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# GUIDELINES FOR LECTURES

**Course of Information and communication technology**
**Course code ICT 1105**
**Name of EP /Specialities:**
6B10115 Medicine
6B10106 Pharmacy
6B10116 Pediatrics
6B10117 Stomatology
6B10104 Nursing
6B10111 Public health
6B07201 Technology of pharmaceutical production
6B10118 Medical and preventive care

**Number of academic hours/ credits: 150/5**
**Year: 1,2**
**Term: 1,2**
**The number of hours for lectures:  10**

**Shymkent 2023**

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The lecture complex was developed in accordance with the working curriculum (syllabus) of the discipline ICT and was discussed at the meeting of the department.

Departmental discussion held on " _16_ " _05_ _____2023

Record of meating № _____12_____

Head of department ass.professor Ph.D._____Ivanova M.B

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# LECTURE № 1

**1.Theme:** An ICT role in key sectors of development of society. Standards in the field of ICT. Introduction to computer systems. Architecture of computer systems.

**2.The goal:** to give a brief introduction to ICT Skills and introduce the terminology related to the subject, to discuss and give a brief idea on computer hardware.

**3.Teaching methods:** introduction lecture

**4.lecture thesis**

**1.Definition of ICT. Subject ICT and its purposes**

**Information and Communications Technology** (ICT) is an extended term for information technology (IT)  which stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information.

Information and Communications Technologies (ICT) are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information.

Information Communications and Technology (ICT) is a term that refers to all the hardware and software that people use to send and  receive  information.  Social networking sites  such  as Facebook, Twitter and  MySpace, computers, phones and tablets make up the term ICT.

The term ICT is more inclined and widely used in the educational sector. Some have simplified ICT as using audiovisual equipment for learning at school and the use of networks that help transmit information across schools.

As already mentioned above, by the technology of communication we process transfer digital data from one device to another. These technologies related to the communications are usually complex. Though you are not going to study about them in this material, there are some aspects of digital communication that you need to study such as the types of networks and the mechanism of getting connected with the internet. These topics are discussed within this course material in coming sessions.

In addition to the terms IT and ICT described above, you might have heard another terminology "Computer Science" which also sounds similar to the above two. **Computer Science** is the mother of all computational disciplines (Computer Engineering, Information Technology/Information Science, Software Engineering, ICT, etc). In simple words, Computer Science is all about computers. In contrast with IT, CS is the science of computing with in depth knowledge of working principles of computers whereas information technology is the science designed to make best use of information systems to make work easier in business environments. CS is the scientific and practical approach to computation and its applications. A computer scientist specializes in the theory of computation and the design of computational systems. So, a computer scientist is obviously thorough in Physics, Mathematics, electrical engineering, and forms of languages. CS is a field related to research work and thus itis evolving with the innovations of the research outcomes.

Now you may have some idea that the ones who can afford to be in touch with the information and communication technology can be updated with evolving knowledge while the ones who fail or have less chances may remain in the pre-knowledge stage.

It is clear that you require some skills ranging from basic to advanced, that areneeded to be able to work with computer based information systems. Simply, you will require the capability of using computers and computer software in order to deal with information and communication technologies.

The fundamental objective of this course unit is to be able to:

- Convert

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- Store
- Protect
- Process
- Transmit/communicateand
- Retrieve

## 2.An ICT role in key sectors of development of society.

Beginning in the 1980s, during the rise of the level of use of personal computers, as well as a consequence ofincreased demand for software products and completing formation of the different approaches of state policy towards the development of the ICT sector. Next, the transition to digital telecommunications in the 1990s and the subsequent formation of the Internet, the impetus to promote the further development of ICT in the world.

Alot of approaches toICT development conventionally divided into two directions: the first - the development of ICTproduction andservices (computers, software, devices, telecommunications and others.), inorder to increase output and to strengthen ICT industry - "ICT as a manufacturing sector "; the second - the introduction of ICTs indifferent sectors of the economy to maximize the information society and economy - "ICT as a tool of informationsociety." Within these two areas can be classified in the following levels of strategic approaches: the development of the ICT sector, export-oriented; ICT sector development, oriented to the domestic market; approach global positioning; ICT as a tool for social and economic development. Consider these approaches on country practices.

Favorably, the gap between the access to the Internet and mobile coverage has decreased substantially in the last fifteen years, in which "2015 is the deadline for achievements of the UN Millennium Development Goals (MDGs), which global leaders agreed upon in the year 2000, and the new data show ICT progress and highlight remaining gaps."ICT continues to take on new form, with nanotechnology set to usher in a new wave of ICT electronics and gadgets. ICT newest editions into the modern electronic world include smart watches, such as the Apple Watch, smart wristbands such as the Nike+ Fuel Band, and smart TVs such as Google TV. With desktops soon becoming part of abygone era, and laptops becoming the preferred method of computing, ICT continues to insinuate and alter itself inthe ever-changing globe.

The Kazakhstan Information Technology (IT) sector represents a growing and dynamic market that is especially attractive for the International market players in view of the slowdown in the global telecommunications sector. Although still relatively small at about$220 million, the Kazakhstan IT market grew by 25 - 30% in 2002. It is expected to reach $275 million in 2003. The major factors for its growth in Kazakhstan were low dependence of the IT sector on fluctuations of the international economy, the increase in the home demand due to the rise of international prices for Kazakhstan's mineral commodities and growing demand for customized solutions in the private sector.

A considerable increase in state purchase of computers and software within government regional procurement programms has facilitated the spread of the Internet in the sphere of education. According to research conducted by Actis Systems Asia, each third Internet user in the country is a student.

Kazakhstan's government has realized the importance of the internet and information technology in improving the efficiency and effectiveness of government bodies, enhancing political transparency, and improving quality of life in general.

The ambitious state program named "Formation and Development of National Informational infrastructure Kazakhstan" waslaunched in 2001 and was aggressively followed to stress the IT sector's importance for the national authorities. The estimated cost of the program for the period 2001 – 2003 is about $130 million. The target is to create key elements of a national information

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infrastructure that are able to provide independence and security for the country.

Standards in the field of ICT

A new generation of components and systems

- ICT1 – 2016: Smart Cyber-Physical Systems
- ICT2 – 2016: Thin, Organic and Large Area Electronics
- ICT3 – 2016: SSI – Smart System Integration
- ICT4 – 2017: Smart Anything Everywhere Initiative
- ICT5 – 2017: Customized and low energy computing
- ICT6 – 2016: Cloud Computing

Standards play a very important role for ICT since they bring the language that enables technology tounderstand each other. This is especially relevant because the key idea behind ICT is that informationstorage devices need to communicate with communication networks and computing systems.

Satellite and cable TV and mobile telephony spread relatively quickly in Kazakhstan, as well as digital and web media, informational media resources and optical fiber connection.

Rather successful projects in Kazakhstan were projects like "Electronic government", state service through the Internet, blogs of officials,communication with local government through websites and open data of the state.

## 3. Overview of computer systems.Evolution of computer systems.

The above three descriptions are some standard definitions extracted from different information resources available in the World Wide Web, Meanwhile, a computer can be defined as follows in terms of basic usage of the computer which is more readable for a layman.

*A computer is an electronic device that manipulates information, or "data". It has the ability to store, retrieve, and process data. You can use a computer to type documents, send email, and browse the internet. You can also use it to handle spreadsheets, accounting, database management, presentations, games, and more.*

When reading the above definitions you may find some common behaviors of computers such as:

- It is a man-made machine
- It accepts instructions of a human given in a sequential manner
- As per the given instructions, it performs some calculations and does changes for the information fed by human
- Releases or produces an output that is useful to the user

**Hardware.**The tangible parts that make up the computer are called „Hardware". The physical parts such as monitor, key board, processor, and speakers can be identified as hardware. We can use the generic term **device** to refer any piece of hardware. You will learn deeply about computer hardware in Session 03 of this course material.

**Software.**Computer software is a set of instructions that tells computer hardware what to do. The computer will work according to the instructions given to it. We can use the generic term **computerprogram** to refer any piece of software. Some software are specially designed for the primaryfunctions of the computer to manage its operations while some software are designed for the users to get their work done, ex. to prepare a letter. However, software can be categorized into different categories and you will learn deeply about software in Session 04 of this course material.

**Data.**Any individual fact or piece of information in a form suitable for use with a computer is known as „data". This information may be in the form of text, documents, images, audio clips or software program. The primary use of the computer is to convert these data into useful information to the user. The computer accepts data from some sources or from the user to produce useful information. Thus the raw data fed into the computer may not make much sense to the users until it is processed.

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**User/ Live ware.** Though the computers automate most functions we cannot say that it is fully automatic, as the intervention of a human being or an operator is often needed. You may think whether a user is essential as you might have seen some performs their job without a person sitting in front of the computer. But you should not forget that the people design and build the programs running on it. The people do repairs to computer systems when needed. Therefore, „User" is an essential part of a computer system. Further, you will learn about the applications that you can run in „Personal computers" within this course material.

### Evolution of computer systems.

The history of computers begins with the people's need to calculate and keep records. From ancient times, people have working to invent a computing device to assist them in calculating and processing data.

All the data processing equipment can be categorized under three types:
1- Mechanical devices: Which are hand-operated such as the "ABACUS" and the "Slide rule"
2- Electro-mechanical devices: Which are powered by an electric motor and use switches and relays, e.g. "Card reader" and "Card stored"
3- Electronic devices: Which have such components as "Transistors, Circuits, Chips", e.g. "Modern Computer"

We outline historical evolution of the computer in three stages:
1- The dark (earliest) ages:(3000 B.C.E – 1890 C.E)
2- The middle ages: (1890 – 1944)
3- The modern ages: (1944 till now)
B.C.E (Before the Common Era) C.E (Common Era (Current))

#### Generations of Computer

First Generation of Computer:The beginning of commercial computer age is from UNIVAC (Universal Automatic Computer). Itwas developed by two scientists Mauchly and Echert at the Census Department of United States in 1947. The first generation computers were used during 1942-1955. They were based on vacuum tubes. Examples of first generation computers are ENIVAC and UNIVAC-1.

Second Generation of Computers (1955-1964):The second generation computers used transistors. The scientists at Bell laboratories developed transistor in 1947. These scientists include John Barden, William Brattain and William Shockley. The size of the computers was decreased by replacing vacuum tubes with transistors. The examples of second generation computers are IBM 7094 series, IBM 1400 series and CDC 164 etc.

Third Generation of Computers (1964-1975):The third generation computers used the integrated circuits (IC). Jack Kilby developed the concept of integrated circuit in 1958. It was an important invention in the computer field. The first IC was invented and used in 1961. The size of an IC is about ¼ square inch. A single IC chip may contain thousands of transistors. The computer became smaller in size, faster, more reliable and less expensive.

Fourth Generation of Computers (1975-1981):The fourth generation computers started with the invention of Microprocessor. The Microprocessor contains thousands of ICs. **Ted Hoff** produced the first microprocessor in 1971 for **Intel.** It wasknown as Intel 4004. The technology of integrated circuits improved rapidly. The LSI (Large Scale Integration) circuit and VLSI (Very Large Scale Integration) circuit was designed. It greatly reduced the size of computer. The size of modern Microprocessors is usually one square inch. It can contain millions of electronic circuits.

Fifth Generation (1981-Onward):Scientists are working hard on the **5th generation computers** with quite a few breakthroughs. It is based on the technique of **Artificial Intelligence (AI).** Computers can understand spoken words & imitate human reasoning. Can respond to its surroundings using different types of sensors. Scientists are constantly working to increase the

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processing power of computers. They are trying to create a computer with real IQ with the help of advanced programming and technologies.

## 4. Architecture and components of computer systems. Data representation in computer systems

A computer is an electronic machine that accepts, processes, stores and outputs information. A typical computer consists of two parts: hardware and software.

Hardware is any electronic or mechanical part of the computer system that you can see or touch.

Software is a set of instructions, called a program, which tells a computer what to do. There are three basic hardware sections.

The CPU is the heart of the computer, a microprocessor chip which processed data and coordinates the activities of all the other units.

The main memory hold the instructions and data which are being processed by the CPU. It has two main sections: RAM (random access memory) and ROM (read only memory).

Peripherals are the physical unit attached to the computer. They include: input devices, which let us enter data and commands (the keyboard and the mouse) and output devices, which let us extract the results (the monitor and the printer).

Storage devices, which are used to store information permanently (hard disks and DWD-RW drivers)

The main circuit bord of a microcomputer. The motherboard contains the connector for attaching additional bords. Typically, the motherboard contains the CPU, BIOS, memory, mass storage, interfaces, serial and parallel ports, expansion slots, and all the controllers required to control standard peripheral devices, such as the display screen, keyboard, and disk drive. Collectively, all these chips that reside on the motherboard are known as the motherboard's chipset.

An Input Device is any hardware component that allows you to enter data, programs, commands, and user responses into a computer. Some of the commonly used input devices are listed below.

•Keyboard
•Pointing devices
• Mouse
• Trackball
• Joystick
• Touchpad
• Light Pen
•Scanners
•Voice input systems
•Web Cam
•Bar code readers.

An output device is any computer component capable of conveying information to a user. Some commonly used output devices are listed below.

Display devices
Cathode Ray Tube (CRT) monitors
Liquid Crystal Display (LCD) monitors / Flat-panel displays
LED Monitors
Gas plasma monitors
Printers
Impact printers
- Daisy Wheel and Dot Matrix printers

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Non-Impact Printers
- Ink Jet printers
- Thermal Dye Transfer printers
- Laser printers

Plotters

Audio Devices

Speakers

Headphones

**5.References**

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2. Lorenzo Cantoni (University of Lugano, Switzerland) James A. Danowski (University of Illinois at Chicago, IL, USA) Communication and Technology, 576 pages.

3. Craig Van Slyke  Information Communication Technologies: Concepts, Methodologies, Tools, and Applications (6 Volumes). ISBN13: 9781599049496, 2008, Pages: 4288

4. Utelbaeva A.K.,Utelbaeva A.K. Study guide for lectures on discipline "Computer science", Shimkent 2008, 84 pages.

**6.Control questions:**

1. What is the digital revolution?
2. What is the difference between IT and ICT?
3. What are the key applications of ICT that you will learn during this course unit?
4. Why does a computer need memory?
5. What is the best type of storage for my data?
6. What factors affect a computer's screen display?
7. Are ink jet printers better than laser printers?
8. What's the best way to add devices to a computer system?
9. How can I protect my computer system from theft and damage?

## LECTURE №2.

**1.Theme:** Software. Operating systems. Human-computer interaction.

**2.The goal:** to provide the basic ideas of Software to the Students, to introduce the learner to the Windows 7 operating system and get the learner familiar to operate the computer through the Operating system Windows; to work with a system, the users need to be able to control the system and assess the state of the system. To work with a system, the users need to be able to control the system and assess the state of the system.

**3.Teaching methods:** review lecture

**4.lecture thesis**

**1.What is Software?** Software, also called a **computer program** or simply a **program,** is a series of instructions that tells the hardware of a computer what to do. For example, some instructions direct the computer to allow you to input data from the keyboard and store it in memory. Other instructions cause data stored in memory to be used in calculations such as adding a series of numbers to obtain a total.

Before a computer can perform or execute a program, the instructions in the program must be loaded into the memory of the computer. Usually, they are loaded into memory from storage like hard disk.

When you purchase a program, you will receive one or more CD-ROMs or a single DVD-ROM on

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which the software is stored. To use the software, you often need to **install** the software on the computer"s hard disk. Sometimes, a program can be loaded in memory directly from a CD-ROM or a DVD-ROM so that you do not have to install it on the hard disk to use it.

When you buy a computer, it usually has some software already installed in its hard disk. Thus you can use the computer as soon as you receive it. Software is the key to productive use of computers. With the correct software, a computer can become a valuable tool.

**System Software.** System software consists of the programs that control the operations of the computer and its devices. Functions that system software performs include starting up the computer; opening, executing, running, applications; storing, retrieving, and copying files; formatting disks; reducing file sizes; and backing up the contents of a hard disk. Accordingly you can see that the System Software will handle the smooth running of all the components of the computer as well as providing general functionality for other programs to use, tools to speed up the computer, tools to develop new software and programs to keep you safe from attacks.

**Operating Systems (OS).**The Operating System contains instructions that co-ordinate all of the activities of hardware devices of your computer. It also contains instructions that allow you to run any applications software. One may define the Operating system as an interface between a user and all computer resources.

When you start a computer, the operating system is loaded or copied into memory from the computer hard disk. It remains in memory while the computer is sunning and allows you to communicate with the computer and other software. A computer cannot function without an operating system. It is an important component of the computer system, because it sets the standards for the application programs that run on it. All programs must "talk to" the OS.

There are two main types of Operating Systems:

**Single-user OS**: A type of OS which allows only one user at a time. There can be single-user OSeither as **single-user single-task** or **single-user multi-task.** The Single-user single-task OS has to deal with only one person at a time running only one application at a time. MS DOS is an example for a single user single task OS.

Think of the OS of your Personal Computer. It is designed mainly with one user (i.e. you) in mind but that only user: you can deal with many applications running at the same time. You may word process a document with a word processing application like MS Word while listening to music played in the windows media player in parallel. Or you might be answering the school assignment while searching more facts on the internet while a suitable video is being downloaded. This type of OSs is of **single-user multi-task** OS. An example of such OS is Windows 95.

**Multi-user OS**: In some situations, we need to share the single computer among few users. Sothe OS should be a multi-user where more than one user is logged on to the computer and uses it at the same time. These multi users may work with remote desktop connections. Further, these different users may need to run different applications at the same time. So the OS must support multi-task facility as well. Obviously the computer should be a powerful one. Each user draws on a big power of the computer in a shared way. This type of Multi –user multi-task OSs have to manage some tasks as listed below:

    Each user logged on to the system, their workspace and so on.
    Allocate resources to the jobs they want to run.
    Keep logs of how much processing time and resources they use
    Work out the most efficient use of computer processing cycles
    Maintain security

Following are some examples of such OS:

    Windows XP, 7, 8 etc.
    Unix

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Linux (Ubuntu, Centos, Fedora etc.)

**Desktop OS vs. Server OS**

The OS can also be categorized as Desktop OS and Server OS depending on whether the OS is to be installed in a desktop computer or a server. For example, the latest versions of the Windows OS family can be categorized as follows:

*Desktop OS: windows XP, windows 7, Windows 8*

*Server OS: Windows 2000Server, Windows 2005Server, Windows 2008Server*

As most of you are using Desktop Personal Computers, following web article is extracted in order to give you an overview on the different operating systems you may use.

**Operating Systems for your Desktop PC.** Following is a note extracted from the web regarding the OS and given for the reader for additional facts about your OS Premium or Professional, so the decision won't be too hard. If you don't know why you'd want to get Professional then Home Premium will do the job nicely. Home Premium will be the right fit almost all home users

**Utility Software.** Utility software or utility programs are some small programs which performs specific task, usually related to managing a computer, its devices, or its programs. Most operating systems include several utility programs. Also, you can buy them as stand-alone software that offer improvements over the ones supplied with the OS. Following are some of the specific tasks done by commonly used utility programs:

- Viewing files
- Compressing files
- Diagnosing problems
- Scanning disks
- Defragmenting disks
- Uninstalling software
- Backing up files and disks
- Checking for viruses
- Displaying screen savers

**Library Programs. Library programs** are collections of some pre-written codes or resources that are used todevelop other programs. For an example, you might have noticed that all Microsoft Programs look like the same or have the same look and feel in the interfaces though the application differs. The reason for this consistent look is the using of same graphical user interface libraries when developing different applications by the Microsoft. Another classical example is, the computer game developers often buy and use pre-done graphical user interface libraries and develop new games as they need to save time and cost of entire development process. This will allow them to quickly develop a good looking game that runs on the desired hardware. In w\Windows, you can often identify library programs by their extension **.dll** (dynamic link library).

**Programming Language Translators.** You are already aware that a Program is a set of instructions written for performing a specific task. These instructions are just like English words. We call that these programs are written in programming **languages** that can be understood by human beings. These written programs are called that **Source codes**. However, some programs run on a **machine code** that is executed directly on computer architecture. Machine code is not easily read by humans and it is a long series of bits (i.e. ones-1 and zeros-0). Therefore, the source code is to be converted into machine code which is called an **object program.** This translation can be done by translator. Simply, the translators translate source code into machine code. There are three approaches of program translating: Assembler, Interpreter, Compiler.

**Assembler**:

An assembler translates the symbolic codes of programs of an assembly language into machine language instructions (See Figure 1 below). The **symbolic language** is translated to the machine

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code in the ratio of one is to one symbolic instructions to one machine code instructions. Such types of languages are called **low-level languages**. The assembler programs translate the low-level language to the machine code. The translation job is performed either manually or with a program called **assembler**. In hand assembly, the programmer uses the set of instructions supplied by the manufacturer. In this case, the hexadecimal code for the **mnemonic** instruction is searched from the code sheet. This procedure is tedious and time-consuming. Alternate solution to this is the use of assemblers. The program called assembler provides the codes of the mnemonics. This process is fast and facilitates the user in developing the program speedily.
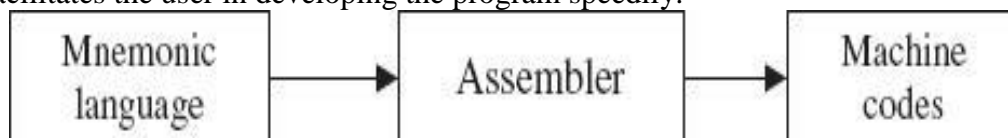


*Figure 1: Assembler*

**Interpreter**:
Interpreters also come in the group of translators. It helps the user to execute the source program with a few differences as compared to compilers. The source program is just like English statements in both interpreters and compilers. The interpreter also generates object codes from the source program. Interpreter reads the program line by line, whereas in compiler the entire program is read by the compiler, which then generates the object codes. Interpreter directly executes the program from its source code. Due to this, every time the source code should be inputted to the interpreter. In other words, each line is converted into the object codes. It takes very less time for execution because no intermediate object code is generated.

**Compiler:**
Compilers are the translators, which translate all the instructions of the program into machine codes, which can be used again and again (See Figure 2 below). The source program is input to the compiler. The object code is output for the secondary storage device. The entire program will be read by the compiler first and generates the object code. However, in interpreter each line is executed and object code is provided. M-BASIC is an example of an interpreter. High-level languages such as C, C++ and Java compilers are employed. The compiler displays the list of errors and warnings for the statements violating the syntax rules of the language. Compilers also have the ability of linking subroutines of the program.
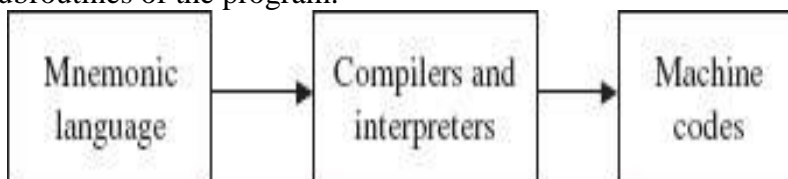


*Figure 2: Compilers and Interpreters*

**Application Software**
Re-call the classification of software given in Figure 4.1. Accordingly, the second major class of Software is the Application Software. Application software consists of programs designed to perform specific tasks of users. Application Software, also called a software application or an application, can be used for the following purposes, among others:

    As a productivity/business tool
    To assist with graphics and multimedia projects
    To support household activities, for personal business, or for education
    To facilitate communications

A variety of application software is available that you can buy from software vendors in retail stores or on the Web. A specific software product, such as Microsoft Word, often is called a
**Software Package**.Based on the purposes as listed above, the application software is three-fold

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namely General Purpose, Special purpose, and Bespoke. Let us look at each type of applications software briefly.

**Special Purpose Application Software.**

Special Purpose Application Software is the software created for execution of a single specific task. Some examples are Chess game, calculator, camera application in your mobile phone which allows you only to capture and share pictures, web browsers, media players, calendar programs.

2.Evolution of operating systems. Classification of operating systems, including for mobile devices.

**What is Windows 7?** Windows 7 is a latest public release version of Microsoft Windows. Windows 7 was released to manufacturing on July 2009. Windows Server 2008 R2 was released at the same time. It is redesigned with Windows Shell with a new taskbar. Windows 7 includes a number of new features, such as advances in touch and handwriting recognition, support for virtual hard disks, improved performance on multi-core processors, improved boot performance, Direct Access, and kernel improvements.

**Versions of Windows 7. Starter** is the smallest version of the windows 7. Actually it is less waiting, less clicking,less hassle connecting to networks. Windows 7 Starter combines the latest in reliability and responsiveness with the familiarity and compatibility of Windows.

**Home Premium** makes it easy to create a home network and share all of your favoritephotos, videos, and music. And you can watch shows for free when and where you want with Internet TV on Windows Media Center.

**Professional** is a great choice for home and for business. Using Windows 7 professional,You can run many Windows XP productivity programs in Windows XP Mode and recover data easily with automatic backups to your home or business network. You can also connect to company networks effortlessly and more securely with Domain Join. With all the exciting entertainment features of Windows Home

**Ultimate** is the most versatile and powerful edition of Windows 7. It combines remarkableease-of-

| № | Name | Brief Description |
|---|---|---|
| 1 | Desktop | Work area on which you see your programs |
| 2 | Start Menu | Let you open programs available in your computer |
| 3 | Task Bar | Let you launch and monitor running programs |
| 4 | Notification area | A portion of the taskbar that provides a temporary source for notifications and status. |
| 5 | Task Buttons | Currently opened programs/applications |
| 6 | Desktop Icons | Icons that belongs to and leads you to important parts of the computer |
| 7 | Shortcut Icons | Easy way to access programs |
| 8 | Windows Gadgets | Popular mini-programs |

use with the entertainment features of Home Premium and the business capabilities of Professional, including the ability to run many Windows XP productivity programs in Windows XP Mode. For added security, you can encrypt your data with BitLocker and BitLocker-To-Go. And for extra flexibility, you can work in any of 35 languages. Get it all with Windows 7 Ultimate. **Basic Operations in Windows7.** Let us have a look at the basic operations available with Windows 7. This knowledge will be helpful to you to make working with your computer easy.

First, we will learn about some required fundamental skills before performing basic operations available with your operating systems.

**Log on to your computer.** The process of starting a computer session is called logging on. When you start the computer, Windows displays a Welcome screen containing links to each of the computer's active user accounts. (If your computer is part of a domain, you will need to press Ctrl +

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Alt + Delete to display the Welcome screen.) You select your user account and, if your account is password protected, enter your password to log on to the computer. See Figure 2 below for the login interface. When logging on to a computer which is part of a domain, you will always enter your domain credentials.

Brief descriptions of each component are given below.

**Using Windows Accessories.** Windows comes with several accessories, built-in programs that are extremely useful for completing everyday tasks. One of the most useful features Windows offers is the ability to use data created in one file in another file, even if the two files were created in different Windows programs. To work with more than one program or file at a time, you simply need to open them on your desktop. A program button on the taskbar represents any window that is open on the desktop. When you want to switch from one open window to another, click the program button on the taskbar. If you tile, or arrange open windows on the desktop so that they are visible, you can switch among them simply by clicking in the window in which you want to work. The table 3 below lists some frequently used windows applications with a brief description on each.

**1.User interface as means of human-computer interaction. Usability of interfaces.**

Human–computer interaction (commonly referred to as HCI) researches the design and use of computer technology, focused on the interfaces between people (users) and computers. Researchers in the field of HCI both observe the ways in which humans interact with computers and design technologies that let humans interact with computers in novel ways.

Humans interact with computers in many ways; and the interface between humans and the computers they use is crucial to facilitating this interaction. Desktop applications, internet browsers, handheld computers, and computer kiosks make use of the prevalent graphical user interfaces (GUI) of today. Voice user interfaces (VUI) are used for speech recognition and synthesising systems, and the emerging multi-modal and gestalt User Interfaces (GUI) allow humans to engage with embodied character agents in a way that cannot be achieved with other interface paradigms. The growth in human-computer interaction field has been in quality of interaction, and in different branching in its history. Instead of designing regular interfaces, the different research branches have had different focus on the concepts of multimodality rather than unimodality, intelligent adaptive interfaces rather than command/action based ones, and finally active rather than passive interfaces

The Association for Computing Machinery (ACM) defines human-computer interaction as "a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them". An important facet of HCI is the securing of user satisfaction (or simply End User Computing Satisfaction). "Because human–computer interaction studies a human and a machine in communication, it draws from supporting knowledge on both the machine and the human side. On the machine side, techniques in computer graphics, operating systems, programming languages, and development environments are relevant. On the human side, communication theory, graphic and industrial design disciplines, linguistics, social sciences, cognitive psychology, social psychology, and human factors such as computer user satisfaction are relevant. And, of course, engineering and design methods are relevant."Due to the multidisciplinary nature of HCI, people with different backgrounds contribute to its success. HCI is also sometimes termed human–machine interaction (HMI), man–machine interaction (MMI) or computer–human interaction (CHI).

Poorly designed human-machine interfaces can lead to many unexpected problems. A classic example of this is the Three Mile Island accident, a nuclear meltdown accident, where investigations concluded that the design of the human–machine interface was at least partly responsible for the disaster. Similarly, accidents in aviation have resulted from manufacturers' decisions to use non-standard flight instrument or throttle quadrant layouts: even though the new designs were proposed to be superior in basic human–machine interaction, pilots had already

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ingrained the "standard" layout and thus the conceptually good idea actually had undesirable results. Human–computer interaction studies the ways in which humans make, or don't make, use of computational artifacts, systems and infrastructures. In doing so, much of the research in the field seeks to improve human-computer interaction by improving the usability of computer interfaces. How usability is to be precisely understood, how it relates to other social and cultural values and when it is, and when it may not be a desirable property of computer interfaces is increasingly debated.

The human–computer interface can be described as the point of communication between the human user and the computer. The flow of information between the human and computer is defined as the loop of interaction. The loop of interaction has several aspects to it, including:

Visual Based :The visual based human computer inter-action is probably the most widespread area in HCI research.

Audio Based : The audio based interaction between a computer and a human is another important area of in HCI systems. This area deals with information acquired by different audio signals.

Task environment: The conditions and goals set upon the user.

Machine environment: The environment that the computer is connected to, e.g. a laptop in a college student's dorm room.

Areas of the interface: Non-overlapping areas involve processes of the human and computer not pertaining to their interaction. Meanwhile, the overlapping areas only concern themselves with the processes pertaining to their interaction.

Input flow: The flow of information that begins in the task environment, when the user has some task that requires using their computer.

Output: The flow of information that originates in the machine environment.

