

Design of Information Systems

1st Lecture

Evaluation method

- <http://online.ase.ro>
- <http://sinf.ase.ro>
- Final grade:
 - 50% seminar grade (minimum 5)
 - 50% course grade
 - 1st written test (in the 6th week): 2p
 - 2nd written test (in the 10th week): 2p
 - Final evaluation: 6p

Agenda

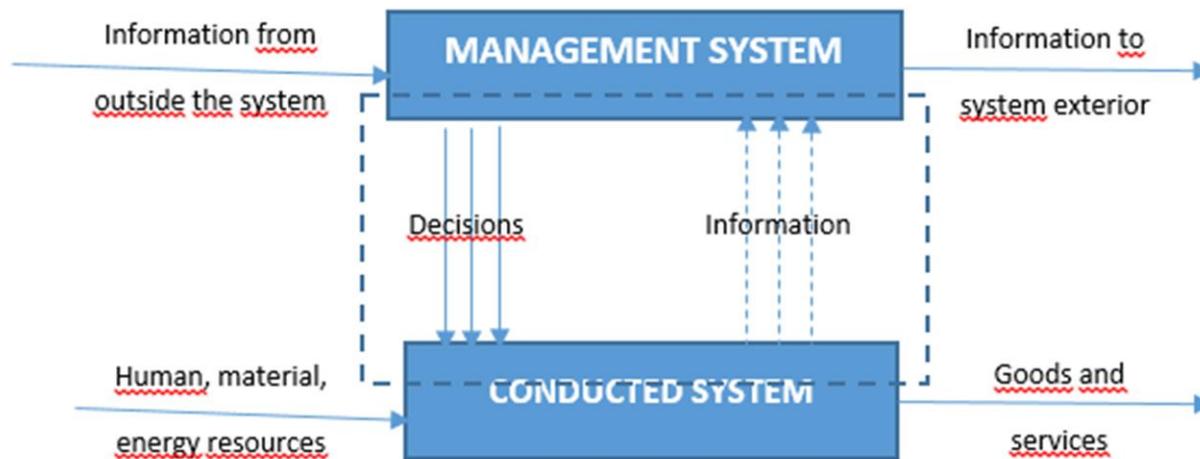
- ✓ Information system– definition and components
- ✓ Typology of computer systems
- ✓ Computer system lifecycle and development cycle
- ✓ Strategies for computer-based automation of organization's activities

Information system concept

- **Information system** is used for collecting, storing, processing and generating the necessary information for activity management and decision making
- The use of information systems adds value into organizations, enhancing emergence of techniques and support technologies for **computer system** development.

