INTRODUCTION TO SYSTEMS

Lecture Notes Prepared by
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System (definitions)

- A regularly interacting group of elements forming a unified whole
- A collection of related parts treated as a unit where its components interact
- A group of related procedures for a particular business function such as inventory or payroll
- A group of interrelated procedures used for a business function, with an identifiable boundary, working together for some purpose.

Examples of Systems

Car System

- a collection of mechanical/electrical items

Water System

- a collection of pipes, meters, etc.

Information System

- a collection of people, procedures, programs, equipment and methods that process data and make it available to management for decision-making

Have you noticed that…

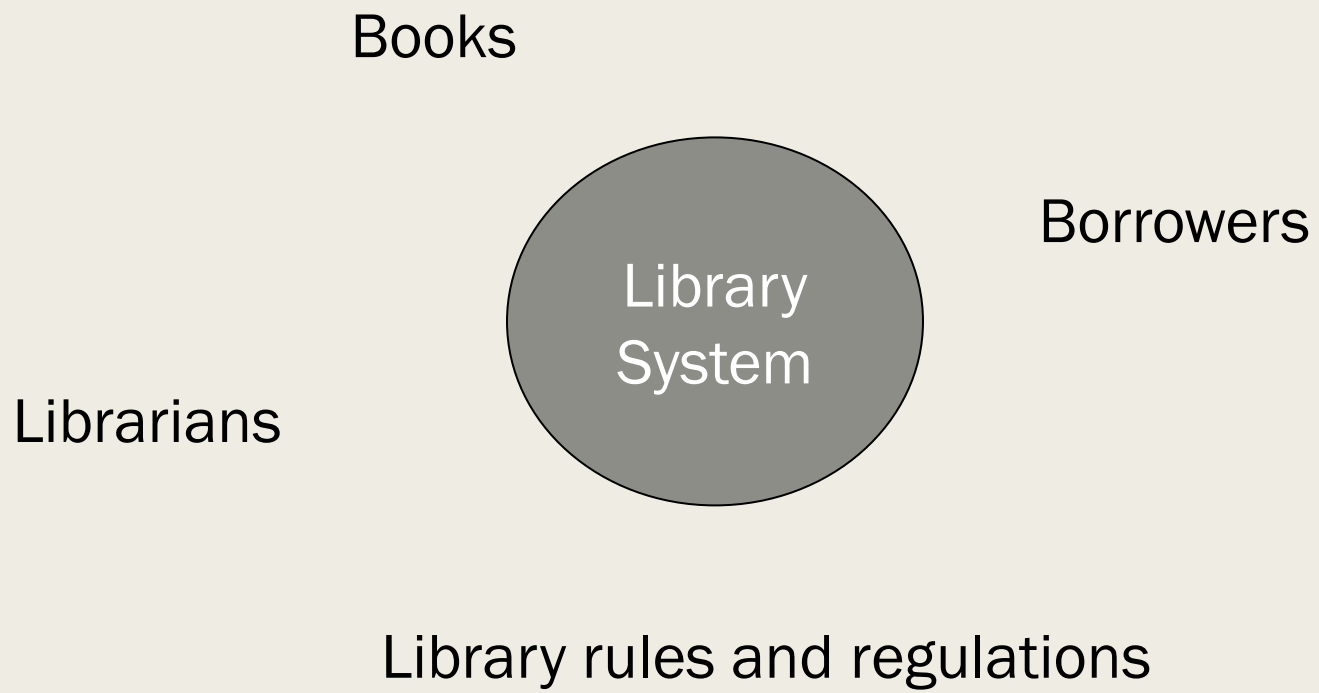
- Each item or part of a system is of little use by itself
- But if you integrate it with other parts, you get a functioning system with monetary value.

PARTS OF A SYSTEM

The Environment

- The people, facilities, rules, policies, and regulations that surround a system
- Systems exist in relation to other systems and to the outside world
- Example: Library system environment
  - *Borrowers*
  - *Librarians*
  - *Books*
  - *Library policies and regulations*