Feedback: Loops through the interface that evaluate, moderate, and confirm processes as they pass from the human through the interface to the computer and back.

Fit: This is the match between the computer design, the user and the task to optimize the human resources needed to accomplish the task.

Topics in HCI include:

Definition of User Interface.

1.In computer science and human-computer interaction, the user interface (of a computer program) refers to the graphical, textual and auditory information the program presents to the user. The user employs several control sequences (such as keystrokes with the computer keyboard, movements of the computer mouse, or selections with the touchscreen) to control the program.

2. Types of interfaces: command line interface, text interface, graphic interface.

There exist several types of user interfaces.

Command-Line Interface (CLI): The user provides the input by typing a command string with the computer keyboard and the system provides output by printing text on the computer monitor

A Command Line Interface allows the user to interact directly with the computer system by typing in commands (instructions) into a screen which looks similar to the one below: Fig 3.

 Fig 3. A Command Line Interface.

You cannot just type in any kind of instruction of course, because the computer will only react to a definite set of words.

These commands are very specific, for example in DOS you could type in:

copy c:\item.txt   d:\

That tells the machine to copy the file 'item.txt' that resides in the root directory of drive C: into the root directory of drive D:\

Many commands have what are called 'switches'. These are extra parameters or flags which add extra functionality to the command. For example:

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»Dir gives a directory listing

»Dir /w gives the listing across the page

»Dir /s includes the sub directories

»Dir /p pauses at the bottom of every page

Before Windows was developed, this type of user interface was what most people used to get the computer to follow instructions. Nowadays, very few people have the knowledge to be able to use a command line interface.

An example of this type of interface is DOS (Disk Operating System).

Sometimes referred to as the command screen or a text interface, the command line or Windows command line is a user interface that is navigated by typing commands at prompts, instead of using the mouse. For example, the Windows folder in a Windows command line (MS-DOS) is C:\Windows> (as shown in the picture) and in Unix or Linux, it may be % or >. Unlike a GUI operating system, a command line only uses a keyboard to navigate by entering commands and does not utilize a mouse for navigating.

Because a command line interface requires unique commands, this interface is often more difficult to learn because of the need to memorize dozens of different commands. However, a command line operating system can be a very valuable resource and should not be ignored. For example, users who have Microsoft Windows may find trivial tasks, such as renaming 100+ files in a folder, a very difficult task. However, renaming 100+ files in a directory can be done in less than a minute with a command entered into the command line.

Advantages and Disadvantages

Advantages. Disadvantages

If the user knows the correct commands then this type of interface can be much faster than any other type of interface for someone who has never used a CLI, it can be very confusing

This type of interface needs much less memory (RAM) in order to use compared to other types of user interfaces Commands have to be typed precisely. If there is a spelling error the command will fail

This type of interface does not use as much CPU processing time as othersIf you mis-type an instruction, it is often necessary to start from scratch again

A low resolution, cheaper monitor can be used with this type of interface There are a large number of commands which need to be learned - in the case of Unix it can be hundreds

A CLI does not require Windows to run You can't just guess what the instruction might be and you can't just 'have a go'.

Text interface with menus

A text interface can be made easier to navigate using menus created with text and ASCII extended characters. For example, many command line text editors have some type of interface with menus and shortcut keys that make navigating the file being edited easier. The picture below is an example of the MS-DOS editor used to edit files while at the MS-DOS or Windows command line.

WIMP or GUI Interface

A graphical user interface (GUI) is the most common type of user interface in use today. It is a very 'friendly' way for people to interact with the computer because it makes use of pictures, graphics and icons - hence why it is called 'graphical'.

A GUI (pronounced gooey) is also known as a WIMP interface because it makes use of:

Windows - a rectangular area on the screen where the commonly used applications run

Icons - a picture or symbol which is used to represent a software application or hardware device

Menus - a list of options from which the user can choose what they require

Pointers - a symbol such as an arrow which moves around the screen as you move your mouse. Helps you to select objects.

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Advantages and Disadvantages

This type of user interface is easy to use, especially for a beginner

GUIs take up a much larger amount of hard disk space than other interfaces

It is easy to explore and find your way around the system using a WIMP/ GUI interface

They need significantly more memory (RAM) to run than other interface types

You do not have to learn complicated commands

They use more processing power than other types of interface

There are usually a reasonable 'help' system included with WIMP interfaces

They can be slow for experienced programmers to use. These people often find CLI interfaces much faster to use

You get the benefits of WYSIWYG

They let you exchange data between different software applications

A GUI is an interface built around visual (graphical) things:

•Windows are regions of the screen used to display information

•Icons are small pictures that are used to represent folders, software, etc.

•Menus are lists of options the user can select from

•A pointer is an arrow that can be moved around the screen and is used to select things

Windows XP is an example of an operating system with a GUI.

GUIs are quite easy to use due to the visual nature of the interface – the user has lots of visual clues as to what things do.

However, to display all of the nice graphics required by a GUI takes a lot of computing power so quite a powerful computer is needed.

•Graphical User Interface (GUI): The use of pictures rather than just words to represent the input and output of a program. Input is accepted via devices such as keyboard and mouse.

Many years ago when computers were not very powerful they could not display the colourful graphics required for a GUI. The only interface available to most computer uses was the 'command line'.

The user would see nothing but a black screen. They would have to type a command to make anything happen.

 To copy a text file called NOTES from a floppy disc to the hard drive the user would have to type:

> COPY A:\NOTES.TXT C:\

The user would have to learn a whole set of strange commands so that they could make use of the computer system. Plus it was not very interesting look at – no visual clues to tell you what to do next.

3. Physical and mental characteristics of the user. Development stages of the user interface. Types of testing of interfaces (testing of users). Perspectives of development of interfaces.

This meant computers used to be quite difficult to use, so this type of interface is only really suitable for expert users.

The system that people use to interact with a computer (to give it commands, to see the results of those commands, etc.) is known as the user interface.

Graphical user interface

In computer science, a graphical user interface (GUI /ɡuːiː/), is a type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, instead of text-based user interfaces, typed command labels or text navigation. GUIs were introduced in reaction to the perceived steep learning curve of command-line interfaces (CLIs), which require commands to be typed on a computer keyboard.

The actions in a GUI are usually performed through direct manipulation of the graphical elements.[4] Beyond computers, GUIs are used in many handheld mobile devices such as MP3

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players, portable media players, gaming devices, smart phones and smaller household, office and industrial equipment. The term GUI tends not to be applied to other lower-display resolution types of interfaces, such as video games (where head-up display (HUD) is preferred), or not restricted to flat screens, like volumetric displays[6] because the term is restricted to the scope of two-dimensional display screens able to describe generic information, in the tradition of the computer science research at the Xerox Palo Alto Research Center (PARC).

Post-WIMP interfaces

Smaller mobile devices such as personal digital assistants (PDAs) and smart phones typically use the WIMP elements with different unifying metaphors, due to constraints in space and available input devices. Applications for which WIMP is not well suited may use newer interaction techniques, collectively termed post-WIMP user interfaces. As of 2011, some touch screen-based operating systems such as Apple's iOS (iPhone) and Android use the class of GUIs named post-WIMP. These support styles of interaction using more than one finger in contact with a display, which allows actions such as pinching and rotating, which are unsupported by one pointer and mouse.

Human interface devices, for the efficient interaction with a GUI include a computer keyboard, especially used together with keyboard shortcuts, pointing devices for the cursor (or rather pointer) control: mouse, pointing stick, touchpad, trackball, joystick, virtual keyboards, and head-up displays (translucent information devices at the eye level).

There are also actions performed by programs that affect the GUI. For example, there are components like inotify or D-Bus to facilitate communication between computer programs.

Operating system command-line interfaces

Operating system (OS) command line interfaces are usually distinct programs supplied with the operating system.

A program that implements such a text interface is often called a command-line interpreter, command processor or shell.

Examples of command-line interpreters include DEC's DIGITAL Command Language (DCL) in OpenVMS and RSX-11, the various Unix shells (sh, ksh, csh, tcsh, bash, etc.), the historical CP/M CCP, and MS-DOS/IBM-DOS/DR-DOS's COMMAND.COM, as well as the OS/2 and the Windows CMD.EXE programs, the latter groups being based heavily on DEC's RSX-11 and RSTS CLIs. Under most operating systems, it is possible to replace the default shell program with alternatives; examples include 4DOS for DOS, 4OS2 for OS/2, and 4NT or Take Command for Windows.

Although the term 'shell' is often used to describe a command-line interpreter, strictly speaking a 'shell' can be any program that constitutes the user-interface, including fully graphically oriented ones. For example, the default Windows GUI is a shell program named EXPLORER.EXE, as defined in the SHELL=EXPLORER.EXE line in the WIN.INI configuration file. These programs are shells, but not CLIs.

Application command-line interfaces

Application programs (as opposed to operating systems) may also have command line interfaces.

An application program may support none, any, or all of these three major types of command line interface mechanisms:

1.Parameters: Most operating systems support a means to pass additional information to a program when it is launched. When a program is launched from an OS command line shell, additional text provided along with the program name is passed to the launched program.

2.Interactive command line sessions: After launch, a program may provide an operator with an independent means to enter commands in the form of text.

3.OS inter-process communication: Most operating systems support means of inter-process

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communication (for example; standard streams or named pipes). Command lines from client processes may be redirected to a CLI program by one of these methods.

Menu Interface

This type of interface lets you interact with a computer or device by working your way through a series of screens or menus.

Think about your iPod or mobile phone, they both use a menu driven interface. You are presented with a menu, you make a choice and then the next menu appears on the screen. You make another choice and so on.

Cash point machines (ATMs) are another good example of a menu driven interface.

Menu driven interfaces can also be verbal rather than visual. Have you ever made a telephone call and been asked to 'press 1 for abc, press 2 for def, press 3 for ghi'?

Most of the software that you use have menu interfaces. You can use many features of the software by working your way through the menu options. Have a look at the menus in your word processor or spreadsheet package and see how many different choices you are given.

A well designed menu interface is simple to use, you just follow the instructions and make your choices.

Advantages and Disadvantages

Advantages

Extremely easy to use. Someone who has never seen the interface before can work out what to do

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| A poorly designed menu interface may be slow to use |
| There are no commands to learn or remember |
| Step-by-step options are given so that the user doesn't have to remember anything |
| Even if you don't know what to do, you can usually guess your way around the options |
| Menu interfaces don't have to be visual, they can be spoken - good for telephones or for visually impaired people. If the menu is poorly designed it might be hard to read e.g. writing is too small for people with poor sight, colours might clash and be difficult to read, font style might be hard to read. |

Sound and speech interface

This type of interface allows the user to speak or type in their normal everyday language in order to interact with the computer.

For example, some applications such as speech recognition software accepts the spoken words and converts them into text on the computer. These applications have a much wider vocabulary than the dialogue interface.

An example of a natural language interface which makes use of written text is a 'chat bot'. This software mimics a conversation - you ask it questions and it will come back with a suitable comment for you.

This is the most technically challenging form of interface for the designers as it has to cope with different accents, dialects, slang, homonyms (bare or bear) etc.

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### 6. Control questions:

1. What is Software?
2. Differentiate System software and Application software.
3. What are the responsibilities of Operating Systems?
4. Define the following with suitable examples.
5. Single–user OS
6. Multi-user OS
7. What are utility programs? Define some tasks performed by them.
8. What is meant by library programs?
9. What are program language translators? Briefly describe three translating approaches.
10. State the advantages and disadvantages of Bespoke Application Software.
11. What are the most popular types of application software?
12. What basic utilities are included with Windows and Mac operating systems?
13. How do iPhones provide adaptive utilities for people who can't see the screen?

## LECTURE №3

**1.Theme**: Database systems
**2.The goal**: to provide an overview about Database Management Systems(DBMS) and introduce you to one of DBMS: SQL
**3.Teaching methods** demonstration
**4.lecture thesis**
**1.Bases of database systems: concept, characteristic, architecture. Data models. Normalization. Integrity constraint on data. Query tuning and their processing.**
**Introduction to Databases.** A database is a structured collection of records or data. A computer database is a kind of software to organize the storage of data. Databases help you organize this related information in a logical fashion for easy access and retrieval. To develop a database, there are several models used such as Hierarchical model, Network model, Relational model, Object-Oriented model etc. Though discussing about these models in details is beyond the level of this course unit, for the sake of completion, some models are briefed below.
**Hierarchical model.** In a hierarchical model, data is organized into an inverted tree-like structure. This structure arranges the various data elements in a hierarchy and helps to establish logical relationships among data elements of multiple files. Each unit in the model is a **record** which is also known as a **node**. Each record has a single parent.
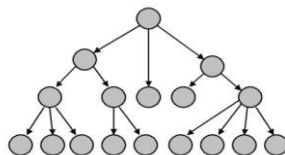


*Figure 4: Hierarchical Model*

**Network model.** The network model tends to store records with links to other records. Each record in the database can have multiple parents, i.e., the relationships among data elements can have a many to many relationships. So this model is an expansion to the hierarchical structure, allowing many-to-many relationships in a tree-like structure that allows multiple parents.
The network model provides greater advantage than the hierarchical model in that it promotes greater flexibility and data accessibility.
**Relational model.** The relational model for the database management is a database model based on relations. The basic data structure of the relational model is a **table** where information about a particular **entity** (say, a student) is represented in columns and rows. The columns enumerate the

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various **attributes** (i.e. characteristics) of an **entity** (e.g. student name, address, registration _number). The rows (also called records) represent **instances** of an entity (e.g. specific student).
We will be following the relational database model within this course and designing and using such databases will be covered within the next two sessions.
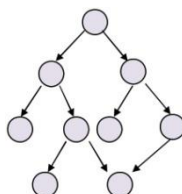


*Figure 5: Network Model*

**Object –Oriented model.** In this Model we have to discuss the functionality of the object oriented Programming. It takes more than storage of programming language objects. It provides full-featured database programming capability, while containing native language compatibility. It adds the database functionality to object programming languages. This approach is the analogical of the application and database development into a constant data model and language environment. Applications require less code, use more natural data modeling, and code bases are easier to maintain. Object developers can write complete database applications with a decent amount of additional effort. But object-oriented databases are more expensive to develop.

**Database Management System.** A Database Management System (DBMS) is computer software designed for the purpose of managing databases based on a variety of data models. A DBMS is a complex set of software programs that controls the organization, storage, management, and retrieval of data in a database. DBMS are categorized according to their data structures or types, sometime DBMS is also known as a *Database Manager*. Data management tasks fall into one of four general categories as given below:

Entering data into the database.

Housekeeping tasks such as updating data, deleting obsolete records, and backing up the database.

Sorting the data: arranging or re-arranging the database''s records.

Obtaining subsets of data.

There are several advantages in DBMS such as reduced data redundancy and inconsistency, enhanced data integrity, improved security etc.

**Basic terminology in Databases.** These terms are used often in Database Management Systems, so you need to become familiar with them before using the database management system, MS Access in this session. A brief and a simple description on some basic terms are given below.

**Database.** A database is an organized collection of the related information.

**Object.** An object is a component in the database such as a table, query, form, report, or macro, etc.

**Table.** A table is a group of related data organized in fields (columns) and records (rows) on a datasheet. By using a common field in two tables, the data can be combined. Many tables can be stored in a single database.

**Field.** A field is a column on a datasheet and defines a data type for a set of values in a table. For a mailing list table might include fields for first name, last name, address, city, and telephone number.

**Record.** A record is a row on a datasheet and do fields define a set of values. In a mailing list table, each record would contain the data for one person as specified by the intersecting fields.

**Primary key.** A primary key is used to uniquely identify each row in a table. It can either be a part of the actual record itself, or it can be an artificial field (one that has nothing to do with the actual record). A primary key can consist of one or more fields on a table. When multiple fields are used

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as a primary key, they are called as a composite key.

**Foreign key.** A foreign key is a field (or fields) that points to the primary key of another table. The purpose of the foreign key is to ensure referential integrity of the data.

**Relationships.** Two tables/entities in a database may relate to each other using one or more common attribute. There are three types of relationships among tables namely, One-to-one, one-to-many, many-to-many.

Consider the two entities, **Faculty** and the **Dean** in the university database. The data item comes under the attribute *Dean ID* of the *Science faculty* is found in only one place of the *Dean* table under the attribute *Dean ID*. In other words, the table Faculty has one and only one corresponding entry in table Dean. In simple words, one faculty has only one Dean and one dean is holding the deanship in only one faculty. Therefore, we say that the relationship between the two entities Faculty and Dean is of type **One-to-one**. This relationship can be illustrated by a diagram as follows.
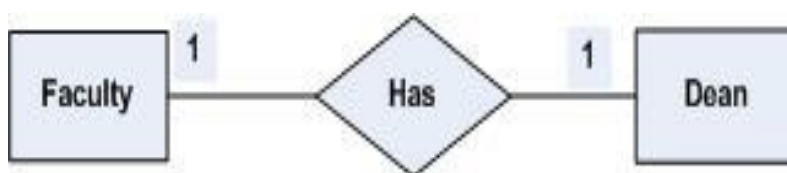


*Figure 6: One-to-one relationship*

**One-to-Many relationship**

Table A has a relationship to table B such that many entries in B can refer to one entry in A. Consider the above University database. Think of the relationship between the two entities **Faculty** and **Lecturer**. Each faculty may have many lecturers but each lecturer is joined only in one faculty. Therefore, we say that the relationship between the two entities Faculty and Lecturer is of type **One-to-many**. This relationship can be illustrated by a diagram as follows.



*Figure 7: One-to-Many Relationship*

**Many-to-Many relationship**

Table A has a relationship to table B such that many entries to A can map to many entries in B. Consider the above University database. Think of the relationship between the two entities **Lecturer** and **Student**. Each lecturer teaches many students and each student is taught by many lecturers. Therefore, we say that the relationship between the two entities Lecturer and Student is of type **Many-to-many**. This relationship can be illustrated by a diagram as follows.



*Figure 8: Many-to-Many Relationship*

**Different Database Management Applications**

There are several different database management applications which are not only meant for entering and retrieving information but also they facilitate simultaneous updates and queries from multiple users.

Some of the database management applications are listed below:

Oracle

MySQL/ SQL Server

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Microsoft Access
IBM DB2
Sybase

## 2.Fundamentals of SQL. Parallel processing of data and their restoration.

We'll use a system called **SQL** to manipulate databases.

SQL allows us functionality in setting up databases:

- We can use create database to create a database. There are also features for switching between databases.
- We can use create table to create the tables that make up a database.

SQL allows us functionality in manipulating the contents of tables:

- Via insert statements, we can add records to tables.
- Via update statements, we can change the data in existing records.
- Via delete statements, we can remove entire records.

Finally, SQL allows us to retrieve data from tables:

- The select statement allows this.
- We can also do more complicated select statements with concepts such as joins and subqueries that allow us to use tables together in extremely powerful ways.

SQL is quite different from the programming language experiences you've had thus far. Instead of telling SQL *how* to get the information you want, you use SQL to say *what* you want. For example:

- In C++ or Java, to retrieve all of the employees from a database whose hourly wage is at least $10, you would likely write a for loop to iterate through all the elements of an array (or some other structure), with a nested if statement checking the salaries.
- In SQL, you'd write a statement like so: select * from employees where salary > 10;

Let's note a few technical details:

- SQL is case-insensitive.
- Lines of SQL code end in semicolons. (Exception: not necessary for one statement, but it's nice to get in the habit anyway.)
- Block-style comments (/* ... */) are allowed.
- There are various flavors of SQL that have slight differences. What I'll teach you is Apache Derby's flavor (and the majority of what I'll show you is common to MySQL and Derby).

Introduction • Data Types • Creating Tables • Inserting Data • Retrieving Data • Derby/Netbeans

### 1.1. Microsoft Access

Access 2000 is a database software programme that runs on Windows. Database software is used to manage data that can be organised into lists of related information, such as customers, products, vendors, employees, projects or sales. Many small companies record customer, inventory and sales information in a spreadsheet programme like Excel. While this electronic format is more productive than writing information on index cards, Excel still lacks many of the database advantages provided by Access.

The advantages that database software has over a manual index card system include:

- Data entry is faster and easier
- Information retrieval is faster and easier
- Information can be viewed and sorted in multiple ways
- Information is more secure
- Information can be shared among several users
- Duplicate data entry is minimised

### 1.2. Planning a Database

The first and most important object in a database is the **table** object because it contains the raw data – the pieces of information stored in individual fields in the database. When you design a table, you

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identify the fields of information the table will contain and the type of data to be stored in each field. Some databases contain multiple tables linked together.

In planning a database it is important to:

1.  Determine the **purpose** of the database and give it a meaningful name
2.  Determine what **reports** you want the database to produce
3.  Collect the **raw data** that will be stored in the database
4.  **Sketch the structure** of each table including field names and data types

## 1.3. Database Terminology

A database is a collection of information associated with a topic (for example sales of products to customers).

The smallest piece of information in a database is called a **field**.

A **key field** (primary key) is a field that contains unique information for each record.

A group of related fields such as a customer name, address and contact details is called a **record**.

A collection of records for a single subject is called a **table**.

An Access database is a **relational database** in which more than one table can share information. The term "relational database" comes from the fact that two tables are linked, or related by a common field.

**Tables** are the **most important object** in an Access database because they contain the data within the database. An Access database may also contain six other objects, which serve to enhance the usability and value of the data. A list of these is provided below with a brief description. This course covers **Tables**, **Queries**, **Forms** and **Reports**.

| Object | Purpose |
|---|---|
| Table | Contains all the **raw data** within the database in a spreadsheet-like view. Tables can be linked with a common field to share information and therefore minimise data repetition/redundancy. |
| Query | Provides the user with fields or records from one or more tables. Queries are created when a user needs to **extract** data from a table. |
| Form | Provides and easy-to-use **data entry screen**. |
| Report | Provides a **printout** of data that may contain enhancements such as headers, footers and calculations on groups of records. |
| Page | Creates **Web pages** from Access objects as well as provides Web page connectivity features to an Access database. Also called Data Access page. |
| Macro | Stores a **collection of keystrokes** or **commands**, such as printing several reports or displaying a toolbar when a form opens. |
| Module | Stores **Visual Basic programming code** that extends the functions and automated processes of Access. |

Data can be entered and edited in four of the objects: tables, queries, forms and pages. Regardless of how the data is entered, it is stored in a table.

Data can be **printed** from a table, query, form, page or report object.

All of the **objects** are stored in one **database file**.

**Creating a Database**

When creating a new database, you must give it a name. To create a new empty database, start Access and choose Blank Access database then click the OK button.
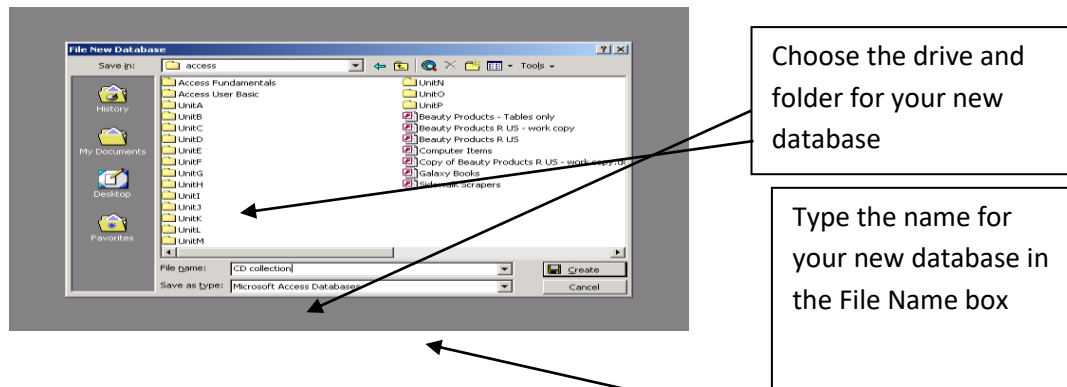
Once you have created your database, you need to create **objects** to store, print, query and present your data.
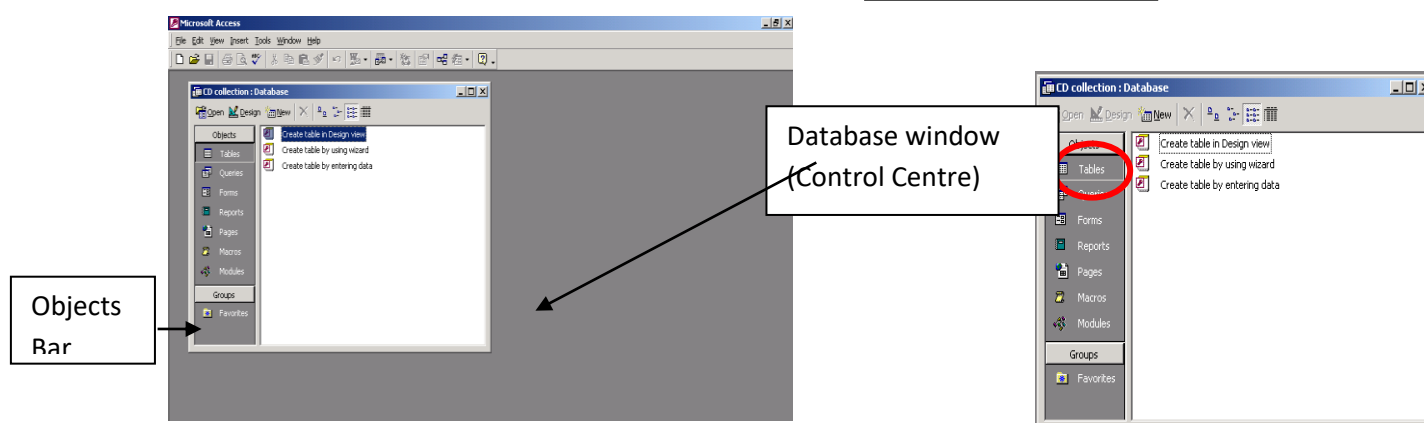
## 1.4. Creating Tables

**Tables** are the **most important object** in an Access database because they contain the data within

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the database displayed in a spreadsheet-like view.

Tables can be linked to other tables with a common field to share information and therefore minimise data repetition/redundancy.

Choose the drive and folder for your new database

Type the name for your new database in the File Name box

Database name

The **Database** window opens:

Database window (Control Centre)

Objects Bar

Tables can be created from the database window by clicking onto the '**New**' button, or by double-clicking one of the '**Create table**' options:
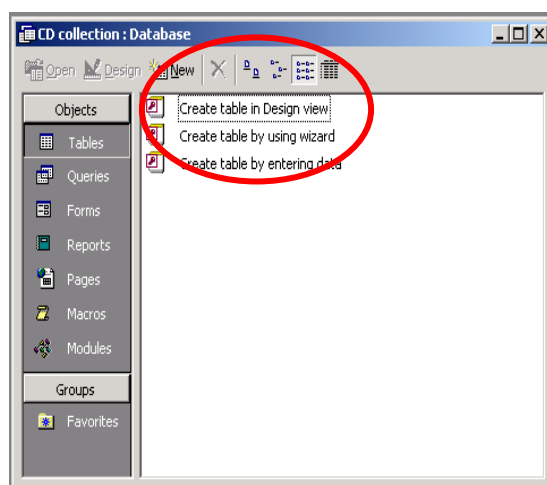
**Create a table in design view** is the preferred option for creating a table. In **Design** view, you specify field names and field attributes – including the type of data the field is to store e.g. **Text**, **Yes/No**, **Date** etc. This specification is then saved and data can be entered into the table via **Datasheet** view.

**Creating table by using wizard** will create a table (within pre-set parameters) according to your responses to options that it presents to you.