Information system concept

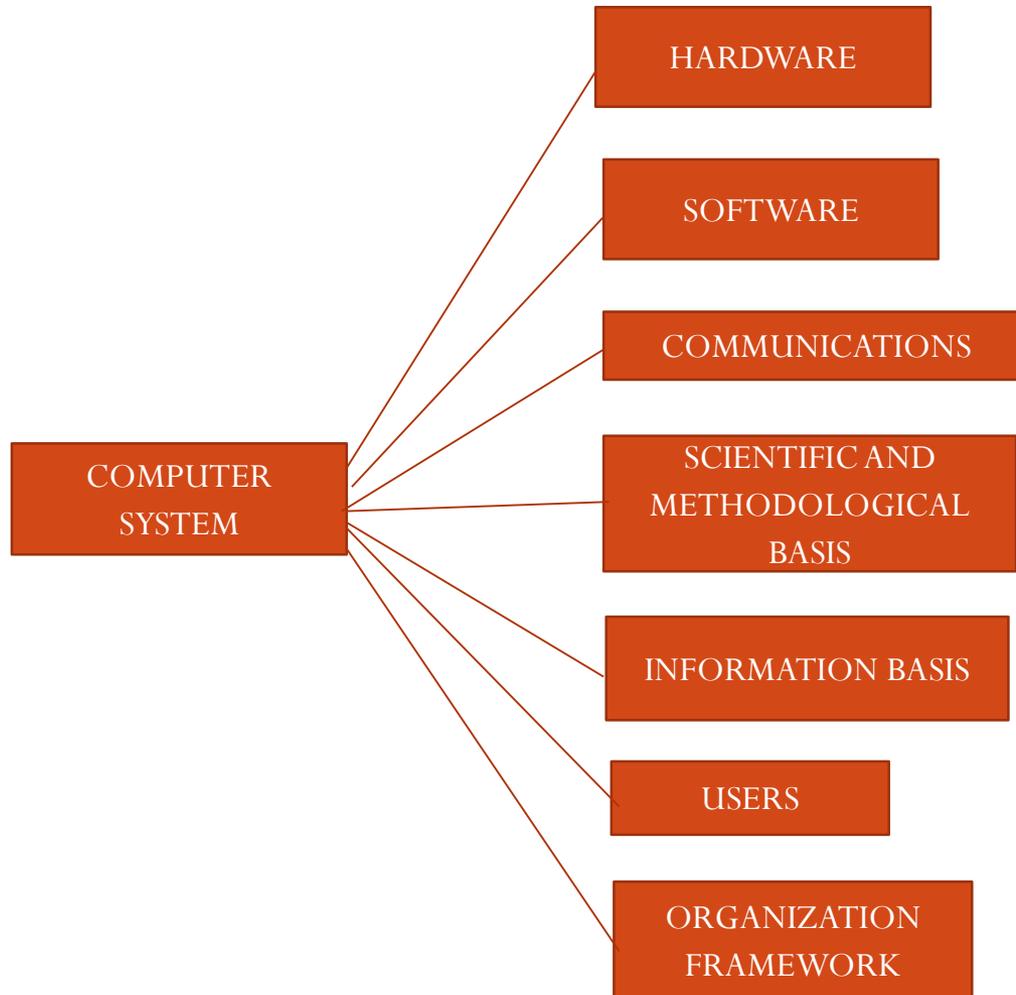
- Communication between various systems, subsystems and within them is performed via **information system**, that is situated between the conducted system and the management system
- Information system can be defined as a **technical and organizational assembly of procedures** for identifying, recording, collecting, verifying, transmitting, storing and processing data in order to meet the **information requirements** necessary for leadership in the process of decision making



Information system – definition and components

- When activities within the information system are accomplished using **electronic devices** for **automated** data collecting, transmitting, storing and processing, it is called information system automation; this causes the use of **computer system concept**
- **Computer system** represents an assembly of functionally interrelated elements that **automate** the obtaining of necessary information used in decision making process
- The main components of a computer system are: hardware, software, communications, scientific and methodologic basis, information basis, users and organization framework. They are functionally interrelated within the system.

Computer system – definition and components

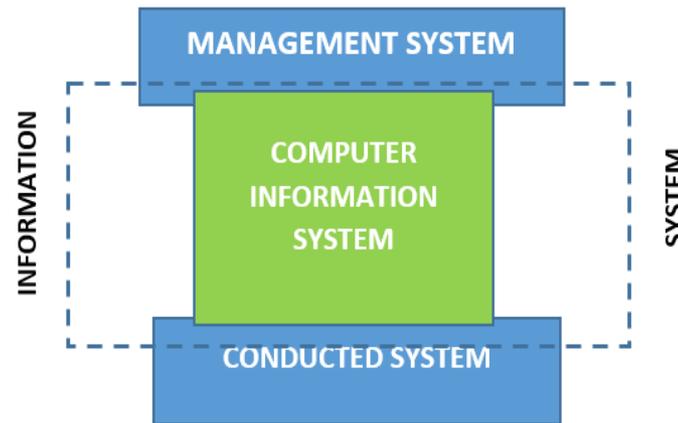


Computer information system – definition and components

- **HARDWARE** – all the technical devices involved in automated data collection, transmission, storage and processing
- **SOFTWARE** – all the software programs needed to make the information system run, according to its established functions and objectives. This applies to both basic programs (basic software) and application programs (application software).
- **COMUNICATIONS** – all equipment and technologies involved in data communication among systems.
- **SCIENTIFIC AND METHODOLOGIC BASIS** – all the models of economic processes and phenomena, methodologies, methods and techniques of information system development
- **INFORMATION BASES** – all data that are processed, all the information flows, coding systems and catalogs (nomenclatures)
- **USERS** – all the specialization staff necessary for running the information system. The specialization staff includes: computer specialists with higher or secondary education, analysts, programmers, system engineers, operators, etc.
- **ORGANISATION FRAMEWORK** – it is the one specified by the internal rules and regulations on the organization and functioning of the company which hosts the information system.