The Environment



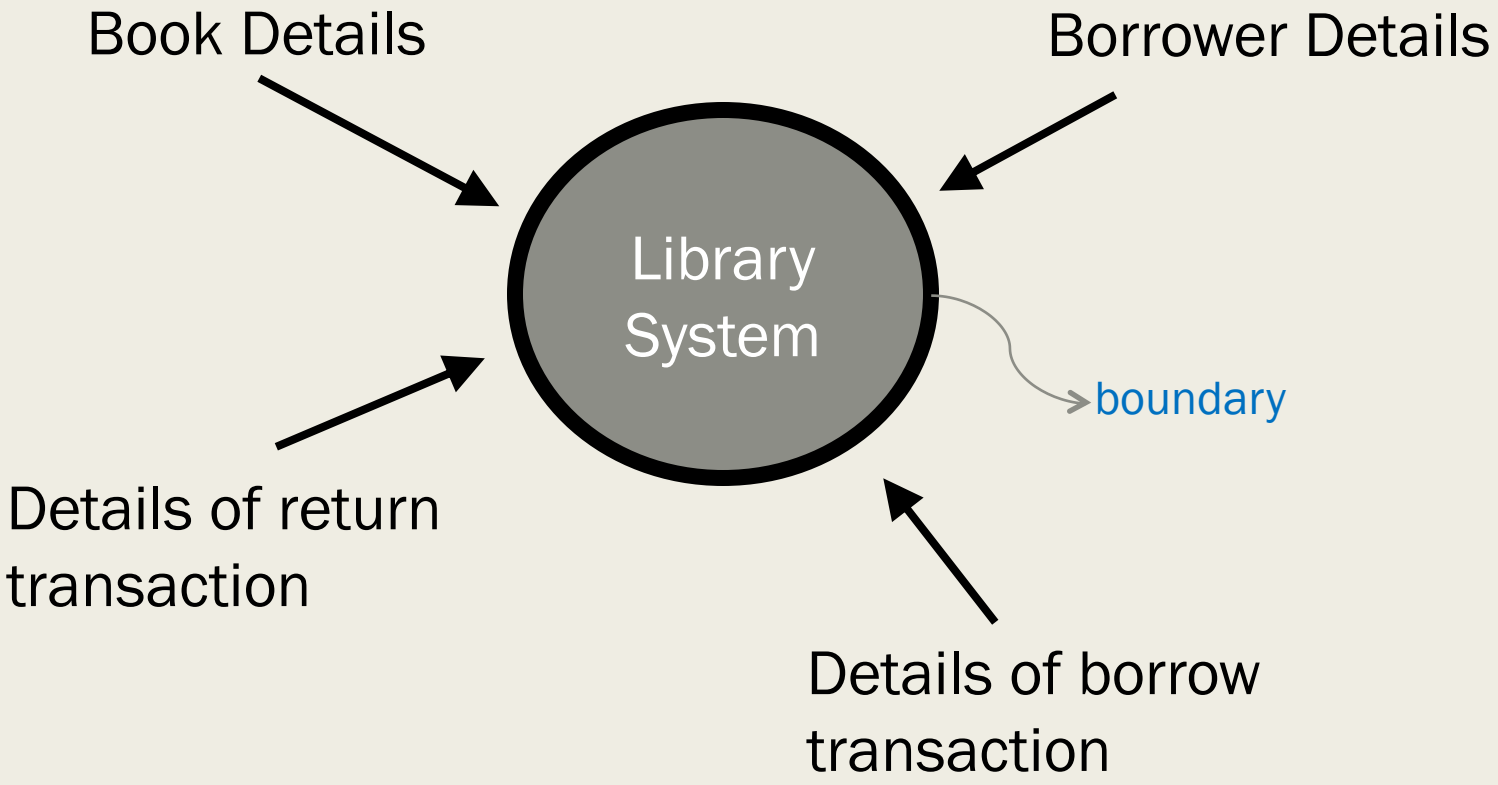
Boundary

- The **perimeter**, or line of demarcation between a system and the environment
- Distinguishes between:
  - *the elements that make up the system and*
  - *the outside world with which it interacts*

INPUTS

- Items that enter the boundaries of the system from the environment and are manipulated by the system
- Without input, a system cannot function or generate output
- Examples:
  - *Book details*
  - *Borrower details*
  - *Return transaction*
  - *Borrow transaction*