**Create table by entering data** will allow you to enter data directly into a table without any named fields

**Table Design View**

Before you create your table, you will need to decide what **Fields** you want to include and what **Data** you want the fields to contain:

A list of available data types is displayed when you click into **Data Type** column:

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## 1.5. Defining Fields

In **Table Design view**, enter the first field name.  Field names can be up to 64 characters long but must **not include full stops, exclamation marks or brackets** – spaces are acceptable.
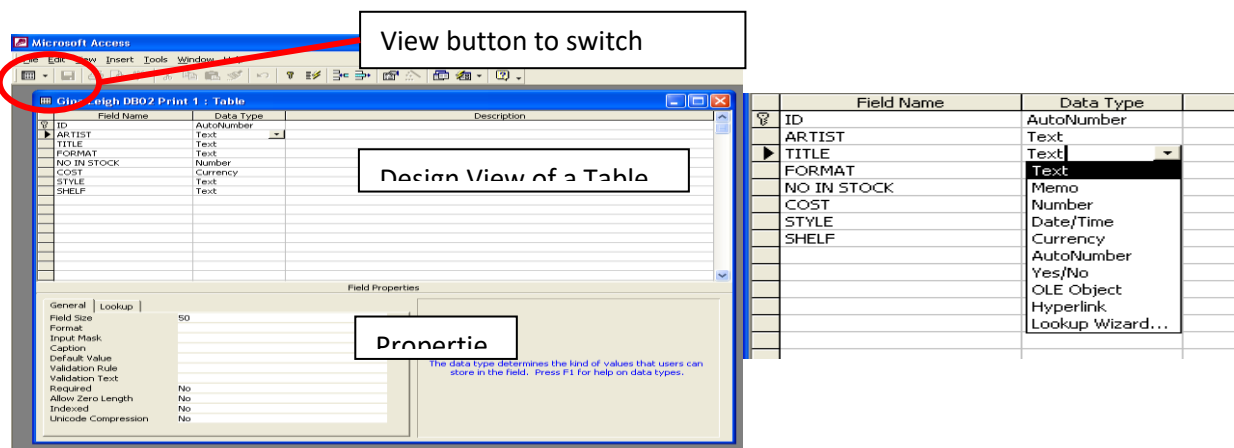


The next step is to define what **type of data** will be stored in this field.  Choose one of the following data types:
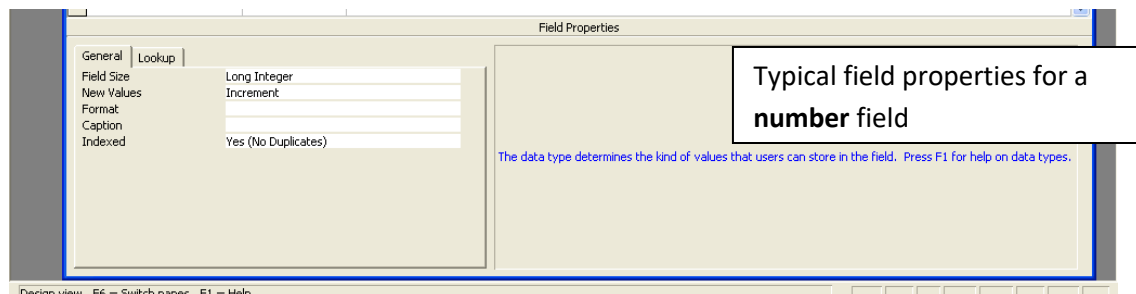
| Data Type | Description: | |
|---|---|---|
| Text | The database default.  Text fields can contain up to 255 alphanumeric characters.  The default is 50. | |
| Memo | Similar to a text field, a memo field can hold up to 65,535 alphanumeric characters. | |
| Number | Used for 'real' numbers.  The field size property of a number data type will determine how large a number can be stored: | |
| | Field Size | Range of values that can be stored: |
| | Byte | 0 – 255 |
| | Integer | -32,768 – 32,767 |
| | Long Integer | -2,147,483,648 – 2,147,483,647 |
| | Single | -3.4 – 10^38 |
| | Double | -1.797 to 10^308 |
| AutoNumber | Assigns a unique number to each record that is added. | |
| Yes/No | A single bit setting to indicate whether something is in one state or another – for example Yes or no, True or false etc | |
| Currency | Fixed format to 4 decimal places designed to prevent rounding errors. | |
| Date/Time | Used in conjunction with the format property, can be used to display any date or time in any format, e.g. Short Date, Long Date etc | |
| OLE | Used for objects such as Excel spreadsheets, images, etc. created in other applications.  Can hold up to 1 gigabyte. | |
| Hyperlink | Path names for 'jumps' | |
| Lookup Wizard | Not actually a data type, this wizard can be used to help to create relationships between two tables and to provide combo-box (dropdown) lookups. | |

The description column is optional; you can put explanatory notes in here if you wish.
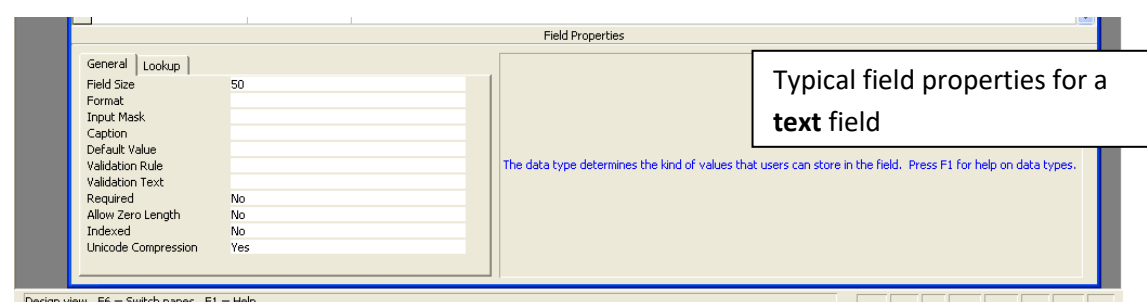
**Field Properties**

Field properties allow you to define the characteristics of Data types, such as how they are displayed or how many characters can be entered.
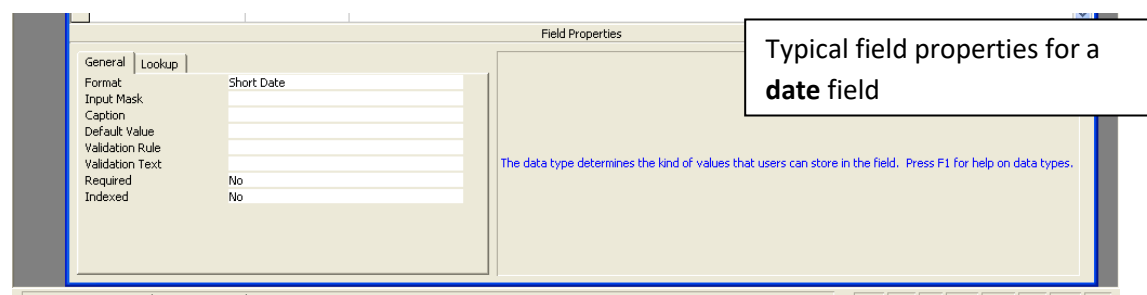
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Each Data type has its own set of properties:



Typical field properties for a **number** field



Typical field properties for a **text** field



Typical field properties for a **date** field

To set a field with default settings, no further action is essential. You could move on to define the next field in the next row. However, you may find it appropriate to set some properties for the field:

| Property: | Description: |
|---|---|
| Field Size | If **text** is the data type, field size equals the number of characters to be allowed in this field. (This makes no difference to database size). If **numeric** is the data type, field size will have named size (e.g. integer). |
| Format | Some data types will have **preset formats** that you can utilise – e.g. short date. You can also use **placeholders** to create your own format, e.g. dddd, dd/mm/yy. Consider using the greater than sign (>) to ensure all text is displayed in upper case whether entered in upper case or not. |
| Decimal Places | For currency, auto will be set to 2 |
| Input Mask | Different placeholders determine what sort of character is allowable in what columns e.g. a part number to be entered with three leading alphas, a dash and |

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| | four numbers could have an input mask: AAA-0000. Any attempt to put a number in an alpha position would result in an error message and vice versa. |
|---|---|
| Caption | If your field names do not make 'good English', you could use a caption as its label on forms. (Example: Some people prefer not to put spaces in field names and may abbreviate items. The field name 'custno' may then be given a caption of 'customer number' |
| Default Value | If nothing is entered by the data entry operator, the value that is to be automatically assigned to the field. Often used for current date by using the function =date() in the default property. |
| Validation Rule | Data entered into the field must conform to any rule placed here. For example, to ensure that the field 'colour' only has entries of red, white or blue in it, make the validation rule: red or white or blue |
| Validation Text | The text of an error message returned to the user when they violate the rule above. |
| Required | Makes this field mandatory to complete |
| Indexed | An index speeds up queries on the indexed fields as well as sorting and grouping operations. For example, if you search for specific employee names in a LastName field, you can create an index for this field to speed up the search for a specific name. |

## 1.6. Input Masks

An input mask ensures that the data will fit in the format you define, and you can specify the kind of values that can be entered in each blank.
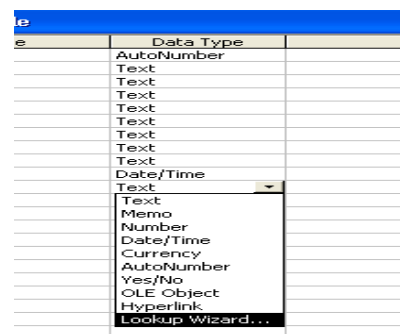
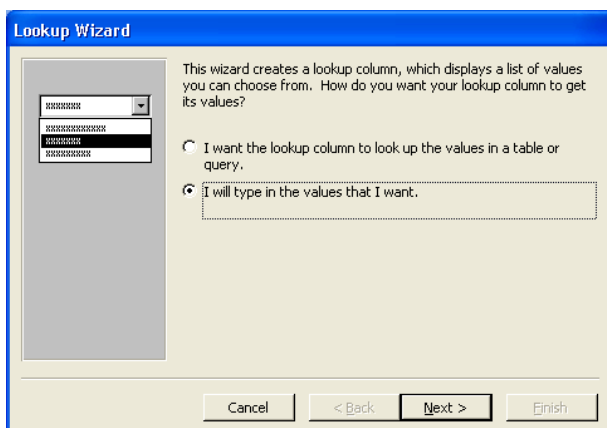| Input Mask Codes | |
|---|---|
| 0 | Digit (0 through 9, entry required; plus [+] and minus [-] signs not allowed). |
| 9 | Digit or space (entry not required; plus and minus signs not allowed). |
| # | Digit or space (entry not required; blank positions converted to spaces, plus and minus signs allowed). |
| L | Letter (A through S, entry required). |
| ? | Letter (A through S, entry optional). |
| A | Letter or digit (entry required). |
| a | Letter or digit (entry optional). |
| < | Causes all characters that follow to be converted to lowercase. |
| > | Causes all characters that follow to be converted to uppercase. |

## 1.7. Looking up Values from a list or table

Access will create a field that allows you to choose a value from another table or from a list of values by using a **list box** or **combo box**. Ensure that the table is saved **before** using the lookup wizard



1. Choose **data type** lookup wizard

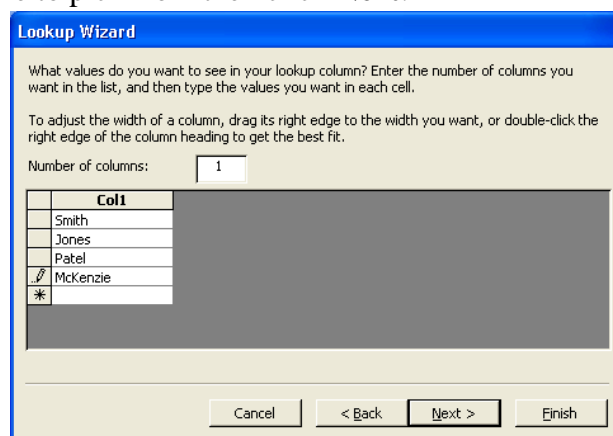2. To type your own values, choose the **I will type the values that I want** option then click **Next**:

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3. Enter the text or values you want to be able to pick from then click **Next**:



4. Choose **Finish**:



5. In the **Datasheet** view of the Table, the lookup is shown and the value can be selected:



6. The **Lookup** tab of **Field Properties** shows the **Row**

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**Source** with each entry in quotes and separated by a semi-colon. You can edit or add to the list by typing in the Row Source.
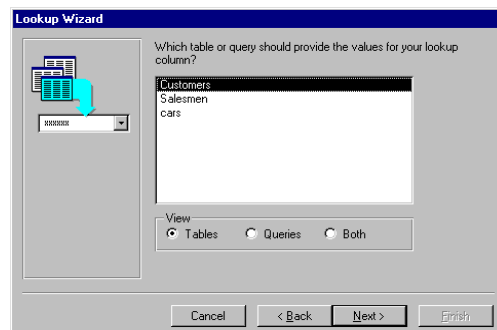
7. If the lookup values are stored on another table within the database: Choose **data type** lookup wizard
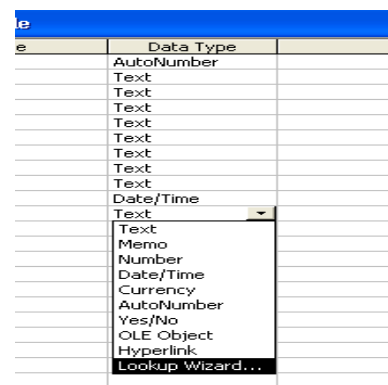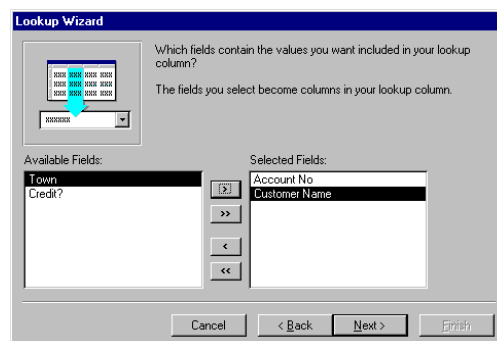
8. Choose I want the lookup column to look up the values in a table or query then click Next:
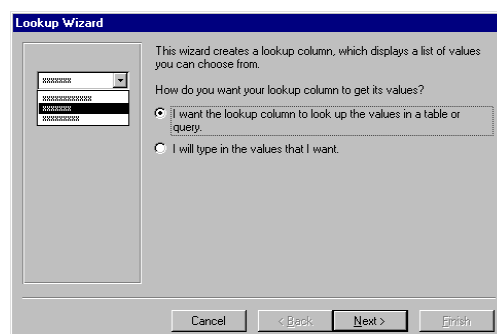
9. The lookup wizard will display the other tables in your database. Select the table and click **Next**:

10. The available fields from the table are displayed. Add the fields you want to be able to pick from and click **Next**:
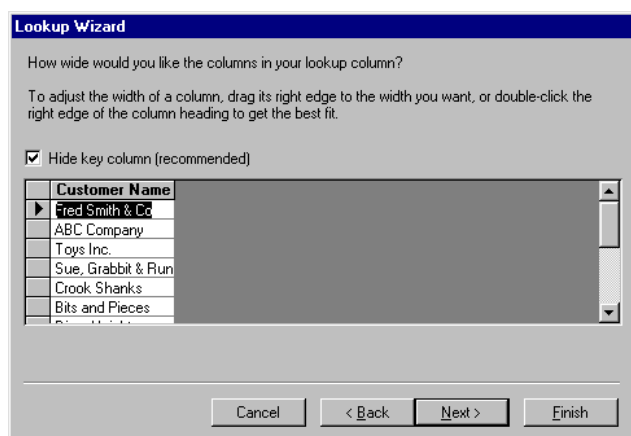
In this example, hiding the **key column** suppresses the "Account No" column.

If you choose to, you can leave this checkbox blank, and instead of seeing just a list of customer names, you would see account numbers in one column and their corresponding names in the second

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column.

**NOTE:** It is important to remember that even if you are seeing names not numbers, the actual value being stored in the underlying database is the account number. Bear this in mind if you perform filters or finds on the table later!

You can now enter some test data into your table in datasheet view.

When you are satisfied that your table is working and you are able to collect data, you may want to create a **Form** to make it easier to display and enter the information.

**5.Referenses:**

*3.* June J. Parsons and Dan Oja, *New Perspectives on Computer Concepts 16th*

4. *Edition - Comprehensive*, Thomson Course Technology, a division of Thomson Learning, Inc Cambridge, MA, COPYRIGHT © 2014.

2. Lorenzo Cantoni (University of Lugano, Switzerland) James A. Danowski (University of Illinois at Chicago, IL, USA) Communication and Technology, 576 pages.

3. Craig Van Slyke Information Communication Technologies: Concepts, Methodologies, Tools, and Applications (6 Volumes). ISBN13: 9781599049496, 2008, Pages: 4288

4. Utelbaeva A.K.,Utelbaeva A.K. Study guide for lectures on discipline "Computer science", Shimkent 2008, 84 pages.

**6.Control questions.**

1. What are the different ways to create a table in an MS Access database?
2. What are the different ways to create a query, a form in, a report an MS Access database?
3. What is SQL Server?
4. How and why use it?
5. What are the features of MySQL?

## LECTURE №4.

**1. Theme:** Data analysis. Data management.

**2. The goal**: to know about data analysis bases, methods of collection, classification and prediction.

**3.Teaching methods** demonstration

**4. lecture thesis**

**1. Data analysis bases. Methods of collection, classification and prediction.**

*Introduction to Data Management.* Data management falls under the rubric of project management. Most researchers are unprepared for project management, since it tends to be underemphasized in training programs. An epidemiologic project is not unlike running a business project with one crucial difference, the project has a fixed life span. This difference will affect many aspects of its management. Some areas of management that are affected are hiring, firing, evaluation, organization, productivity, morale, communication, ethics, budget, and project termination. Although the production of a study proposal raises many management challenges, if the proposal is approved and funds allocated, the accomplishments of the project are dependent more upon its management than any other factor.

A particular problem for investigators and staff, if they lack specific training or experience, is to fail to appreciate and prepare for the implications and exigencies of mass production.

*The Data Management System.* The data management system is the set of procedures and people through which information is processed. It involves the collection, manipulation, storage, and retrieval of information. Perhaps its most visible tool is the computer; however, this is merely one of many. Other "tools" are the instruments and data collection forms, the data management

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protocol, quality control mechanisms, documentation, storage facilities for both paper and electronic media, and mechanisms of retrieval. The purpose of the data management system is to ensure: a) high quality data, i.e., to ensure that the variability in the data derives from the phenomena under study and not from the data collection process, and b) accurate, appropriate, and defensible analysis and interpretation of the data.

*Specific Objectives of Data Management.* The specific objectives of data management are:

**Acquire data and prepare them for analysis**

The data management system includes the overview of the flow of data from research subjects to data analysts. Before it can be analyzed, data must be collected, reviewed, coded, computerized, verified, checked, and converted to forms suited for the analyses to be conducted. The process must be adequately documented to provide the foundation for analyses and interpretation.

**Maintain quality control and data security.** Threats to data quality arise at every point where data are obtained and/or modified. The value of the research will be greatly affected by quality control, but achieving and maintaining quality requires activities that are often mundane and difficult to motivate. Quality control includes:

Preventing and detecting errors in data through written procedures, training, verification procedures, and avoidance of undue complexity

Avoiding or eliminating inconsistencies, errors, and missing data through review of data collection forms (ideally while access to the data source is still possible to enable uncertainties to be resolved) and datasets

Assessing the quality of the data through notes kept by interviewers, coders, and data editors, through debriefing of subjects, and through reviews or repetition of data collection for subsamples

Avoiding major misinterpretations and oversights through "getting a feel" for the data.

Security concerns include: (1) legal, (2) safety of the information, (3) protection from external sources, (4) protection from internal sources. While abuse is more salient, accidental problems are more common. Typical preventive measures are removal or isolation of information that identifies research subjects (to protect confidentiality), redundancy, and backups (to protect against human and machine malfunction). The loss of important data due to failure to have a secure backup copy could be construed as negligence. Unfortunately, there can be an inverse relationship between security and accessibility/usefulness of the data.

**Support inquiries, review, reconstruction, and archiving**

Inquiries and requests for instruments and/or data may arise at any time during the project and after its completion. The funding agency will require a final report. Other investigators or interested parties (e.g., corporations whose products are implicated as health threats) may request a copy of the data set to pursue their own analyses. Rarely, an investigation may be conducted because of the salience of the findings, the involvement of parties with a large stake in their implications, or suspicions or charges concerning the study. For example, Herbert Needleman, a pioneering investigator into the effects of childhood lead exposure on cognitive function, had his data and results audited by a scientific committee (which included a UNC faculty member). Proctor and Gamble, Inc., brought suit against the CDC to require the provision of data from their case control studies of toxic shock and tampons.

Concern about scientific misconduct and fraud continues to increase, and investigators have the responsibility to maintain documentation to allay any such charges should they arise. Increasingly, journals require that data (and supporting documentation) be retained for several years following publication. On a more mundane level, innumerable questions will arise during the course of the data analysis, and the project's data management system needs to be able to provide accurate and timely answers.

An important principle in data management, at all levels and stages, is the full accounting for data.

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Thus when a data collection activity takes place, there should be a detailed record of the number of subjects (if known) in the universe from which subject recruitment takes place and a complete tabulation within a set of mutually exclusive categories (dispositions). Typical dispositions are -- ineligibles according to the reason for their ineligibility (e.g., out of age range, medical conditions), nonparticipants according to the reasons for their nonparticipation (e.g., no telephone number, disconnected telephone, out of town, refused), participants whose data are excluded (e.g., too many missing data items, interviewer skeptical of participant's truthfulness), etc.

An audit trail is an essential mechanism to identify changes to the data at every step. The audit trail should document what changes were made, who made them, and where, when, and how the changes were made. Audit trails are important for responding to or recovering from: (1) legal challenges, (2) procedural issues, (3) minor problems, and (4) disaster.

Note that the above objectives apply to both manual and computerized systems.

**Special issues in blinded studies**

Special care is needed to design a data management system that can prevent the possibility of linking data to individual subjects. For example, standard data collection procedures such as the use of sequential ID numbers, inclusion of exact dates on all forms, and recording of supplemental information to clarify atypical data items can compromise anonymity. Indeed, unlinked studies engender a basic conflict between the need to prevent linkage and major data management objectives, such as monitoring and quality control, which require the ability to be able to trace back and verify information.

**2.Decision trees. Processing of large volumes of data. Methods and stages of Data mining. Tasks Data mining. Visualization of data.**

Decision Trees

A decision tree is a classifier expressed as a recursive partition of the in-stance space. The decision tree consists of nodes that form a rooted tree , meaning it is a directed tree with a node called "root" that has no incoming edges. All other nodes have exactly one incoming edge. A node with outgoing edges is called an internal or test node. All other nodes are called leaves (also known as terminal or decision nodes). In a decision tree, each internal node splits the instance space into two or more sub-spaces according to a certain discrete function of the input attributes values. In the simplest and most fre- quent case, each test considers a single attribute, such that the instance space is partitioned according to the attribute's value. In the case of numeric attributes, the condition refers to a range. Each leaf is assigned to one class representing the most appropriate target value. Alternatively, the leaf may hold a probability vector indicating the probability of the target attribute having a certain value. Instances are classified by navigating them from the root of the tree down to a leaf, according to the outcome of the tests along the path. Note that this decision tree incorporates both nominal and numeric at- tributes. Given this classifier, the analyst can predict the response of a potential customer (by sorting it down the tree), and understand the behavioral characteristics of the entire potential customers population regarding direct mailing. Each node is labeled with the attribute it tests, and its branches are labeled with its corresponding values.

There are various top–down decision trees inducers such as ID3, C4.5, CART. Some consist of two conceptual phases: growing and pruning (C4.5 and CART). Other inducers perform only the growing phase. Figures presents a typical algorithmic framework for top–down inducing of a decision tree using growing and pruning. Note that these algorithms are greedy by nature and construct the decision tree in a top–down, recursive manner (also known as "divide and conquer"). In each iteration, the algorithm considers the partition of the training set using the outcome of a discrete function of the input attributes. The selection of the most appropriate function is made according to some splitting measures. After the selection of an appropriate split, each node further

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subdivides the training set into smaller subsets, until no split gains sufficient splitting measure or a stopping criteria is satisfied.

Univariate Splitting Criteria

In most of the cases, the discrete splitting functions are univariate. Univariate means that an internal node is split according to the value of a single attribute. Consequently, the inducer searches for the best attribute upon which to split. There are various univariate criteria. These criteria can be characterized in different ways, such as: According to the origin of the measure: information theory, dependence, and distance. According to the easure structure: impurity based criteria, normalized impurity based criteria and Binary criteria.

## 3.Data analysis. Data management.

*The Components of Data Management.* **Management.**The general concepts of management are as applicable to data management as they are to project management. Management issues are critical components of the data management system. The data are merely the objects being manipulated by the data management system. Unless there is adequate attention to the process, the data will not be worthy of much attention.

The investigative team is ultimately responsible for the outcome of the project. Even in those large projects where a project manager and a data manager are present, the investigative team are the project's board of directors. Management skills are required to evaluate the managers and ensure that they are doing a reasonable job, beyond the issue of is the project on schedule? Even for a relatively small project, researchers may need to work diligently to adapt to the managerial role, since many of the qualities that make for a good researcher are quite the opposite of those of a good manager:

| Researcher | Manager |
|---|---|
| Optimal Solutions | Pragmatic Solutions |
| Accurate Solutions | Workable Solutions |
| Works with things | Works with people |
| Process Oriented | Outcome Oriented |
| Individually Successful | Group Successful |

A good researcher requires creativity and may be considered a tinkerer, i.e., a person who is constantly changing things based on new ideas. A good manager is also creative but is less of a tinkerer. Constant change in a management situation results in confusion and a lack of consistency, which ultimately result in data of low quality. A few of the key management issues that directly affect the data management system are:

**Two-way communication**

Any person on the project can make a valuable contribution, comment, or observation. These contributions should be respected. Listening is an important aspect to learn what is truly happening and discover remedies. The person actually performing the task will often know more about the nuances and what is effective than anyone else. People have different degrees of readiness to express their ideas and concerns, and opportunities for informal one-on-one discussions (e.g., over coffee) are important.

**Consistency**

Consistency is essential in the implementation of the protocol, in the data collection process, and with regards to decisions made during the project. Lack of consistency may result from different decisions among the principal investigators, a lack of communication in relaying problems and

solutions, and different decisions made on the same issue at different times. Innumerable minor questions (and many major ones) will arise during the course of a project. A useful perspective to use in resolving these questions is how would outside investigators view the decision. Decisions often need to be made quickly and recorded in some form that they can be readily consulted when the same or a similar question arises at a later date.

An inability to implement the study protocol consistently may result in selection bias or information bias. Information bias in confounding variables may compromise the ability to correct fully for confounding in the analysis. Also, when the methods and results are presented to others (a fundamental part of academic research) and the inevitable questions arise, it is very embarassing to have to describe and explain inconsistent methods.

**Lines of authority and responsibility**

Authority and responsibility need to be clearly defined and the designated persons accessible to the staff. Accessibility is often a problem in an academic research project where many of the staff are part-time employees, and the full-time management staff has other commitments resulting in a lack of accessibility to the staff. Among other things it is generally desirable to designate a specific person to be responsible for authorizing all changes to the computerized data sets.

**Flexibility.**The data management system must be flexible to respond to changes in the protocol, survey instruments, and staff changes. The longer a project runs the more susceptible it is to changes. Even a project using secondary data is subject to changes. Every project will undergo some modifications. Thus the data management system must be flexible to allow for easy modification.

**Simplicity.** Keep the data management system as simple as possible and within the talents of the (potential) staff. Simplicity reduces errors by reducing dependency on "key" personnel and by making the system easier to learn and implement.

Computers are wonderful tools in data management, but it is easy to complicate things by their use. The use of non-user friendly software packages or uncommon packages breeds complexity. Computerized systems actually increase the cost and technical support of systems. Their benefits are in the realm of increased efficiency and (hopefully) a reduction of errors. A small project may benefit from a predominantly, manual system when properly designed and implemented.

**Integration.** Integrate the data management system throughout the entire study process from the idea and proposal stage to the final paper, storage of information, and storage of data until planned destruction. Obviously, some concern to data management is given at the proposal stage during the budget and staffing process. More than this is needed; a general flow of the system should be thought through. This will provide a preliminary assessment of its resource demands and feasibility.

**Standardization.** Standardization extends not just to the instruments but to the procedures for participant enrollment, procedures for records review, data entry mechanisms, documentation, and other facets. This is essential to obtain quality information.

**Pilot testing.** Pilot testing is routinely done with the survey instruments. Rarely, does one pilot test crucial parts of the data management system. Use the pilot test of the survey instruments as an opportunity to pilot test aspects of the data management system, e.g. coordination of interviewers, call backs, coordination with other sources (participant identification) etc. A key aspect is to make this as real as possible to avoid the "test run" syndrome and a lack of seriousness among the staff.

The data management system may be pilot tested when the preliminary versions of the survey instruments are under evaluation and during the evaluation of the laboratory methods. If the project is sufficiently large, then a pilot test of the entire system may be done on the first few participants (5, 10, or 20). The project is then briefly halted for review and modification prior to complete implementation. Large projects make use of a "vanguard" cohort that goes through all aspects of the study sufficiently in advance of the actual study population to enable adjustment of instruments and

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procedures.

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2. Lorenzo Cantoni (University of Lugano, Switzerland) James A. Danowski (University of Illinois at Chicago, IL, USA) Communication and Technology, 576 pages.

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4. Utelbaeva A.K.,Utelbaeva A.K. Study guide for lectures on discipline "Computer science", Shimkent 2008, 84 pages.

**6. Control questions:**
1. Is it possible to access databases using the Web?
2. What is the significance of field types in a database?
3. Why do errors creep into databases?
4. How do database designers use normalization to reduce
5. data redundancy?
6. What roles do sorting and indexing play in making databases
7. more versatile?
8. Is it difficult to create reports from a database?

# LECTURE №5.

**1.Theme: Networks and telecommunications**
**2. The goal**:  to develop a solid grasp of network by introducing the basic concepts.
**3.Teaching methods:** interactive lesson
**4.lecture thesis**
**1.   End devices, data transfer devices, transmission medium. Types of networks.**
**What is a Computer Network?** Two or more independent computers connected together through a communication media form a computer network. The computers are connected in a network to exchange information and data. The computers connected in a network can also use resources of other computers such as software packages and peripherals like modems, printers, backup drives, or CD-ROM drives. Networks are built with a mix of computer hardware and computer software. Further, you do not need the same software package installed on your machine, if your network has that software installed on one of the machines on the network. In this sense, computer networks are clear means for sharing resources. This makes the use of computer technology cost effective. Following Figure 9 shows a typical network with four computers.
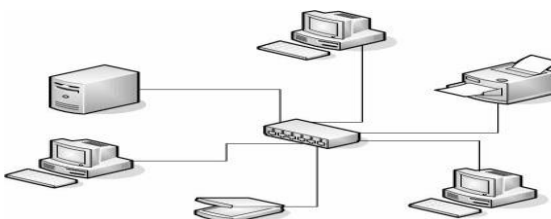


*Figure 9: Typical computer network*

**Basic hardware and terminology in networks**
If you explore more on computer networks, you will come across with a huge list of terminology associated with networks. Let us look at the basic terminology used in the subject of computer networks in brief. It is worth to note here that all networks are made up of basic hardware building

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blocks to interconnect network nodes.

**Node.** Any device attached to the network capable of communicating with other network devices is called a **Node**. A node can be a computer or some other device, such as a printer. Every node has a unique network address, sometimes called a Data Link Control (DLC) address or Media Access Control (MAC) address.

**Client.** A device or application that uses the services provided by a server is called a **Client** in the network. A client may be a PC or a workstation on a network using services provided from the network file server, or it may be that part of an application program that runs on the workstation supported by additional software running on the server. One of the most familiar clients is the Web browser.

**Server.** Any computer that makes access to files, printing, communications, and other services available to users of the network is called a **Server** in the network. In large networks, a dedicated server runs a special network operating system; in smaller installations, a non-dedicated server may run a personal computer operating system with peer-to-peer networking software running on top.

A server typically has a more advanced processor, more memory, a larger cache, and more disk storage than a single-user workstation. A server may also have several processors rather than just one and may be dedicated to a specific support function such as printing, e-mail, or communications. Many servers also have large power supplies, UPS (uninterruptible power supply) support, and fault-tolerant features, such as RAID technology. On the Internet, a server responds to requests from a client, usually a Web browser.

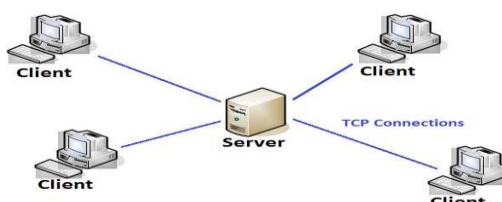Following Figure 10 shows the client and server in a network.



*Figure 10: Client and Server*

**Hub.** A device used to extend a network so that additional workstations can be attached. In some star networks, a hub is the central controlling device. Hubs typically provide from 4 to 24 connections, allowing anything from 2 to 24 devices to communicate with one another. Following Figure 11 shows the use of a hub in a Star network (You will learn what a star network is in the latter part of this session) while the Figure shows an enlarged view of an 8-port hub.
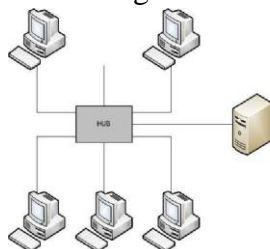


*Figure 11: Hub in a Star network*          *Figure 12: 8-port Hub*

**IP Address.** An Internet Protocol (IP) address is a numerical identification (logical address) that is assigned to devices participating in a computer network utilizing the Internet Protocol for communication between its nodes. Although IP addresses are stored as binary numbers, they are often displayed in more human-readable notations, such as 192.168.100.1(for IPv4). The role of the IP address has been characterized as follows: "A name indicates what we seek. An address indicates where it is. A route indicates how to get there."

