digital
literacy
movement

e - learning

building
modern
society

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Basic Concepts of Information and Communication Technology

Handbook

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PREFACE

Today's society is shaped by sudden growth and development of the information technology (IT) resulting with its great dependency on the knowledge and competence of individuals from the IT area. Although this dependency is growing day by day, the human right to education and information is not extended to the IT area. Problems that are affecting society as a whole are emerging, creating gaps and distancing people from the main reason and motivation for advancement-opportunity. Being a computer illiterate person today means being a person who is unable to participate in modern society, and a person without opportunity; and despite the acknowledged necessity and benefits of inclusive computer literacy from institutions like the European Commission, UNESCO, OECD, there are still groups of people having difficulties accessing basic computer education viz. persons with disabilities, persons with learning difficulties, migrant workers, unemployed persons, persons that live in remote (rural) areas where IT education is not accessible.

This handbook, combined with other materials published on ITdesk.info, represent our effort and contribution to the realization and promotion of human rights to education and information considering the IT area. We hope that this education will help you in mastering basic computer skills and with that hope we wish you to learn as much as you can, and therefore become an active member of modern ICT society.

Sincerely yours,

ITdesk.info team   Expert review of Croatian version:

CONTENT:

IT (Information Technology) encompasses all of the technology that we use to collect, process, protect and store information. It refers to hardware, software (computer programs), and computer networks.

ICT (Information and Communication Technology)

This concept involves transfer and use of all kinds of information. ICT is the foundation of economy and a driving force of social changes in the 21st century. Distance is no longer an issue when it comes to accessing information; for example, working-from-home, distance learning, e-banking, and e-government are now possible from any place with an Internet connection and a computing device.

1. HARDWARE

1.1 HARDWARE BASICS

The concept of hardware includes computer components, the physical and tangible parts of the computer, i.e., electrical, electronic and mechanical parts which comprise a computer.

Computer working principle:

Input devices	→	System unit	Output devices	→
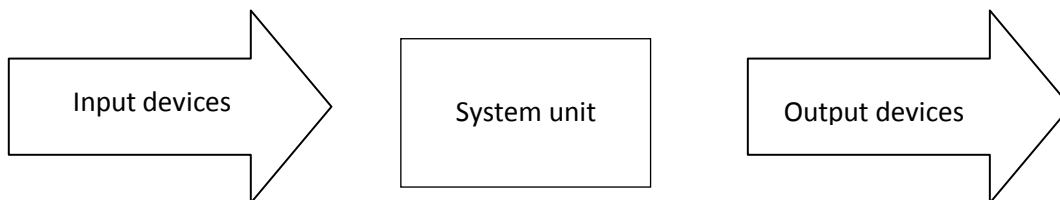
Computer working principle: data are entered into a computer via input devices, then are processed and stored in a system unit, and are finally displayed by the output device.

PERSONAL COMPUTER

Personal computer (PC), as the name suggests, is intended for personal use, as opposed to the server, which is used by a larger number of people simultaneously, from different locations, often via terminals. If you do not intend to move your computer frequently from one place to another, and at the same time you want maximal price/performance ratio, then you should use a desktop computer. In comparison to laptops or tablet computers, it is much larger in size, inconvenient to carry/move, consumes more electricity but has a much better price/performance ratio. Also, they are much easier to upgrade.

LAPTOP OR TABLET PC

Laptop or tablet PC is used by individuals who have the need to travel with a computer or simply use them for aesthetic reasons when computing power is not an issue. Laptop computers, as opposed to tablet PCs, more closely resemble a personal computer when it comes to data input. Data entry is done via keyboard and mouse, while the tablet PC data entry is done via touch screen.

Unlike desktop computers, notebooks and tablet PCs are optimized for portability, low power requirements at the expense of performance and can be used (for a limited period of time-i.e. until the batteries are depleted) without connection to the power grid. In order to prepare a laptop or a tablet computer for use without a power connection, it is necessary to recharge the batteries.

PORTABLE DIGITAL DEVICES

PDA-Personal Digital Assistant (**PALM**) is a convenient small sized computer. It easily connects to mobile phones and can prove a good solution for less demanding users. As the name suggests, it is a device that fits in the user's palm. Its name directly tells us that this computer is more of an assistant and not a workstation-whose name suggests the superiority in capabilities and computing power, especially in comparison with PDA.

Mobile phone is a portable electronic device used for distant communication. In recent years, mobile phone has evolved from simple communication device into a multi-functional device. Additional functions, such as short text messaging (SMS), electronic mail, Internet access, contact registration, calculator, clock, alarm, recording and photograph displaying, recording and playback of video clips, sending/ receiving multimedia messages (MMS), audio recording and playback, etc. has turned the mobile phone into an extremely useful device, whose absence would make active involvement and participation in a modern society not possible.

Smartphone is a device that merges functionality of phones, PDAs, cameras, camcorders and computers. To function properly, Smart phones use operating systems, which are the basis for application development. Some smart phones can be connected to an external screen and keypad, which creates a working environment, similar to that of a laptop or a desktop computer. Some operating systems for Smartphone are: GoogleAndroid, Symbian, Blackberry, PalmPilot, and WindowsPhone.

MAIN COMPUTER PARTS

As already stated, computer's functionality can be divided into:

Input devices → System unit → Output devices
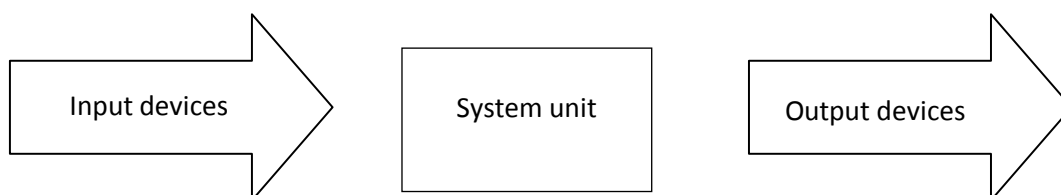
Basic computer working principle: data is entered into a computer via input devices, processed and stored in a system unit, and displayed by the output device.

SYSTEM UNIT

The system unit (case) contains a computer's vital parts. There are two basic types of cases:

- Desktop casing is placed on a desk in a horizontal orientation.

- Towers come in 3 sizes (mini-tower, mid-tower and full-tower) and it is vertically orientated.

Motherboard, MBO is computer's basic circuit, to which all computer components are connected, directly or indirectly. Devices are connected to the motherboard through a system bus. System bus connects all devices, ensures data flow and communication between different devices using predefined protocols.