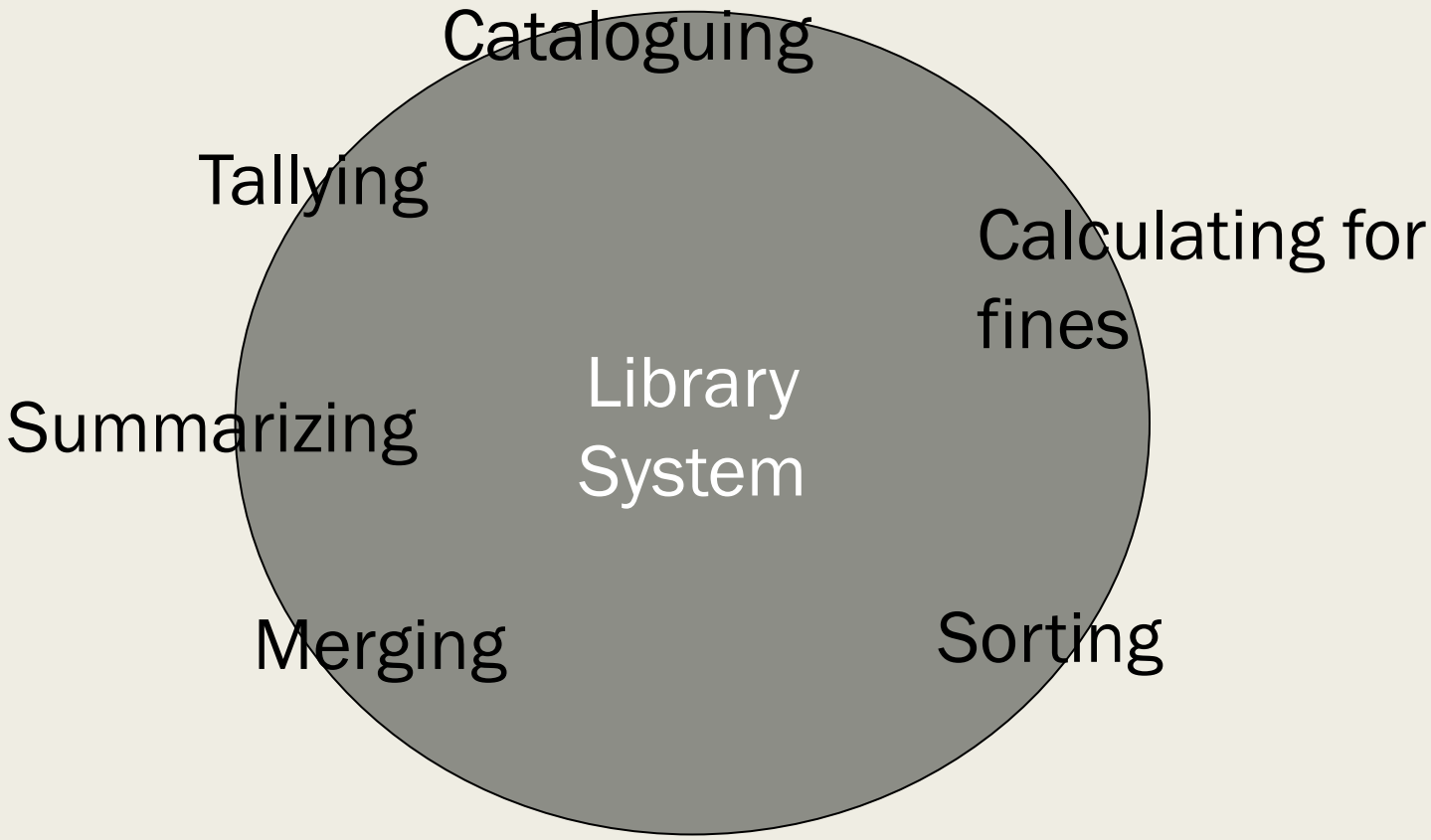
Boundary and Inputs



Processing

- The conversion of inputs, or raw materials, to outputs, or finished results
- Examples:
  - *Tallying*
  - *Summarizing*
  - *Merging*
  - *Sorting*
  - *Cataloguing*
  - *Calculating for fines*