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A repeater is an electronic device that receives a signal and retransmits it at a higher power level, or to the other side of an obstruction, so that the signal can cover longer distances without degradation. In most twisted pair Ethernet configurations, repeaters are required for cable which runs longer than 100 meters.

**Bridges.**A network bridge connects multiple network segments at the data link layer (layer 2) of the OSI model. Bridges do not promiscuously copy traffic to all ports, as hubs do, but learn which MAC addresses are reachable through specific ports. Once the bridge associates a port and an address, it will send traffic for that address only to that port. Bridges do send broadcasts to all ports except the one on which the broadcast was received.

**Routers.** A router is a networking device that forwards packets between networks using information in protocol headers and forwarding tables to determine the best next router for each packet. Routers work at the Network Layer of the OSI model and the Internet Layer of TCP/IP.

**2.Stack protocols: TCP/IP, OSI. IP addressing. Local and wide area networks.Wire and wireless network technologies.**

**Classifications of Computer Networks**

Computer networks can be classified by considering following different aspects as the basis.
- The scale
- The connection method
- The functional relationship (Network Architectures)
- The network topology

The given below classifies the computer networks according to the above different basis.

| The basis | Different categories |
| --- | --- |
| **Scale** | Personal Area Network (PAN) Local Area Network (LAN) Metropolitan Area Network (MAN) Wide Area Network (WAN). |
| **Connection method** | Optical fiber Ethernet Wireless LAN Home PNA |
| **Functional Relationship (Architecture)** | Active Networking Client-server networking Peer-to-peer (workgroup) architectures |
| **Network topology (Arrangement of components)** | Bus network topology Star network topology Ring network topology |

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Mesh network topology

Tree or Hierarchical topology

*Table 5: Classifications of Computer Networks*

**Classification of computer networks by scale**

According to the Table 5 above, the networks can be classified into six classes abbreviated as PAN, LAN, MAN and GAN.

**Personal Area Network (PAN)**

A personal area network (PAN) is a computer network that will be useful in communicating computerizes devices such as telephones and PDAs. Mostly, the PAN is communicated through wireless network technologies such as Wireless USB, Bluetooth, Z-Wave, and IrDA. You may use PANs to communicate among the personal devices or you may connect even to higher level networks or to the internet.



*Figure 11: Personal Area Network*

**Local Area Network (LAN)**

A local area network (LAN) is a computer network covering a small geographic area, like a home, office, or group of buildings. Ex: a school (See Figure 11 below). The defining characteristics of LANs, in contrast to Wide Area Networks (WANs), include their much higher data transfer rates, smaller geographic range, and lack of a need for leased telecommunication lines. LANs can be small, linking as few as three computers, but often link hundreds of computers used by thousands of people. The development of standard networking protocols and media has resulted in worldwide propagation of LANs throughout business and educational organizations. The Figure 12 below shows a LAN consisting of six computers/work stations.
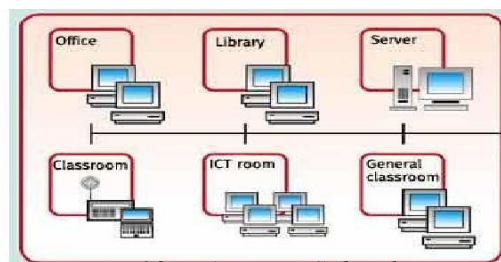


*Figure 12: Local Area Network (LAN)*



*Figure 13: LAN in a School*

**Wide Area Network (WAN)**

Wide Area Network is defined as a group of computers and network devices connected across large physical areas such as states or countries. Computers connected to a Wide Area Network are often

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connected through the telephone system. They can also be connected through leased lines or satellites. One may define a WAN as a collection of several LANs as depicted in Figure 14 below.

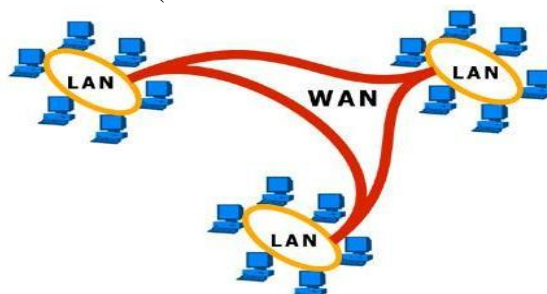The largest WAN in existence is the Internet. (You will learn about Internet in a coming section).



*Figure 14: Wide Area Network*

**Metropolitan Area Network (MAN)**
MAN is a network that interconnect users with computer resources in a geographic area or region larger than that covered by a local area network (LAN) but smaller than the area covered by wide area network (WAN). Further a MAN is a network that connects two or more Local Area Networks or Campus Area Networks together but does not extend beyond the boundaries of the immediate town, city, or metropolitan area. See Figures 15,16 below for a typical set up of a MAN.
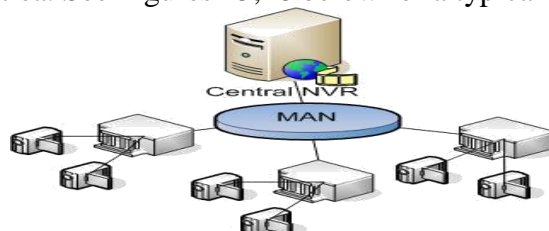


*Figure 15: Metropolitan Area Network (MAN)*



*Figure 16: LAN, MAN, and WAN*

**Classifications of networks based on the topology**

Network Topology is the schematic description how the arrangement of the network is including the nodes, connecting lines, and other devices. As per the above Table 5, the main network topologies are listed below.

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- Bus
- Star
- Ring
- Mesh
- Tree/Hierarchical

Deep discussions on the topologies are beyond the level of this course unit. However, brief descriptions on each topology and images of them are given below.

**Bus Topology**

Bus networks (not to be confused with the system bus of a computer) use a common backbone to connect all devices. A single cable, the backbone, functions as a shared communication medium that devices attach or tap into with an interface connector. A device wanting to communicate with another device on the network sends a broadcast message onto the wire that all other devices see, but only the intended recipient actually accepts and processes the message.
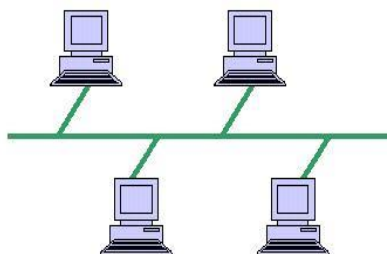


*Figure 17: Bus topology*

**Star Topology**

Many home networks use the star topology. A star network features a central connection point called a "hub node" that may be a network hub, switch or router. Devices typically connect to the hub with Unshielded Twisted Pair (UTP) Ethernet.

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.)

**Ring Topology**

In a ring network, every device has exactly two neighbors for communication purposes. All messages travel through a ring in the same direction (either "clockwise" or "counterclockwise"). A failure in any cable or device breaks the loop and can take down the entire network.
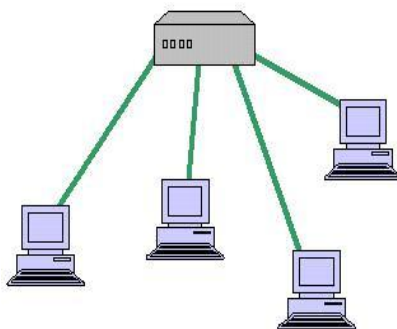


*Figure 18: Star topology*

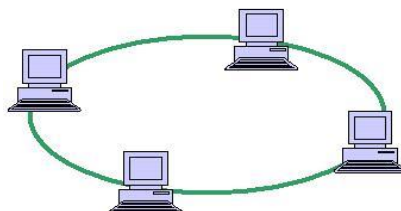| OŃTÚSTIK-QAZAQSTAN **MEDISINA AKADEMIASY** «Оңтүстік Қазақстан медицина академиясы» АҚ | SOUTH KAZAKHSTAN **MEDICAL ACADEMY** АО «Южно-Казахстанская медицинская академия» |
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*Figure 19: Ring topology*

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

**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. (Recall that even in a ring, although two cable paths exist, messages can only travel in one direction.) Some WANs, most notably the Internet, employ mesh routing.

A mesh network in which every device connects to every other is called a full mesh. As shown in the illustration below, partial mesh networks also exist in which some devices connect only indirectly to others.
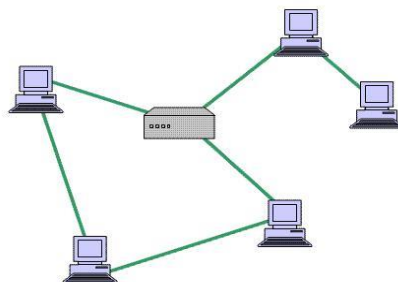


Figure 20: Mesh topology

**Tree Topology**

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 connection points) alone.
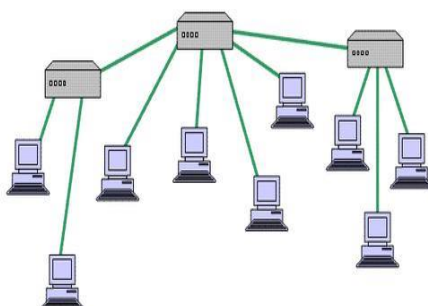


Figure 21: Tree topology

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### The Internet

As you are already aware, the Internet is the largest WAN in existence (See Figure 21 below). It is a *network of networks* that consists of millions of private, public, academic, business, and government networks, of local to global scope, that are linked by a broad array of electronic, wireless and optical networking technologies. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents of the World Wide Web (WWW) and the infrastructure to support email.

With the dramatic rise in demand for connectivity, the Internet has become a communications highway for millions of users. The Internet was initially restricted to military and academic institutions, but now it is a full-fledged conduit for any and all forms of information and commerce. Internet websites now provide personal, educational, political and economic resources to every corner of the planet.
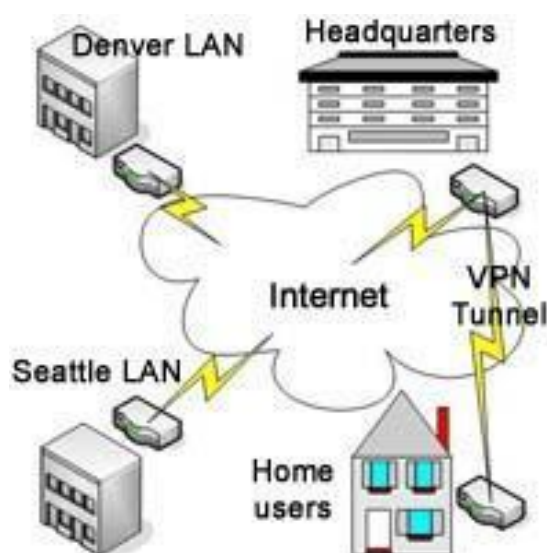


*Figure 21: Internet: the largest WAN in existence*

### The Intranet and Extranet

**The Intranet.** You are already aware what the Internet is. Accordingly, the internet which is a worldwide system can be accessed by any person or by any organization. Since it is a vast public communication tool, some organizations were willing to maintain their own local network which supports their employees or the members. The *Intranets* were developed as a solution to the above requirement. However, the intranet also has almost all the services provided by the Internet, but it is a private system. The access of an intranet is restricted to the authorized members or people within the organization such that the authorized members need to log on with a secure password.

More comprehensively, intranets are private networks based on Internet Technologies that are located behind an organization"s firewall. A *Firewall* is a set of technologies designed to protect a private network from users on a public network. Some intranets provide access to the Internet through a special server called a **Proxy Server**, designed to cache (to store for quick re-use) frequently requested information to keep that information readily available. This type of proxy server also provides tools for tracking and controlling access to networks.

An intranet can cover a LAN where only staff in the same building or region can use it. Or it can run over a WAN where staff (authorized people) from around the world can log in.

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**What Intranets do**

Intranets usually start by publishing web pages about the organization"s events, health and safety policies, and staff newsletters. Popular applications follow, such as forms to reclaim expenses or request holidays. All these help eliminate paperwork and speed up workflows of the organization.

As more features are added, this intranet can become essential to the operation of an organization. It becomes a portal that provides access to all the things workers need.

A typical intranet may provide the services such as E-mail, File transfer, Real time chat, web pages, video and audio streaming services. Each service requires at least one server to provide the service. For example, the intranet of the Open University of Sri Lanka maintains two main servers; a web server for the *OUSL web site* and a Moodle server for the service of delivery of on-line courses.

**Advantages of an Intranet**

- ☐ Commercial or confidential data is kept secured within the organization.
- ☐ E-mails remain private and may also be encrypted.
- ☐ High bandwidth. No connection limits unlike the Internet
- ☐ Reliable. The organization will have dedicated IT personnel to keep things running smoothly.
- ☐ Information specificity tailored to the organization or staff"s needs can be published.

**The Extranet**

We can consider an Extranet as an extension to the Intranets what we described above. Because, the extranets are again private networks that contains information related to the company and accessible only for the members of the company BUT allowed for outside individuals as well who have obtained the authority to access. Therefore, an extranet is partially accessible to authorized outsiders.

An extranet can be configured (set up) either using a direct leased line linking all intranets or by using a secured separate link created across the participants as a VPN (Virtual Private Network). The latter method is more cost effective than the firs method.

**Advantages of Extranets**

- A cost effective method to share and trade information and all other data effectively at any time to the authorized people (internal and external) such as the customers, partners, investors, suppliers who are included within the built up extranet.

- A platform for companies to conduct business-to-business deals. Can assist in strengthening relationships between two or more organizations.

- Useful when the staff of the company works outside the office, from their homes, or sales sites so that they can still be in with the company network with the access permission.

**4.DHCP protocol. Technologies of connection to the Internet.**

Short for **Dynamic Host Configuration Protocol**, **DHCP** is a protocol used to assign an IP address to a computer or device that has been connected to a network automatically. Routers, switches, or servers that use DHCP to assign addresses to other computers can make setup and management easier for the network administrator.

On a home network, DHCP can be setup by purchasing a home router, wireless router, or switch with NAT/DHCP and connecting each computer to it. If the network has a firewall, ports 67 and 68 need to be open for devices to function properly.

**1.8. Configuring a DHCP Server**

To configure a DHCP server, you must create the dhcpd.conf configuration file in the /etc/

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directory. A sample file can be found at /usr/share/doc/dhcp-<*version*>/dhcpd.conf.sample.

DHCP also uses the file /var/lib/dhcpd/dhcpd.leases to store the client lease database. Refer to Section 20.2.2, "Lease Database" for more information.

### 1.8.1.  Configuration File

The first step in configuring a DHCP server is to create the configuration file that stores the network information for the clients.Use this file to declare options and global options for client systems.

The configuration file can contain extra tabs or blank lines for easier formatting. Keywords are case-insensitive and lines beginning with a hash mark (#) are considered comments.

Two DNS update schemes are currently implemented — the ad-hoc DNS update mode and the interim DHCP-DNS interaction draft update mode. If and when these two are accepted as part of the Internet Engineering Task Force (IETF) standards process, there will be a third mode — the standard DNS update method. You must configure the DNS server for compatibility with these schemes. Version 3.0b2pl11 and previous versions used the ad-hoc mode; however, it has been deprecated. To keep the same behavior, add the following line to the top of the configuration file:

ddns-update-style ad-hoc;

To use the recommended mode, add the following line to the top of the configuration file:

ddns-update-style interim;

Refer to the dhcpd.conf man page for details about the different modes.

There are two types of statements in the configuration file:

• Parameters — State how to perform a task, whether to perform a task, or what network configuration options to send to the client.

• Declarations — Describe the topology of the network, describe the clients, provide addresses for the clients, or apply a group of parameters to a group of declarations.

The parameters that start with the keyword option are reffered to as *options*. These options control DHCP options; whereas, parameters configure values that are not optional or control how the DHCP server behaves.

Parameters (including options) declared before a section enclosed in curly brackets ({ }) are considered global parameters. Global parameters apply to all the sections below it.

### 1.9. Important

If the configuration file is changed, the changes do not take effect until the DHCP daemon is restarted with the command service dhcpd restart.

### 1.10.  Tip

Instead of changing a DHCP configuration file and restarting the service each time, using the omshell command provides an interactive way to connect to, query, and change the configuration of a DHCP server. By using omshell, all changes can be made while the server is running. For more information on omshell, refer to the omshell man page.

Additionally, a subnet can be declared, a subnet declaration must be included for every subnet in the network. If it is not, the DHCP server fails to start.

In this example, there are global options for every DHCP client in the subnet and a range declared. Clients are assigned an IP address within the range.

### 1.10.1. Lease Database

On the DHCP server, the file /var/lib/dhcpd/dhcpd.leases stores the DHCP client lease database. Do not change this file. DHCP lease information for each recently assigned IP address is automatically stored in the lease database. The information includes the length of the lease, to whom the IP address has been assigned, the start and end dates for the lease, and the MAC address of the network interface card that was used to retrieve the lease.

All times in the lease database are in Coordinated Universal Time (UTC), not local time.

The lease database is recreated from time to time so that it is not too large. First, all known leases

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are saved in a temporary lease database. The dhcpd.leases file is renamed dhcpd.leases~ and the temporary lease database is written to dhcpd.leases.

The DHCP daemon could be killed or the system could crash after the lease database has been renamed to the backup file but before the new file has been written. If this happens, the dhcpd.leases file does not exist, but it is required to start the service. Do not create a new lease file. If you do, all old leases are lost which causes many problems. The correct solution is to rename the dhcpd.leases~ backup file to dhcpd.leases and then start the daemon.

### 1.10.2. Starting and Stopping the Server

### 1.11. Important

When the DHCP server is started for the first time, it fails unless the dhcpd.leases file exists. Use the command touch /var/lib/dhcpd/dhcpd.leases to create the file if it does not exist.

If the same server is also running BIND as a DNS server, this step is not necessary, as starting the named service automatically checks for a dhcpd.leases file.

To start the DHCP service, use the command /sbin/service dhcpd start. To stop the DHCP server, use the command /sbin/service dhcpd stop.

If more than one network interface is attached to the system, but the DHCP server should only be started on one of the interfaces, configure the DHCP server to start only on that device. In /etc/sysconfig/dhcpd, add the name of the interface to the list of DHCPDARGS:

\# Command line options here

DHCPDARGS=eth0

This is useful for a firewall machine with two network cards. One network card can be configured as a DHCP client to retrieve an IP address to the Internet. The other network card can be used as a DHCP server for the internal network behind the firewall. Specifying only the network card connected to the internal network makes the system more secure because users can not connect to the daemon via the Internet.

Other command line options that can be specified in /etc/sysconfig/dhcpd include:

- -p *<portnum>* — Specifies the UDP port number on which dhcpd should listen. The default is port 67. The DHCP server transmits responses to the DHCP clients at a port number one greater than the UDP port specified. For example, if the default port 67 is used, the server listens on port 67 for requests and responses to the client on port 68. If a port is specified here and the DHCP relay agent is used, the same port on which the DHCP relay agent should listen must be specified.
- -f — Runs the daemon as a foreground process. This is mostly used for debugging.
- -d — Logs the DHCP server daemon to the standard error descriptor. This is mostly used for debugging. If this is not specified, the log is written to /var/log/messages.
- -cf *<filename>* — Specifies the location of the configuration file. The default location is /etc/dhcpd.conf.
- -lf *<filename>* — Specifies the location of the lease database file. If a lease database file already exists, it is very important that the same file be used every time the DHCP server is started. It is strongly recommended that this option only be used for debugging purposes on non-production machines. The default location is /var/lib/dhcpd/dhcpd.leases.
- -q — Do not print the entire copyright message when starting the daemon.


### 4.Telecommunication technologies.

Some of the factors that determine teleworking are: quality of IT infrastructure, good computer literacy, type of work that can be done from any place with a computer equipped with necessary programs, employees with a professional attitude towards work, organization of work adapted to this operation mode, etc.

Some advantages of teleworking:

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- reduced utility costs and employees transportation reimbursement
- reduced time for traveling to and from work
- adapting working conditions to personal habits-flexibility
- possibility of working in the convenience of a person's home (or other places that are not an office),
- lower stress level, provided there is a good organization and coordination , i.e. the flow of information between employees is unconstrained
- an excellent solution for people with disabilities or longterm illness, parents, or those who enjoy traveling

Some disadvantages of teleworking:
- physical isolation - lack of direct social contact with colleagues
- not suitable for everyone - requires a certain dose of self-control and motivation
- less opportunity for advancement due to lack of traditional vertical hierarchy in the company, however horizontal hierarchy is created, where no one is above anyone, but everyone has their own duties and obligations
- less emphasis on teamwork in the traditional sense, since tasks are done independently, physically isolated from others. It requires a heightened focus, due to lack of physical contact among team members, and emphasizes teamwork in terms of communication, information exchange. Each team member depends on others to perform their tasks. For example, a programmer from Australia works in a team with developers from Croatia, Ireland and America, on a software development for a company from Asia. In most cases a coordinator travels and his/her function is coordination among the parent company, client and programmers. Coordinators, whether by visit or otherwise, have client's demands, organizes teams of programmers, distributes tasks and reports to company headquarters. Each programmer is assigned his own programming task and they are all responsible for the program's functionality overall. They must coordinate in order to achieve full program functionality.

It is evident that they can work in a team, regardless of the place of work, provided that they have excellent communication and exchange of information, good organization and professional attitude towards work.

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3. Craig Van Slyke  Information Communication Technologies: Concepts, Methodologies, Tools, and Applications (6 Volumes). ISBN13: 9781599049496, 2008, Pages: 4288
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**6. Control questions::**
1. Why do we need to connect computers?
2. What is a computer network?
3. Briefly describe the following network components.
4. a. Client          b. Server       c. Hub           d. Router
5. What are the differences between a Hub and a Switch?
6. What is the use of a MODEM?

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7. Briefly describe the following categories of networks.
8. a. PAN      b. LAN      c. WAN      d. MAN
9. Briefly explain the classifications of networks according to the topology.
10. What is meant by Internet and Intranet? Why it is important to use intranet than internet?
11. What is the most suitable connection method for the following;
a. Computers within a laboratory.
b. Connect two computer laboratories.
12. List the advantages of having an Extranet for a company.

# LECTURE №8

**1.Theme:** Cybersafety.
**2. The goal**: to give an idea of legal regulation that covers the information security.
**3.Teaching methods:** interactive lesson
**4.lecture thesis**

## 1.Security risks of information and their classification. Industry of cybersafety.
**Introduction to Information Security**

*Information security is the practice of defending information from unauthorized access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction.*
*Wikipedia*

In the other words, Computer Security is the protection of computing systems and the data they store or access. Here, it is required to assure that your information are protected in terms of **Confidentiality**, **Integrity**, and Availability as illustrated in the Figure 22 below.
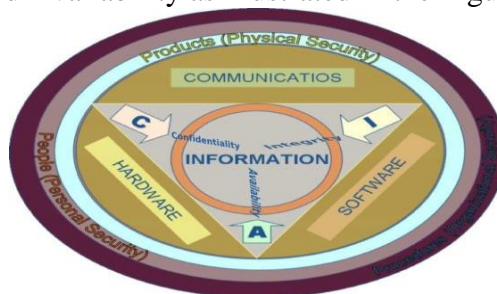


*Figure 22: Information Security*

### Importance of Information Security
Information security plays a major role in your computing system, especially when the computer is connected to the internet or any other network. Due to being attacked, an unprotected computer can become infected or compromised within a few seconds after it is connected to the
network. In the other hand it can be a case for the other computers which are available in its network.

### Possible attacks
Following is a list of attacks that may arise with your computer if not proper security measures taken. In other words, following are the ways that your computer may behave due to being hacked.

☐ Record keystrokes and steal passwords.
☐ Send spam and phishing emails.
☐ Harvest and sell email addresses and passwords.
☐ Access restricted or personal information on your computer or other systems that you have access to.
☐ Illegally distribute music, movies and software.
☐ Distribute child pornography.

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☐ Infect other systems.

☐ Hide programs that launch attacks on other computers.

☐ Generate large volumes of traffic, slowing down the entire system.

**Security measures**

The following steps can be followed to prevent being attacked.

☐ Use good, cryptic passwords that can"t be easily guessed. And keep your passwords secret.

☐ Make sure your computer"s operating system and applications are protected with all necessary security "patches" and updates.

☐ Make sure your computer is protected with up-to-date anti-virus and anti-spyware software.

☐ Don"t click on unknown or unsolicited links or attachments, and don"t download unknown files or programs onto your computer.

☐ Remember that information and passwords sent via standard, unencrypted wireless are especially easy for hackers to intercept.

☐ Look for "https" in the URL before you enter any sensitive information or a password (The "s" stands for "secure").

☐ Also avoid standard, unencrypted email and unencrypted Instant Messaging (IM) if you"re concerned about privacy.

**Forms of software threats**

In the previous section you learnt what type of attacks may arise with your computer. We call that the cause of such attacks could be due to a Computer Virus, a Worm, or any other form of other harmful program. Let us discuss more about such software threats with some examples.

**What is a computer virus?**

We all get affected by viral infection deceases it is difficult to find a cure for a viral infections. Computer virus is a harmful computer program developed by a person that disrupts operations of a computer in various ways. It can be either malfunction of a program or set of programs, it can be a program which generates e-mails in thousands, it can be a program that damages important files such as documents beyond recovery, a program just simply destroys the files system of computer making it completely unusable or simply a harm less program which displays a message in a taskbar or a title bar. Definitely you need to know that computer viruses do not infect any human being.

The **Creeper virus** was first detected on ARPANET, the forerunner of the Internet in the early 1970s. Creeper was an experimental self-replicating program written by Bob Thomas at BBN in 1971. Creeper copied itself to the remote system where the message, "I'm the creeper, catch me if you can!" was displayed. The Reaper program was created to delete Creeper.

A program called "**Rother** J" was the first computer virus to appear "in the wild" that is, outside the single computer or lab where it was created. Written in 1981 by Richard Skrenta, it attached itself to the Apple DOS 3.3 operating system and spread via floppy disk. This virus was created as a practical joke when Richard Skrenta was still in high school. It was injected in a game on a floppy disk. On its 50th use the Elk Cloner virus would be activated, infecting the computer and displaying a short poem beginning "Elk Cloner: The program with a personality."

**Common virus types**

There are several types of computer viruses existing and basically they can be classified according to different categories. First two categories are resident viruses and nonresident viruses.

**Boot Sector Virus**

This type of virus affects the boot sector of a floppy or hard disk. This is a crucial part of a disk, in which information on the disk itself is stored together with a program that makes it possible to boot (start) the computer from the disk.

Examples of boot viruses include: Polyboot.B, AntiEXE.

**Worms**

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Worms do not require user actions to spread, they move from system to system over networks on their own. It increases network traffic, CPU utilization of computer thereby making systems slow. Worms can do nasty actions such as creating unnecessary files inside system folders, steal information from user"s computers and upload to web sites, provide unnecessary load in database servers, infect files of selected file types like script files in web servers.
Examples: Confiker, PSWBugbear.B, Lovgate.F, Trile.C, Sobig.D, Mapson

**Macro Viruses**
Macro viruses infect documents created by Microsoft Office programs (Word, Excel, PowerPoint and Access). Macro viruses infect to the files that are created using certain applications or programs that contain macros. These mini-programs (MACROS) make it possible to automate series of operations so that they are performed as a single action, thereby saving the user from having to carry them out one by one. A valid macro performs useful job while illegal macro might destroy important contents of a file when executed automatically.
Examples of macro viruses: Relax, Melissa.A, Bablas, O97M/Y2K.
The functionality of virus differs from one to another. Some will increase size of certain files when infected. Some other viruses especially worms create files inside Windows or other folders hiding their identity by naming them in irrelevant characters or with a name that is closer to a required system file with hidden attributes. (e.g. lsass.exe is a valid system file whereas isass.exe is virus file). Some viruses employ polymorphic and an anti-stealth technology which prevents them from identified and erased by virus catching programs called antivirus programs.

**Other harmful programs**
When people browse internet there are many web pages that displays a bogus question to user saying that your computer is infected with some harmful program and do you wish to clean it using their advertised program?. People are tempted to click on yes then the harmful program is installed in the computer with user"s permission. Then it will always nag the user to buy the program or slows down the computer, prevent from browsing some other sites especially antivirus (virus cleaning program) vendor"s sites. These programs are called **malware**.

**Common Methods of infection**
Computer viruses can be infected using many methods. Before the popularity of computer networks most of the computer viruses are written to spread through removable media like floppies. Today most of the viruses being infected using removable media like thumb drives and through networks and the Internet.
Today most of the computer viruses are designed to exploit some kind of an error (security hole) or vulnerability of operating system or a program when it was programmed and try to sneak in to computer system using the security hole.
Resident virus always runs on computers memory and runs automatically or trigged by an action performed by user to infect or replicate itself to new locations or files. Nonresident viruses are activated when user performs specific activity such as accessing floppy/removable media, starting a specific program like Microsoft Word etc.
In a computer which is affected by a worm try to infect other computers through network. Worms run automatically and scan network shares which are not password protected or having weak passwords and try to infect the computer.
Trojan horses programs are distributed by some kind of fancy program such as screen saver which is intended to do some other task. The danger of Trojan horse is that it tries to damage the security of the computer from inside and open back door for other computer viruses to sneak in to system.

**Suspecting a Virus/malware present in your computer**
There are several ways to find out that a computer virus or malware program is present in your computer. One of the good symptoms is that your computer suddenly slows down after installing a

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program downloaded from internet which gives you a good impression of that.

You can always press **Ctrl**, **Alt** and **Delete** and get the task manger by clicking on task manger button of your computer if it is not displayed that means you are at a problem.

If you are able to get the task manager and in performance tab CPU usage is always reaching 100% without doing any useful task then you can suspect that some kind of virus or malware is present in your computer.

If there are always nagging messages appearing and computer gets terribly slow down or does unnecessary things like moving mouse automatically when you working with Microsoft Office packages then you can suspect that a macro virus or some malware present.

If you cannot eject your thumb drive without any document or program open from that thumb drive, you are definitely infected with a virus. If you cannot see the folder options from windows explorer or you cannot show the hidden files using folder options, you can suspect that a computer virus might be present.

If you see that files are automatically created with unknown rubbish names it is a sign of virus activity. If you cannot double click and access drives in My Computer it is also can be an activity of a virus.