Protocol describes a manner in which communication between devices is defined. It enables them to address each other and defines how they should look for each other on either system bus or network. Buses can, according to the purpose, be divided into:
- Serial-USB, Firewire, etc.
- Parallel-AGP, PCI, etc.
- Mixed-Hyper Transport, InfiniBand, PCI, etc..

Central Processing Unit (CPU or processor) is a central part of a computer (and can be referred to as the computer's "brain"). It manages all other computer parts, monitors their mutual communication and performs arithmetic-logical operations. Processor speed is measured in hertz (or megahertz or gigahertz). Most famous manufacturers for personal computer processors are Intel and AMD.

Cache is a small capacity memory which allows quick access to data. By storing data from working memory in cache, the speed of communication between processor and RAM is increased. Microprocessors use three levels of fast cache, L1, L2 and L3, used to store often used data.

ROM (Read Only Memory) is a type of permanent, internal memory that is used solely for reading. BIOS (Basic Input/Output System), a program which is located in a separate ROM on the motherboard, and defines, as the name suggests, basic input/output system, is a good example. Please note that not all BIOS programs are stored in ROM.

RAM (Random Access Memory) is a working memory in which analyzed data and programs are stored, while computer runs. It allows reading and writing data, and is deleted/cleared when the computer shuts down.

Hard Disk Drive (HDD) is a place for permanent data storage (it does not delete/clear when computer shuts down). Its features are: large capacity, faster performance in comparison to optical devices but slower in comparison to RAM and are used for permanent data storage. We can distinguish between internal and external hard drives.

Floppy Disk Drive is used for storing and reading data stored on a floppy disk. Disk capacity is 1.44MB. Before memory stick and a wider usage of CD recorders, it was used as data carrier. 'Modern memory sticks have a memory capacity measured in GB while floppy disks only have memory capacity of 1.44MB, indicating that floppy disks are becoming obsolete.

CD-ROM drive is used for reading CD media.

DVD drive is used for reading DVD discs. DVD disc capacity ranges from 4.7 to 18GB.

Soundcard is a device used for sound creation and production by means of computer speakers.

Graphics card is responsible for image processing and displaying it on a monitor. It has its own graphics processor and memory. Image quality depends on the strength of these components.

Modem enables computers to communicate via telephone lines. They connect computers to the Internet.

Connectors or ports are slots visible in the back and the front side of a computer.

COMMON INPUT /OUTPUT PORTS

Universal Serial Bus (USB) is used to connect various devices (mouse, keyboard, USB memory).

Serial port is used for example in connecting a mouse (labeled COM1 or COM2).

P**arallel port** is used for connecting a local printer (LPT1 or LPT2).

Network port is used for connecting computers to a network.

Firewire - used for connecting computers and audio-video devices (digital cameras, etc.).

1.2 COMPUTER PERFORMACE

Factors affecting computer performance:

- processor clock speed, amount of cache and number of kernels

- the amount of installed RAM

- graphics card- its memory and processor

- clockbus

- number of running applications

Applications use computing resources. The processor runs applications and performs code that defines applications; therefore processors get the most workload when it comes to running the application. In order for processors to execute the application, it is necessary for application code to be loaded into the system memory. As a result, running applications take up a certain amount of working memory. The more applications are running, the greater the load on the processor and RAM .That is why the computer's performance depends on both the processor (clock speed, number of cores, cache memory), and the amount of working memory, as well as the number of applications running.

Processor speed is measured in hertz (Hz), and due to a large working clock speed of today's processors, it is expressed in megahertz (MHz) or gigahertz (GHz). Besides the frequency, the processor performance depends on the number of operations that the arithmetic-logic unit (ALU) performs in one clock cycle.

1.3 MEMORY AND STORAGE DEVICES

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RAM (Random Access Memory) is a working memory in which analyzed data and programs are stored, while computer runs. It allows reading and writing data, and is deleted/cleared when the computer shuts down.

Measurement units

Bit (binary digit) is the basic unit used to measure the amount of information. A byte or octet contains eight bits.

1 KB (kilobyte)- 1024 B (approx. 1000 B)

1 MB (megabyte)- 1024 KB (approx. 1000 KB)

1 GB (gigabyte) -- 1024 MB (approx. 1000 MB)

1 TB (terabyte) – 1024 GB (approx. 1000 GB)

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BASIC TYPES OF STORAGE DEVICES

CD (Compact Disc) is an optical disc used for data storage. The standard capacity of a CD is 700MB. CD-R is used for reading and writing data one time-only, while CD-RW for reading and writing data multiple times.

DVD (Digital Versatile Disc) is an optical disc which is, due to the larger capacity (about 4.7 GB), mostly used for video storage.

Blu-ray disc (BD)- the successor to DVD, is an optical disk storage, it comes in different capacities, depending on how many layers it has and the capacity of each layer. Currently, the capacity of one layer is between 27 GB and 33 GB, while the overall capacity is the product of the number of layers and capacity of each layer. (Source used: http://hr.wikipedia.org/wiki/Blu-ray_Disc)

Memory card is a type of flash memory used to store data in digital cameras, cell phones, MP3 players etc.

USB Stick is a data storage device. It features small dimensions, relatively high capacity, reliability and speed. It belongs to the type of flash memory that remembers data, even when not under voltage i.e. they do not need electric power to maintain data integrity.

There is a difference between an internal **hard disk drive,** which is embedded in the computer case, and an external **hard disk drive,** which is connected to a computer by using an appropriate cable or USB port, and is usually used to transfer data from one computer to another or for backup.

1.4 INPUT AND OUTPUT DEVICES

Input devices:

Mouse is an input device that facilitates work with the graphical user interface (GUI). The mouse transmits hand movements and the screen displays the cursor (mouse pointer) movements. They are divided into mechanical and optical (with respect to a transfer movement), and wired and wireless (with respect to connection).

Trackball, unlike a mouse, is not movable. Hand movements are transmitted to the screen by rolling the ball which is located on the upperside of the device.

Keyboard is used for data entry and issuing commands. They can also be wired or wireless.

Scanner is used to load data (image, text, etc.) from the printed material into a computer. The result of scanning is an image, but with special programs, if we scan the text, we can get a text as a result. Software used to recognize text from image is called a *text recognition tool*.

Touchpad is used for transmission of hand movement, but unlike working with a mouse, the user is the one who determines the position of the cursor by touching the touchpad.

Lightpen enables handwriting on screen and can be used as a mouse. It requires an appropriate monitor type.

Joystick: mainly used in computer games. Unlike a mouse, it has many buttons which allow control over game objects.

Microphone is a device that converts sound into an electrical signal, which can be stored on a computer. It is mainly used for recording sound, communication between players in online games, in combination with a web camera in video conferencing, for converting voice into text on a computer (speech-to-text processing (e.g., textual files or emails), etc.

