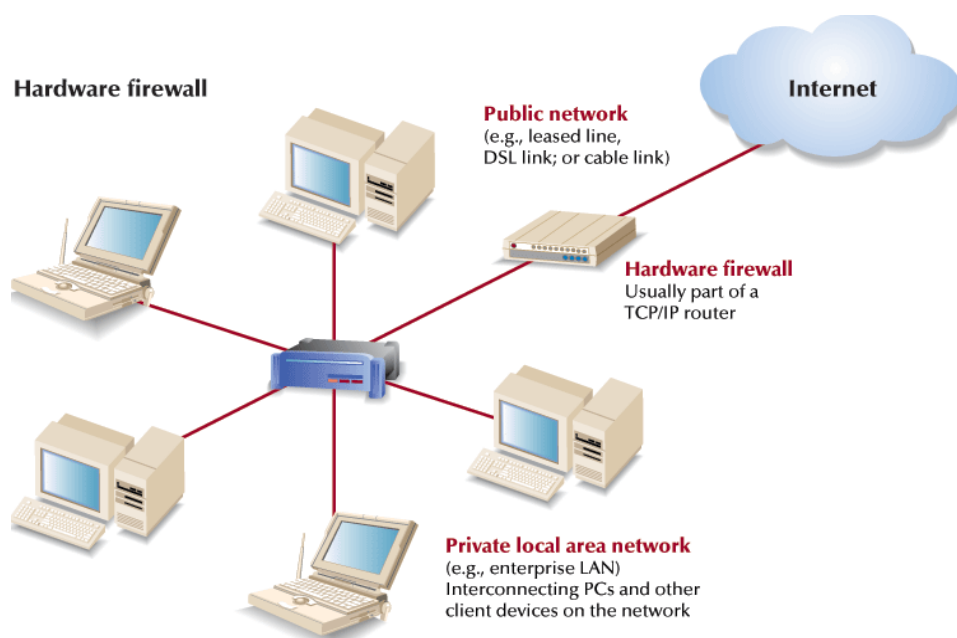
Fig. 23.2: A Hardware Firewall Protecting against Unauthorised Access to a Private Network
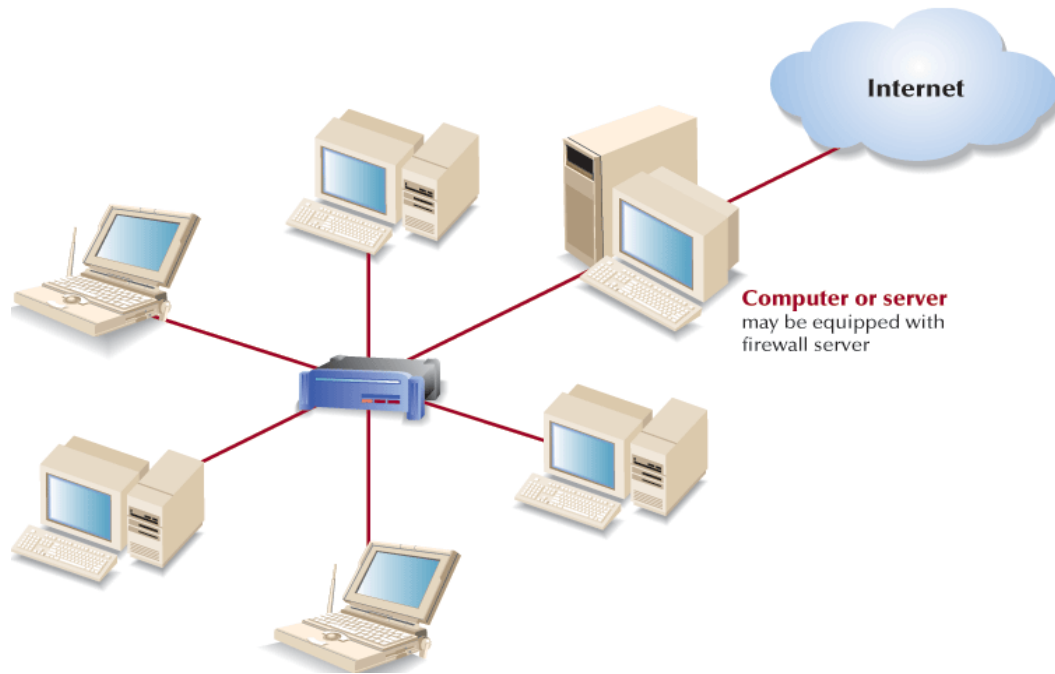
Source: Senn (2004)

Fig. 23.3: A Computer Firewall Protecting against Unauthorised Access to a Private Network

Source: Senn (2004)

Fig. 23.4: An overview of a Firewall Protecting against Unauthorised Access to a Private Network

Source: Senn (2004)

Fig. 23.5: Proxy Servers

Source: Senn (2004)

3.2 Reliability

Reliability is the assurance that computers and communications systems will do what they ought to do at the expected time.