**2.Cybersafety and control of the Internet. Malicious applications. Measures and means of information protection.**

**Hardware Threats.** Though you manage and protect your data with proper use of software, your data may get lost or damaged due to hardware problems. Really, Hardware is a common cause of data problems. While you work, all of a sudden the power can fail, you can mistype, a repair technician can accidently damages the data, or a magnets used closer to the PC without your knowledge can damage disks. Likewise, hardware errors are of varying types and most of them are unpredictable. But, some of them have solutions; unfortunately some do not. So, it is worth to have a fair knowledge about the hardware threats to your PC and the solutions if any.The following sections discuss the examples for possible hardware threats along with solutions, if any.

**Power Faults.**

Your PC may be busy writing data to the disk and in a sudden power may go out. Obviously, you will be afraid if it lost your data. Your will be hurried to get know for sure if anything was damages soon after the power is back. Usually, power faults can cause data problems, particularly if they occur when data is being written to disk. Data in memory generally does not get corrupted by power problems; it just gets erased if the problems are serious enough.

Some other similar power related problems are briefed below.

**Brownout**: Lower voltages at electrical outlets. Usually they are caused by an extraordinary drain on the power system. Frequently you will see a brownout during a heat wave when more people than normal have air conditioners on full. Sometimes these power shortages will be

"rolling" across the area giving everyone a temporary brownout. Maybe you"ll get yours just as that important file is being written to disk.

**Voltage Spikes**: Temporary voltage increases are fairly common. Large motors or circuit breakers in industry can put them on the electrical line. Sudden losses (ex; a driver hits a power pole) can causes spikes as the circuits balance. An appliance in your home can cause a spike, particularly with older wiring. Lightning can put large spikes on power lines. And, the list goes on. In addition to current backups and integrity information for your software and data files, including a hardware voltage spike protection device between the wall and your computer hardware (don"t forget the printer and monitor) can be very helpful.

**Frequency Shifts**: While infrequent, if the line frequency varies from the normal 60 Hertz (or 50 Hertz in some countries), the power supply on the computer can be affected and this, in turn, can reflect back into the computer causing data loss.

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**Solution**: Consider using a Combined Surge Protector (CSP) and Uninterruptible Power Supply (UPS). See Figure 23 and 24 below for a CSP and UPS used for PCs respectively.

*Figure 23: Combined Surge Protector for a PC*

*Figure 24: Uninterruptable Power Supply for a PC*

**Age.**It is not an amazing thing that as computers age they tend to fails more often. Electronic components are stressed over time as they heat up and cool down. Mechanical components simply wear out. Some of these failures will be dramatic; something will just stop working.

Some, however, can be slow and not obvious. Unfortunately, it"s not a question of "if", but "when" in regard to equipment failure.

**Solution**: Keep an eye on the specials after three to five years.

**Incompatibilities**

You can have hardware problems on a perfectly healthy PC if you have devices installed that do not properly share interrupts. Sometimes problems are immediately obvious, other times they are subtle and depend upon certain events to happen at just the wrong time, and then suddenly strange things happen.

**Solution**: Make a really good backup before installing anything (hardware or software) so you can revert the system back to a stable state which should something crop up.

**Finger Faults**

Your fingers may make mistakes when using the keyboard and frequent cause of data corruption. This commonly happens when replace one file but actually get another.

the mouse and they are too you are intending to delete or

If you are using a laptop computer or a notebook, another finger fault problem arises with touchpads below the space bar. It"s very easy to brush the touchpad when you are typing away and suddenly find yourself entering characters in a screen location very different from where you were before you touched the pad.

**Solution**: Be careful and look up now and again to make certain your cursor is where you want it.

**Malicious or Careless Damage**

Someone may accidentally or purposely delete or change a file on your PC when you"re not around. If you don"t keep your PC locked in a safe, then this is a risk. Sometimes, you may not detect that something has happened to your data while you are not around. Most of this type of damage is done unintentionally by someone you probably know. This person didn"t mean to cause trouble; they simply didn"t know what they were doing when they used your PC. That may be a person who is new to use computers.

**Solution**: Never run the computer as an administrative user and have guest accounts available for others who use the computer. Keep up-to-date backups as well.

**Data carriers**

One possible source for computer infections is the Customer Engineer (CE), or repairman. When a CE comes for a service call, they will almost always run a diagnostic program from CD. It"s very easy for these CDs to become infected and spread the infection to your computer. Sales representatives showing demonstrations via CDs are also possibly spreading viruses. Always check

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your system after other people have placed their data carriers such as CDs, Portable Hard disks, and USB pen drives into it. (Better yet, if you can, check their disk with up-to-date anti-virus software before anything is run.)

**Solution**: Insist on testing their CD/Pen drive/portable hard disk before use or make certain they"ve used an up-to-date anti-virus before coming to your location.

### Magnetic Zaps

Computer data is generally stored as a series of magnetic changes on disks. While hard disks are generally safe from most magnetic threats because they are encased within the computer compartment, the older technology: floppy disks are highly vulnerable to magnets. You may be happy that Floppy disks are not now in use with your PC.

The obvious threat would be to post a floppy disk to the refrigerator with a magnet. Some of the more subtle sources of magnetism include:

**Computer Monitor:** Don"t put floppy disks anywhere near the monitor; it generates a magnetic field. (Generally applies to the older CRT displays.)

**Telephone:** When ringing, telephones (particularly older phones with a bell) generate a magnetic field.

**Solution**: Stay away from magnets or sources of static of all kinds when working with a computer.

**Note:** *There are tools to assist in recovery from disk problems, but how do you know all the data is OK? These tools do not always recover good copies of the original files. Active action on your part before disaster strikes is your best defense. It's best to have a good, current backup and, for better protection, a complete up-to-date integrity-check map of everything on your disk.*

**3.Standards and specifications in information security field. The acts of the Republic of Kazakhstan governing legal relations in the sphere of information security. Digital signature. Encoding.**

### Exposure in browsing Web

Sometimes, you may think that you are unidentified an unexposed to other users when you browse web sites. But there may be a possibility of leaving information about you left behind. However, you can reduce the amount of such information that reveals about you to other users by following some privacy policies. Next sections will discuss how to protect your privacy when using Web.

### Information that reveals you

The following information may be automatically sent to the web sites when you visit them.

**IP address of your computer**: the Internet Protocol address assigned to each computer on the internet. It may be a static one which remains unchanged or it may be dynamic which changes time to time as you access internet.

**Domain name:** the domain (division of internet) to which your user account associated with.

**Software particulars:** There is a possibility for an organization of identifying the operating system used and the details of the web browser you use.

**Details of pages visit:** what pages and for how long you stay on a particular page, and the fact whether you used a search engine to access that page can be identified

**Other information:** some non-critical information such as the web browsing pattern and some critical information such as passwords saved in temporary memory also can be detected if the web site uses cookies.

**Limiting the information collection**

You can follow the actions mentioned below in order to reduce the amount of information that can be collect about you.

**Pay special attention when supply personal data:** If you don"t trust any site, don"t give your personal data such as your credit card details, account details, passwords, etc.

**Limiting cookies:** the cookies can provide the store data about you to the attackers who access your

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computer. You cannot limit it. But you can limit the use of cookies. Check and delete cookies: All popular browsers let users view and delete cookies installed on their computer. Methods vary by browser. For instance on Internet Explorer 8, go to the "Tools" menu, pull down to "Internet Options" and under the "General" tab there are options for deleting some or all cookies. There might be hundreds, so deleting all might be easiest. But the next time you visit a favorite site, you may need to retype passwords or other login data previously stored automatically by one of those cookies.

**Adjust Browser Settings**: Once you've deleted cookies, you can limit the installation of new ones. Major browsers let you accept some cookies and block others. To maintain logins and settings for sites you visit regularly, but limit tracking, block "third-party" cookies. *Safari* automatically does this; other browsers must be set manually.

**Browse safely:** If you see that the site you access is suspicious, then immediately leave the site. Keep your virus definitions updated. Scan your computer for spyware.

### Protecting your privacy

To protect your identity and prevent an attacker from easily accessing additional information about you, you are required to avoid providing certain personal information such as your birth date, your phone number, and social security number online. Further, the following help protect your privacy.

**Privacy Policy:** You are advised to look for the privacy policy statement given in the sites before you submit your information such as e-mail address, name, phone number, etc. Usually, the privacy policy must state how the information they request are used and whether they are going to distribute those data to other organizations, etc.

**Encrypt the information provide:** Many sites use SSL (Secure Socket Layer) certificate to encrypt the information you provide to that site so that other attacker or an organization cannot access your information collected by the site.

**Work only with trusted companies:** When you do business with some sites, you are required to assure that you trust them. You may answer yourself to the facts such as whether the company is a reputed, well established one, is it providing assurance on privacy of information provided, is there legitimate contact information provided that enables you decide that the company is a trusted one.

**Avoid using primary e-mail address:** When performing online submissions, use an additional e-mail address in place of your primary e-mail address to avoid accumulation of spam or unwanted messages.

**Avoid using Debit Cards for online purchasing:** Your Credit card usually give the protection to some extents. However, the Debit cards do not give such protection and they deduct charges immediately from your account. So, if an attacker obtains your debit card details, they will completely use your money in the account even without giving you a time to realize it.

**Use Options in providing information:** You might have found that some options are there with certain web sites to make your work easy without concerning your security. Prompting an option to remember your password is an example for such instances and such options may make your data readily available for the attackers. We can take the privacy settings given to your account in social networks such as *Face book* as another example. You can restrict the other parties accessing your data by setting the privacy options to reduce the risk of attackers.

### Computer Related Legal Regulations in Sri Lanka

As a person who uses the computer and the internet, it is worth to get a considerable knowledge in the legal aspects related to the computer using to be aware and prevent any illegal actions. The following sessions will brief you about the premier organizations/projects developed in Sri Lanka on this regard, the copyright law, and the data protection laws in the context of Sri Lankan law.

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**6. Control questions:**

1. What is meant by Information Security?
2. Explain the possible attacks that may arise with your computer and how to prevent them.
3. What is a computer virus?
4. Give two types of computer viruses with two examples for each type.
5. What is meant by malware?
6. Briefly explain the ways to find out that a computer virus or malware program is present in your computer.
7. Discuss the examples for possible hardware threats to your computer along with solutions.

**LECTURE № 7**


**1.Theme:** Internet technology. Cloud and mobile technology

**2. The goal**:  Introduce Internet to the student, to provide an introduction to the e-mail. Introduce Data centres, tendencies of development of the modern infrastructure decisions.

**3.Teaching methods:** interactive lesson

**4.lecture thesis**


**1. Basic concepts Internet. The universal identifier of resources (URI), its assignment and components. Service DNS.**

A **URL** (**Uniform Resource Locator**) is a form of URI and is a standardized naming convention for addressing documents accessible over the Internet and Intranet. An example of a URL is http://www.computerhope.com, which is the URL for the Computer Hope website.

**1.12.  Overview of a URL**

Below is additional information about each of the sections of the http URL for this page.



http://www.computerhope.com/jargon/u/url.htm

Protocol — Subdomain — Domain and domain suffix — Directories — Web page

http://

The "http" stands for HyperText Transfer Protocol and is what enables the browser to know what protocol it is going to use to access the information specified in the domain. After the http is the colon ( : ) and two forward slashes ( // ) that separate the protocol from the remainder of the URL.

Tip: A URL is not explicit to HTTP addresses; HTTPS, FTP, TFTP, Telnet, and other addresses are also considered URLs and may not follow the same syntax as our example.

www.

Next, www. stands for World Wide Web and is used to distinguish the content. This portion of the URL is not required and many times can be left out. For example, typing "http://computerhope.com" would still get you to the Computer Hope web page. This portion of the address can also be substituted for an important sub page known as a subdomain. For example, http://support.computerhope.com forwards you to the main help section of Computer Hope.

computerhope.com

Next, computerhope.com is the domain name for the website. The last portion of the domain is

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known as the "domain suffix", or TLD, and is used to identify the type or location of the website. For example, **.com** is short for commercial, .org is short for an organization, and .co.uk is the United Kingdom. There are dozens of other domain suffixes available. To get a domain, you would register the name through a domain registrar.

/jargon/u/

Next, the "jargon" and "u" portions of the above URL are the directories of where on the server the web page is located. In this example, the web page is two directories deep, so if you were trying to find the file on the server, it would be in the */public_html/jargon/u* directory. With most servers, the public_html directory is the default directory containing the HTML files.

url.htm

Finally, url.htm is the actual web page on the domain you're viewing. The trailing .htm is the file extension of the web page that indicates the file is an HTML file. Other common file extensions on the Internet include .html, .php, .asp, .cgi, .xml, .jpg, and .gif. Each of these file extensions performs a different function, just like all the different types of files on your computer.

- See our index.htm definition for additional information about this important file.

Tip: As you may have noticed the protocol, domain, directories, and files are all separated by forward slashes ( / ).

## 1.13. What characters are not allowed in a URL?

Most people realize that a space is not allowed in a URL. However, it is also important to realize, as documented in RFC 1738, the URL string can only contain alphanumeric characters and the !$-_+*'(), characters. Any other characters that are needed in the URL must be encoded.

## 1.14. Understanding more complex URLs and parameters

When a URL points to a script that performs additional functions, such as a search engine pointing to a search results page, additional information (parameters) is added to the end of the URL. Below is additional information about a URL that points to the Computer Hope Search page, with the search query of "example search".

http://www.computerhope.com/cgi-bin/search.cgi?q=example%20search

In this URL, the script file being pointed to is **search.cgi** in the cgi-bin directory. Because this file ends with .cgi, it is assumed to be a Perl script.

After the script file name is a **?** (question mark). The question mark in a URL separates the URL from all the parameters or variables that are being sent to the script. In the above example, the parameter being sent is **q=example%20search**. The "q" is a variable name, and the "example%20search" is the value being sent to that variable. Because no spaces are allowed in a URL, the space has been encoded as %20. In many scripts, a + (plus) is also used to represent a space.

In our example, because there is a variable the script would use it as it is executed. Scripts are also not limited to only one variable. If the script needs multiple variables, each variable can be separated with an **&** (ampersand) as shown in the example below.

http://www.computerhope.com/cgi-bin/search.cgi?q=example%20search&example=test

In the above example, there are two different variables. The "q" variable equals "example search" and the "example" variable equals "test". If the script was looking for an *example* variable, it could be processed and perform an additional feature.


## URL

URL stands for Uniform Resource Locator. This is a standard address format that constitutes a reference to an Internet resource. Each URL starts with a protocol followed by a colon followed by two slashes.

URLs are case sensitive and do not contain any spaces. URLs or web addresses can be broken down

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into various components Access protocol, Service, Server, Domain and the country.
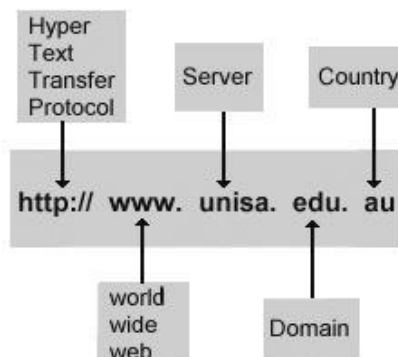The structure of the URL is shown in the figure below.



*Figure 25: Structure of the URL*

There are several domains available in the web such as:

    edu = education institute
    com = commercial enterprise
    gov = government
    org = organization
    net = network provider
    mil = military

## 2. Web technologies: HTTP, DHTML, CSS, and JavaScript.
## Internet Protocols

| Internet Protocol | Refers to | Description | Internet Services |
|---|---|---|---|
| SMTP | Simple Mail Transfer Protocol | A protocol for sending e-mail messages between servers | Email |
| POP3 | Post Office Protocol version 3 | Used by local e-mail clients to retrieve e-mail from a remote server over a TCP/IP connection | email |
| FTP | File Transfer Protocol | This is used to transfer files from one host to another host over a TCP-based network, such as the Internet. | Transferring files |
| HTTP | Hyper Text Transfer | Defines how messages are | World Wide |

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| | Protocol | formatted and transmitted, and what actions Web servers and browsers should take in response to the wide range of commands. | Web(www) |
|---|---|---|---|
| HTTPS | Hyper Text Transfer Protocol Secure | Provides authentication of the web site and associated web server and protects against man-in-the-middle attacks. | World Wide Web(www) |
| VoIP | Voice over Internet Protocol | This enables people to use the Internet as the transmission medium for telephone calls. | Online chat(there are exceptions) |

*Table 6: The Internet Protocols*

The Internet uses a variety of languages to transmit information from one place to the other. These languages are called **protocols**. Using these protocols we can acquire the services from the Internet. Each protocol has a specific functionality and www is considered to be the largest service acquired amongst the services provided by the Internet. If we take the above analogy in the hotel, we have seen in many hotels that even though there are so many dishes available, only one of these dishes will be popular. Likewise although there are so many services available in the Internet the most popular dish on the menu is www.

Internet is an interconnection of computer networks all around the world. In other words, it is the hardware which forms the physical layer to these connections is what we refer to as the Internet. Hence, the Internet comprises of network of computers, fiber-optic cables, copper wires and wireless networks. But www is the software which is used to access the information from the Internet. It consists of files, folders and the documents which are stored in different computers. Now it is crystal clear to you that the www depends on the Internet to work.

**22.1.4 Introducing the Internet buzz words**
**World Wide Web**
WWW is a part of the Internet which functions using HTML. WWW operates under a protocol called HTTP.
**Browser**
A browser is a computer software which can be used to view documents on the Internet. Web browsers interpret HTML code and display images and text.
**Search Engine.** Search engine is an automated web-site which is programmed to search specified keywords and give the websites and Internet based documents as a result.
**Client.** A computer which is capable of receiving the information from the server in the Internet is called a client. A home PC is an ideal example for this.
**Server.** Client computers download files in the Internet from the Server. These servers are directly linked to the internet and consist of a lot of documents.
**Domain**

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The Domain is the top level identification string for a particular server (yahoo.com). There are various types of domains. It can be categorized using one or more extensions.

**FTP**

FTP is a standard Internet protocol which refers to the File Transfer Protocol. Using this protocol we can transfer files from one computer to the other via Internet. This is the simplest way to exchange files between computers on the Internet. FTP is an application protocol that uses the Internet's TCP/IP protocols. FTP is commonly used to transfer Web page files from their creator to the computer that acts as their server for everyone on the Internet. It's also commonly used to download programs and other files to your computer from other servers.

p.microsoft.com/

**HTML**

HTML is the abbreviation for Hyper Text Markup Language. The web pages are called hypertext documents because when you click a word or a picture which is hyper linked you can go to another location. From there you can jump to another webpage. This is made possible because HTML allows the document"s author to embed hyperlinks.

**HTTP**

HTTP is the foundation of data communication for the World Wide Web. HTTP (Hypertext Transfer Protocol) is the set of rules for transferring files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web. When the browser user enters file requests by either "opening" a Web file (typing in a Uniform Resource Locator or URL) or clicking on a hypertext link, the browser builds an HTTP request and sends it to the Internet Protocol address (IP address) indicated by the URL. The HTTP daemon in the destination server machine receives the request and sends back the requested file or files associated with the request.

Example URL: **http://**www.yahoo.com

**HTTPS**

HTTPS stands for "Hyper Text Transfer Protocol Secure". This means that the data transferred electronically is encrypted and cannot be accessed by unauthorized people. HTTPS provides authentication of the web-site and related web server which is interacting with thus protecting against *Man-in-the middle attacks*.

**2. CSS**

1. Short for **Cascading Style Sheet**, **CSS** is a concept first created by Håkon Wium Lie in 1994. In December 1996, CSS was made a specification by the W3C and today allows web developers to alter the layout and appearance of their web pages. For example, CSS may be used to change the font used in certain HTML element, as well as its size and color. A single CSS file may be linked to multiple pages, which allows a developer to change the appearance of all the pages at the same time.

The following box contains a basic example of using CSS code to define fonts, the color of hyperlinks, and the color of a link when the mouse cursor hovers over it. In this specific example, we are only changing the HTML tags <a> and <body>, rather than creating any new class or id selectors.

```
body {
  font: normal 100% "trebuchet ms", Arial, Helvetica, sans-serif;
}
a {
  color: #000000;
}
```

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```
A:visited {
  color: #005177;
}
a:hover {
  color: #005177;
}
```

The CSS code in the box above can be inserted into the head section of a page's HTML using the following code. However, keep in mind that performing this action only applies these changes to a single page.

```
<style type="text/css">
<!--
    above code inserted here
-->
</style>
```

If you want to use the CSS code on multiple pages, we suggest storing the code in a separate CSS file and then loading it on every page. For example, the CSS code shown in the first box on this page can be copied and pasted into a file with the .css file extension.

Tip: A CSS file can be created using any text editor or even Notepad if you're using Windows.

After the file has been saved, it must linked to in the head of the HTML code using the <link> tag. The following box shows an example of this element in use.

```
<link rel="stylesheet" Type="text/css" href="URL or path to css file here">
```

If you named the file example.css (and it was in the same directory as the HTML file it is being loaded for), the following would link it.

```
<link rel="stylesheet" Type="text/css" href="example.css">
```

**CSS3** is the version of CSS (Cascading Style Sheets) that replaces **CSS2**. It introduces a number of new selectors and properties that allow for more flexibility with page layout and presentation. Some updates, such as the box-shadow property (which allows a drop-shadow to be added to an element), allow visual effects to be applied without the need for creating special images.

Originally developed by Brendan Eich and originally known as **LiveScript**, the programming language **JavaScript** was renamed in 1995. JavaScript is an interpreted client-side scripting language that allows a web designer the ability to insert code into their web page. JavaScript is commonly placed into an HTML or ASP file, and runs directly from the web page. It is utilized to perform tasks such as printing the time and date, create a calendar, or other tasks that are not possible through plain HTML.

**2.1. Hello, World! in JavaScript**