Webcam is a camera that stores video signal in a format appropriate for video transfer over the Internet in realtime.

Digital camera, unlike analog, stores photographs in digital format. It can be directly connected to a computer and photographs can be downloaded. Photograph quality is expressed in megapixels. More megapixels mean better quality of photograph, however more memory is occupied.

Output devices:

Monitor displays images from the computer, it enables us to see, work and control computers. In other words, working on a computer without a monitor would be inconceivable. Common types of monitors, with regard to manufacturing technology, are the CRT and LCD. **CRT monitors** have been present on the market for a long time, and other technologies are pushing them out. They are based on cathode tube technology. **LCD monitors use** liquid crystal technology. In comparison with CRT monitors, LCD monitors use less electrical energy, do not emit radiation and their price is higher, however due to smaller dimensions, more attractive design and a good picture quality, they are pushing CRT monitors out of the market. Monitor size is expressed by the size of screen diagonal and measured in inches (''). Picture quality is expressed with the notion of resolution, which is a number of horizontal and vertical dots (pixels) (e.g. 1920x1080).

Projector is a device used to project a computer image or other images from independent devices, such as DVD players, Blu-ray player, etc. onto canvas or a wall.

Printer is a device used for printing data from a computer onto a paper. We distinguish between local printer (connected directly to the computer) and network printer (connected directly to network using a network card). Also, printers also differ according to print technology: dot matrix, laser, inkjet, thermal printer and plotter.

Dot matrix printers are the oldest, with the lowest price of print per paper, they are slow, make a lot of noise while printing, and are mostly appropriate for printing text.

Laser printers are similar to photocopy devices when it comes to technology. They have exceptional print quality, speed and are quiet. Downsides of laser printers are their high price and high price of toners.

Inkjet printers have a high print quality (somewhat lower in comparison with laser printer), they are quiet while printing, and have low initial investment. Ink price, especially color ink, can cost as much as the printer itself. Printing technology is based on ink dispersion from container onto paper.

Plotter is used for printing large drawings (up to A0). They are extremely expensive and used only for professional purposes, such as in designing firms for printing technical drawings (blueprints).

Thermal printer, as its name states, leaves a print on the paper by utilizing heat. They use paper sensitive to heat, feature small dimensions; they are quiet while printing and relatively cheap. They are usually used for printing receipts, and owing to that they are

called POS printer (printer of sale). Also, they are used as calculator printers and due to their small dimensions, as portable printers.

Input and output devices

Storage devices, due to necessity for writing and reading data, they are classified as input/output devices.

Touch screen (i.e. monitor sensitive to touch) is out device while displaying computer image, and at the same time input device while receiving manual orders.

2.   SOFTWARE

Software is, unlike hardware, intangible part of the computer. It consists of a sequence of commands, written according to strict rules. Programs are written by programmers, in various programming languages.

Software types:

Operating system is a program which manages computer hardware. First computers did not have operating systems; they had programs that were directly loaded into the computer (e.g. punchcards). Today, computers have an operating system which loads into the computer's memory during its startup. Computer functions are based on its operating system. Within operating system, drivers (responsible for the functioning of a computer) and various utility programs (responsible for the functionality of a computer) are installed. The most famous operating systems are:

1. Linux (Debian, Ubuntu, Fedora, Knoppix,...) - open source software
2. Microsoft Windows (XP, Vista, 7,...) - proprietary software
3. Mac OS X (Cheetah, Panther, Snow Leopard,...) - proprietary software

Application Software (Utility programs) are all programs that users use to perform different tasks or for problem solving. Users, according to his/her needs, install the appropriate utility software. Computer functions and tasks that computers can perform are defined by the installed utility software. Utility software can often cost more than computer hardware unless the software is open source.

Common utility softwares are:

   Text processing software is used for creating and forming text documents and nowadays, they can contain images, charts and tables. Examples of such programs are OpenOffice.org Writer (open source software) and MicrosoftWord (proprietary software).

   Spreadsheet calculations software is used for performing various calculations and presentation of results in charts. Examples of such programs are OpenOffice.org Calc Writer (open source software) and MicrosoftExcel (proprietary software).

   Software for **presentations** is used to create professional presentations that consist of **slides** with graphical and textual elements. Such a presentation can afterwards be displayed as a "slide show" by using a projector. Examples of such programs are OpenOffice.org Impress (open source software) and MicrosoftPowerPoint (proprietary software).

Software for **creating and managing database** helps to manage a collection of structured data. Examples of such programs are OpenOffice.org Base (open source software) and MicrosoftAccess (proprietary software).

Common utility software installed on a computer:
- office programs - OpenOffice.org, Microsoft Office
- antivirus programs – Avira, Sophos, Kaspersky, Antivir etc.
- Internet browser: Mozilla Firefox, Microsoft Internet Explorer, Opera, Safari etc.
- programs for image editing: Adobe Photoshop, Canvas, CorelDraw, Draw etc.

2.1 PROGRAMS TO FACILITATE EASIER COMPUTER ACCESSIBILITY

We can access accessibility options: **Start** menu → **All Programs** → **Accessories** → **Ease of Access**

Magnifier is used to enhance a part of the screen.
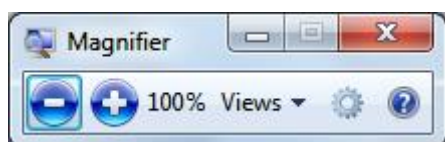
Fig. 1. Magnifier

On-Screen Keyboard – text is entered using a mouse to click on the on-screen keyboard.

Fig. 2. On-Screen Keyboard

Narrator is commonly used by users with visual impairment - it can read text displayed on monitor, it tells current cursor position, and describes certain events, like warning and error messages generated by OS.

Windows Speech Recognition enables speech recognition, i.e. recognizes spoken word, transfers it to text and enters it into a document; therefore it enables you to dictate a text to a computer, to browse the web using your voice etc.

3.   NETWORKS

Computer network is comprised of at least two, connected, by wire or wireless, computers that can exchange data i.e. communicate. There are many reasons for connecting computers into a network, and some of them are:

- exchange of data between users that have network access,

- access to shared devices, such as network printers, network disks, etc.,

- enables user communication and socializing, etc.

Internet is the most famous and most widespread network with nearly2 billion users and the number of users is still growing.

3.1   TYPES OF NETWORKS

Types of networks according to their size:

- **LAN (Local Area Network)** - a network that covers a relatively small geographical area- it connects computers within a firm or household by wire,

- **WLAN(Wireless Local Area Network)** - a network that covers a relatively small geographical area - it connects computers within a firm or household wirelessly,

- **WAN (Wide Area Network)**- a network that covers a relatively large geographical area - it connects a greater number of computers and local networks.