3.2.1 Ensuring IT Service Reliability

Fault-tolerant Computer: A computer designed with duplicate components to ensure reliability.

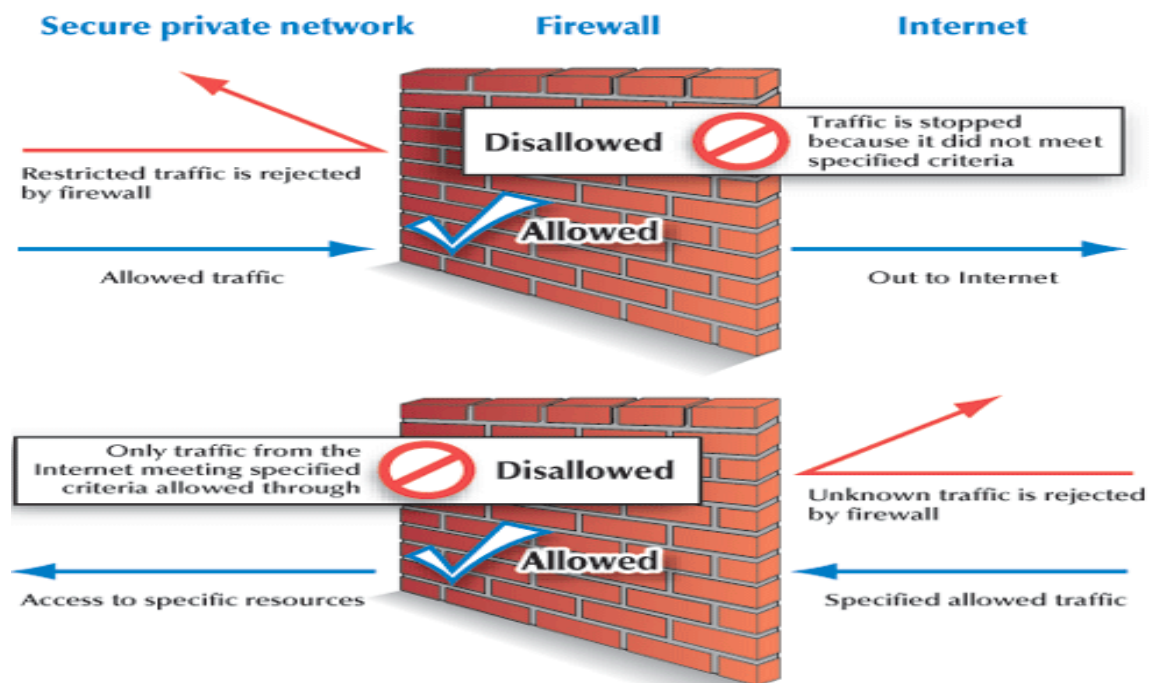**Uninterruptible Power Supply (UPS) System:** A system that ensures the continued flow of electricity when the primary source of power fails.

Disaster Recovery Plan: A procedure for restoring data lost when a system stops functioning.

Off-site Backup Facility: A backup computer centre located away from a company's main facility.

a.   Hot Site: A fully equipped backup computer centre to which a company can take its backup copies of data and software and resume processing.

b.   Cold Site: A backup facility outfitted with electrical power and environmental controls so that it is ready for a company to install a computer system.

3.3 Ethics

Ethics are guidelines for moral computer use. The standards of conduct and moral behaviour that people are expected to follow.

Privacy: It concerns collection and use of data about individuals

Accuracy: This is related to the responsibility of those who collect data to ensure correctness.

Property: Relates to who owns the data.

Access: Relates to the responsibilities of those who have data to control and who is able to use it.

3.3.1 Ethics and ICT Usage in Business

- E-mail Privacy

- Software Licenses

- Software Copyrights

- Hardware Access

- Intellectual Property Ownership

- File Access

- Data Ownership

3.3.2 Ethics Challenges

Developing a Code of Ethics

- Informed Consent

- The Higher Ethic

- Most Restrictive Action

- Kantian Universality Rule

- Descartes' Change in Rule

- The Owner's Conservative Rule

- The User's Conservative Rule

- Social Responsibility

This is the concept that businesses need to balance their commitments to investors, employees, customers, other businesses, and the communities in which they operate.