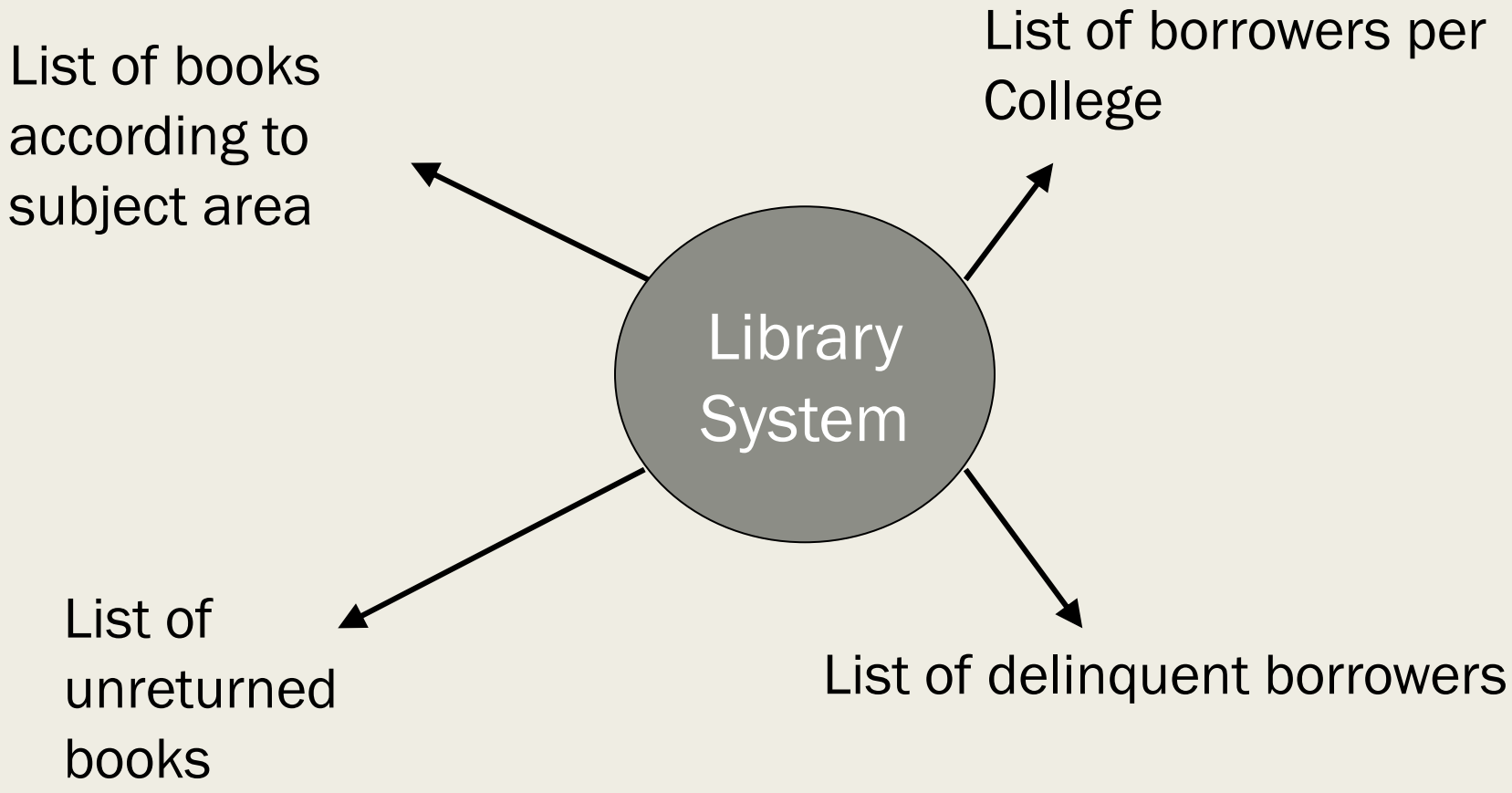
Processing


Cataloguing
Tallying
Calculating for fines
Library System
Summarizing
Merging
Sorting

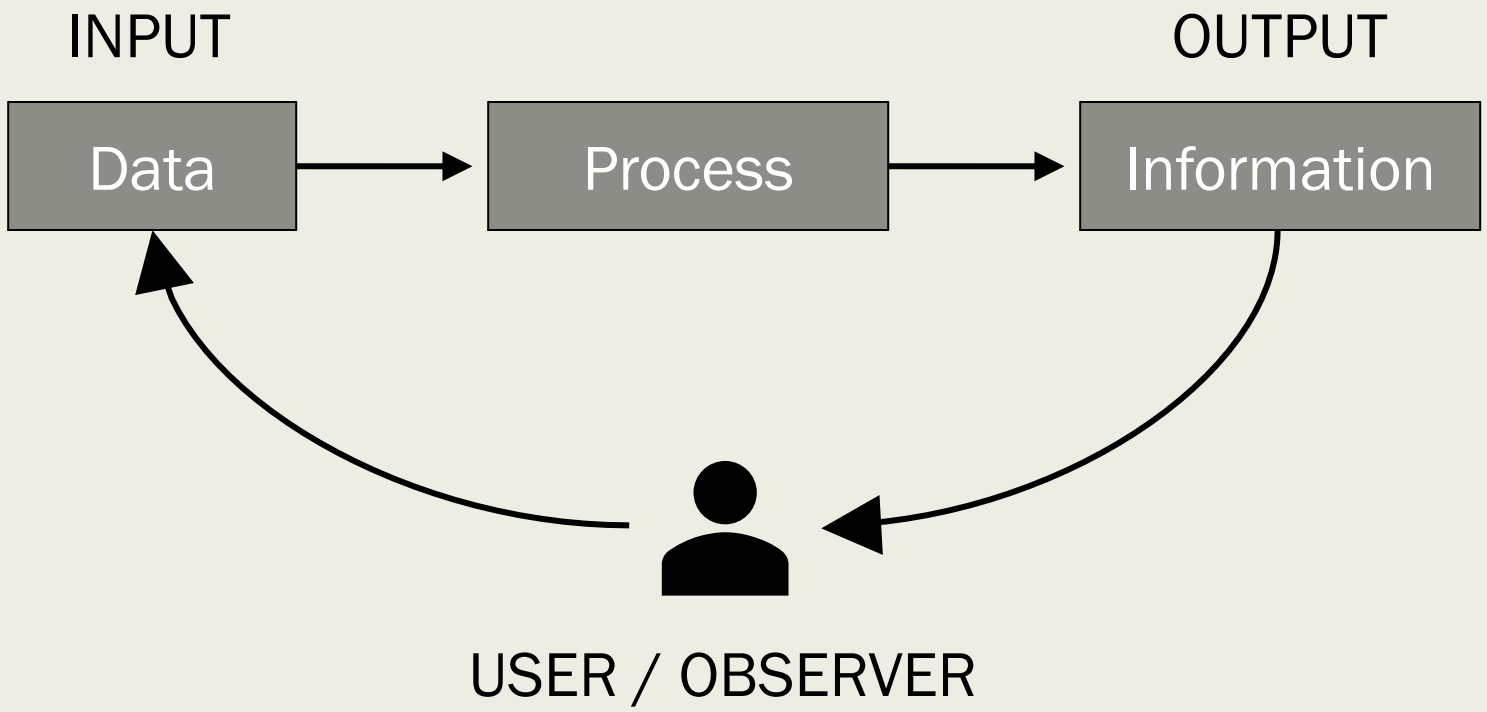
Outputs

- The product of processing
- Can be **hardcopy** (printed on paper) or **softcopy** (shown on an output device such as a monitor)
- Example:
  - *List of borrowers per College*
  - *List of unreturned books*
  - *List of delinquent borrowers*
  - *List of books according to subject area*