Terms: client / server

Relationship client - server is defined in the following manner: client sends requests and server responds to those requests. We can use Internet as the best known example. User's computer, connected to the Internet, sends requests to a certain web page (by entering page address into the Internet browser Address bar), and the server responds. Web page is loaded into the user's computer Internet browser as a result of server response. From this example, we can see that communication between client and server depends on connection speed (bandwidth). Since bandwidth is limited, the amount of data that can flow through network is limited too. Today, for instance, while purchasing access to mobile Internet, you will notice a limited amount of data that can be transferred within a package, i.e. amount of transferred data is what is charged.

The reason for that is limited bandwidth of mobile networks, and since companies that are offering mobile Internet access do not want networks to be congested, they de-stimulate their users by charging amounts of money related to the amount of transferred data. That was the case with ADSL Internet access. Today, once Internet providers have developed communication infrastructure, they do not need to de-stimulate users by charging based on the amount of transferred data, therefore they are offering so called "flat rate" access) charging only based on the access speed. That is why you will, while listening or reading news about communication technologies, have the opportunity to hear how important it is to develop communication infrastructure.

Types of networks according to their architecture:

- client-server - all clients are connected to the server,

- P2P (peer to peer) - all computers are clients and servers at the same time.

INTERNET, INTRANET, EXTRANET

Internet ("network of all networks") is a global system comprised of interconnected computers and computer networks, which communicate by means of using TCP/IP protocols. Although, in its beginnings, it emerged from the need for simple data exchange, today it affects all domains of society. For example:

- **Economy**: Internet banking (paying bills, transferring funds, access to account, access to credit debt, etc.), electronic trading (stocks, various goods, intellectual services, etc), etc.

- **Socializing**: social networks, forums...

- **Information**: news portals, blogs etc.

- **Healthcare**: diagnosing disease, medical examinations (for people living on an island or in other remote places, some examinations, that require a specialist, can be done remotely), making appointments for medical examinations, the exchange of medical data between hospitals and institutes, surgery and remote surgery monitoring

- **Education**: online universities with webinars (web + seminar), websites with tutorials, expert advice, Ideas Worth Spreading @ www.TED.com , etc.

Internet really does have many applications and a huge social impact. Perhaps the most important trait is information exchange, because information exchange among people

enables collaboration, collaboration of like-minded people leads to ideas and actions in real life, and coordinated actions of people results in social change.

Intranet is a private network of an organization to which only authorized employees have access (login and password).

Extranet is part of Intranet, to which independent collaborators have access.

DATA FLOW/ TRANSFER

Download is a term that implies taking a copy of digital data from a network computer on a local computer, and upload means placing digital content on a network computer. For example, when you saved a copy of this manual from the web sitehttp://www.itdesk.info to your computer, you have **downloaded** digital data, that is, the manual. Likewise, when we finished writing this manual, we have placed it (**uploaded**) it on the network computer (our Internet server).

Bitrate represents speed at which data is transferred through a modem (network). It is measured in bit/s (bit per second). bit/s is/are a measurement unit for speed of digital data flow through the network. The number of bits transferred in one second tells us how many bits can be transferred through a network in one second.

1,000 bit/s rate = 1 kbit/s (one kilobit or one thousand bits per second)

1,000,000 bit/s rate = 1 Mbit/s (one megabit or one million bits per second)

1,000,000,000 bit/s rate = 1 Gbit/s (one gigabit or one billion bits per second)

(source used: http://en.wikipedia.org/wiki/Bit_rate#Prefixes)

Speed of data flow can be expressed in bytes per second. Since one byte has eight bits, such is the relation between bit/s and Bp/s, i.e. bits per second and bytes per second.

Ways to connect to the Internet:

- **Dial-up** Internet access method uses a modem (56k) and a telephone line.

- **Broadband** is characterized by a high-speed data transfer, permanent access to the Internet, and thus the risk of unauthorized access to the network or your personal computer.

Connection methods:

- **Mobile**-connecting by using a mobile network (GPRS, EDGE, UMTS, HSPA)

- **Satellite**-commonly used in parts of the world where there is no proper infrastructure and there is no other way of accessing the Internet

- **Wireless (Wi-Fi)** - data is transferred between computers by using radio frequencies (2,4 GHz) and the corresponding antennaes

- **Cable** - connecting to the Internet through television cable network using a cable modem

- **Broadband** is characterized by a high-speed data transfer, permanent access to the Internet, and thus the risk of unauthorized access to the network or your personal computer. In the beginning of broadband Internet access, due to underdeveloped communication infrastructure, Internet providers charged based on the data traffic but not time spent on the Internet (unlike dial-up Internet access). Today, in large cities, telecommunications infrastructure is developed, therefore Internet providers do not charge money based on the time spent on the Internet or the amount of transferred data but they do charge by access speed.

4.   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.

4.1   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.

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.

4.2   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.

4.3 TELEWORKING

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:

- 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.

4.4   E-MAIL, IM, VOIP, RSS, BLOG, PODCAST

E-mail is the transmission of text messages via Internet. Using attachment, users can exchange files like images, multimedia, documents, etc. E-mail addresses consist of a username, @ sign ("at") and a domain name, e.g. mark.marich@ITdesk.info, where "mark.marich" is the username and "ITdesk.info" is the domain name.

IM (Instant Messaging) service is used for instant message exchange and real time communication. Besides textual communication and video conferencing, they allow file transfer as well. Some of the popular IM services are: WindowsLiveMessenger, Skype, and GoogleTalk.

VoIP (Voice over Internet Protocol) is a term for technology that enables digitalization and transfer of sound (and multimedia sessions) over the Internet. Therefore, it enables sound communication much like the telephone call. In short, VoIP protocol enables audio/video communication between users.

RSS (Really Simple Syndication) is a set of web formats, used by web pages that are being constantly updated, considering that by using RSS, new information, articles, etc. can be

published. RSS enables us to, with use of appropriate software, read new titles and access news summaries. Users can, with appropriate software, obtain   news from various portals and receive information without the need to visit all of them independently, while publishers can distribute news easily to end-users who are monitoring their RSS feeds/channel.

Blog (web log) is a form of Internet media in which users can re-post or write their opinion on any topic. It can be personal (a form of Internet diary), thematic, or in the form of journals. Blogs are popular because end-users do not need to have advanced computer knowledge, or knowledge of webpage creation, in order to be present on the Internet and write about various topics, i.e. state their opinion. Blogging has greatly facilitated the exchange of interests, ideas, opinions, and contributed to realization of human right to free expression. Some use blogs to share their art, personal aesthetic, or to collect virtual clippings from websites online.