```
<SCRIPT                                              LANGUAGE="JavaScript">
<!       --        Hide        from        old        browsers
document.write('Hello                                              World!');
//                    Stop                    hide                    -->
</SCRIPT>
```

Below is an example of a JavaScript implemented into this page that will print the current time and date. Like all JavaScript files, the user's Internet browser must be capable of viewing JavaScript and the execution of JavaScript must be enabled. If JavaScript is not enabled, the time and date will not be visible.

Today is Thu Sep 22 2016 17:16:48 GMT+0600

Tip: See the JavaScript time and date source code to create this feature on your own web page.

Although JavaScript files are often embedded into the HTML file, users can also save their JavaScript code in an external file. This file often ends with a .js file extension.

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**3. E-mail. Message format.**

In the previous session we dealt with one of the most important usage of the Internet. We are going to discuss another here. It is all about the **Electronic Mail** or simply **e-mail**.

A person can exchange his/her messages digitally through e-mail. E-mail has so many similarities with the postal mail. Similar to a postal mail, e-mail too can be sent from anyone but the mail will be received by the person who owns a particular **e-mail address**. Of course, you would have used e-mail to convey messages to a person living in another part of the world. Let"s discuss this in detail.

**How e-mail works in brief**

The mails you send will be temporarily saved in your mail server. Email servers accept, forward, deliver, and store messages. Neither the users nor their computers are required to be online simultaneously; they need connect only to an e-mail server, to send or receive messages. **Mail server** is also used to mean a computer acting as a Mail Transfer Agent (MTA) that is running the appropriate software.

Let us see a real world analogy to understand the basics of this connectivity. We have not dealt the process in deep details here since it would be beyond the scope of this course.

Suppose Amali wants to send a mail to Sanath. Amali sends the mail to the MTA which is also can be referred to the *Mail Server*. Then the message is routed from server to server through the Internet. At last, Sanath receives the message from the Mail Server and reads it (See Figure 25 below).
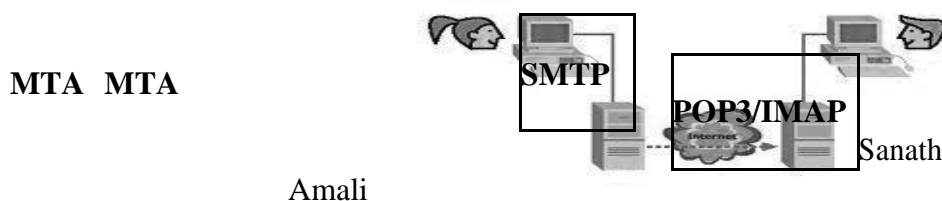
**MTA  MTA**



**SMTP**

**POP3/IMAP**

Sanath

Amali

*Figure 26: Flow of the E-mail through the Internet*

**Using emails**

**Email address.** An Email address has 3 parts in it. If we type an email address, it will be in the following format.

Eg: username@hostname

1   2   3

1:-The first part identifies the user. Usually case sensitive. 2:- The @ sign which comes in between

Short for **electronic mail**, **e-mail** or **email** is information stored on a computer that is exchanged between two users over telecommunications. More plainly, e-mail is a message that may contain text, files, images, or other attachments sent through a network to a specified individual or group of individuals. The first e-mail was sent by Ray Tomlinson in 1971. By 1996, more electronic mail was being sent than postal mail.

**2.2. E-mail address breakdown**

support@computerhope.com

• The first portion all e-mail addresses, the part before the @ symbol, contains the alias, user, group, or department of a company. In our above example **support** is the Technical Support department at Computer Hope.

• Next, the @ (at sign) is used as a divider in the e-mail address; it is required for all SMTP e-mail addresses since the first message was sent by Ray Tomlinson.

• Finally, **computerhope.com** is the domain name to which the user belongs.

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## 2.3. How to send and receive e-mail

E-mail Program

To send and receive e-mail messages, you can use an **e-mail program**, also known as an **e-mail client**, such as Microsoft Outlook or Mozilla Thunderbird. When using an e-mail client, you must have a server that stores and delivers your messages, which is provided by your ISP or in some cases, another company. An e-mail client needs to connect to a server to download new e-mail, whereas email stored online (see next section) updates automatically when you visit the site.

E-mail Online

An alternative way of sending and receiving e-mail (and the more popular solution for most people) is an online e-mail service or webmail. Examples include Hotmail (now Outlook.com), Gmail, and Yahoo Mail. Many of the online e-mail services, including the ones we just mentioned, are free or have a free account option.

## 2.4. Writing an e-mail

When writing an e-mail message, it should look something like the example window below. As you can see, several fields are required when sending an e-mail:

- The **To** field is where you type the e-mail address of the person who is the recipient of your message.
- The **From** field should contain your e-mail address.
- If you are replying to a message, the To and From fields are automatically filled out; if it's a new message, you'll need to enter them manually.
- The CC or Carbon Copy field allows you to send a copy of the message to another e-mail address, but is not mandatory.
- The **Subject Line**, although not required, should consist of a few words describing the e-mail's contents.
- Finally, the **Message Body** is the location you type your main message. It often contains your signature at the bottom; similar to a hand-written letter. What makes a valid e-mail address?

There are several rules that an e-mail address must follow to be valid:

- As mentioned earlier, an e-mail must have a username followed by an @ (at sign) which is followed by the domain name with a domain suffix.
- The username cannot be longer than 64 characters long and the domain name cannot be longer than 254 characters.
- There should be only one @ sign in an e-mail address.
- The space and special characters: ( ) , : ; < > \ [ ] are allowed. Occasionally, a space, backslash, and quotation mark work but must be preceded with a forward slash. Although valid, some e-mail providers do not allow these characters.
- The username and e-mail addresses as a whole cannot begin or end with a period.
- The e-mail must not have two or more consecutive periods.


## 4.  SMTP, POP3, IMAP protocols.

**More about E-mailing concepts**

**E-mail clients**

An **email client** is a computer program used to access and manage a user's email. It is also referred to as an **e-mail reader** or a **Mail user Agent** (MUA). It can refer to any system capable of accessing the user's email mailbox, regardless of it being a mail user agent, a relaying server, or a human typing on a terminal. In addition, a web application that provides message

**The SMTP Server**

When we send an email, our computer connects to our email service"s mail server. A *server* is a centralized computer which manages a specific type of service. An email server for instance,

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handles emails. The email server responsible for sending emails is called the **SMTP** (Simple Mail Transfer Protocol) server. One SMTP server can pass on the mail to another SMTP server and relay it to the destination through several hops.

Every email has the sender"s address (e.g. *sender@sendermail.com*) and the recipient"s in the *To* Field (e.g. *recipient@recipientmail.com*). When an email is sent, the email client connects to the SMTP server of the sender"s email service (e.g. *mailserver.sendermail.com*). The client transmits the address of the sender, the address of the recipient and the content of the message.

The SMTP server goes to work at locating the whereabouts of the recipient. Using the recipient"s **mail ID** (i.e. recipient@recipientmail.com) it locates the domain name – e.g.recipientmail.com.

**Note:** If the recipient"s mail ID had the same domain name as the sender, then the process would be simpler. The SMTP server would have transferred the mail to its local outgoing mail server (POP3 or IMAP).

Each domain name represents a unique Web address, called an **Internet protocol (IP) address**. Think of it as postal addresses of the internet. The link between domain names to their IP addresses is stored in the **Domain Name Registry**. The SMTP server then contacts the server where the registry is kept (The **DNS Server**). The DNS server sends back the address to the SMTP server.

The SMTP server then proceeds to hand over the email to the SMTP server of the recipient"s email service (let"s call it mailserver.recipientmail.com). This SMTP server checks and confirms that the mail addressed to recipient@recipientmail.com belongs to it and hands it over to its counterpart, the POP3 server (or the IMAP server).

**The POP3 Server**

**Post Office Protocol (POP3)** servers are the servers that do the job of receiving mails. The number *'3'* is the version number of the protocol in use. POP3 servers have mail accounts (our email IDs). Each mail account is mapped to a username-password combination. Once the message is handed over to the POP3 server, it is kept and stored in the mail account till the recipient logs in and checks the mail.

**The IMAP Server**

An email client connects to the POP3 server and tells it to allow download of the email. Once downloaded to the local machine, POP3 mailboxes do not retain a copy of the email. Thus, you cannot check your emails from another PC as it has already been downloaded. To tack this difficulty, IMAP was introduced. IMAP (Internet Message Access Protocol version) simply retains a copy of the emails on the server. This allows you to access your e-mail from any location with an internet connection.

   **Different e-mailing methods**

First of all it is essential to know the anatomy of an email message. Basically email contains 2 parts: the **header** and the **body**.

In order to have a better understanding about the emails, let"s take a real life example. If you want to send a letter to someone what will you do? Firstly, you"ll be writing the letter and then put it into an envelope. Then you"ll write the recipient"s name and address on the envelope, and then post it. The letter you write can be compared to the body and the envelope is comparable to the header.

Sending an email is very much similar to this scenario but really with more advantages. You don"t need a pen and a paper anymore. Documents are exchanged swiftly without any delays.

But you need a computer, internet connectivity and an email account and the recipient"s email address to send an email.

**1.Data centres. Tendencies of development of the modern infrastructure decisions. Principles of cloud computing. Technologies of virtualization.**

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## Data Centers

- **Large server and storage farms**
– Used by enterprises to run server applications
– Used by Internet companies
- Google, Facebook, Youtube, Amazon…
– Sizes can vary depending on needs

## Data Center Architecture

- **Traditional: applications run on physical servers**
– Manual mapping of apps to servers
- Apps can be distributed
- Storage may be on a SAN or NAS
– IT admins deal with "change"
- **Modern: virtualized data centers**
– App run inside virtual servers; VM mapped onto physical servers
– Provides flexiblility in mapping from virtual to physical resources

## Virtualized Data Centers

- **Resource management is simplified**
– Application can be started from preconfigured VM images / appliances
– Virtualization layer / hypervisor permits resource allocations to be varied dynamically
– VMs can be migrated without application down-time

## Workload Management

- **Internet applications => dynamic workloads**
- How much capacity to allocate to an application?
– Incorrect workload estimate: over- or under-provision capacity
– Major issue for internet facing applications
- Workload surges / flash crowds cause overloads
- Long-term incremental growth (workload doubles every few months for many newly popular apps)
– Traditional approach: IT admins estimate peak workloads and provision sufficient servers
- Flash-crowd => react manually by adding capacity
– Time scale of hours: lost revenue, bad publicity for application

## Dynamic Provisioning

- **Track workload and dynamically provision capacity**
- Monitor -> Predict -> Provision
- Predictive versus reactive provisioning
– Predictive: predict future workload and provision
– Reactive: react whenever capacity falls short of demand
- **Traditional data centers: bring up a new server**
- Borrow from Free pool or reclaim under-used server
- **Virtualized data center: exploit virtualization to speed up application startup time**
– How is this done?

## Energy Management in DataCenters

- **Energy: major component of operational cost of data centers**
– Large data centers have energy bills of several million $.
– Where does it come from?
- Power for servers and cooling
- **Data centers also have a large carbon footprint**

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- How to reduce energy usage?
- Need energy-proportional systems
– Energy proportionality: energy use proportional to load
– But: current hardware not energy proportional

**Energy Management**
- Many approaches possible
- Within a server:
– Shut-down certain components (cores, disks) when idling or at low loads
– Use DVFS for CPU
- Most effective: shutdown servers you don't need
– Consolidate workload onto a smaller # of servers
– Turn others off
- Thermal management: move workload to cooling or move cooling to where workloads are
– Requires sensors and intelligent cooling systems

**2.Web service in the Cloud.**

Level Agreement in Cloud Computing

Abstract. Cloud computing that provides cheap and pay-as-you-go com-puting resources is rapidly gaining momentum as an alternative to tra-ditional IT Infrastructure. As more and more consumers delegate their tasks to cloud providers, Service Level Agreements(SLA) between con-sumers and providers emerge as a key aspect. Due to the dynamic na-ture of the cloud, continuous monitoring on Quality of Service (QoS) attributes is necessary to enforce SLAs. Also numerous other factors such as trust (on the cloud provider) come into consideration, particu-larly for enterprise customers that may outsource its critical data. This complex nature of the cloud landscape warrants a sophisticated means of managing SLAs. This paper proposes a mechanism for managing SLAs in a cloud computing environment using the Web Service Level Agree-ment(WSLA) framework, developed for SLA monitoring and SLA en-forcement in a Service Oriented Architecture (SOA). We use the third party support feature of WSLA to delegate monitoring and enforcement tasks to other entities in order to solve the trust issues. We also present a real world use case to validate our proposal.

Cloud computing [1] is the new trend of computing where readily available com-puting resources are exposed as a service. These computing resources are gen-erally offered as pay-as-you-go plans and hence have become attractive to cost conscious customers. Apart from the cost, cloud computing also supports the growing concerns of carbon emissions and environmental impact since the cloud advocates better management of resources. We see a growing trend of off-loading the previously in-house service systems to the cloud, based primarily on the cost and the maintenance burden. Such a move allows businesses to focus on their core competencies and not burden themselves with back office operations.

Cloud is defined as *both the applications delivered as services over the In-ternet and the hardware and systems software in the data centers that provide those services* [1]. According to this definition delivery of application as services (SaaS - Software as a Service) over the Internet and hardware services (IaaS - Infrastructure as a Service) are both parts of cloud computing phenomena. From hardware service(utility computing) point of view, there are few new aspects in cloud [1], the most prominent being the *illusion of infinite computing resources* and the *ability to pay for use of computing resources on a short-term basis as needed*.

As consumers move towards adopting such a Service-Oriented Architecture, the quality and reliability of the services become important aspects. However the demands of the service consumers vary significantly. It is not possible to fulfill all consumer expectations from the service provider perspective and hence a balance needs to be made via a negotiation process. At the end of the

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negotiation process, provider and consumer commit to an agreement. In SOA terms, this agreement is referred to as a SLA. This SLA serves as the foundation for the expected level of service between the consumer and the provider. The QoS attributes that are generally part of an SLA (such as response time and throughput) however change constantly and to enforce the agreement, these parameters need to be closely monitored [2].

Due to the complex nature of consumer demands, a simple "measure and trigger" process may not work for SLA enforcement. Four different types of monitoring demands made by consumers are mentioned in [3]. One scenario is *a consumer demands the data exposed by a service provider without further re-finement* such as transaction count, which is a raw metric. Second scenario is *consumer requests that collected data should put into meaningful context*. This scenario creates the requirement for a process which collects data from different sources and applies suitable algorithms for calculating meaningful results. Such metrics include statistical measures such as average or standard deviation that need to be computed from a raw set of numbers. The third scenario is the *con-sumer requests certain customized data to be collected*. In the fourth scenario the *consumer even specifies the way how data should be collected*. Both the latter mentioned scenarios imply an advanced consumer who would have a knowledge of the inner workings of a provider and somewhat rare in practice. Other issues such as trust also need to be considered during SLA enforcement. For example consumers may not completely trust the certain measurements provided solely by a service provider and regularly employ third party mediators. These media-tors are responsible for measuring the critical service parameters and reporting violations of the agreement from either party.

We believe the upcoming trend of cloud computing is an extension of the SOA paradigm and the above mentioned issue of *striking a balance* applies to the cloud as well. The process of managing the provider-consumer agreements in computing clouds closely resemble the generic provider-consumer agreement process we mentioned above. Hence we propose an architecture for managing cloud consumer and provider SLAs, based on the WSLA specification [3].

We highlight two reasons to justify the importance of this research.

 The most prominent cloud provider, Amazon EC2, puts the burden of prov-ing SLA violations on the consumer. i.e. the consumer should take steps to enforce the SLA [4]. Having a formalized SLA enables the set up of the en-forcement process to be automated and hence relieves consumers from that burden.

 We believe the work that significantly intersects with ours is [5] where WSLA has been used as a base for grid service monitoring. However computing grids are very different from computing clouds in terms of 1) business model, 2) architecture, 3) resource management, 4) programming model, 5) application model and 6) security model [6]. Hence we believe applying WSLA to the cloud context would be a significantly different effort from the previous work. Some of the important aspects we discovered are detailed in section 4. To the best of our knowledge this is the first use of WSLA in the context of cloud computing.

In the rest of this paper we present the related work [section 2] and introduce the WSLA framework [section 3]. Then we present our architecture proposal [section 4] and provide a use case based on a real world cloud usage scenario [section 5]. We conclude the paper with a detailed discussion [section 6] on the architecture as well as the pros and cons of our proposal.

##  Related Work

Significant level of research in SLAs has been performed during standardizing efforts. There are two main specifications for describing a SLA for web services. 1)Web Service Agreement [7](WS-Agreement) from Open Grid forum (OGF) and 2) Web Service Level Agreement language and framework (WSLA) [3] from IBM. To the best of our knowledge, other most prominent ongoing

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research project for SLA specification is SLAng [8]. In other related work, Rule-based Service Level Agreement(RBSLA) [9] is highlighted. RBSLA follows a knowledge based approach and uses RuleML [10] to specify the SLA.

Another relevant specification in this context is WS-Policy[11] from the World Wide Web Consortium (W3C). By using WS-Policy, Service providers can ad-vertise their policies. On the other hand service consumers can also specify their policy requirements. These *policies* primarily consist of non-functional proper-ties. Web Service Offering Language[12](WSOL), Web Service Modeling Ontol-ogy [13](WSMO) and Web Service Management layer [14](WSML) all provide some level of description for non-functional properties. However all the above work is not in the direct context of SLA.

☐   Background - WSLA framework

As described in [3], WSLA consists of a set of concepts and a XML language. It is designed to capture service level agreements in a formal way. WSLA comprises of mainly three entities.

1.  Parties: WSLA contains the descriptions about 1) service provider, 2) ser-vice consumer and 3) third parties. The task of these third parties may  vary from measuring service parameters to taking actions on violations as delegated by either the service provider and service consumer.

2.  SLA parameters: In WSLA, SLA parameters are specified by metrics. Metrics define how service parameters can be measured and are typically functions. There are at least two major types of metrics. 1)Resource metrics are retrieved directly from the provider resources and are used *as is* without further processing. For example, transaction count. 2) Composite metrics represents a combination of several resource metrics, calculated according to a specific algorithm. For example *transactions per hour* combines the raw resource metrics of transaction count and uptime. Composite metrics are required when the consumers need insightful and contextual information where raw numbers do not suffice. In [2], a third metrics referred to as a *business metric* has been defined. It relates SLA parameters to financial terms specific to a service customer.

3.  Service Level Objectives(SLOs): A set of formal expressions. These for-mal expressions have the well known *if...then* structure. The antecedent (*if* ) contains *conditions* and the consequent (*then*) contains *actions*. An action represents what a party has agreed to perform when the conditions are met.

Figure 1 illustrates the major components of WSLA in a UML diagram [3]. An established WSLA contains the following major sections:

1. Parties:This section comprises of two parties : supporting parties and sig-natory parties. Signatory parties are the service provider and the service consumer. Supporting parties are the third parties that come into picture when signatory parties decide to delegate certain tasks such as measuring SLA parameters.

2. Service Definitions: A service definition contains the description of the service providers interface. Services are represented by service objects. Each service object associates with one or more SLA parameters.

3. Obligations: This section contains the conditions and the action guarantees.

### 3.Main terms and concepts of mobile technologies. Mobile services. Standards of mobile technologies.

*Mobile computing is a relatively new field. While the challenges arising from mobility and the limitations of the portable devices are relatively well understood, there is no consensus yet as to what should be done to address these challenges. A comprehensive solution has to address many different aspects, such as the issue of dynamically changing bandwidth, the power, computational, and other limitations of  the portable devices, or  the varying availability of services in different*

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*environments. A Mobile service is pro- grammable application logic accessible using standard Internet protocols.*

## 1. Introduction

Mobile services combine the best aspects of component based development and the web. Like components, Mobile services represent black-box functionality that can be reused without knowing about how the service is implemented. Unlike current component technologies, Mobile services are not accessed via object-model-specific protocol.

Service-Oriented Architecture (SOA) is a new software development paradigm intro- duced by recent research surrounding mobile services. SOA features [1, 2]

● Uniform data marshaling protocol (via Simple Object Access Protocol: SOAP and eXtensible Markup Language: XML),

● Standard communication infrastructure (via Mobile service Definition Language: WSDL and HyperText Transfer Protocol: HTTP), and

● Service query facility (via Universal Description, Discovery, and Integration: UDDI).

This architecture includes a service area tier to offer necessary roles and functionality for the consolidation of multiple services into a single composite service based on com- ponent. The component consists of security facade component and backside component.   It also provides a tier for service operations management that can be used to monitor the correctness and overall functionality of aggregated/orchestrated services. Finally, we explained how component architecture model of mobile service-security can be used to implement the security mobile service. The mobile applications support a much wider range of activities than desktop applications and leverage information about the user's environment to provide novel capabilities. From a technology perspective, mobility shifts the global computing infrastructure from static, homogenous, powerful desktop comput- ers to highly dynamic, heterogeneous, resource-constrained handheld and wearable com- puters. This new computing context demands entirely new software architectural para- digms that address the challenges of mobile software development, are specialized for the nature of mobile devices and wireless networks, and take advantage of the opportunities afforded by mobile systems. Mobile software is computing functionality designed to mi- grate across hardware devices at runtime and execute on mobile hardware platforms. The principles of software architecture are intrinsic to the development environments and run- time platforms that support mobile software models and processes. We motivated the architecture by classifying likely mobile applications and identified common properties. The architecture intends to be more general than previous work with respect to adapta- bility, flexibility, and user mobility.

In this paper, we developed various pieces of the overall architecture and collected some preliminary experience with adaptive mobile applications we explain the core con- cepts and open research problems at the cross-section of the fields of software architec- ture and mobility. In parallel with (and supported by) these achievements, research activi- ty that leverages this work to build mobile systems has expanded. Mobile systems are computing applications that include mobile software and hardware elements. These ap- plications are characterized by customized software architectures that are designed for  and intrinsically facilitate mobility. We present our architecture for such adaptive mobile applications. We motivated the architecture by classifying likely mobile applications and identified common properties. The architecture intends to be more general than previous work with respect to adaptability, flexibility, and user mobility. We developed various pieces of the overall architecture and collected some preliminary experience with adap- tive mobile applications. We give an overview of the intersection of the areas of software architecture and mobile applications. We consider the mobile applications, which represent the computing functionality designed to migrate across hardware devices at runtime and execute on mobile hardware platforms, and the mobile systems, which are computing applications that include mobile

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software and hardware elements.

**Related Works.**

**Mobile Applications Design**

The key software architectural abstractions are components, connectors, their interfac- es, configurations, and constraints on system structure, behavior, composition, and inte- raction. Architectural styles are essentially named sets of such constraints: client–server, peer to-peer (p2p), publish-subscribe (pub-sub), event notification, and so on. It is not readily obvious what level of support for mobility is yielded by, say, a given architectural style such as p2p or pub-sub. These traditional styles do provide many design guidelines that can prove to be useful in mobile applications. The guidelines include:

- Component decoupling, whereby the practical units of mobility are delimited the most architectural styles adhere to this guideline.

- Avoiding shared memory, whereby potential side effects of computations are limited and interaction ''back doors" eliminated.

- Styles such as pub-sub and event notification adhere to this guideline.

- Insulating components from execution context, whereby a single component may be effectively redeployed onto a number of sites.

- Implicit invocation, whereby no component relies directly on the geographical pres- ence or location of another.

- Asynchronous interaction, whereby no component relies on the temporal presence of another.

- Stateless components, whereby the migration process and system consistency assur- ance are greatly simplified – clients in some client–server applications are examples of stateless components.

- Stateless interactions, whereby each interaction is self-contained and handled indepen- dently of the service requester's or provider's location.

   **Framework Description**

Figure 1 illustrates an overview of a framework for Mobile applications development that involves two main participants: the mobile client environment and the backend serv- er/mobile service. This framework represents a logical structure and does not necessarily reflect a physical architecture. For example, the backend server may actually be load- balanced across several machines. In a large implementation, separate machines are used to run specific components of the framework. A description of each module of our framework presented in Figure 27 is provided hereafter.
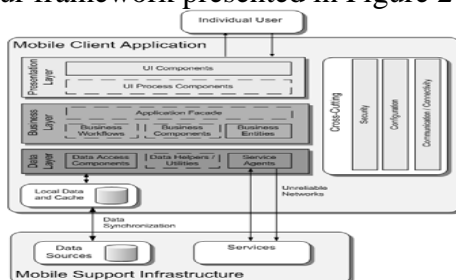


**Figure 27. An Overview of a Framework for Mobile Applications**

*A. Backend Server*

The backend server consists of eight components/modules that are: the enterprise mo- bile applications, business logic, content management system, workflow and profile man- agement, user management, document repository, Mobile services, and database.

• **Enterprise Mobile Applications:** integrate functionality from remote Servers that might host Mobile services, portlets, *etc*. The backend server might support the J2EE standard Management System.

• **Business logic:** represents the core of the mobile application that exposes functional- ities. The business logic can be deployed on the backend server and used remotely by the mobile application

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to reduce the load due to limited resource available on the mobile devices. In other situation, a subset or the whole of the business logic can also be dep- loyed on the mobile device

**Content Management System:** is a system (set of tools) used to manage different contents (data, multimedia information, and forums. These include for example, import- ing, creating, updating, and removing content to/from the mobile application.

• **Workflow and profile management**: manages the flow of data between the mobile application and the backend server and adapts the mobile application features and inter- face to different users' profiles.

• **User management:** allows management of different types/classes of users with dif- ferent levels of services and/or permission.

• **Database:** is used to store metadata about objects and content.

• **Document repository:** is used to store different types of documents… The reposito- ry keeps track of all the updates performed by different users and provides version con- trol capabilities.

• **Mobile services:** are mobile components that can be deployed on backend server and can be invoked/consumed by the mobile application.

*B. Mobile Device Client Environment:*

The client environment consists of six components/modules that support the mobile client environment; these are mainly the business logic, secure layer interface, mobile application API, user interface, data storage, and the browser.

• **Business logic:** as stated above, there are situations where it is suitable to deploy some of the business logic on the mobile device itself. For example, business logic re- quired for offline transactions.

• **Secure Layer Interfaces:** handles secure user authentication for the Mobile envi- ronment using a protocol such as SSL, and provides different interfaces for different us- er's profile (*e.g.*, admin, normal user, *etc*.).

• **Mobile Application APIs:** is a set of libraries and application programming inter- faces (API) that implement a set of utilities that might be required by the mobile applica- tion.(*e.g.*,)

• **User interface:** this is the graphical user interface components that mobile clients use to access different services. User interfaces includes mainly widgets, navigation facil- ities, and search tools.

• **Data storage:** this is the place where persistent data is stored. This might include transactions data, users' personal information, profiles, and preferences.

• **Browser:** these consist of *mini browsers* that are designed for use on mobile devices and optimized to display mobile content most effectively on small screens. The frame- work components' provide a rich, drag-and-drop development environment for develop- ment of mobile applications. This environment supports developers in providing efficient and secure mobile applications. Efficiency, in terms of used resources, is highly required for such applications due to limited available resources in mobile devices and the draw- backs of wireless networks in terms of low bandwidth and high latency. Security is of prime importance whenever wireless and open networks are being used as a medium for data exchange.

**5.References:**

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**6. Control questions:**
1. What is a „mail server"? Describe how to send an e-mail between two people.
2. What is an e-mail client? Name two types of e-mail clients with examples.
3. Define the following terms.
SMTP, DNS Server
4. What are the advantages of POP sever and IMAP server?
5. When sending an e-mail what is the difference between CC and BCC?
6. How can you attach a document to your e-mail?
7. List three e-mail etiquettes and give reasons for doing them.
8. What are the three parts of an e-mail address?
9. When creating an e-mail account what is the purpose of typing a given code in the cage provided?
10. What is the purpose of "inbox" in an e-mail account?
11. Tendencies of development of the modern infrastructure decisions.
12. Principles of cloud computing.
13. Technologies of virtualization.
14. Web service in the Cloud.
15. Main terms and concepts of mobile technologies.
16. Mobile services. Standards of mobile technologies.

# LECTURE №8

**1.Theme:** Multimedia technology. Smart technology.
**2. The goal**: Introduce 3-D representations of the virtual world and animation. to know about Big data, technology Block Chain, using of Smart-services, green technologies in ICT.
**3.Teaching methods:** demonstration, discussion
**4.lecture thesis**

**1.Representation text, audio, video and graphical information in a digital format. Basic technologies for compression of information.**
A multimedia framework and model are employed, to embrace the interactive and visual presentation of a series of case-studies with large conventional (static), and multi-mode (dynamic) data sets. This identifies multifaceted presentation requirements. Graphs are utilised to enable rigorous multimedia system (MMS) design, effortless updates and unproblematic future expansion. Multimedia environments (MME) facilitate rapid prototyping and a data-oriented approach is advocated. As a result, the customised presentation attributes vary widely from case-study to case-study, touching upon aspects such as interfaces, interaction, data-content organisation and presentation styles. At the user-level, a number of novel features are introduced, beyond those frequently observed in proprietary software. Interaction through multi-menus engenders direct interfacing with the underlying graph, enabling effortless transition, and direct data-access, notwithstanding remote data-content. Combinations of novel interaction techniques are realised, being combined under a single interface. The data-content, originates from simulation and experimental scientific fields of study. The MMSs advanced have been actively used to cover presentation requirements, in addressing both industrial and academic audiences.

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The use of multimedia environments for scientific subject matter is studied, placing particular emphasis on issues such as, user-interface, data organisation, interactive data interrogation, and meaningful presentation styles, all united to aid comprehension and optimisation of industrial process design. To accomplish this, one appeals to traditional software development stages that involve: specification, design, implementation and maintenance. ISO 9126 guidelines [1] are adopted to ensure that basic software requirements are fulfilled. Presentation-mode factors include functionality, reliability usability and efficiency. These features lead to efficient and effortless data presentation modes, which guarantee data integrity, along with inter-data relationships. Such factors would include maintainability and portability. The same affect the MMS in the long term, as fresh data are generated, or deployment onto new platforms. The ISO-14915 [2] compliant *Scientific Interactive Multimedia*

*Model* (SIMM) [3] is utilised. This model determines both content- and context-connectivity and user-interaction. Combined with the *Multi-Menus* user-interface construct [4], the model permits efficient MM-development. For this purpose, graphs are employed [5], hidden from user-view, to aid system design and description of system performance. SIMM addresses the issue of content- and context-connectivity. This is achieved through a higher-level of abstraction in the representation of content. Indexed frames are used for encapsulation, replacing individual media components with their defining interrelationships. Each frame may contain one or more media elements, such as text fields, buttons, icons, animations, sounds and images. At this abstraction level, interrelated content instances may appear either within a single frame (further connectivity being unnecessary) or across distinct frames. To emulate connectivity across lower-level content (such as single-streams), frames with a single media-element may be employed. This approach presents some advantages, over traditional single-stream based linking. First, low-level content-connectivity is abstracted, as direct comparison is activated between two or more streams. In-turn, linkage volume is reduced, by removing redundant links. A second advantage is that media-components may be referenced individually, whilst residing within a more general organized structure. In addition, further MM-combinations are permitted. This may be achieved separately, by being linked to other frames. Furthermore, a frame containing a title, and a set-of-streams provides immediate identification and categorisation of content. This introduces an advanced indexing mechanism, consisting of a frame-index, media-indexes (contained within each frame), and a set-of-states (in which a frame and a set-of-media are active). Content-linking is addressed using a "media-element to frame" referencing procedure. Each media-element may be employed as a user-interface construct. Fixed links may either be programmed directly, or copied across other media-elements, reducing re-programming of the same links. Additionally, case-based links may be programmed locally (within frames of a single-MMS), unless external frame-access is necessary. Combination of the model and scripting, under MMS, supports use of a knowledge-based approach (to dictate link-behaviour).

Mathematical representation is used to describe the model formally. Various factors render the mathematical representation advantageous over alternative algorithmic forms. As a consequence, the set/functional representation chosen may be modeled algorithmically, to enable automated presentation-construction and verification. Accessibility and systematically-organised data-categorisation are crucial issues here. In this respect, graphs are utilised to implement each MMS, programmed to reflect optimised system performance. A system is defined as responding optimally, when data-access may be achieved through a pre-established minimum number of search steps. Content-based architectures are employed [3] that vary from study to study, according to data-type and dictates. Multi-menus, as such, are classified as a user-interface construction structure. These are linked directly to the underlying SIMM of an MMS. In this respect, visual media components (icons, streams, text) are used as a link-to-frames. When large content-domains are involved,