Outputs

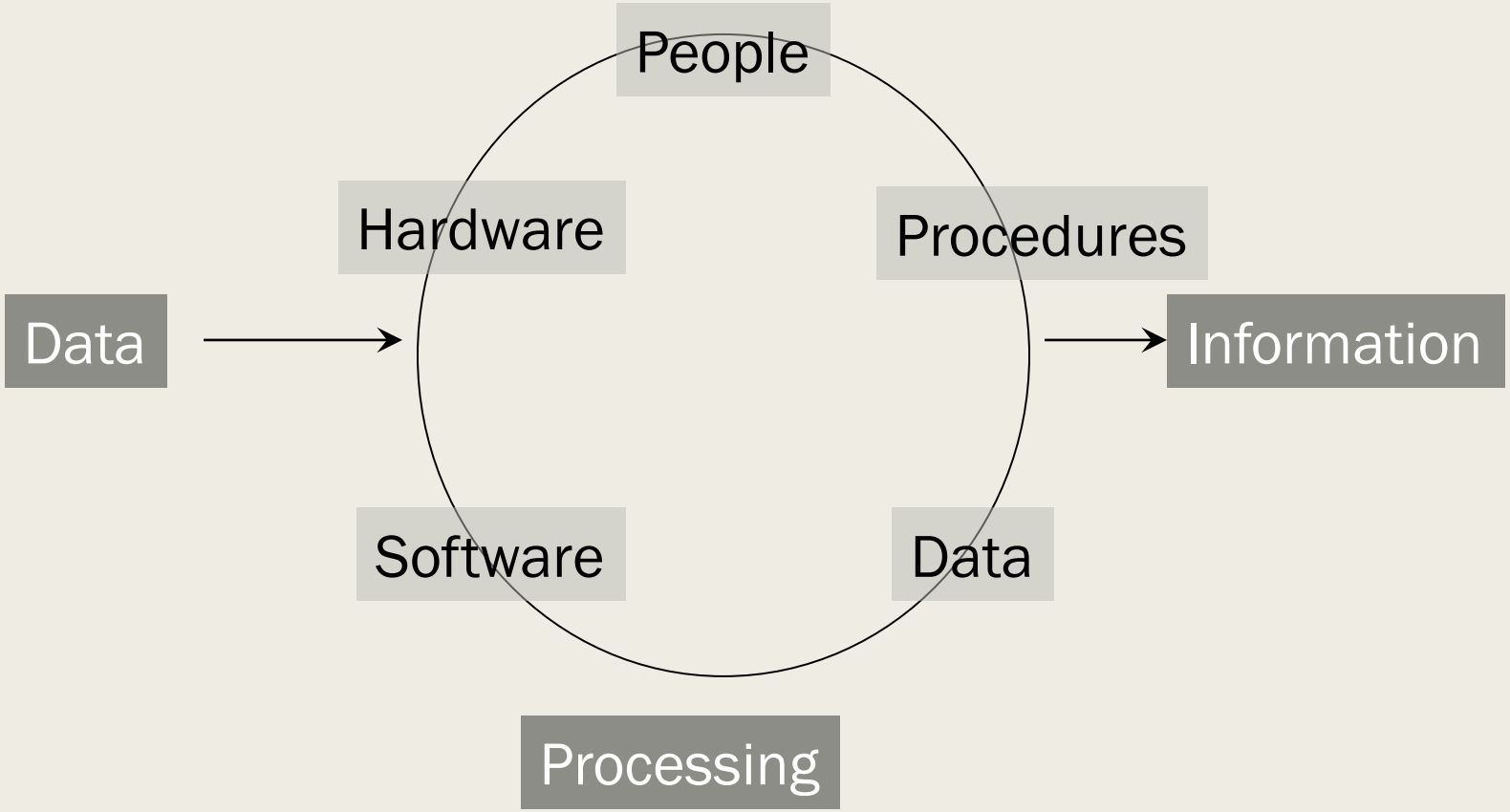

List of books according to subject area
List of borrowers per College
Library System
List of unreturned books
List of delinquent borrowers

Model of a Simple System



COMPONENTS OF AN INFORMATION SYSTEM

Components of an Information System



Hardware

- The physical layer of the information system
- Computers
- Networks
- Communications equipment
- Scanners
- Printers
- Digital capture devices
- Global positioning satellite equipment
- Other technology-based infrastructure

Software (1)