3.4 Privacy

Privacy in IT is the term used to refer to how personal information is collected, used, and protected**.**

3.4.1 Spam and Privacy

Spam: Is an unsolicited e-mail.

Opt-in E-Mail/Permission-Based E-Mail: If customers check a box agreeing to receive postings about the company's products, they have actually given approval for the mailing.

Cookies: These are specialised programs deposited into your computer system that record sites visited, activity at sites and other information.

Types of Cookies

Traditional cookies: monitor activities at a single site.

Ad network cookies: also known as adware cookies, monitor activities across all sites visited.

Web bugs: programs typically hidden within the HTML codes as a graphic image. They migrate when ever an unsuspecting user visits a web site containing a Web bug or open an infected e-mail message.

Computer monitoring: record every activity and keystroke made on your computer system. Also known as sniffer programs and keystroke loggers, these programs are used by businesses, CIA, SSS, FBI, private investigators and others.

A new program known as spy ware removal program was recently designed to detect Web bugs and monitoring software.

3.4.2 Private Networks

Many organisations monitor employee e-mail and computer files using special software called **snoopware**. Most online information services restrict libellous, obscene, or other offensive material.

3.5 Digital Piracy

Digital Piracy is the making of illegal copies of copyrighted information.

3.5.1 Protection against Software Piracy

Software piracy *is* the making of illegal copies of software**.**

Software Copyright

It is the legal protection of original works against unauthorised use, including duplication.

Copy Protection

It is a software protection scheme that frustrates any attempt to copy a program or makes the copied software unreliable.

Software Site Licensing

Site License *is* an agreement under which a software purchaser pays a fee to the manufacturer to make a specified number of copies of a particular program.

3.6 Public Domain Software

Public domain software *is* any non-copyrighted software that can be used by the general public.

Shareware

This is any software that is given away and freely distributed. The developer retains ownership, asks users to register with the owner, and requests a nominal fee for using the program.

3.7 Ergonomics

Ergonomics is the study of human factors in relation to things people use, including computers.

Physical health problems and their solutions include:

Eye Strain and Headache: take frequent breaks; avoid glare on the monitor.

Back and Neck Pain – use adjustable chairs, tables, monitor stands, keyboards, and footrests.

Repetitive Strain Injury (RSI), also known as repetitive motion industry e.g. carpal tunnel syndrome: take frequent breaks, use good posture; adopt healthy lifestyle; use ergonomic keyboards.

3.8 The Environment

Microcomputers are the greatest users of electricity in the work place. The Energy Protection Agency (EPA) has established the Energy Star Program (ESP) to promote energy efficient computer use to reduce or eliminate hazards. The computer industry has responded with the concept of the **Green PC.**

The Green PC

The basic elements of the green PC include:

- system units with energy-saving processors, sleep-mode capability, efficient adapters, and no cooling fans

- display units that replace CRT displays with flat panels, use special power-down monitors, and use screen savers software

- manufacturing that eliminates or reduces the use of harmful chemicals such as chlorofluorocarbons (CFCs), nickel, and other heavy metals.

Personal Responsibility

As a responsible computer user, you can help protect the environment by:

- conserving energy by turning off computer systems at night and using screen-savers

- educating yourself and others about ecological dangers and using ecologically sound products

- recycling paper, computer boxes, packaging materials, printer cartridges, and floppy disks.

4.0 Conclusion

To be a competent and knowledgeable ICT end user you need to be aware of the potential impact of technology on people and your surroundings. You need to be sensitive and knowledgeable about personal privacy, organisational security, ergonomics, and the environmental impact of technologies.

5.0 Summary

In this unit, you learnt that:

- security involves keeping enterprise hardware, software, data and programs safe

- reliability is the assurance that computers and communications systems will do what they should when they should

- privacy refers to how personal information is collected, used, and protected

- ethics are guidelines for moral computer use.

6.0 Self-Assessment Exercise

1. What are the sources of security breach?

2. Differentiate between security and breaches.

3. What are the measures required to prevent software piracy?

4. What are the measures needed to ensure ICT service reliability?

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

O'Leary, T.J. & O'Leary, L. I. (2004). *Computing Today.* New York, US: McGraw-Hill.

Senn, J. A. (2004). *Information Technology: Principles, Practices, Opportunities.* (3rd ed.). New Jersey, US: Pearson Prentice Hall.

Unit 6 Careers in ICT

1.0 Introduction

In the previous units you learnt about the world of information and communication technology. This unit will take you round the various positions and professionals in the ICT world.