Role and place of the computer information system reported to the information system

- Computer system is included within information system and it has as main object of activity the process of automated data collection, validation, transformation, storage and processing
- As it implements mathematical models and it uses information technology, computer information system adds new aspects in terms of quantity and quality to the generic information system



- Computer information system scope tends to equal information system scope, but this will never be entirely possible because of the technology limitations. Usually, there will always be some activities that cannot be 100% automated within the information system scope.

Types of computer information systems

A. Based on the field of use:

- **Information systems for managing activities of social-economic organizations** – their entry data are, usually, provided by documents prepared by man and output data are provided by the system in the form of documents, also (lists, reports)
- **Information systems for managing technological processes** – their entry data are provided by automatic devices that transmit in form of signals (electronic impulses) information about various parameters of the technological process (level of pressure, humidity, temperature). Output data are also transmitted in form of signals to some devices or controllers that automatically adjust the parameters of the technological process.
- Technological process control and command is automated in places where direct intervention of the human factor represents a danger. For example: steel lamination, petrochemicals, cement or paper production, nuclear plants
- **Information systems for scientific research and design activity** – they provide the automatically computation of technical-engineering calculations, computer-aided design and other facilities necessary to specialists in certain fields
- **Information systems for special activities** they are intended for some specific areas of activity, such as: technical-scientific information and documentation, geographical information systems (GIS), medicine etc.

Types of computer information systems

B. Based on the contribution to decision making process:

- **Operational level systems** – are used for collecting, storing and processing data related to **economic transactions and processes** (raw material supply, raw material consumption, finished products obtained, receipts, payments to suppliers);
- **Knowledge systems** are used for promoting new knowledge and technologies within the company (software solutions for computer aided design - CAD), as well as **document flow automation and control**;
- **Management information systems** are used for **control and management of short term activity**;
- **Strategic management information systems** - they offer **support to top management team** in planning the **long term** organization's activity in order to achieve expected strategic objectives

Types of computer information systems

C. Based on the **nature of the processing** made by computer systems:

- **TPS- Transaction Processing System** – they are specialized in collecting, storing and processing **data related to daily, routine transactions**. Their main characteristics are: high degree of repeatability, big volume of processed data and intended for operational level.
- **OAS – Office Automation System** - they are mainly intended for the **personnel involved in the information processing**. This category can include: text processors, e-mail systems, spreadsheets.
- **KWS - Knowledge Work System** – they are intended for the **creation and integration of new technologies**. These systems are used by the engineers, designers and other specialists involved in research and development activities.

Types of computer information systems

- **MIS – Management Information System** – they are designed to provide routine summary reports that are required in the process of **short term decision making, control and planning**. They also support the generation of deviation reports such as online consultation of information related to prior management periods.
- **DSS – Decision Support System** – they provide managers **complex analysis models for decision making**. They put into value internal information offered by TPS and MIS on one side and information from the exterior economic environment, on the other side.
- **ESS - Executive Support System** – they are computer systems designed for **strategic management** and they support unstructured decision making, other than the routine decision making.