- Consists of **system software** and **application software**
- **System software**
  - *controls the hardware and software environment*
  - *OS, communication software, and utility programs*
- **Application software**
  - *consists of programs that process data to produce information needed by users*
  - *Word processing, Spreadsheet, Presentation, etc.*

Software (2)

- In-house applications
  - *developed by the IS Department of a company*
- Software packages
  - *basic systems developed and sold by an outside vendor*
- Legacy systems
  - *older systems, typically DBMSs, running on mini-computers or mainframes*

Data

- consists of basic facts that are the system's raw material
- Examples:
  - *hours worked, pay rate, deductions (in a payroll system)*
  - *Student ID number, last name, first name, middle initial (in an enrollment system)*
  - *Student ID number, book number, date borrowed, date returned (in a library system)*

Procedures

- defined tasks that must be performed by people (users, managers, information systems staff) who work with the system
- described in written documentation manuals and online reference material

People

- users (sometimes called *end users*), including employees, customers, vendors, and others who directly interact with the system
- skilled professionals like systems analysts, programmers and IS managers

Integrating Technologies for Systems (1)

- **E-commerce Applications and Web Systems**
  - *Benefits*
    - Increase user awareness of the availability of a service, product, industry, person or group
    - The possibility of 24/7/365 access for users
    - Improve the usefulness and usability of interface design
    - Systems can extend globally, reaching people in remote locations without worry of the time zone in which they are located

Integrating Technologies for Systems (2)

- **Enterprise Resource Planning Systems (ERP)**
  - *Performs integration of many information systems existing on different management levels and within different functions*
  - *SAP, Oracle*
- **Systems for Wireless and Mobile Devices**
  - *The systems analyst may be asked to design standard or wireless communication networks that integrate voice, video and email into organizational intranets or industry extranets, or to develop intelligent agents*
  - *Wireless ecommerce is referred to as **m-commerce** (mobile commerce)*

Integrating Technologies for Systems (3)

- **Open Source Software (OSS)**
  - *An alternative of traditional software development where propriety code is hidden from the users*
  - *Free to distribute, share and modify*
  - *Characterized as a philosophy rather than simply the process of creating new software*
  - *Apache Web Server, Mozilla Firefox, Linux OS, Drupal, Joomla*

OTHER SYSTEM CONCEPTS

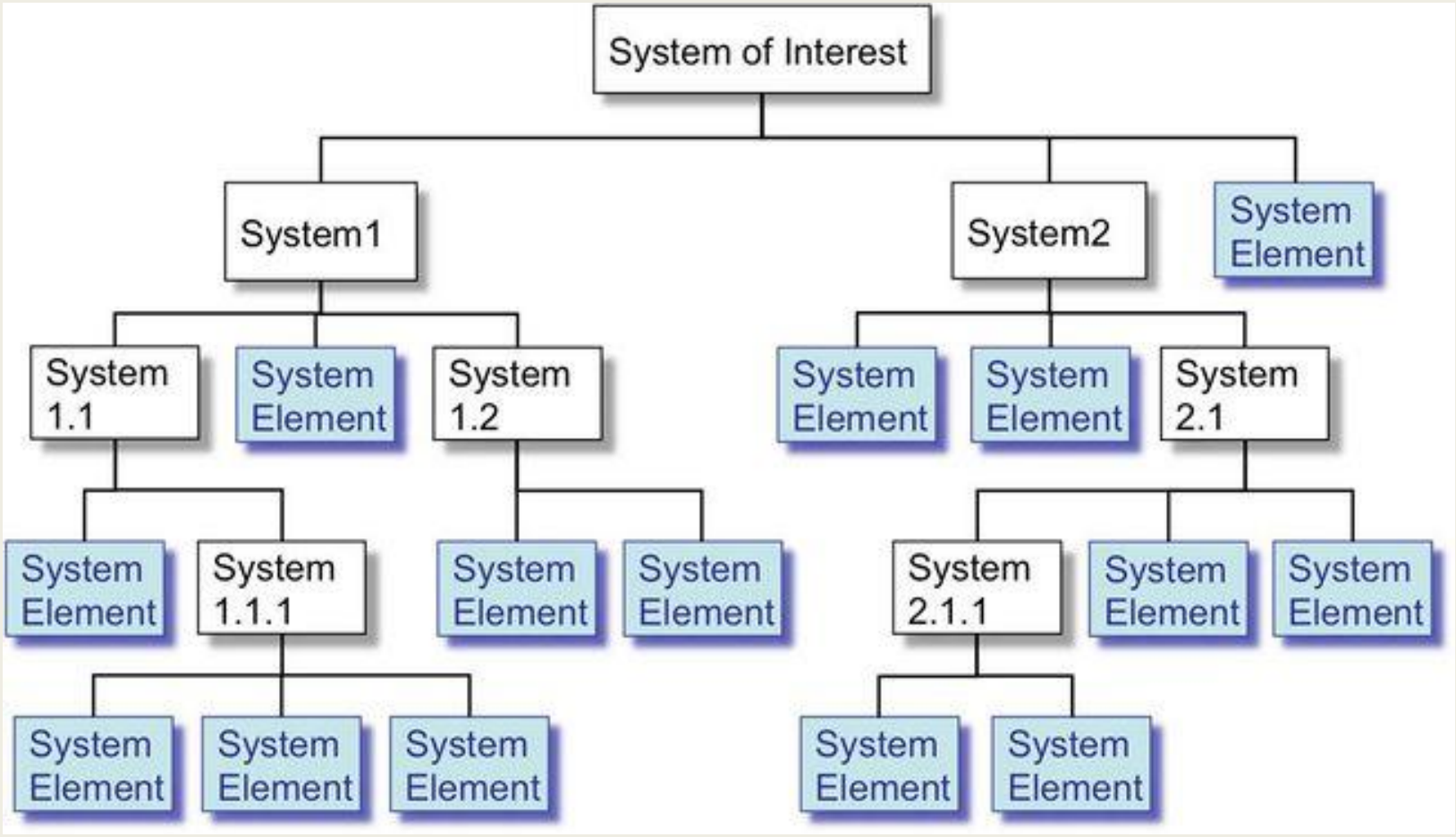
Decomposition (1)