Entries published on **blogs** are called **posts,** which may allow a space below for visitors to leave their comments. Besides text, it is possible to exchange multimedia files, such as photos or videos. In order to share your texts, pictures, video clips, etc., it is necessary to create a personal account on websites that offer this type of service. In case you simply wish to browse the content, it is not necessary to open a personal account.

Podcast (POD - <u>P</u>ersonal <u>O</u>n <u>D</u>emand+ Broad<u>cast</u>) is a digital file containing audio or video content. It is distributed over the Internet using RSS technology.

4.5   VIRTUAL COMMUNITIES

The term "virtual community" encompasses a group of people who communicate via social networks, forums, IM service, blogs. We call it a community, since they are a collection of people who participate in a group of their interests, thus forming a virtual community, because it does not involve physical contact, but is carried out by means of ICT technologies.

Social Networks are free online services that provide users with various forms of presentation and communication. Some of the more popular social networks are: MySpace, Facebook, Twitter, Google+.

Forum is a service that allows users to exchange opinions. It can be compared to bulletin boards on which participants leave their messages, while others leave their comments. Examples of forums are: Reddit, TED Conversations.

MMO (Massive Multiplayer Online) are network games, played by a large number of players via the Internet. One of the sub-genres of MMO is a MMORPG (Massive Multiplayer Online

Role-Playing Game), and its most popular representative is a game called 'World of Warcraft'.

Chatroom is a webpage or part of a webpage which allows a real-time information exchange. Unlike the instant messaging writing software, it does not require computer installation, only a web browser and Internet connection.

The most popular service for video clip sharing is YouTube.

Picture or photograph exchange services– Photobucket, Flickr, lolcats etc.

One of the main features of the Internet is information flow. That is why information is valuable, and today companies are looking for ways to obtain information via the Internet. For instance, Google does not charge for the use of the search engine, however every time you enter something into a search engine, you inform the search engine what you want to know, what your interests are. Using this information, Google will display ads that might be of interest to you, and will gain revenue through advertising.

Another example is online community. In online communities you open a user account and fill it out with more or less personal information. You will often have the opportunity to read that someone got fired for leaving negative comments on sites, such as Twitter, about their boss or a company they work for. Another characteristic of the Internet is that once you publish some information, it is extremely difficult, if not impossible, to remove it. For that reason it is necessary to be careful when leaving personal data on social networks. One should avoid sharing information regarding date and place of birth, home address, phone number, planned vacation, and use security settings to restrict access to your user profile. Also, be careful with the terms of use agreement to which you agree when you open an account, because that very agreement defines how the company - owner of the some social network, can handle the information that you released on their social networks.

Also, it is also necessary to bear in mind that, when communicating with someone over the Internet, you do not really know who that person really is. It is very easy to impersonate someone, and that fact further accentuates the need for caution when giving any personal information.

Parents must particularly be careful, because children are easily deceived. How to protect children on the Internet is a special issue of great importance, which is why we paid special attention to it on our page http://www.itdesk.info/en/child-safety-internet/..

5.   INFLUENCE ON HEALTH

Ergonomics is a scientific discipline that studies people and objects that surround them, in order to provide solutions and guidance on how to adapt those items to humans.

Most common health problems associated with computer use:

- injuries related to working with keyboard and mouse → sprains (dislocation) / **RSI (Repetitive Strain Injury)**

- flickering screen or improper distance from a monitor → vision impairment

- improper seating and inappropriate use of chairs → problems with the spine (due to position of a computer, desk and chair, which affect posture)

- improper use of artificial light, light amount, light direction etc. also has a significant impact on health, as it may also lead to vision impairment

It is important to properly illuminate the places of work. ISO 9241 (Ergonomic requirements for office work with visual display terminals (VDTs)) - *Part 6*: Guidance on the work environment recommends:

- general level of illumination - 300-500 lux

- local lighting - controlled by the operator

- glare control - avoiding large contrast, using partitions and curtains

In poor lighting conditions, a person gets tired easily (eyes hurt and tear, headache from unnecessary strain, etc.) and thus a noticeable drop in productivity occurs. Also, it can result in permanent visual impairment. For that reason, it is very important to have an adequate lighting, whether at home or office

Lighting is just one of the factors affecting health, as well as productivity. Proper arrangement of equipment, table and chair significantly affect the body posture when working on a computer, and also has bearing on fatigue. Prolonged improper posture can often cause long lasting health problems with the spine and joints.

Regular equipment arrangement:

- monitor must be kept away from the eyes approx. 50cm (cca: 20 inches)

- keyboard must be placed in front-wrists are in a straight position

- mouse must be located next to the keyboard-the forearm parallel with a desk

- chair should be adjustable (seat and backrest), with armrests

Recommendations:

- take regular breaks from work, get up and walk, often change position (5- 10 minutes every hour)
- exercise regularly
- relax eyes by looking into the distance(every 20min),
- rest arms (every 15min)

6.   ENVIRONMENTAL IMPACT

Many computer components can be recycled. Specialized companies that recycle computers sell usable materials and safely dispose of hazardous materials. Some computer manufacturers offer recycling possibility - by offering "old for new" computer exchanges.

In case you have electronic trash, you can use Internet search engine to find out which companies offer electronic waste management service. All you need to do is enter words "electronic waste" or "disposal of electronic waste" into the search field and find contacts.