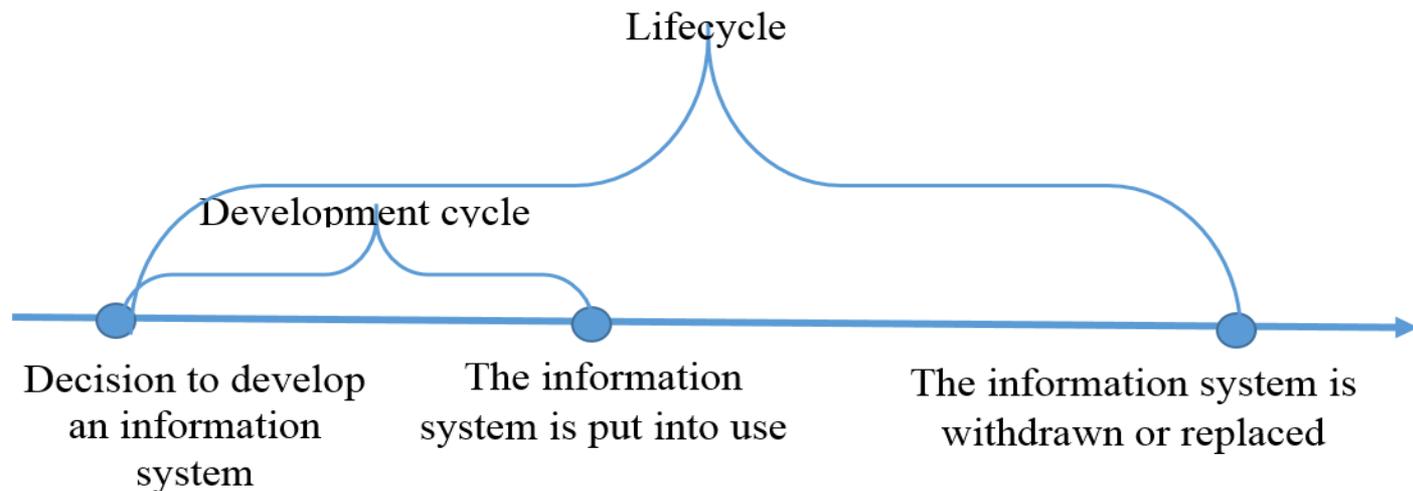
Types of computer systems

Information system taxonomy by field of use

IS type	Input data	Processing	Output data
TPS	Primary data related to transactions	Updating, sorting, report generation	Analytic and summary reports
OAS	Primary data, documents, video and audio streaming	Document processing, communications, Personal Information Management	Documents, mail, messages
KWS	Design specifications, technical-scientific knowledge base	Modeling, simulation	Models, designs, drawings
MIS	Big volume of data (coming from TPS, KWS)	Simple processing models, low-level analysis	Summary reports, exception reports
DSS	Low volume of data (coming from TPS, MIS, KWS)	Analytical models for data processing	Decision analysis Special reports Query response
ESS	Aggregate data (internal and external)	Charts, simulations, interactive processing	Analyses and forecasts

Computer system lifecycle and development cycle

- The computer system **lifecycle** is a template used for ordering information system realization activities, covering the interval of time that begins with the decision to develop the information system and ends with the decision of withdrawal and replacement with a new system.
- The computer system **development cycle** is contained within the system lifecycle. It includes the time length that starts with the decision to develop the information system and it ends when the system is put into use and the maintenance process begins



Computer system lifecycle and development cycle

The activities belonging to the lifecycle of software products are grouped in many ways, in **stages** or **phases**. Here is such a grouping of activities:

- **User requirements specification**– it includes the identification and formulation of overall requirements regarding information system realization, as well as justification for its necessity and opportunity
- **Analysis** – it is the stage of analyzing the system functional and quality requirements, identifying the following elements: what are the functions to be met by the system, what data should be processed, what results must be obtained, what type of interface is to be used. Essentially, the analysis stage offers an answer to the question “**What should the system do?**” and it shouldn’t be concerned about the technology to be chosen for implementation. The quality of results is very important for this stage, as it represents a bridge between client requirements, architecture designs and implementation models that will be developed in the next stages
- **Design** – it essentially answers the question “**How will be implemented the requirements identified during analysis?**”, given the particular technology chosen for implementation. The design aims to: modulate and establish the system architecture, organize and structure data, design the algorithms needed for processing, detail design the user interface etc.

Information system lifecycle and development cycle

- **System implementation**
 - **System coding** - it is the effective writing of software programming code as specified in the design phase. Each of the application modules will be individually implemented and tested. At this level, the overall integration and testing assume that modules that have been implemented and tested during previous phase to be integrated, following the overall system testing to check the correctness of inter-modules relationships and the functionality of the system as a whole
 - **System deployment and user training.** Functioning in real conditions is particularly important as the system is validated using real data sets in real operating conditions.
- **System operation and support**

Within various lifecycle models, the stages presented above are included (totally or partially) in various combinations. There is a big variety of such models.