- **The process of breaking down a system into its smaller components**
  - *these components may themselves be systems (subsystems) and can be broken down into their components as well*
- Results in smaller and less complex pieces that are easier to understand than larger, complicated pieces

Decomposition (2)

- Decomposition is a technique that allows a systems analyst to:
  - *Break a system into small, manageable, and understandable subsystems*
  - *Focus attention on one area (subsystem) at a time, without interference from other areas*
  - *Concentrate on the part of the system pertinent to a particular group of users, without confusing users with unnecessary details*
  - *Build different parts of the system at independent times and have the help of different analysts*

Decomposing a System

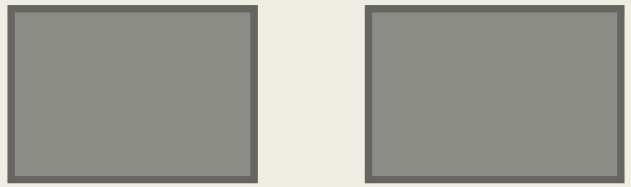


Modularity

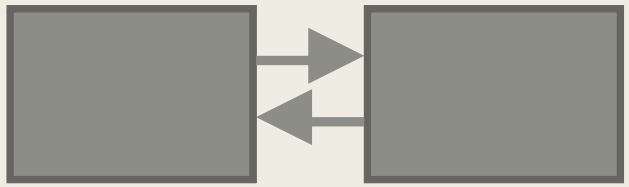
- the direct result of decomposition
- dividing a system into chunks or modules of a relatively uniform size
- modules can represent a system simply
  - *Makes it easier to understand and easier to redesign and rebuild*
- helps the designer to compartmentalize the design into functional compartments
  - *the entire system can be conceived to be composed of modules*
  - *each module has its own special feature and functionality rather than a monolithic entity*

Coupling

- Means the extent to which subsystems depend on each other
- **Subsystems should be as independent as possible**
- If one subsystem fails and other subsystems are highly dependent on it, the others will either fail themselves or have problems functioning
- When designing, you must **strive for low coupling** (dependency between modules should be less)