The thing we should always take care of is paper recycling. You should use electronic documentation as much as possible, in order to save on paper. Toners and ink cartridges should also be excluded from regular rubbish, since they can be recharged.
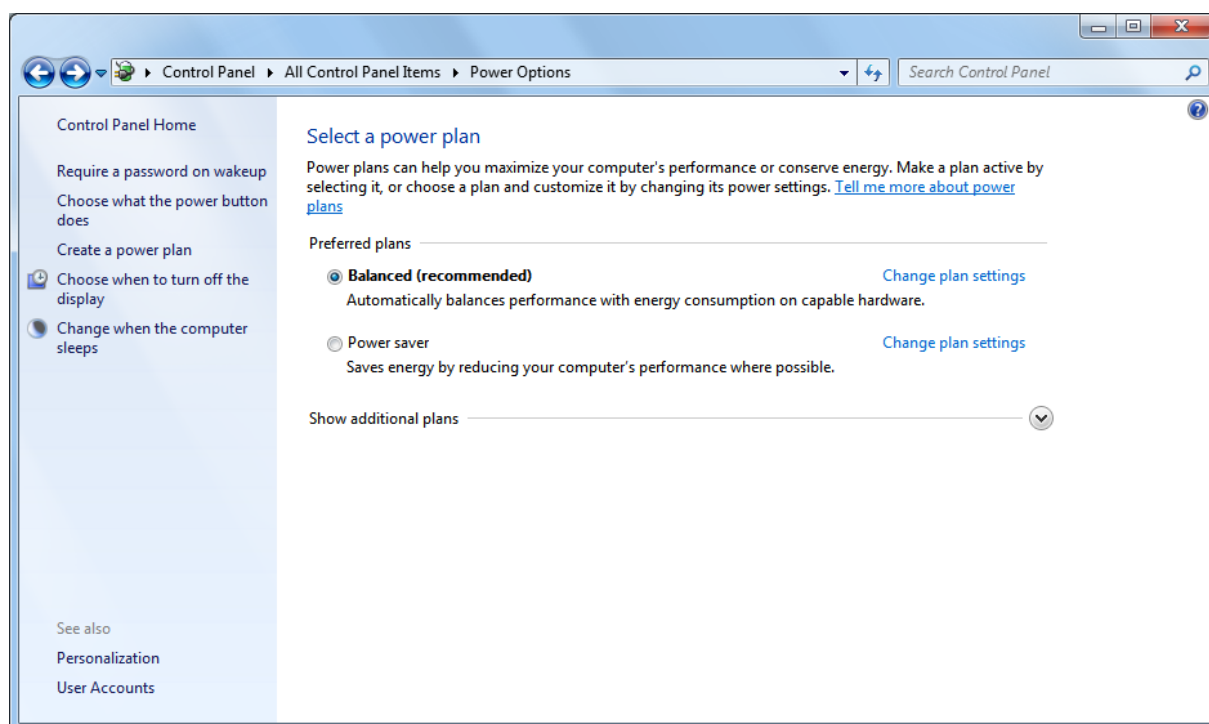

Fig.3. Control Panel – Power Option

Today, there are almost 7billionpeople on the planet, and that number has a tendency to increase. Absence of energy would make it extremely difficult for us to imagine today's society. It is one of the key factors in our survival and sustainable society development. Therefore, effective energy management has a special emphasis and it is done on both macro and micro levels. In terms of computers, energy management is integrated into an operating system, and it allows users to make adjustments in order to save energy.

Options for saving energy are accessed via the **Start** menu → **Control Panel** → **System and Security** → **Power Options.**

Turn off the display option-monitor turns off after a certain period of inactivity. Monitor, when turned on, consumes an average of 60 Watts (for example, spends as much as a light bulb), and when turned off, only a few watts.

Put the computer to sleep option-this setting determines computer idle time after which it goes into sleep mode. Desktop computer, when turned on, can spend several hundred Watts (about 5 bulbs). When in sleep mode, this value falls down to a few Watts.
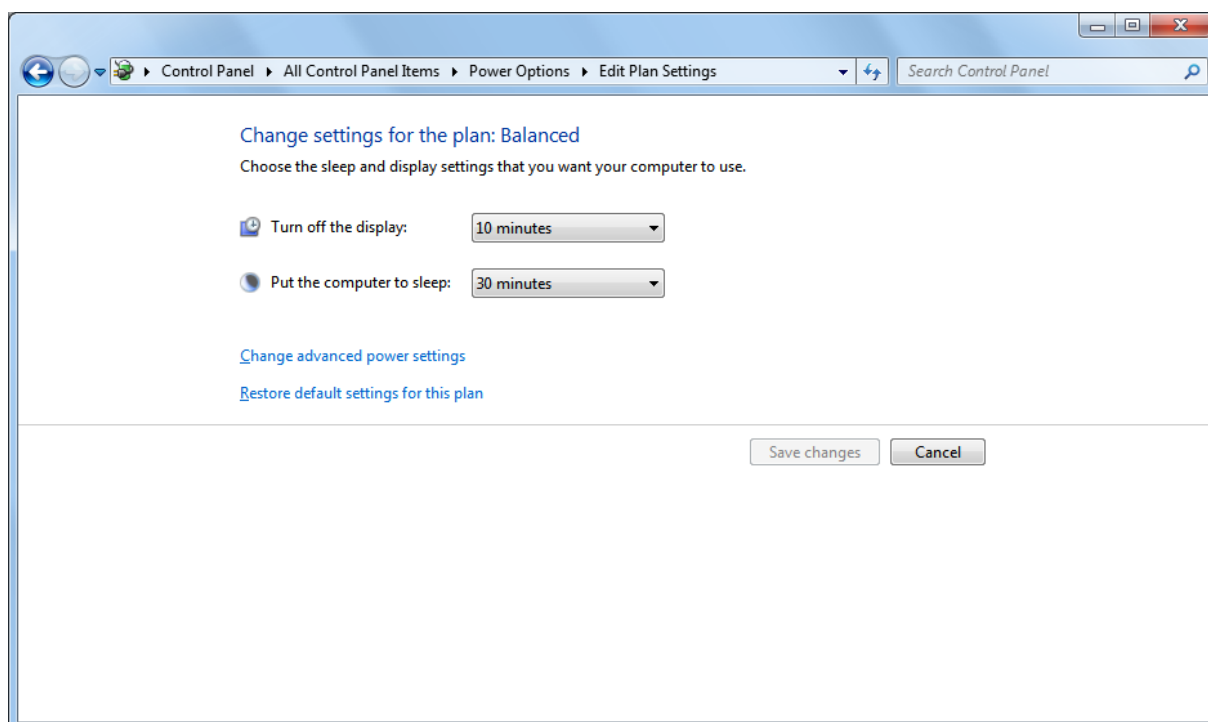
Fig.4. Control Panel – Power Option - Edit Plan Settings

7. PROTECTION WHEN USING ICT

Information security is defined as:

- Preservation of information confidentiality, integrity and availability

- Information security measures are the rules of data protection on physical, technical and organizational level.

User authentication involves user identification, so individuals can gain access to a certain content (data). For example, to check e-mail via browser, i.e., access an account, it is necessary to enter a username and password. If the required information is entered correctly, access is granted. Passwords should, for security reasons, be kept confidential. Password is a key (like a key to access your home or a car) that allows access. As you would not share your apartment or car keys with just anyone, you should not share your password either. Nowadays, many people have home security doors with locks whose keys are difficult to copy, with the aim of blocking unauthorized home intrusion. Passwords should be created with the same caution. The more complex your password is, the harder it will be to break through (*crack it*), therefore it is less likely that someone will gain unauthorized access to your data.