2.0 Objectives

At the end of this unit, you should be able to:

- build a career in ICT

- update your curriculum vitae and become more marketable

- identify which ICT field is related to your work or field of specialty

- identify who to contact when you have a job at hand.

3.0 Main Content

3.1 Careers

A few important career development paths are:

Webmaster

Webmasters develop and maintain websites and Web resources. The job may include back-up of the company website, updating resources, or developing new resources. Webmasters are involved in the design and development of website. Part of their job may also include monitoring and updating the interface design. Some webmasters monitor traffic on site. Webmasters may also work with marketing personnel to increase the site traffic and may be involved in development of Web promotions.

Computer Trainers

Computer trainers instruct new user on the latest software or hardware. They are usually expected to prepare new materials for instruction and may be asked to write and maintain course manual. A position may also include design and development of a website for the course. Computer trainers typically teach new users how to use the latest software and hardware. Experience with the most popular business software is an advantage.

Desktop Publisher

Desktop publishers use computers to format and create publication-ready material. They may create books, magazines newsletters, and newspapers on computers using special applications software. Large part of the job is designing page layout, importing text, and

manipulating graphics. Most desktop publishers work for companies that handle commercial printing accounts.

Computer Support Specialist

Computer support specialists provide technical support to customers and other users. They may also be called technical support specialist or help desk technicians. They manage the everyday problems faced by computer users. They resolve common networking problems and may use troubleshooting programs to diagnose problems.

Computer Technician

Computer technicians may repair and install computer components and systems. They may work on everything from personal computers to mainframe servers or printers. Some Computer technicians are responsible for setting up and maintaining computer networks. Experience computer technicians may work with computer engineers to diagnose problems and run routine maintenance on complex systems.

Certification: CompTIA's, A+ hardware examination and Network+

Data Entry

Data entry workers input customer information, lists, and other type of data. Input devices are typically limited to keyboards, mice, and scanners. Because the accuracy of recorded data is so important, data entry workers are often required to verify the accuracy of data they and others have entered.

Technical Writers

Technical writers prepare instructional manuals, technical reports, and other scientific or technical documents. Most technical writers work for software firms, government agencies, and research institutions.

Software Engineers

Most software engineers analyse users need and create application software. Software engineers usually have experience in programming, but focus on the design and development of programs using the principles of mathematics and engineering. They rarely write codes themselves.

Network Administrator

Network administrator manages a company's LAN and WAN networks. They may be responsible for the design, implementation and maintenance of networks. Responsibilities usually include the maintenance of both hardware and software relating to a company's intranet and Internet networks. Some are responsible for planning and implementing the security measures as well.

Certification: Microsoft Certified Systems Engineer (MCSE), Certified Novell Administrator (CNA), and Certified Novell Engineer (CNE).

Cryptographer

Cryptography is the science of disguising and revealing encrypted information. In ICT cryptography means keeping any intercepted information private. For example, information like financial data, banking and credit card information used in online shopping or private e-mail and correspondence. Cryptographers design systems, break systems, and do research on encryption.

Information System Manager

Information system managers oversee the work of programmers, computer specialists, system analysts, and other computer professionals. They create and implement corporate computer policy and systems. These professionals consult with management, staff and customers to achieve goals.

Database Administrators

Database administrators use database management software to determine the most efficient ways to organise and access a company's data. They are responsible for maintaining database security and backing up systems.

Certifications: MySQL Server, Oracle, and Sybase.

Systems Analyst

A systems analyst follows the steps described in the systems development life cycle. Analysts plan and design new systems or reorganise a company's computer resources for optimal use.

Computer Programmers

Computer programmers create, test, and troubleshoot programs used by computers. Programmers may also update and repair existing programs.

Certifications: Java, C++, Visual Basic and knowledge of SQL.

3.2 Other Areas of Expertise/Organisation

a. Hardware

- Cisco Products

- D-link

- Linksys

b. Software

- Microsoft Products

- Linux (Red Hat, Unbutu, and Fedora) – Open Source: Free

c. Database

- Oracle

- MySQL - Open Source: Free

d. Web Design

- PHP - Open Source: Free

- Dream Weaver

4.0   Conclusion

Knowing the ICT positions and their responsibilities help you to prepare your curriculum vita (CV) and make you marketable.

5.0 Summary

In this unit, you learnt that:

- most ICT professions do not require a degree in computer science

- professional certifications will boost your curriculum vitae

- you can start today and develop a career in ICT

- some key positions require knowledge in two or three fields.

6.0 Self-Assessment Exercise

1. Which fields are related in terms of hardware?

2. Which IT positions are unique?

3. Which IT position requires knowledge in all fields?

4. Which IT position is a top level position?

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

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