Strategies for computer-based automation of organization's activities

- The strategies, approaches and techniques for computer system development have been continuously renewed and improved.
- At first, computer system development focused only on the use of databases and programming languages.
- Then, **commercial software components and packages** and **ERP systems** developed by software companies gradually entered the market and offered companies an alternative to full development of solutions, from scratch.
- Lately, organizations can use software without needing to install their own applications, by using Internet based **SaaS – Software as a Service solutions** .

Strategies for computer-based automation of organization's activities

- There are two main strategies:
 1. System acquisition
 2. System development
 - ❑ Within organization
 - ❑ Externalization– the system is going to be developed by an external software company

1. System acquisition

- Is the first strategy that must be considered
- It involves that organization will use some **existing products**, with the possibility of configuration and customization.
- The main categories of existing software products that are purchased: commercial **software packages**, **ERP-type** integrated systems, **SaaS**.

Strategies for computer-based automation of organization's activities

Commercial software packages

- They are available for sale or rent to the general public
- They usually address small and medium-size organizations
- They often have **limited customization features** to respond to specific requirements

ERP type integrated systems

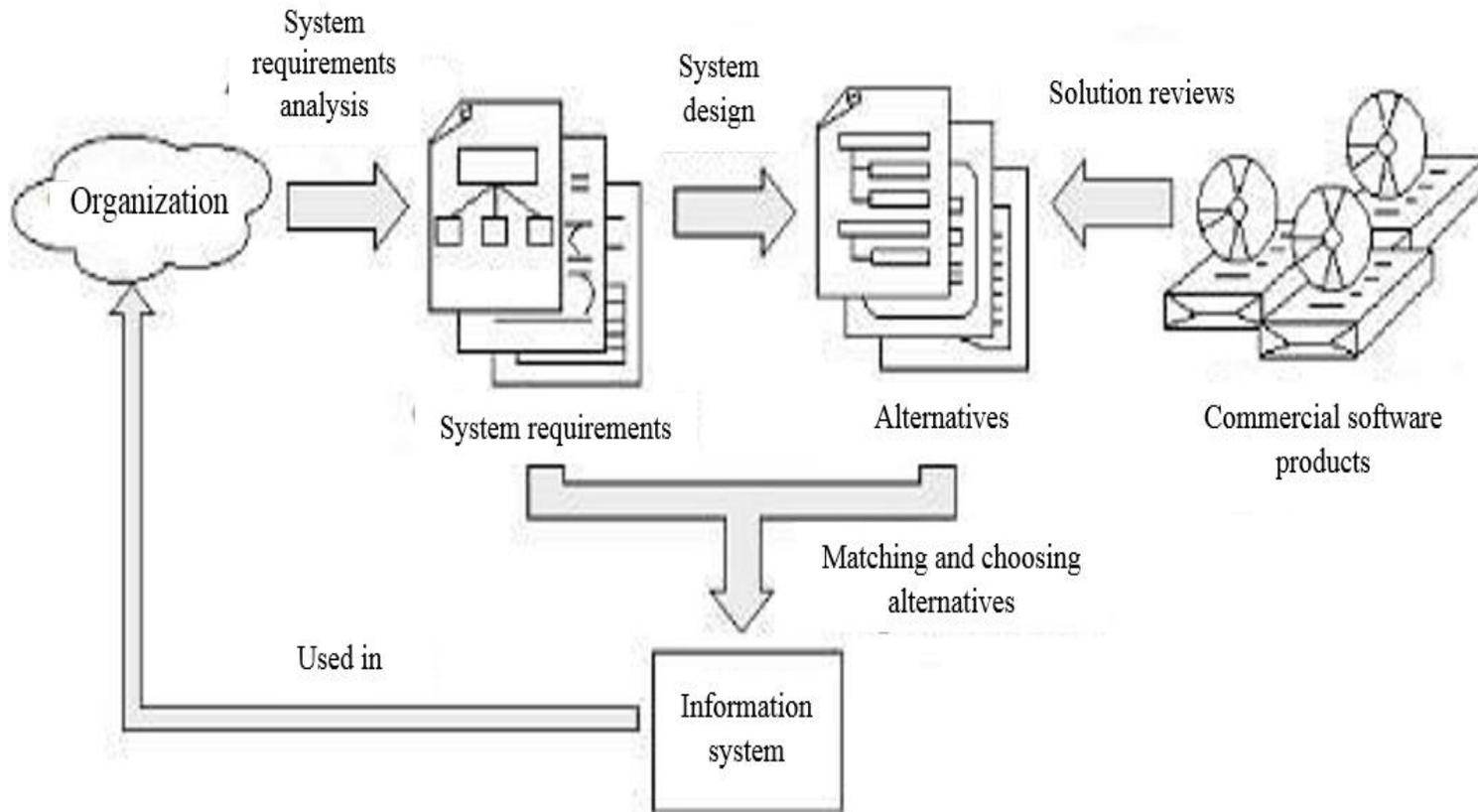
- They facilitate **the integration of all business processes** of the organization functional units and manages connections with external organizations.
- They operate real-time;
- They have a unique database for all applications;
- They consist of a set of modules that can also run individually;
- They address all organization types.