When choosing a password, it is advisable to use punctuation, numbers and a mix of uppercase and lowercase letters. A minimum length of 8 characters is recommended (shorter passwords are easier break through). From time to time, it is necessary to change the password. That way, the possibility of its detection decreases. Some of the most common mistakes when choosing passwords are:

- using words from a dictionary

- passwords based on personal information, such as name or birth date, employment place etc.

- characters that follow the order given on a keyboard: 123, qwert, etc.

How to choose a good password:

- Select a sentence: e.g. ITdesk.info-Project of Computer E-education with Open Access

- Take the first letters: I.iPoCEwOA

- Add numbers: for example, ITdesk.infopresentsbasiccomputereducationin7modules; each module hasabout3videopresentations: 7I.iPoCEwOA3

By choosing a password, such as: 7I.iPoCEwOA3, you will have a secure password, which is difficult to break through and one you can easily remember. It is a combination of numbers, uppercase and lowercase letters, and has 12 characters.

7.1 DATA SECURITY

Any data can be lost; therefore it is necessary to have it stored in several places. Imagine you lose your ID card, and the information about you exists solely there. By losing that card, you would have virtually lost your identity. However, since the police have your information, it is not a problem to issue a new ID. In fact, information about you is not only on the identity card, but there is a copy with the police. The example highlights the importance of data copies, in order to get information from other copies in case of data loss. The term **backup** signifies the process of making a copy of the original data (files, programs). This helps protect data in the event of damage to the original data source or its loss. Electronic data can be stored on another server, magnetic tape, hard disk, DVD or CD, etc.

Firewall is a software (or network device) that is used to control authorized access and protect against unauthorized access to your computer. Figuratively speaking, computers are connected via network port. In the computer world, the term port is used to describe the network of connections through which computers can connect to a computer network, or someone can connect to your computer from outside of your network. All data traffic between a computer and the rest of network is done through ports. Control port controls data flow from our computers to the network and vice versa. Control is done through a firewall; some ports are opened, some closed, and some allow temporary traffic.

To protect data from unauthorized access and theft, we use a username and password to confirm our identity, and prevent unauthorized data access. Similarly, in case we need to briefly step away from a computer, it is necessary to lock it. Computers can be locked by opening the **Start** menu, clicking the arrow next to the **Shut Down** button and selecting the **Lock** command.

The **security cable** is used as a protective measure to deter theft of laptops.

7.2 MALICIOUS PROGRAMS

Malware (malicious + software) is a software, which infiltrates an operating system in a seamless manner, whether by human mistake or due to shortcomings of the operating system and software support, with malicious intentions. Malicious software includes:

- **Virus** is a malicious program with the possibility of self-replication. In a computer it seeks other files, trying to infect them and the ultimate goal is to spread to other computers. Depending on what malicious code it contains, it may cause more or less damage to your computer.

- **Worms** like viruses, they possess the ability of self-replication, however they cannot infect other programs. Their usual intent is to take control of your computer and allow remote control by opening, the so-called, 'backdoor'.

- **Trojan horses** can be presented in the form of games or files in e-mail attachments, with different purposes, such as: to allow remote control to your computer, delete data, allow spreading of viruses, send spam from the infected computer, etc. Unlike viruses and worms, it does not replicate and it needs to be executed, that is, it is not autonomous.

- **Spyware** is a program that secretly collects data about computer users (passwords, credit card numbers, etc.), therefore it spies on users. The most common spyware infections usually occur while visiting suspicious sites with illegal or pornographic content.

- **Adware** is a program that uses collected data about a user in order to display advertisements in a way regarded as intrusive. It usually manifests itself in the form of many pop-up windows that display ads.

- **Hoax** is a false message being spread by e-mail in order to deceive users. Their goal is to obtain data of, for instance, a bank account, or persuade users to pay some fees in order to win the lottery (which they never applied for), or pay costs of money transfers from an exotic prince to help him withdraw money from a country that is falling apart and, in return, will receive an impressive award, etc.

In order to demystify malicious programs, it is necessary to explain that malicious software is nothing more than a computer program. Like any other computer program, it must be installed on your computer (operating system) to act. Without making the distinction between malignant and benign programs, let us think of them as just a computer program.

Taking this into consideration, ask yourself the following questions:

- Question: How can I install a computer program?
    - A: We must have a program installation/update file.

- Question: How can I get software installation?

- A: Installations are available on CD/DVD, USB stick, network drive, the Internet (need to be downloaded), in electronic mail, etc. i.e. through any electronic medium capable of storing and distributing digital data.

From these questions and answers, it is evident how you can become infected by malicious programs. Unlike legal and non-malicious programs, malicious programs are designed in a way that they do not have to be looked for, i.e. you do not need to search for them, you do not need to have any computer knowledge to install them, indeed, the less you know, the better it is for them. So, the more you know, the more likely it is you will be safe from an infection, with the use of professional protection programs against malicious programs.

Finally, here is some advice on additional protection against malicious programs. As already stated, malicious programs are nothing more than computer programs, which means they must be installed in order to act. To install any program on a computer, a person/user must be logged into an account that has **Administrator** privileges. Only by means of a user account with administrator privileges, can a computer program be installed. Therefore, if you are logged into an account with no administrator privileges, but limited privileges (that is, with no authority to install software), then malicious programs, like any other program, cannot be installed.

From all this we can conclude:

- For everyday computer use (especially for Internet browsing), do not use an account with administrator privileges but a limited account, which has no authority for software installation. Use an Administrator account only when you need to administrate the system.
- Use professional programs for protection against malicious programs, they are not that expensive, 10-20 € per year, and provide complete protection. Be sure to regularly update your program for protection.
- Educate yourself, because nothing can protect you from reckless computer use. Be careful about opening unsolicited received e-mails, because you have to notice if it is of suspicious character, make sure websites you visit are safe, because only you have control over it. Also, check all external media with protection/security programs immediately after you connect them to a computer; do not use pirated software, it is considered a theft and they usually come with malware.

8. LEGAL REGULATIONS

Copyright is a right which is used to protect the author's intellectual property. If someone wants to use such copyrighted work, they must respect the conditions under which the author, as the owner, has allowed the use of his/her work (payment of fees, referencing the original, etc.). The use of copyrighted works is defined by the license and the user is bound by EULA.

EULA (End User License Agreement) is a software license agreement for end users. EULA will be displayed during program installation and by pressing an "I agree" button you agree to terms of use and are legally bound to respect contract conditions.

- Q: How to be sure that legal software is used?
    - A: For example, after installation of the Windows operating system, it must be activated. Activation verifies whether the serial number/ identification number is valid, that is, whether the operating system is genuine.