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complications are introduced, due to their unwieldy size and complexity of connectivity. This may result in numerous system-deficiencies, such as link- or interface-inconsistency. Therefore, link-management protocols are introduced (at the developmental stage), to allow consistent replication of frame-connectivity. This is achieved through the deployment of MM-templates, featuring fully functional external connectivity (to principal frames). When fresh data-content is appended, use of an appropriate template, with external links earmarked, reduces programming effort to amending local-links. Hence, by design, the interface reflects the nature of the data, using custom-designed components, united in a modular fashion. Interaction modes are combined, creating new customised higher-order sets, to serve individual and particular needs. In addition, menu components are merged to aid rapid system development, using multimedia user-interface objects, with inheritance attributes. Complete and consistent specification of parent-objects, provides for rapid and flawless MMS development. Other characteristics include, multi-mode interaction through the use of "cruise-control" buttons, and deployment across a wide variety of computer platforms.

The principal aspects of these MMS implementations include: "*correct data categorisation and presentation*", "*effortless navigation*", "*comparison across multiple modes*" and "*direct access to inter-related data, on-demand*". Factors that have enabled the straightforward implementation of these dynamic MSSs include, the uniformity of data and the extensive use of object-technology to minimise re-programming requirements. As a consequence, these factors may impose additional time-development constraints, due to the increased complexity of implementation.

## 2 Reverse Roller Coating

A "Reverse Roller Coating" case study has emerged based on the industrial process of coating aluminium foil with solvent resin. Simulation is employed in this case study to classify the most significant factors that govern the process. In this regard, attention is paid to a range of roller and foil speeds to investigate process operating windows, and the corresponding flow and deformation patterns that result. The numerical simulation of this process has resulted in the creation of a substantial volume of data, to be interpreted through flow field variables such as pressure, shear-rate and streamlines. The development of a Reverse-Roller-Coating MMS has adopted two incremental stages to completion. The first stage covered steady-state scenarios, whilst the second encompassed transient data. A tree structure was initially utilised to represent the content organisation. This was converted subsequently to a graph with sparse connectivity, to deal with selective access to separate branches.

Backtracking is implemented within each major menu under the main section. A pre-determined navigational tour through the MMS (forward-search, interactive display path) is also set, complete with voiceover. By default, this is set as active, to be actioned per tour-point via a green "cruise-control" button (top-left of screen). Such a demonstrator display path, serves many purposes: including key-features only, comprehensive show, or propriety view of data content. Hence, it may encompass and surpass the *show-mode* of Microsoft PowerPoint (.PPT), for example. At any tour-position, one may interrupt cruise-control, and digress into available menu options, at will. Resumption of cruise-control is simply achieved by selection of a recognised tour-point, and taken up subsequently.

## 2.3-D representations of the virtual world and animation. Instruments of development of multimedia applications.

**Abstract.** This paper presents an analysis and discussion of visual information representations in multi-user avatar-based 3D virtual worlds. We discuss benefits and issues of such environments for displaying scientific and information visualizations. In comparison to traditional two-dimensional representation forms, virtual worlds can be used to display more dimensions of information and illustrate data with real-world metaphors. Additionally, their collaborative and social character allows new ways to explore and experience visualizations. However, the design, implementation,

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and integration of three-dimensional visual representations in such environments are more challenging than for 2D representations. Thus, only a few visualization forms are reasonable. In this paper we reflect on implications for more useful 3D visualizations and introduce and discuss these on own examples.

In recent years there has been considerable interest in the examination of new user interfaces to display and explore scientific and information visualizations. Innovations in 3D technologies such as virtual reality devices offer new possibilities to graphically illustrate and interact with information in 3D. Although many authors have discussed and analyzed benefits of visual representations in 2D over 3D, the introduction of these devices and recent innovations in 3D graphics have renewed the discussion about application areas and potential benefits of presenting and exploring information in 3D.

An important issue of scientific (visual representation of scientific phenomena) and information (visual representation of data) visualizations is the successful representation of data connected to specific object or environmental information. The traditional forms of visualization technologies often use abstract elements, such as lines or pies, to illustrate data. Three-dimensional visualizations cannot only be used to integrate more dimensions and enable viewing information from different angles and views, but also to present data with visual metaphors. For instance, real-world models such as the replication of a city can be used to visualize data linked to geographical information.

The current trend towards three-dimensional user-interfaces and interaction possibilities such as holographic display, 3D printing, and airborne haptics is and will enable new technologies for visualizations (Robert et al., 2014). Also, the current introduction of different virtual reality home solution and immersive gaming interfaces will allow affordable and more immersive solutions for different kinds of visualizations. One way to interact with these immersive virtual reality devices and make use of different 3D interaction interfaces are 3D virtual worlds. Virtual worlds can be avatar-based or designed from the first-person perspective. They can be designed as multi-user community environments, or as single-user worlds. In the following sections we will focus on collaborative community-based virtual worlds.

Although much research has been done using different 3D technologies to visualize data, only a few authors have described their experience with collaborative multi-user virtual worlds for presenting visualizations in a collaborative setup. Virtual worlds support several new options for displaying and exploring scientific information and abstract data. The 3D capability turns 3D virtual worlds into excellent environments for displaying and interacting with phenomena and datasets. Their collaborative character enables users to create, explore, and discuss visualizations with other users. Their ability to present data linked to geographical information and to use real-world metaphors make them into powerful tools to explore information in a realistic setup. However, the design and integration of three-dimensional information presentations in such an environment can be an overhead for simple datasets.

But what kind of visualizations should be integrated into virtual worlds? What kind of representational forms should be used to enhance the user experience? The aim of this paper is to describe and discuss potential application scenarios of virtual worlds for scientific and information visualizations, assess how well they are suited, and discuss prospects and issues.

## 2. Background and Related Work

In the first section, prior work that explores three-dimensional information visualization techniques is reviewed. After that, virtual worlds are introduced and work on 3D animations, simulations, and visualizations in such environments are summarized.

*Information and Geographic Visualizations in 3D*

Information and geographic visualization in 3D can be used for instance to represent multi-dimensional datasets, such as a mapping of data (e.g. amount of rain, air pollution) with geographic

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location to observe the situation in a 3D world model. Several authors have discussed challenges and conditions of using 3D visualizations. While well-designed 3D visualizations are often visually promising, not every dataset is suitable to be presented in 3D. For simple datasets, the implementation in 3D might be not better for presenting the information than in 2D. Physical data, however, often require a three-dimensional representation. Unfortunately, the design, implementation, and processing of visualizations in a 3D space are significantly more time- and cost-intensive. Advantages of using 3D applications to present data include the possibility to add additional dimensions and new viewpoints (Card, Mackinlay, & Shneiderman, 1999), and to maximize effective use of the screen (Robertson, Mackinlay, & Card, 1991).

Many authors describe positive experience with 3D visualization forms in different application areas. McCahill and Erickson (1995) discuss an early design for a three-dimensional spatial user interface for the information system Gopher. GopherVR[2] uses 3D visualizations for displaying information in the form of 3D scenes. The user interface reminds of a computer game and is based on early virtual reality experiences. They use different 3D models to represent common icons in the 3D space. The authors already identified several user experience problems, such as navigation problems, grouping and relationship problems, browsing problems, and different interactions issues. Robertson, Mackinlay and Card (1991) use cone trees to display hierarchical information structures in 3D.

The above systems use 3D real-world metaphors, such as rooms, landscapes, or cities, to present information. Virtual worlds can enrich such environments with additional components, such as multi-user capability, which enables social and collaborative activities. In the next section, we will explore work on three-dimensional animations, simulations, and visualizations in virtual worlds.

*3D Visualizations in Virtual Worlds*

Virtual worlds are defined as shared, persistent virtual environments underlying physical rules, where players, represented as avatars, can communicate with each other and interact with the world in real time (Bartle, 2004; De Lucia et al., 2009). They are efficient environments for representing three-dimensional objects, animations, and interactive simulations. Their multiuser support allows different collaborative and social activities. Hence, virtual worlds have become a popular tool for applications in areas such as training, simulation, or design (Benford et al., 2001). Different authors also describe the users' feeling of presence as a significant advantage over traditional communication platforms and communities. This feeling is also known as "being part" of the virtual world (De Lucia et al., 2009; Witmer & Singer, 1998.

Studies suggest using virtual worlds in particular for application scenarios that make use of their three-dimensional objects and their interactive nature (Pirker et al., 2013). There is only little work on the use of multi-user virtual worlds for displaying three-dimensional information visualization forms. However, several authors have described collaborative setups, which integrate 3D applications, animations, or simulations in virtual worlds, and which can further be used and extended to create scientific or information visualizations.

Pirker et al. (2012) describe a prototype system, the Virtual TEAL World, in the context of remote physics education. The virtual world is designed to teach students principles of electromagnetism and uses interactive three-dimensional simulations to display electromagnetic phenomena. The collaborative character allows students to remotely discuss the phenomena illustrated by the simulation and solve assignments in-world together. A similar approach is used to teach students programming concepts by visualizing the behavior of a sorting algorithm (Pirker, Gütl, & Kappe, 2014). Both examples use three-dimensional simulations and animations to make unseen phenomena visible. The collaborative setup gives students the possibility to learn and work together.

While many authors have described systems that use 3D visualizations for learning and training, we

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know little about virtual worlds for scientific and information visualizations, either for explanatory, or exploratory usage. Most studies present visualizations in three-dimensional single-user applications, which use real-world metaphors. These metaphors are perhaps the most well-known visualization form of data in 3D environments. They allow users to explore the content in a familiar environment.

Fokaefs et al. (2010) discuss the use of 3D visualizations in Open Wonderland. They use a city metaphor to display information and statistics about software and communication artifacts. The dimensions to graphically illustrate data are building types, building color, height of the building, and proximity within city blocks.

## 3. Use of multimedia technologies for planning, descriptions of business processes and their visualization.

Within the current MMS, all valid combinations are generated and linked dynamically through the interface, upon request. Parameter adjustment is user-driven. This enables direct data accessibility, with single option selection, for change of geometry and/or fluid, or in worst-case scenario, using a two-stage selection (for a new geometry and a new model fluid). Hence, the MMS is programmed to recognise current selection and adjusts the multi-menu to link only to related data. This process is transparent to the user, being hidden behind the uniform interface. A third characteristic is the parallel presentation of different result types on demand. These are selected from a palette of options; the end process consists of two stages. The first stage is to plot the additional data in combination with the animated data stream, within the same frame. If more detail is required, an additional mode is provided, in the form of slide sorters utilising thumbnail slides. Therefore, data can be presented comparatively to enhance the comprehension of flow characteristics, or separately, in a more detailed manner. A fourth, and final, characteristic is the need for different presentation sections, classified under different priority levels, but that may be raised as so desired. This is made possible via graphs and by specifying interaction rules, to allow customised system-response on user-choice.

## 1. Internet of things. Big data. Technology Block Chain. Artificial intelligence.

**Big data** is a term that describes the process of handling and analyzing evolving data that is in the Petabyte and Exabyte range. It is predicted that when stored data reaches these sizes unknown trends and patterns will emerge that cant be found in smaller data sets. However, when data reaches these sizes, it becomes much more difficult to quickly analyze all the data and find patterns as the data continues to evolve.

Examples of Big data include analyzing the transactions made at a retail giant such as Walmart, processing Twitter posts, and tracking financial markets.

Many believe big data helps predict things to come and help prevent things such as crises, pandemics, and instabilities. Others argue that big data is a major violation of privacy and is primarily going to be used by governments and corporations as another way to take away your rights and spy on you.

From the large amounts of data to the Big Data

Usually, the discussion centered around the Big Data Storage (and the analysis based on such repositories), the volume is much larger than just a few terabytes.

In particular, some data warehouse can grow to thousands of terabytes, ie, up to a petabyte (1000 terabytes petabytes = 1).

Outside petabytes, data acquisition can be measured in exabytes, for example, in he manufacturing sector worldwide in 2010 is estimated to have accumulated a total of 2 exabytes of new information (Manyika et al., 2011).

There are sectors where the data is collected and accumulate very rapidly.

For example, in the industrial sector, such as power plants, a continuous stream of data is generated

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sometimes for tens of thousands of options every minute or every second.

In addition, over the past few years, introduced the so-called "smart grid" technologies that allow utilities to measure the power consumption of individual families every minute or every second. For such applications in which data must be stored for years, the accumulated data are classified as Extremely Big Data.

There is a growing number of applications and Big Data among commercial and government sectors, where the amount of data in storage, may be hundreds of terabytes or petabytes.

Modern technologies allow to "keep track" of people and their behavior in various ways. For example, when we use the Internet, make purchases at online stores or large networks of stores, such as Walmart (according to Wikipedia, Walmart data warehouse is estimated at over 2 petabytes), or move enabled mobile phones - we leave a trace of our activities that It leads to the accumulation of new information.

Various methods of communication, ranging from simple phone calls to social networks to download information through sites such as Facebook (according to Wikipedia, the exchange of information each month is 30 billion. Units), or sharing videos on sites such as YouTube (Youtube says he load 24 hours of video every minute; see Wikipedia), daily generate a huge amount of new data..

Similarly, modern medical techniques generate large amounts of data relating to the medical assistance (images, video, real-time monitoring).

Thus, the amounts of data classification can be represented as:

Large data sets from 1000 megabytes (1 gigabyte) to hundreds of gigabytes

Huge data sets: from 1,000 gigabytes (1terabayt) to several terabytes

Big Data: from a few terabytes to hundreds of terabytes

Extremely Big Data: from 1,000 to 10,000 terabytes = 1 to 10 petabytes

Problems associated with Big Data

There are three types of problems associated with Big Data:

1. Storage and Management

The amount of data in the hundreds of terabytes or petabytes does not allow to easily store and manage with traditional relational databases.

2. Unstructured Information

Most of the data is unstructured Big Data. Those. how to organize text, video, images, etc.?

3. Analysis of Big Data

How to analyze unstructured information? As on the basis of Big Data to make simple reports, build and deploy predictive models of in-depth?

Storage and management of Big Data

Big Data is generally stored and organized in a distributed file system.

In general, information is stored in multiple (sometimes thousands) hard drives on standard computers.

So-called "card» (map) keeps track of where (on which computer and / or disk) stores the particular piece of information.

To provide fault tolerance and reliability, each piece of information is usually stored several times, for example - three times.

For example, suppose that you have collected the individual transaction in a large retail chain stores. Details of each transaction will be stored on different servers and hard drives, and "map» (map) index, where it stores information about the relevant transaction.

Using standard hardware and open source software for the management of distributed file system (eg, Hadoop), relatively easy to implement a reliable data warehouse to petabyte scale.

Unstructured information

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Much of the information collected in a distributed file system consists of unstructured data such as text, images, photos or video.

It has its advantages and disadvantages.

The advantage is that the ability to store large data allows you to store "data", without worrying about how much of the data relevant for analysis and decision making.

The downside is that in such cases, to extract useful information requires subsequent processing of huge amounts of data.

Although some of these operations can be simple (for example, simple calculations, etc.), while others require more complex algorithms, which must be specifically designed to work effectively in the distributed file system.

One top manager once told StatSoft that he "spent a fortune on IT and data storage, but still began to get money," because I do not think about how best to use these data to improve core operations.

Thus, while the amount of data may increase exponentially, the ability to retrieve information and act on basis of this information will be limited and asymptotically reach the limit.

It is important that the methods and procedures for the construction, model updates, and to automate decision making process have been developed along with the data storage system to ensure that such systems are useful and advantageous for the company.


Analysis of Big Data

This is really a big problem with the analysis of unstructured data Big Data: how to analyze them to good use. On this issue it is written much smaller than on the data storage and management technologies Big Data.

There are a number of issues that should be considered.

Map-Reduce

When analyzing hundreds of terabytes or petabytes of data, it is not possible to extract the data in any other place for the analysis (eg, STATISTICA Enterprise Analysis Server).

The process of transferring data channels on a single server or server (for parallel processing) take too long and require too much traffic.

Instead, analytic calculations to be performed physically close to the location where data is stored.

Map-Reduce algorithm is a model for distributed computing. Its working principle is as follows: there is a distribution of the input data on the working units (individual nodes) distributed file system for the pretreatment (map-step) and then the convolution of (union) already pre-processed data (reduce-step).

Thus, for example, to calculate the total sum, the algorithm will calculate subtotals parallel in each of the nodes distributed file system, and then sum the intermediate values.

On the Internet a huge amount of available information on how you can perform various calculations using the model map-reduce, including for predictive analytics.

Simple statistics, Business Intelligence (BI)

To compile simple BI reports, there are many products with open source, allowing to calculate sums, averages, proportions, etc. using a map-reduce.

Thus, to obtain accurate counts and other simple statistics for reporting is very easy.

Predictive modeling, in-depth statistics

At first glance it may seem that the construction of predictive models in a distributed file system more complicated, but it is not so. Consider the preliminary stages of data analysis.

Data preparation. Some time ago, StatSoft has held a series of large and successful projects with very large data sets that describe the per-minute performance of the power plant process. The purpose of the analysis was to increase the efficiency of power plants and lowering emissions (Electric Power Research Institute, 2009).

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It is important that, despite the fact that the datasets can be very large, the information contained in them, has a substantially smaller dimension.

For example, while data is collected every second or every minute, many of the parameters (temperature and gas ovens, flows damper position, etc.) are stable over long time intervals. In other words, the data is recorded every second, are basically repeats the same information.

Thus, there should be "smart" aggregation of data, getting to simulate and optimize the data that contains only the necessary information about the dynamic changes affecting the efficiency of the power plant and the amount of emissions.

Classification of texts and data preprocessing. Let us illustrate again how large data sets can contain far less useful information.

For example, StatSoft participated in projects related to the analysis of texts (text mining) of tweets, reflecting how passengers and airlines are satisfied with their services.

Despite the fact that it was removed hourly and daily large number of relevant tweets sentiment expressed in them are fairly simple and monotonous. Most of the reports - complaints and short messages from one sentence about the "bad experience." In addition, the number and the "power" of these attitudes are relatively stable over time and in specific issues (eg, lost luggage, bad food, cancellation of flights).

Thus, the reduction of the actual tweets up soon (evaluation) mood, using the methods text mining (eg, implemented in STATISTICA Text Miner), results in a much smaller amount of data, which can then be easily compared with existing structured data (actual ticket sales or information about the frequent flyer). The analysis allows to divide customers into groups and study their specific complaints.

There are many tools for aggregation of such data (for example, but rather a) in a distributed file system that allows you to easily carry out the analytical process.

Building models

Often the objective is to quickly build a precise model for the data stored in the distributed file system.

There are map-reduce implementation of various algorithms data mining / predictive analytics, suitable for large-scale parallel processing of data in a distributed file system (which can be supported by a StatSoft STATISTICA platform).

However, because of the fact that you have processed a very large amount of data, if you are confident that the final model is really more accurate?

In fact, probably more convenient to construct a model for small data segments in a distributed file system.

According to a recent Forrester report: "Two plus two is equal to 3.9 - it is usually good enough» (Hopkins & Evelson, 2011).

Statistical and mathematical precision is that the linear regression model, including, for example, 10 predictors based on properly done probabilistic sample of 100,000 observations, will be as accurate as the model based on observations of 100 million.

In probability sampling, each element has a set of specific, predetermined probability of being selected. Moreover, for each element of the aggregate probability of falling into the same sample. In contrast, some vendors in Big Data, often for advertising, claimed that "all the data to be processed."In fact, the accuracy of the model depends on the sample quality (each observation in the population should have a known probability of selection) and its size is related to the complexity of the model. The population size is irrelevant.

For this reason, for example, a sample consisting of only a few thousand votes, can afford to build a very accurate predictions of the actual election results.

So, the real value of Big Data in distributed file systems is not to build a predictive based on

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all the data; the accuracy of the models will be higher.

More significant is the use of the entire volume of data for segmentation and clustering, which will effectively build a large number of models for small clusters.

For example, it can be expected that the models based on the general segmentation (20-30 years) will be less accurate than a large number of models based on more detailed segmentation (eg, 20-21 year old students living in the dormitory, and students on the faculty of business).

Thus, one way to obtain the benefits Big Data is to use the available information to construct a large number of models for a large number of segments and then build an appropriate model predictions. In the extreme case, every single "person" in the large customer data warehouse can have its own model to predict future purchases.

**2.Use of Smart-services. Green technologies in ICT. Teleconferences. Telemedicine.**

**3. S.M.A.R.T.**

1. Short for **Self-Monitoring Analysis and Reporting Technology**, **S.M.A.R.T.**, or **SMART**, is a diagnostic method originally developed by IBM and introduced with the ATA-3 specification that at that time referred to as **Predictive Failure Analysis**. This technology was initially developed for IBM mainframe drives to give advanced warning of drive failures. Based on this diagnostic, Compaq announced IntelliSafe, which was submitted to the ATA/IDE standards committees, and the resulting standard was named S.M.A.R.T.

S.M.A.R.T. analyzes many of the mechanical attributes; over time, some failures can be predicted by detecting if the hard drive is moving out of tolerance. While the S.M.A.R.T. technology can detect upcoming issues, not all hard drive failures are predictable. In the picture below is an example of a S.M.A.R.T error indicating that the status of the Pri Master or Primary hard drive is being detected as bad and that it should be replaced.

Some of the major hard drive manufacturers now including the S.M.A.R.T Technology in their hard drives are IBM, Western Digital, Maxtor, Quantum, Seagate and Fujitsu.

In this paper we have discussed advantages and issues of using collaborative virtual worlds for scientific or information visualizations. To summarize, we believe that a collaborative setup in 3D virtual worlds can enhance the exploratory settings of such worlds. The prospect that virtual worlds for visualizations offer is that innovative collaborative exploration forms are possible. While scientific visualizations in collaborative 3D learning setups have been proven to be valuable learning tools, it is challenging to find application scenarios that are suitable for collaborative 3D information visualizations. Work on the introduced application scenarios is still at an early stage. Future work will involve the evaluation with user studies of the application scenarios with focus on the (a) advantages and limitations of collaborative aspects, (b) comparisons of the scenarios with similar 2D visualizations, and (c) advantages and limitations of immersive aspects.

At the moment, virtual world environments still face different technical (scalability, technical requirements, band width) and social challenges (learning new interaction-forms, prejudices against virtual worlds or game-like systems) (Benford et al., 2001). With the introduction of innovative and affordable virtual reality devices, 3D visualization forms in virtual environments provide additional options for displaying and exploring data and render it more interesting to users again. Also different enabling 3D technologies that support different input and display options are promising future supporters of 3D visualizations that can enhance the users' feeling of immersion. Thus, we will focus our research also on comparing different three-dimensional visualization strategies in immersive settings supported by head-mounted virtual reality devices combined with interactive interactions forms provided by tools such as the Kinect.

Whether three-dimensional information visualizations bring us more information or are less convenient for users has been widely debated. The present discussion demonstrates that well-

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designed visualizations in multi-user virtual world environments can open up new opportunities of exploring and discussing data in a collaborative and social way.

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## 6. Control questions:

1. List the main components of media. Give an example of a nonlinear and comment on multimedia.
2. Describe the advantages and disadvantages of vector graphics. For what purpose uses interlaced scanning and why Currently?
3. What is the nature of the structural approach to design IP?
4. What is Technology Smart?
5. What is Internet of things?
6. What is Big data. Technology Block Chain?
7. What is Artificial intelligence. Use of Smart-services?
8. What is Green technologies in ICT. Teleconferences?

## LECTURE №9

**1.Theme:** E-technology. Electronic business. Electronic training. Electronic government
**2. The goal**:  to provide an introduction about e-commerce and e-learning, identify the benefits and the future trends of the Internet
**3.Teaching methods:** demonstration
**4.lecture thesis**
**1. Electronic business: Main models of electronic business. Information infrastructure of electronic business. Legal regulation in electronic business.**
We are living in an era where we use computers to do major tasks quickly which took hours to complete a couple of decades ago. Paper driven processes are replaced by electronic means. Above all, the global access to information has made a revolution in all sectors. Information is enriched and customized to serve target groups.
Here we are going to discuss about these current developments and the future trends of the Internet. Today, almost everything is reengineered into electronic means. The revolution in the Internet had made an immense impact not only in our day-to-day life but also in the business process and the learning environment. Businesses are transformed into e-businesses; learning is transformed into e-learning etc. Because of this transformation, there is a significant change in the way we do things. We are not doing different things but we are doing things in a different way, which is

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more efficient and effective, aren"t we?

Now, let us see how we can use E-commerce and make our lives easy.

### Introduction to E-commerce

Electronic commerce or E-commerce is a type of industry. This consists of buying and selling of products or services over electronic systems such as the Internet and other computer networks. The quality of business transactions has improved with the usage of telecommunications and data processing technology.

Before explaining what E-commerce is in detail, let us see some simple examples of how E-commerce is being used.

Individual purchasing books on the Internet.

Tourist booking a hotel room from another country over the Internet.

An organization buying computers using the seller"s interactive online system.

A firm buying office supplies through an online auction.

An individual transferring money from his account to his friend"s account using Internet banking.

Here are some E-commerce technologies used by most of the business organizations.

Mobile commerce

Electronic funds transfer

Supply chain management

Internet marketing

Online transaction processing

Electronic data interchange (EDI)

Inventory management systems

Automated data collection systems. etc.

### Does e-commerce only mean buying and selling of goods and services over the Internet?

No. It"s not limited to mere handling of business transactions. The e-commerce includes a larger functionality consisting of a complete system of services which supports the sales processes and provides total account management.

Modern E-commerce usually uses the World Wide Web at least at one point in the transaction's life-cycle. It may also make use of a wider range of technologies such as e-mail, mobile devices, social media, and telephones as well.

E-commerce is commonly considered to be the sales aspect of e-business. It mainly consist the data to facilitate the financing and payment aspects of business transactions. If you want to start up a business, E-commerce would be useful to carry out your transactions in an effective and efficient way. Let us examine some of the benefits of e-commerce both for the buyer and seller.

### The benefits of e-commerce

It is apparent that there are numerous advantages of using E-commerce. Because of the technological breakthrough the web had reached millions of people quicker when compared to television, radio and telephone. Here, we are going to discuss some benefits of E-commerce to the business worlds and to the consumers as well.

Some benefits of e-commerce are listed below.

Benefits to the Business organization/seller:

Improved Productivity

Streamlined Business Processes

Opportunities for New Businesses

Global market place

Low start-up and running cost

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Benefits to the customer/buyer:

24/7 trading

Search facilities

Benefits to both:

Cost Savings

Better Customer Service

Let us see the above benefits in detail.

## Improved Productivity

By using E-commerce we can save a great deal of time. We can create, transfer and process a business transaction easily using the electronic medium. Quite a lot of time that was spent in entering and re-entering the data in the earlier decades is minimized. Human errors and redundancy are eliminated which has led to an accurate data retrieval in quick time, ultimately resulting in high productivity.

## Cost Savings

Since we can communicate efficiently and since the time taken between the submissions of a program for execution is quicker, it"ll be cost effective. Moreover, the businesses can reach out the market so easily and this would also cut down the cost to a great extent. The transaction cost too had plummeted down because of the usage of e-commerce.

## Streamlined Business Processes

Most businesses have taken a step to reach the ultimate goal by using the maximum benefits from e-commerce. This can be achieved mainly by adapting the internal business processes and back end legacy systems.

## Better Customer Service

Customers can communicate with the seller efficiently. They can go through the details of the product and choose the better options which suit their requirement from home itself. On the other hand, the seller is also benefitted by marketing the product and providing a better customer service online which is much easier than dealing the customers directly in a busy business environment.

## Opportunities for New Businesses

Since the business over the Internet reaches the customers in the global arena, there will be better opportunities for the business to expand and establish themselves amongst a wide range of customers.

## Global market place

The E-commerce web-site serves as a global market place because people tend to buy the products not only from different parts of the country but also from different parts of the world.

## 24/7 trading

You can purchase items at any time. Only what you have to do is to place an order and the product will be delivered to your home within a couple of days/week. This will be beneficial to those who are working because they can buy products from home or wherever they are and during whenever they want. Moreover, a person from Sri Lanka can buy a product from America without any trouble. You can purchase from anywhere around the world and during anytime you want.
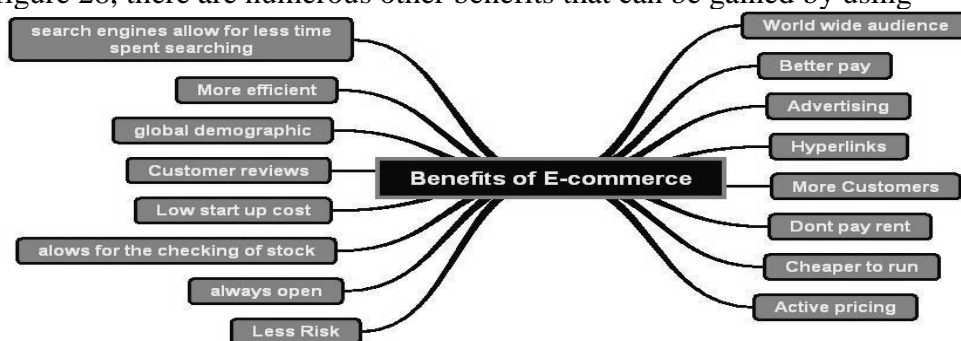
## Low start-up and running cost

You do not have to open a shop. Instead, all you have to do is to buy servers to build and maintain your web-site online. This will cost less than the money that you would pay for rent when you have a shop. Furthermore, it is not necessary to have a huge staff to maintain the website. As a whole, it costs less than running a shop.

## Search facilities

Most of the E-commerce web-sites have an efficient search facility where you can find the required product without spending much time.

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As shown in figure 28, there are numerous other benefits that can be gained by using



E-commerce.

*Figure 28: Benefits of E-commerce*

## Types of Electronic Commerce

The most common participants in e-commerce are the businesses, consumers and the government. Based on the nature of the participants e-commerce can be subdivided into the following:

- B2C – Business to Consumer
- B2B – Business to Business
- B2G – Business to Government
- C2C – Consumer to Consumer
- C2B – Consumer to Business
- G2G – Government to Government
- G2C, G2B, C2G etc.

Let us discuss the four major types in detail.

## B2C – Business to Consumer

B2C can be described as the business between companies and the consumers. Since the revolution of e-transformation unfolded, consumer-business interaction was limited to a great extent. In the past, consumers contacted the information officer to acquire business information. But now this process has changed. Consumers as well as the information officer could gather business information via the Internet. Consumers when they want to buy a product or a service they can do it over an electronic network. This makes the business process much easier.

We all know that there is a sudden explosion in the number of Internet users in the past few years. Profits making companies thought of utilizing this opportunity to market and sell their products. The business process in B2C is shown in figure 29.
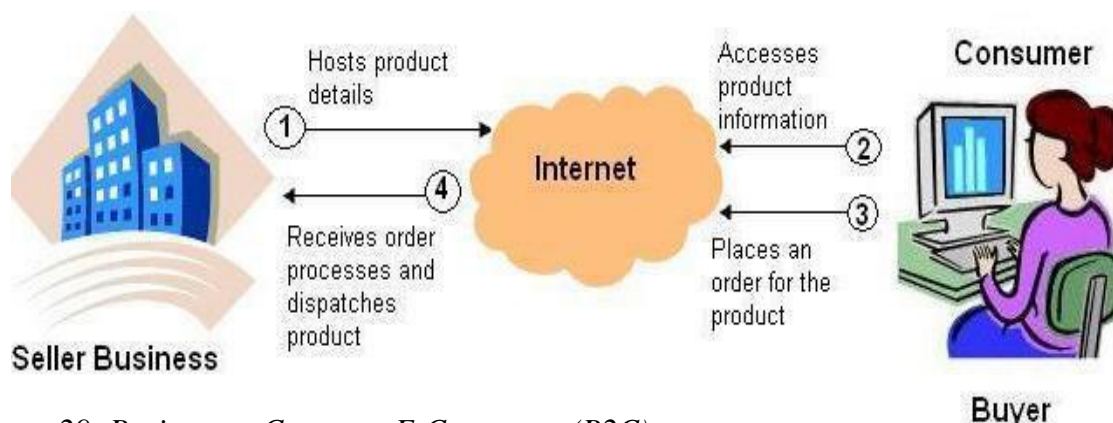


*Figure 29: Business to Customer E-Commerce (B2C)*

## A brief Note on E-banking

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E-banking includes Internet banking mobile banking etc. E-banking offers value added services that you do not normally enjoy at the banking counters. Most of the popular banks in Sri Lanka have introduced many fascinating facilities to their customers. Online access to any of the account, transfer of funds to the customer"s own accounts or to the preferred accounts of other Sri Lankan banks, ability to bank online especially when they hold a joint account, balance inquiry, inquiry about cheque book or request for new cheque book or stop payments online, acquire visa card settlements, transactions and balances, Interest & exchange rates and the ability to make payments of utility bills/scheduling bill payment and transfers on future dates are some of such facilities offered by the banks.

**C2B – Consumer to Business**
Consumer-to-Business (C2B) is a business model in which consumers create value, and firms consume this value created by consumers. This is also called as a **reverse auction** or **demand collection model**. Here the buyers are enabled to claim their own prices generating a demand and the websites in turn gather bids and then offers the bids to the participating sellers.

**B2B – Business to Business**
In this category, the companies do business with each other such as manufacturers selling to distributors and wholesalers selling to retailers. Pricing is based on quantity of order and is often negotiable.