Strategies for computer-based automation of organization's activities

Software as a Service (SaaS)

- It is a way to provide software which involves that **applications** and their related **data** are centrally **stored by the service provider** and are usually accessed by clients via Internet using a web browser.
- They can support **configuration, less customization**;
- They can be **quickly updated**;
- Many applications offer users functions for collaboration and information sharing;
- They are hosted **in cloud**, so the response time and security issues are critical factors.

Computerization strategies for organization activities

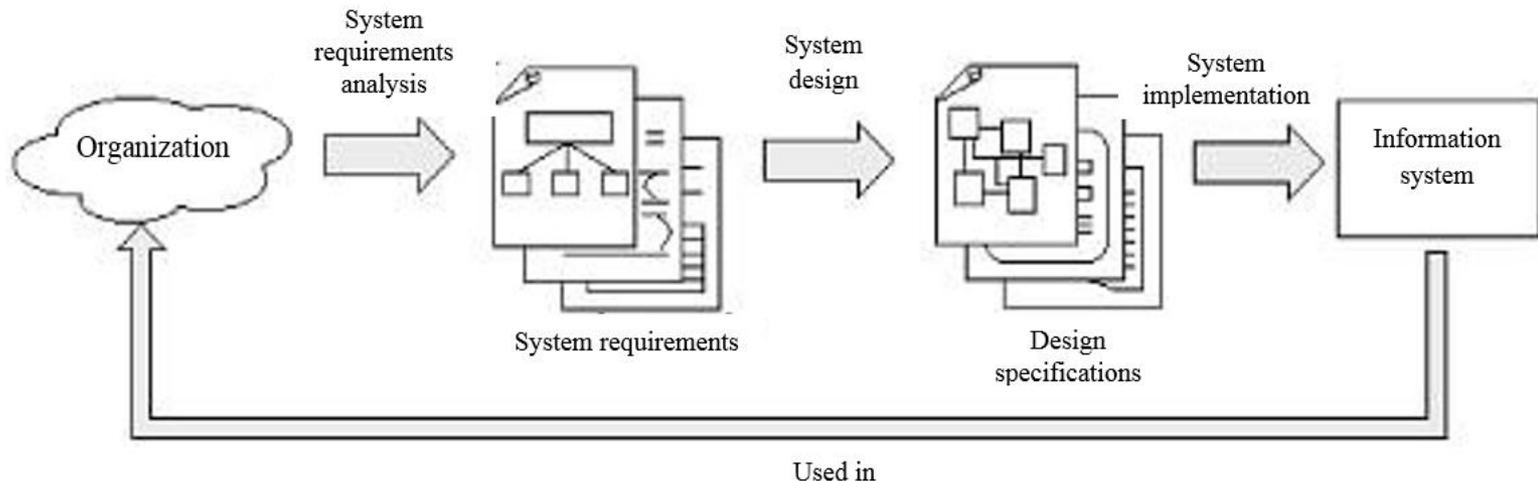


Computerization by system acquisition

Computerization strategies for organization activities

2. System development

- Can be achieved **within organization** or can be **externalized**.
- Generally, it is used for **specific, unique requirements** of the organization
- This is the method adopted by the software and information technologies developers
- It is a **time and resource consuming** solution.
- It involves **performing all the steps** of a system lifecycle.



Computerization by system development