Product identification number (PID) is a number that comes with legally purchased software and it certifies the origin of the program.

Every software publisher has a specific method of verifying the legality of a piece of software you purchased. It mostly comes down to checking via the Internet, i.e., activation and/or registration, updates via the Internet etc. One of the advantages of legally purchased or acquired software is quality customer service that people with unlicensed software cannot have.

Proprietary software is software licensed under the exclusive legal right of the copyright holder. The licensee is given the right to use the software under certain conditions, but restricted from other uses, such as modification, further distribution etc.

Shareware is a term that implies free software use (trials) for a specified time period, after which it is necessary to buy the product.

Freeware is software free for personal use.

Open Source is software whose code is available to users; it can be freely used, modified and distributed.

8.1   LAW ON PERSONAL DATA PROTECTION

(source: official website of the European Union: ,
http://europa.eu/legislation_summaries/information_society/internet/l14012_en.htm, site
run by the Communication department of the European Commission on behalf of the EU
institutions

"PROTECTION OF PERSONAL DATA"

Directive 95/46/EC is the reference text, at European level, on the protection of personal
data. It sets up a regulatory framework which seeks to strike a balance between a high level
of protection for the privacy of individuals and the free movement of personal data within
the European Union (EU). To do so, the Directive sets strict limits on the collection and use
of personal data and demands that each Member State set up an independent national body
responsible for the protection of these data.

ACT

European Parliament and Council Directive 95/46/EC of 24 October 1995 on the protection
of individuals with regard to the processing of personal data and on the free movement of
such data [Official Journal L 281 of 23.11.1995] [See amending acts].

SUMMARY

This Directive applies to data processed by automated means (e.g. a computer database of
customers) and data contained in or intended to be part of non-automated filing systems
(traditional paper files).

It does not apply to the processing of data:
- by a natural person in the course of purely personal or household activities;
- in the course of an activity which falls outside the scope of Community law, such as
  operations concerning public security, defence or State security.

The Directive aims to protect the rights and freedoms of persons with respect to the
processing of personal data by laying down guidelines determining when this processing is
lawful. The guidelines relate to:
- the quality of the data: personal data must be processed fairly and lawfully, and
  collected for specified, explicit and legitimate purposes. They must also be accurate
  and, where necessary, kept up to date;
- the legitimacy of data processing: personal data may be processed only if the data
  subject has unambiguously given his/her consent or processing is necessary:
  1. for the performance of a contract to which the data subject is party or;
  2. for compliance with a legal obligation to which the controller is subject or;
  3. in order to protect the vital interests of the data subject or;
  4. for the performance of a task carried out in the public interest or;

5. for the purposes of the legitimate interests pursued by the controller;

- special categories of processing: it is forbidden to process personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, trade-union membership, and the processing of data concerning health or sex life. This provision comes with certain qualifications concerning, for example, cases where processing is necessary to protect the vital interests of the data subject or for the purposes of preventive medicine and medical diagnosis;

- information to be given to the data subject: the controller must provide the data subject from whom data are collected with certain information relating to himself/herself (the identity of the controller, the purposes of the processing, recipients of the data etc.);

- the data subject's right of access to data: every data subject should have the right to obtain from the controller:
  1. confirmation as to whether or not data relating to him/her are being processed and communication of the data undergoing processing;
  2. the rectification, erasure or blocking of data the processing of which does not comply with the provisions of this Directive in particular, either because of the incomplete or inaccurate nature of the data, and the notification of these changes to third parties to whom the data have been disclosed.

- exemptions and restrictions: the scope of the principles relating to the quality of the data, information to be given to the data subject, right of access and the publicising of processing may be restricted in order to safeguard aspects such as national security, defence, public security, the prosecution of criminal offences, an important economic or financial interest of a Member State or of the European Union or the protection of the data subject;

- the right to object to the processing of data: the data subject should have the right to object, on legitimate grounds, to the processing of data relating to him/her. He/she should also have the right to object, on request and free of charge, to the processing of personal data that the controller anticipates being processed for the purposes of direct marketing. He/she should finally be informed before personal data are disclosed to third parties for the purposes of direct marketing, and be expressly offered the right to object to such disclosures;

- the confidentiality and security of processing: any person acting under the authority of the controller or of the processor, including the processor himself, who has access to personal data must not process them except on instructions from the controller. In addition, the controller must implement appropriate measures to protect personal data against accidental or unlawful destruction or accidental loss, alteration, unauthorised disclosure or access;

- the notification of processing to a supervisory authority: the controller must notify the national supervisory authority before carrying out any processing operation. Prior checks to determine specific risks to the rights and freedoms of data subjects are to be carried out by the supervisory authority following receipt of the notification. Measures are to be taken to ensure that processing operations are publicised and the supervisory authorities must keep a register of the processing operations notified.

Every person shall have the right to a judicial remedy for any breach of the rights guaranteed him by the national law applicable to the processing in question. In addition, any person who has suffered damage as a result of the unlawful processing of their personal data is entitled to receive compensation for the damage suffered.

Transfers of personal data from a Member State to a third country with an adequate level of protection are authorised. However, they may not be made to a third country which does not ensure this level of protection, except in the cases of the derogations listed.

The Directive aims to encourage the drawing up of national and Community codes of conduct intended to contribute to the proper implementation of the national and Community provisions.

Each Member State is to provide one or more independent public authorities responsible for monitoring the application within its territory of the provisions adopted by the Member States pursuant to the Directive.

A Working Party on the Protection of Individuals with regard to the Processing of Personal Data is set up, composed of representatives of the national supervisory authorities, representatives of the supervisory authorities of the Community institutions and bodies, and a representative of the Commission."

More:
Data Protection Act, Croatia:http://www.dataprotection.eu/pmwiki/pmwiki.php?n=Main.**HR**
Information Commissioner's Office from United Kingdom;
http://www.ico.gov.uk/for_organisations/data_protection/the_guide.aspx
_____

*This manual is intended for learning in accordance with materials
published on the following links:*

* Notes:

http://www.itdesk.info/Basic%20Concepts%20of%20Information%20Technology%20notes.pdf

* Video presentation about basic ICT concepts:

http://www.itdesk.info/en/concepts-of-information-and-communication-technology/

* Sample exam:

http://www.itdesk.info/sample exam/sample exam module 1.pdf

* Solution for this sample exam:

http://www.itdesk.info/sample exam/sample exam solution module 1.pdf

*Quiz for self-evaluation:

http://www.itdesk.info/en/basic-concepts-ict-quiz/

http://www.itdesk.info/en/basic-concepts-ict-quiz-2/

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