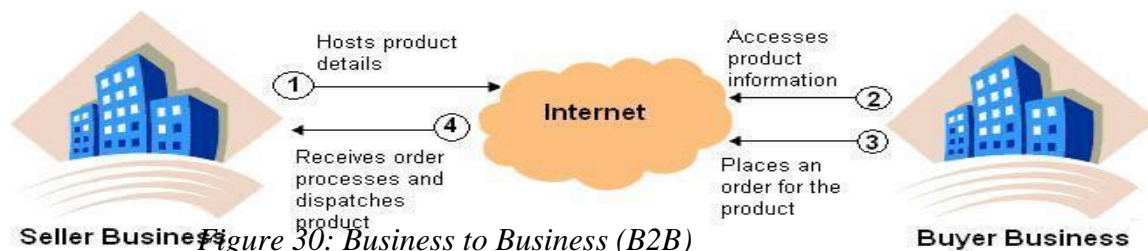Figure 30 shows the process of B2B.



*Figure 30: Business to Business (B2B)*

**C2C – Consumer to Consumer**
In this category, consumer sells directly to another consumer. E-bay is one good example for such kind of web. You can see this category if a consumer, who purchases jewelry, wants to sell to another consumer via the Web. The following figure depicts the process of C2C.
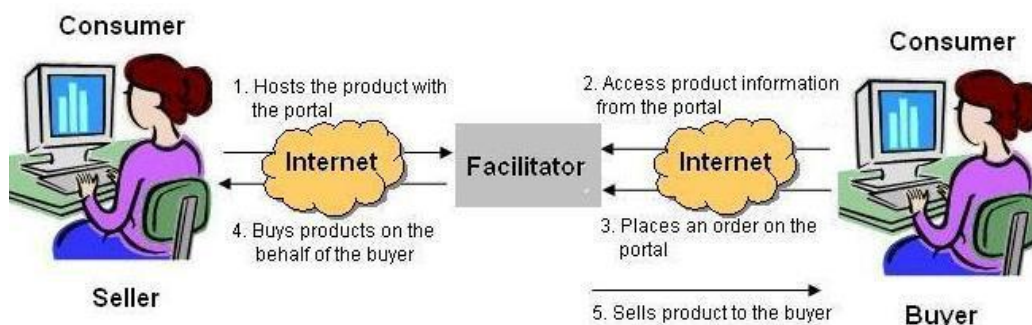


*Figure 31: Customer to Customer E-Commerce (C2C)*

    **Basic Functions in the E-Commerce Site**
Here we are going to look at some features commonly seen in the e-commerce web-site taking *Dell* as an example.

**Catalog Display**
Businesses use the product catalog to display and order products in the e-commerce website.

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Products can be shown in a block view or list view, from which you can navigate to the product details.

Block View(B2C)

The block view format displays a detailed upfront presentation of catalog products. The block view displays more information about a product at first glance for the customer than the list view does. For example, you can display basic eye-catcher texts and hyperlinks about product details, in the block view.

**Shopping Cart**

A shopping cart is a piece of e-commerce software on a web server that allows visitors to a web site to select items for eventual purchase.

Shopping cart which is also named as the **shopping bag** or **shopping basket** keeps track of the items you have selected and allows customers to view the content of it, add new items or remove items. To order an item you need to simply click on that item. The required details of the item (price, product number, other identifying information) are stored automatically in the cart. It is also possible to remove the unwanted items by unselecting the items before completing the transaction. When you are ready to conclude the shopping session, click of a button executes the purchase transaction. Then it displays a screen that asks shipping and billing information and that confirm the order. Some shopping cart software allows you to fill a shopping cart with purchases, put the cart in virtual storage, and come back days later to confirm and pay for the purchases.

**Transaction Processing**

By clicking a checkout button the transaction processing occurs when the shopper proceeds to the virtual checkout counter. This is the most complex part of the online sale. The e-commerce performs the calculations like volume discounts, sales tax, and shipping cost at the transaction processing stage. One of the important things is, at the checkout the customer"s Web browser and the seller"s Web server switch into a secure state of the communication. Other calculation complications such as provisions for coupons, special promotions, and time-sensitive offers can be happen at this stage. Some shopping cart software designed for small and midsize companies provide connections to accounting software so that Web sales can be entered simultaneously in the company"s accounting system.

**2.Electronic training: architecture, structure and platforms. Electronic textbooks.**

**What is e-learning?**

When you hear the word e-learning what comes first into your mind? You might be thinking of an online learning process or a web-based learning. But e-learning comprises of distributed learning, network or web-based learning.

Since the letter "e" stands for electronic, e-learning activities occur by electronic means. This can be performed by individuals or groups, working online or offline.

There are plentiful value added services in the Internet. They are also called as the **high level services**. All these services run on top of the basic protocols. E-learning is also a value added service which contributes a lot to the education. E-learning can be described as any form of technology enhanced learning mechanism.

E-leaning had paved a path to an easier way of teaching and learning. In the modern world people give priority to jobs and don"t have much time to spend on education. Moreover, people tend to

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choose their courses depending on their limited budgets. So the ultimate goal of e-learning is to overcome the limitations such as time, distance and resources. Thus the knowledge and skills are transferred via Internet, intranet, extranet, audio or video tape CD-ROM or even it can be a satellite TV. The content can contain a text document, an image file or it can be an animation, audio or video. It can be a self-paced learning or it can be led by an instructor. As you can see there are different types of e-learning methods and we are going to talk about this in the next topic.

**Types of e-learning**
E-learning can be applied partially or in some occasions education is completely based on it. In blended learning face-to-face classroom sessions are combined along with the computer mediated activities. In contrast there are instances where the learning process absolutely relies on electronic means. Such systems are supportive in non-face-to-face distant based education.

E-learning can be categorized based on some criteria. Some of such criteria are listed below:

    Underlying pedagogical assumptions
    Content model employed
    Size
    Distribution and level of network

E-learning has evolved in many ways in order to support a variety of users" needs. We can classify the types of e-learning as follows:

    Traditional e-learning
    Rapid e-learning
     Asynchronous
     Synchronous

    **Traditional e-learning**
Traditional e-learning is described as a content which consists of an in-depth knowledge with a great preparation and probably produced by an expert.

**2. Rapid e-learning**
This is classified into two.
a.  Synchronous
In this type of e-learning, learner and the instructor have a set time where they have the internet classroom. During this prescribed time, the students log in and they can contact and discuss problems related to the subject.
b.  Asynchronous
The content is based on one aspect which is liable to change. Users can log in whenever they want to do so and can access information any time. Some of the examples of asynchronous e-learning are CDs, DVDs, Networks, Intranet and Internet.

**Advantages and Disadvantages of e-learning**
It is apparent that e-learning has innumerous advantages not only to the learner but also to the teacher. Let"s discuss some of these advantages now.
If we consider a student, e-learning is very flexible, convenient and more interactive. E-learning is accessible from anywhere, during anytime and to anyone. This sort of availability is an added advantage to the learners who are working. Furthermore, the E-learning materials make the

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visualization easy and aid in delivering a better understanding. In the teacher"s perspective updating the contents is made easier. If there is a change in the content he/she can modify it immediately and changes will appear in all course contents all around the world. Both the learner and the teacher need not have to spend time and money on travelling. Instead they can access Internet from home and learn in a hassle-free environment.

Although e-learning provides countless advantages, it has some disadvantages as well. It is difficult to customize the course contents according to the learners" requirement in e-learning. Besides it requires an infrastructure to acquire the materials and carry out operations facilitated by E-learning.

## Traditional Classroom learning Vs. E-learning

Shall we compare a traditional classroom learning and E-learning to get a better understanding? It is going to be interesting for sure!

Even though there are more advanced interactive animations and videos encompassed in the E-learning activity some are of the opinion that there is no personal touch as in a classroom.

In a classroom learning the teacher will pay an individual attention towards each student. This would motivate the students to a greater extent. Teachers too can observe the students" reaction and assume whether they have understood what they have learnt. Students can get into groups and do their activities as a team. Working in teams increases student engagement and this collective work of committed individuals would ultimately give a completely different experience to the students.

On the other hand, in a classroom there can be only limited participants and this requires a space and regular time table.

## 3.Electronic government: concept, architecture, services. Formats of implementation of the electronic government in developed countries.

### Introduction to E-Government

**E-Governmen**t is the digital interaction among the Government, citizens, and the commercial institutions. We can say that E-Government is a generalized term for state sector computerization. Information technology is applied to different public institutions with the intention of improving the effectiveness and efficiency of their service.

Legislature, judiciary and administration are some of the public services which can be upgraded using ICT. This would add quality to the service to the general citizens, government agencies and businesses.

About **E-Governmen**t **of Kazakhstan** you can see on lecture 1.

### Introduction to E-entertainment

If we see the websites worldwide there is a huge demand for entertainment services by almost all age groups. This urge for innovative ideas for the purpose of entertainment had resulted in flourishing abilities and creativity. What is more, this is considered to be one of the largest industries online, internationally.

We have mentioned some online entertainments below which would take new dimensions:

Online Radio
Online TV
Online movies
Computer games
Online News
Online magazines

### Future of Internet

As mentioned in the previous section, definitely, the e-entertainment is taking a new dimension rapidly in the internet. In addition to that there are some other concepts which initiate and evolve in the near future with the emergence of latest internet technologies. However, predicting of internet is not an easy task. But for the sake of your knowledge and for the completion of this session some

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identified future trends in the internet as per the sources available on the web are extracted for you as follows.

**Top Ten Future Trends- The Internet by 2020**

Take a minute to remember how different life was in 1991. If you wanted to call a friend you would have to use a landline, because mobile technology was still many years away from hitting the mainstream. If you wanted to send a written message to relatives overseas you would have to use the post office. It will be quite a while before **domain names** like hotmail become synonymous with email technology. So much has changed in the last 20 years, but how will the world be different in 2020

You can guarantee that the most innovative and revolutionary changes will take place in the digital sector. So what will the internet look like in 2020?

**1.More Centralized**

We can see this trend developing at the present moment. Facebook, Google and Microsoft are becoming incredibly powerful on the internet. Every few months we hear the same story – Microsoft has bought Skype, Google has acquired YouTube; and there is little sign of these digital giants slowing down.

**2.More Open Source Development**

In response to the growing influence of the big digital firms, open source technology is expected to rapidly increase as small-time developers become more and more sophisticated. Expect to see hundreds of high quality open source software suites on the market by 2020.

**3.The Internet Will Be Faster and Cheaper**

Expect to see broadband rates decrease in the near future. Web hosting and **dedicated servers** will be much cheaper as well.

**4.Writing and Reading**

On a more personal level, the influence of the internet by 2020 is expected to dramatically change the way we read and write. Gone are the days of lengthy essay-like blog entries – a more likely scenario is that shorthand will begin to dominate the online sphere. Twitter users are very familiar with this phenomenon.

**5.Lack of Online Anonymity**

Because of the growing influence of hackers and websites like Wikileaks, it is likely that by 2020 the internet will be much more closely monitored.

**6.More Wired Applications**

By 2020, it is expected that almost every device will be wired to the internet – from microwaves to sofas. Furthermore, more applications will be specifically designed to be net friendly.

**7.Personal ID Number**

With growing security concerns regarding online behavior, many security analysts predict that by 2020 some nations will have implemented a personal ID number for online users.

**8.Mobile Internet**

Mobile internet technology is very new, but many feel that by 2020 it will be the most popular way to browse the web. Many sites will be specifically catered towards mobile devices.

**9.More Processes Will Move Online**

Although you can do your grocery shopping online, many people still prefer to buy their groceries in person. This is expected to change by 2020, with more internet savvy customers choosing to utilize online processes.

**10. Cloud Computing**

Cloud computing has only just hit the mainstream with the recent release of Apple‟s iCloud. By 2020 you can expect that millions of internet users will store all of their non-vital information on the cloud.

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The future is never easy to predict, but current trends are all pointing to a 2020 that is more connected but more centralized.

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**6.Questions:**
1. Define „e-commerce". What are the benefits of using e-commerce?
2. Briefly describe four types of consumer oriented applications of e-commerce.
3. To which e-commerce model that the Amazon.com belongs?
4. What is a product catalog? Differentiate Block View and List View.
5. Briefly describe the use of „shopping cart" with respect to e-commerce.
6. What is meant by „traditional e-learning"?
7. Briefly describe the two categories of „rapid e-learning".
8. State the advantages and disadvantages of e-learning.
9. Using suitable examples, briefly explain the concept of „e-government".
10. What is meant by „cloud computing"?
11. Explain the application of e-commerce in following fields
    Banking,Entertainment,Shopping

**LECTURE №10**

**1.Theme:**Information technologies in the professional sphere. Industrial ICT. Prospects of development of ICT
**2 The goal**:   to outline the uses of computers in the day to day life and comprehensively model the environmental effects as well as the physical impacts.
**3.Teaching methods:** final lesson
**4.lecture thesis**

**1.The software for the solution of tasks of the specialized professional sphere.**
You might have not seen a place of work without a single computer in use. The computer has become such essential equipment for almost all places of work no matter if it is a small scale or large scale company. Computer literacy in varying extents has become an essential item under the qualifications required for most of the job vacancies. However, the utilization of computers may vary from place to place depending on the nature of the business they perform.
When we consider the both private and government sector places of work in Sri Lanka, following can be considered as the typical uses of computers.
 Managing data – keep track of data about customers, products, demographics and other information important to the business, uses secured mechanisms for storages.
 Maintain financial status – Keep track of the financial status of the company on an annually, monthly or even day-to-day basis. Spreadsheet software is commonly used to track expenditures,

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sales, and profit and losses. Accounting software provides a business with even more assistance with financial matters, as it is used to do payroll, invoice customers, prepare taxes and execute other essential functions. Companies can use their computers to print checks for payroll and expenditures, and can form a direct link to the company's bank account.

☐ Communication–Uses e-mails, publishes information on web, keeps in touch with stake holders via social networks, conference meetings avoids the need of physical availability of participants of the meetings,

☐ Networking- shares resources, common database of files accessible for authorized members

☐ Research work – Investigate new products, improve the quality of the existing products through effective research

☐ Audio and Video business presentation

☐ Process simulations- The processes allows you to see effect of changes, without having to actually make those changes to your processes, can use to maximize the overall confidence with the proposed changes without implementing

☐ Increase productivity through Industry specific software

Though the typical usage of computers at work has been summarized as above, there will be many more answers to the question „What are the uses and advantages of computers in your office?" depending on the nature of work handled within the company/office of the person. So it is not a marvelous fact that most of the organizations move towards automating the tasks with the help of modern computers.

**Usage of ICT in different sectors**

We looked at the usage of computers in a typical office in the previous section. It was quite difficult to list of uses as it is vast. However, it can be clearly identify the sectors where ICT is now used in the Sri Lanka and in the world, in general as listed below.

**2.Modern IT trends in the professional sphere: medicine, power, etc.**

**Potential Sectors with ICT usage**

ICT can be potentially used in the following sectors. Note that the following list is given in general but not specific to our country. Some of the sectors may be already familiar to you in your everyday life.

☐ Education
☐ Heals care/medicine
☐ Agriculture
☐ Banking
☐ Business/trade and commerce
☐ Transport
☐ Manufacturing
☐ Travel and Tourism
☐ Environment
☐ Gender
☐ Culture

Following sections will give a brief to some of the above sectors with respect to usage of ICT.

**ICT in Education**

The usage of concepts in ICT in the education sector also varies on its application such as,

☐ ICT as a subject (i.e., computer studies)

☐ ICT as a tool to support traditional subjects (i.e., computer-based learning, presentation, research)

☐ ICT as an administrative tool (i.e., education management information systems/EMIS)

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☐ ICT as a medium of knowledge exchange

Accordingly, as a student who follows this course unit, you are dealt with the above first category; ICT as a subject. However, you will be able to get more familiar to use the computer for your studies not only this course unit but also the other courses you follow at OUSL by using your computer as a tool to support your studies. This category is often referred to as **e-learning.** We will be discussing deeply about e-learning in session 25 in this course material. However, the following description is given as it is worth to get a brief idea on what e-learning is before proceeding to the next sections.

**E-Learning**

As per a definition given in an international journey, e-learning, sometimes termed computer-based training (CBT), internet-based training (IBT) or web-based training (WBT), includes all forms of electronically supported learning and teaching, including educational technology. The information and communication systems, whether networked learning or not, serve as specific media to implement the learning process. Accordingly you can see that the term e-Learning is really just an umbrella term which covers a wide set of electronic educational applications and processes.

Mostly, the electronic technology used here is the use of computers with the accessibility to the internet. You will be able acquire and develop your knowledge so that you will be able to demonstrate the particular topic learned which proves that it has positively influenced in your behaviors. You may consider the *OUMoodle* (http://ousl.nodes.lk/) which is the Learning Management System used in the Open University as a major learner support tool.

The advantages of e-learning with respect to both teaching and the learning parties can be considered as;

☐ Cost effective
☐ Saves time without sacrificing quality
☐ Minimizes travel cost
☐ Can be accessed from anywhere any time in the world
☐ Consistent course delivery
☐ Individual instruction

**ICT in Business/Trade and Commerce**

Nowadays, the business IT specialist applies ICT in their organizations to achieve their commercial objectives. It makes them be quick, cheap, and more attractive to the client of their business. One of the major applications of ICT in businesses is the existence of industries where buying and selling of products or services done through internet or other computer networks. This area is called Electronic Commerce or **E-commerce**. You will learn what e-commerce is deeply in session 25 of this material. However, again for your benefit, a brief description of e-commerce is given below before moving on to the next topic.

**ICT in Banking**

Nowadays, for almost all operations in a bank are done with the help of the computers and the internet or any other network. Basically, the banks store all their customers account details on computers. This allows them to easily find out account information on their customers, and make changes to their account balance easily, for things such as when money is put in and withdrawn from the bank. Have you ever used an ATM card? Hopefully the answer is yes. Use of ATM cards is one of the operations used in the banking sector with the ICT. You may know that you can perform some of your banking activities without the physical movement into the bank. In another words, you do your banking online. This facility is known as **E-Banking**.

**ICT in Medicine**

ICT is used in many ways related to the Medicine sector. **E-Medicine** is one of such facility. **E-Medicine** is an online clinical medical knowledge database with a collection of thousands of

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articles, images, videos which support you to browse and get knowledge in any matter related to the medicine field such as details of diseases, drugs, medications, health news, first-aid guides, etc. Further, you can get the answers for your own health care related question as well.

**3.Use of search engines and electronic resources in the professional purposes. Safety issues in industrial information and communication technologies.**

**Health, Safety, and Environment for computers**

Having read the previous sections of this session you might now have the feeling „what a vast range of uses we get from out computers today". Computer, being such common equipment used by people no matter a kid or an adult; did you ever think whether you are working in a good computer based environment? Did you ever think that there are specific guide lines to use your computer with respect to its physical environment? How many hours do you spend a day in front of the computer? You might not thought of these types of questions before.

Following sections discuss about the computer based good working environment and the facts that you need to keep in mind and obey as a computer user.

### Work environment

It is essential to maintain your best possible work environment to ensure the health and the productivity of all computer users. You may think that you have arranged the furniture and the computer equipment correctly, but still it may give health issues arise if the working environment is poor. Following are the physical aspects that you need to consider with respect to a good working environment.

  □   Working space
  □   Location of workstations
  □   Lighting
  □   Decor
  □   Atmospheric conditions
  □   Noise
  □   Housekeeping

A briefing of each above aspect is given below.

**Working space**

You must have enough space to perform your tasks safely and comfortably. The amount of working space depends on the user, nature of work you do, and the devices and the furniture you need to use. Everything should not be crowded. Sometimes, you get stressed or less productive when the space is too compact. Therefore, you need to make sure that your work space gives you a good comfortable posture and that you have easy access to and from the location of your computer.

**Location**

It is important to think about the visual environment when locating your computer with other peripherals. Here, the arrangement of lighting, the type of light fittings used, and the location of the window are important to consider.

  □   The office layout should be planned around the position of light fixtures to prevent walls or partitions blocking or creating shadows over the work area.

  □   If the user is sitting near photocopiers and printers they may be distracted by noise and the heat generated by the other machines and also may get disturbed by the people who are coming often to operate those other machines.

  □   Make sure that you have an easy access to hardware and power points. Well positioned power points can prevent use of multi-plug boards and extra cable lying.

**Lighting**

You may use artificial to provide lighting, but it is better to go for a combination of natural and

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artificial light. Some instances like using LCDs or if the user is an older person, then you may require high level of lighting. Your lighting should be:

☐ Adjustable in direction and intensity level

☐ Does not produce excessive contrasts in different regions of your working area

☐ Does not result in glare or screen reflections at nearby users. Glare may cause visual discomfort and may cause headaches as well as reduces the performance of the user.

**Decor**

Too much of dark colors can create contrasts in brightness so that additional lighting is needed. As a general rule the ceiling should be brighter than walls and walls brighter than the floor.

**Atmospheric conditions**

It is a known fact that people react strongly when they think the air is stuffy, stale or polluted and may express this as general dissatisfaction with the environment. So your working area should be well ventilated and have a comfortable temperature. You may use air conditioners to satisfy this condition.

**Noise**

Noise in your working area (may be generated from equipment, ringing phones, air conditioners/fans, people work close by) can make communicating and concentrating difficult, and may be leading to stresses. Generally, the more complex a task, the lower a user"s tolerance for noise is. So it is required assure that your work area is minimized with noise.

**Housekeeping**

Good housekeeping is promoting maintenance of good health and safety in your work place. So the floors should be tidy and cleaned, environment should be dust free, and it is required to make sure that the power cables do not present tripping hazards.

**Computer related health problems**

There are four potential health issues identified as associated with computer work. They are:

☐ Physical discomfort, pain, or injury

☐ Visual discomfort

☐ Stress

☐ Fatigue

These may often influence each other. Let us have a look at each issue separately.


**Prospects of development of ICT.**


**1.Prospects of development in the sphere of the IT market: development of the free software. Forming of an ecosystem of IT of entrepreneurship and support small startup of the companies.**


**ICT policy and statistics in the Republic of Kazakhstan**

One of the indicators of civilization and openness of the state system of the country is the simplicity of reception by the citizens of the country of necessary, interesting and generally significant for them information as a tool for maintenance of the transparency of government and participation of citizens in democratic process. The information is not simply necessary for the citizens, but it is also the major characteristic of a democratic government.

Today in the development of Kazakhstan the basic place is given to the decision of problems connected with the information policy of the country, mass media and communications, use of the large-scale information control systems. The government of the Republic of Kazakhstan undertakes effective steps on the way of achievement of the transparency of information for the access of population.

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Being on the way to an information-oriented society, Kazakhstan continuously follows the leading countries and advanced information technologies; economic increase observed in the last period in the country is a good help to this process.

Now it is urgent to study statistical indicators allowing to estimate a level of readiness of Kazakhstan for introduction of new technologies, observation of progress in this process, measurement of consequences of influence of electronic technologies for the development of enterprises and population.

For maintenance of deeper understanding of influence of access to information and communication technologies and their uses on socio-economic behavior of the population, it is planned to conduct a specialized survey allowing to describe the position of selected persons in households.

The Agency of Statistics of the Republic of Kazakhstan also plans a national statistical survey "Single survey of the Internet users" in households. The given survey will be carried out with the purposes of study of development of the Internet in Kazakhstan, number of users, age structure, marital status, educational level, main features of the access to Internet, charges on access, basic purposes of use of the Internet, required information, degree of satisfaction of users by the current characteristics of the Internet as well as opinion on some issues.

With development of socio -economic revolution caused by information technologies, the ability of an effective utilization of technology and access to the Internet becomes important for participation in socio-economic development of the Republic of Kazakhstan. The number of users of the Internet is already equal to 200 mln . worldwide. At a regional level there are 85 mln. users in USA, 18.3 mln. in Japan, 45 mln. in Asia and 63 mln. in other areas, while in Kazakhstan the total number of users is about 185 thousand.

In the future, the strong position in sector of information technologies will become a key factor for the country, provoking strong economic growth and high employment.

The information produced by the Agency of Statistics is given to a wide circle of users (according to requests of management authorities of districts, mass media, separate natural persons and etc.) in various forms such as: official publications of databases on paper carriers, official publications of databases on diskettes and compact discs, presentation of the information in the Internet etc.

**2.Programs of acceleration and incubation. Development of necessary infrastructure of electronic payments and logistics.**

**The Government of Kazakhstan has set high objectives for the development of ICT**

ICT is currently relatively underdeveloped in Kazakhstan.3 To remedy this situation, the government has set high targets for the sector. In 2006, the ICT sector made up 6.3% of the total business value added in Kazakhstan (UNCTADStat). Kazakhstan ranked lower than most OECD economies and also lower than most Eastern European and CIS countries (Table 7.).

An overview of business services, including part of the ICT industry, can be found in OECD (2011a), Competitiveness and Private Sector Development: Kazakhstan 2010: Sector Competitiveness Strategy, OECD, Paris.

**Table 7.** Share of the ICT producing sector in total business value added by country

| Country | ICT producing sector as % of total business value added | Last available year |
|---|---|---|
| Hungary | 9.9% | 2008 |
| Estonia | 9.8% | 2004 |
| Romania | 9.8% | 2005 |
| Lithuania | 9.4% | 2004 |
| Latvia | 9.0% | 2005 |

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| Czech Republic | 9.0% | 2008 |
|---|---|---|
| Slovakia | 7.5% | 2008 |
| **Kazakhstan** | **6.3%** | **2006** |
| Poland | 5.7% | 2008 |
| Russian Federation | 4.9% | 2008 |
| Azerbaijan | 2.4% | 2006 |

*Source*: UNCTADStat, "ICT producing sector core indicators", http://unctadstat.unctad.org/TableViewer/tableView.aspx?ReportId=1634, accessed on 9 May 2012. The structure of the ICT market in Kazakhstan also differs significantly from the global average (Figure 32).
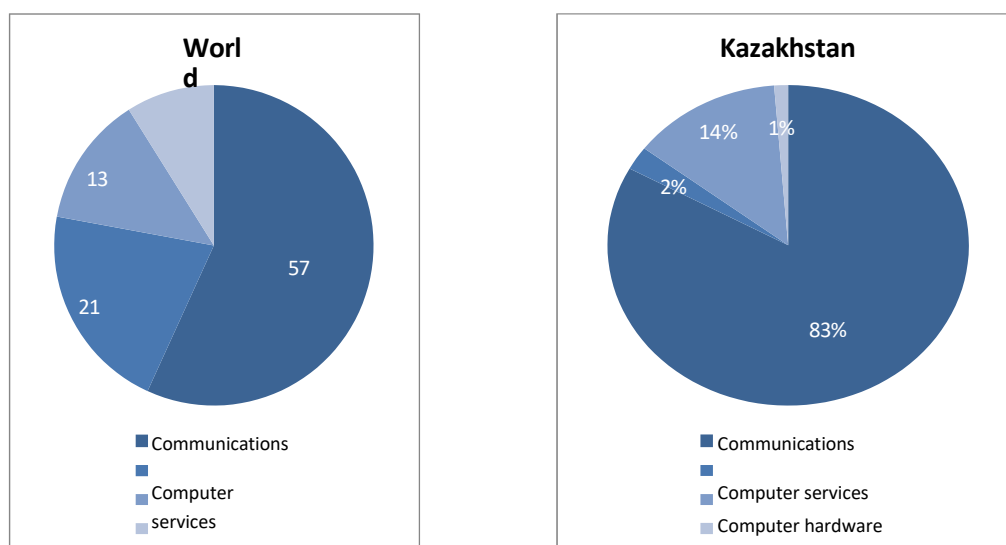


**Figure 32.** Split of ICT spending in the world and in Kazakhstan (2009)
*Source*: OECD (2010a), OECD Information Technology *Outlook*, OECD, Paris, Masimov, K. (2010), Decree 983 of September 29, 2010 - *On the approval of the Programme for Development of Information and Communication Technologies in the Republic of Kazakhstan 2010 – 2014*, Government of Kazakhstan, Astana.

The split of ICT spending in Kazakhstan illustrates the level of development of the ICT industry in the country:

- Dynamic development of mobile telecommunications, which may reflect technology leapfrogging. In Kazakhstan, mobile penetration stands at 95%, whereas landline penetration is only 25% (Masimov, 2010);
- Underdevelopment of computer services, which is common in emerging economies, as strong services may reflect an advanced stage of development of the ICT industry;
- Catch-up in IT equipment;
- Massive under-spending in software, reflecting the early stage of development of the ICT market and the extent of software piracy.

As a result, demand for ICT goods and services is mostly fulfilled by imports. Regarding IT equipment, the government's 2010-2014 ICT Programme indicates that the share of local content amounted to 3% of the value of goods sold in Kazakhstan in 2010. For IT services, often considered more local, the share of local content only reaches 30% (Masimov, 2010).

**To develop ICT in Kazakhstan, developing skills is one of the key levers**
Developing ICT in Kazakhstan will require the development of ICT skills, which are currently

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underdeveloped. To do so, the government will need to improve further the initial education and vocational education and training systems, but also to leverage private sector resources.

The development of a healthy ICT sector relies on the availability of the necessary skills for ICT users (professionals of sectors other than ICT and the general public) as well as for ICT producers (ICT specialists). This is recognised by governments in OECD countries, as in 2012 the development of ICT skills was ranked the second most important policy area for the development of ICT, right after broadband availability (OECD, 2012a). For instance, the European Union (EU) decided on a number of actions on skills development as part of its Digital Agenda for Europe, including skills development in the general public and increased standardisation of ICT specialist skills.

Globalization. Companies are using IT to conduct business in the global market, anywhere, instantly get detailed information. There is a software internationalization and market an information product. Getting benefits through continuous distribution costs of information on a wider geographical region is becoming an essential element of the strategy.

Convergence. Blurs the distinction between industrial products and services, product information and their means of production, their professional and domestic use. The transmission and reception of digital, audio and video signals are combined in some devices and systems.

The increasing complexity of information products and services. The information product in the form of hardware and software, databases and data warehouses, maintenance services and expert support tends to constant development and complexity. At the same time, the interface of the IT for all the complexity of tasks consistently simplified, making it more comfortable and user interactive communication system.

Interoperability. Problems of optimal communication between computer information systems between the system and users, problems of processing and data transfer and the formation of the required information acquired the status of leading technological problems. Modern software and hardware and communication protocols allow us to solve them in an increasingly full.

The elimination of intermediaries (Disintermediation). The development of the ability to interact uniquely leads to a simplification of the delivery of the information product to the consumer. It becomes unnecessary chain of intermediaries, if it is possible to place orders and receive the required directly using IT.

The above changes in the requirements for interest groups in the field of IT and information company culture due to the dynamics of enterprise development and the environment and lead to functional changes in the management system. Key aspects of the development and its impact on the role of IT in enterprise management are listed below.

## 3.Prospects of development of E-technologies. Trends in IT development
ICT IN EVERYDAY LIFE

The acronym ICT (Information and Communication Technology) includes all technical means that are used for handling information and facilitating communication, including computers, network hardware, communication lines and all the necessary software. In other words, ICT is comprised of information technology, telephony, electronic media, and all types of process and transfer of audio and video signals, and all control and managing functions based on network technologies.

INTERNETSERVICES

E-commerce is a form of trade that allows customers to browse and purchase products online.

E-banking allows users to have control over their accounts (view balances and transactions), transactions from one account to another, credit payment, shopping vouchers for mobile phones etc. The benefits are saving time (which would otherwise be spent waiting in lines), lower service fees, and access from anywhere, anytime.

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E-government-use of information technology to provide better public access to government information (www.vlada.hr-GovernmentToCitizens, G2C), therefore providing citizens with their human right to information.

 E-LEARNING

E-learning consists of all forms of learning and/or knowledge transfer that are based on electronic technologies. This term will mostly be used to describe learning and/or dissemination of knowledge without direct teacher-student contact, while using ICT technology.

Advantages of e-learning greatly coincide with learning from books, with a difference that the books come only in text and graphic form on paper, while e-learning materials have multimedia features, and the ability to remotely monitor lectures in realtime. To illustrate, physicians can observe medical procedures that are currently taking place in another hospital; students can attend classes that are currently taking place at another university.

Some of the advantages for students:

- adaptive time, place and pace of learning
- access and availability of education
- unlimited repetition of lectures
- reduced cost of education
- multimedia environment(video, audio, text)

Some of the benefits for teachers and educational institutions:

- reduced costs of conducting teaching (reduced travel costs and accommodation, reduced or eliminated costs for classrooms, etc.)
- much larger education user base
- once created, e-education allows educational staff to invest a much shorter time commitment to implement the respective education
- simple and easy upgrade of materials, etc.

**Summary.** Summing up of the developments in the Kazakhstan IT market described above will bring us easily to the main trends formulation that are as follows:

• Continued economy growth spurred IT spending by industrial enterprise.

• State-financed procurement increased considerably.

• Organizational and financial support of the program "Forming and Development of National Informational infrastructure" by the Kazakhstan Government.

• A decline of PC prices resulted in a small market growth in dollar terms.

• Laptop and server markets grew faster than the desktop market.

• Distributors are expanding from their traditional markets in Almaty into Kazakhstan's regions.

• Demand for Enterprise Management Software increased with local IT companies' expansion deeper into the sector providing enterprise solutions not only hardware delivery.

• Internet (private and corporate) is booming.

• The level of software piracy remains extremely high.

• High dynamics of the mergers-acquisitions-reorganization process inside the Kazakhstan business community prevents the local IT market from predictable and steady growth.

 Brief description of the growing Kazakhstan IT sector could cover only the main tendencies in the market development and perspectives. During the year 2002 a dozen brand name market research companies (local and foreign) devoted efforts to describe Kazakhstan's IT potential and provide to the clientele a comprehensive description of the status quo. But as far as it is publicly known none of these reports had a generally negative evaluation of the Kazakhstan IT market perspective.

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## 6. Control questions:

1.   Using suitable examples, describe how computerization would help an organization to perform more efficiently and effectively.

2.   Briefly describe the following terms.

3.   a. E-Commerce                        b. E-Banking              c. E-Medicine

4.   What are the advantages of e-learning with respect to both teaching and learning?

5.   Briefly explain the nature of the environment that is preferable for a computer based working area.

6.   Prospects of development of ICT.

7.   Prospects of development in the sphere of the IT market: development of the free software.

8.   Forming of an ecosystem of IT of entrepreneurship and support small startup of the companies.

9.   Programs of acceleration and incubation.

10. Development of necessary infrastructure of electronic payments and logistics. Prospects of development of E-technologies.

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