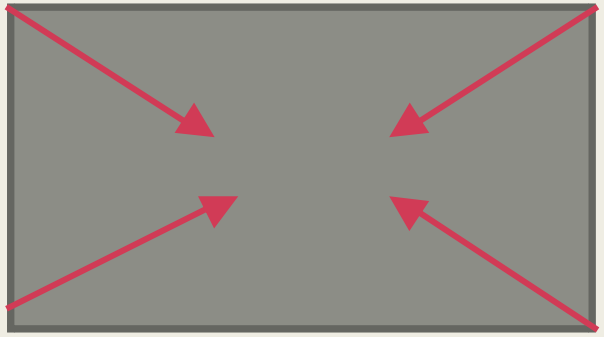
No coupling



Low coupling

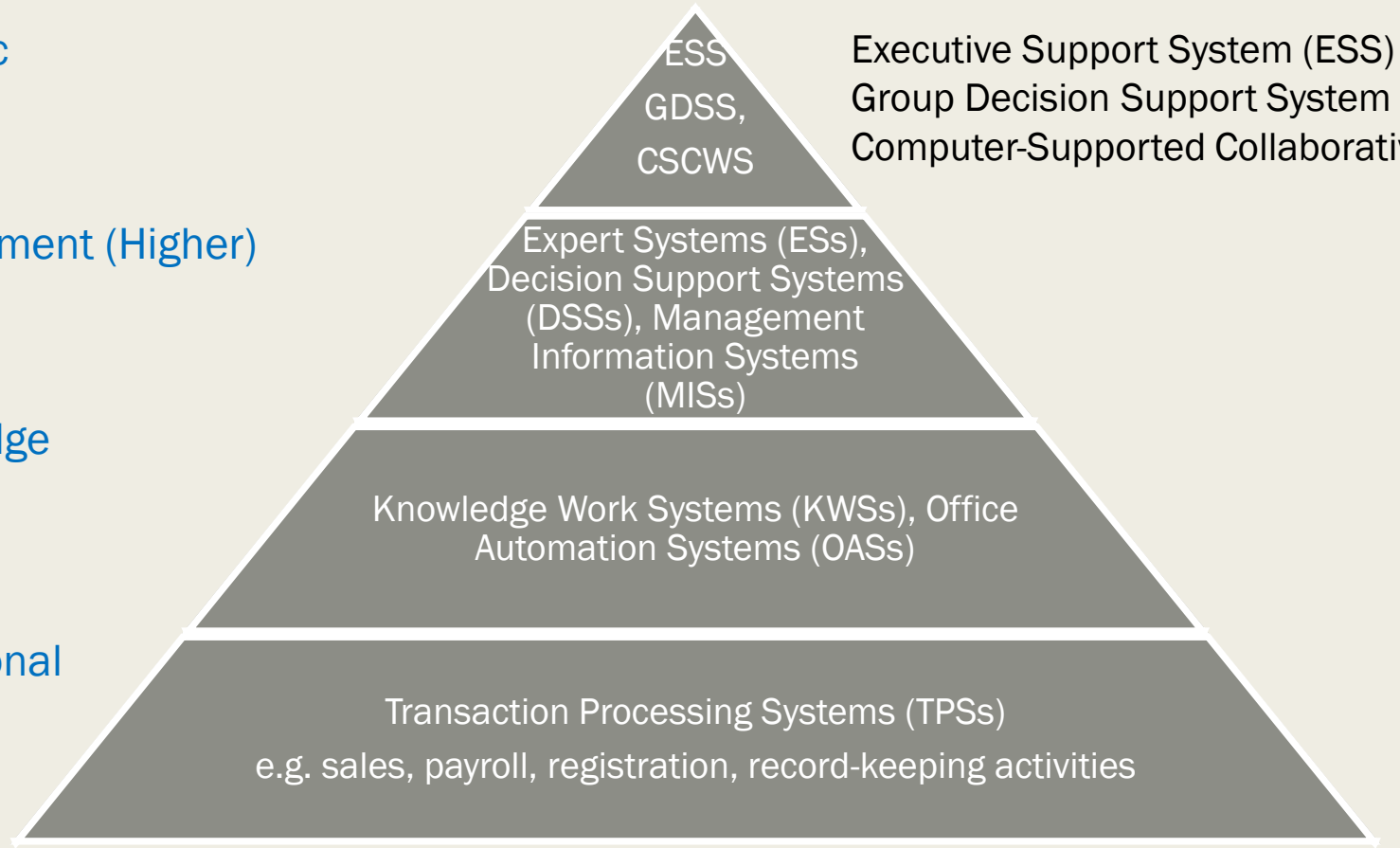
Cohesion

- The extent to which a system or subsystem performs a single function.
- When designing, you must strive for **high cohesion** (a cohesive module focuses on a **single task** with little interaction with other modules



SYSTEMS THAT THE SYSTEMS ANALYST RECOMMENDS, DESIGNS AND MAINTAINS FOR USERS

Types of Systems



Operational Level

- **Transaction Processing Systems (TPSs)**
  - *Information systems that were developed to process large amounts of data for routine business transactions*
  - *Managers use the data of this system to get information about what is happening to their company*
  - *Payroll, inventory*

Knowledge Level

- **Office Automation Systems (OAS)**
  - *Support data workers, who do not usually create new knowledge*
  - *Word processing, spreadsheets, desktop publishing, electronic scheduling, communication (voice mail, email, teleconferencing)*
- **Knowledge Work Systems (KWS)**
  - *Support professional workers such as scientists, engineers and doctors by aiding them to create new knowledge (often in teams)*
  - *CAD systems, virtual reality systems, investment workstations*

Management (Higher) Level (1)

- **Management Information Systems (MIS)**
  - *Includes transaction processing*
  - *Supports users in accomplishing a broader spectrum of organizational tasks, including decision analysis and decision making*
  - *Can help integrate some of the computerized information functions of a business*
  - *Depends on a database as a source of data*

Management (Higher) Level (2)

- **Decision Support Systems (DSS)**
  - *Depends on a database as a source of data*
  - *Emphasizes the support of decision making in all its phases (the actual decision is still the made by the decision maker)*
  - *Tailored to the person or group using them*
  - *Systems that focus on business intelligence*

Management (Higher) Level (3)

- **Artificial Intelligence and Expert Systems**
  - *General thrust is to develop machines that behave intelligently*
  - *Expert systems (ES) use the approaches of AI reasoning to solve the problems put to them by business and other users*
  - *ES captures and uses the knowledge of a human expert(s) for solving a particular problem experienced in an organization*
  - *ES selects the best solution to a problem or a specific class of problems*

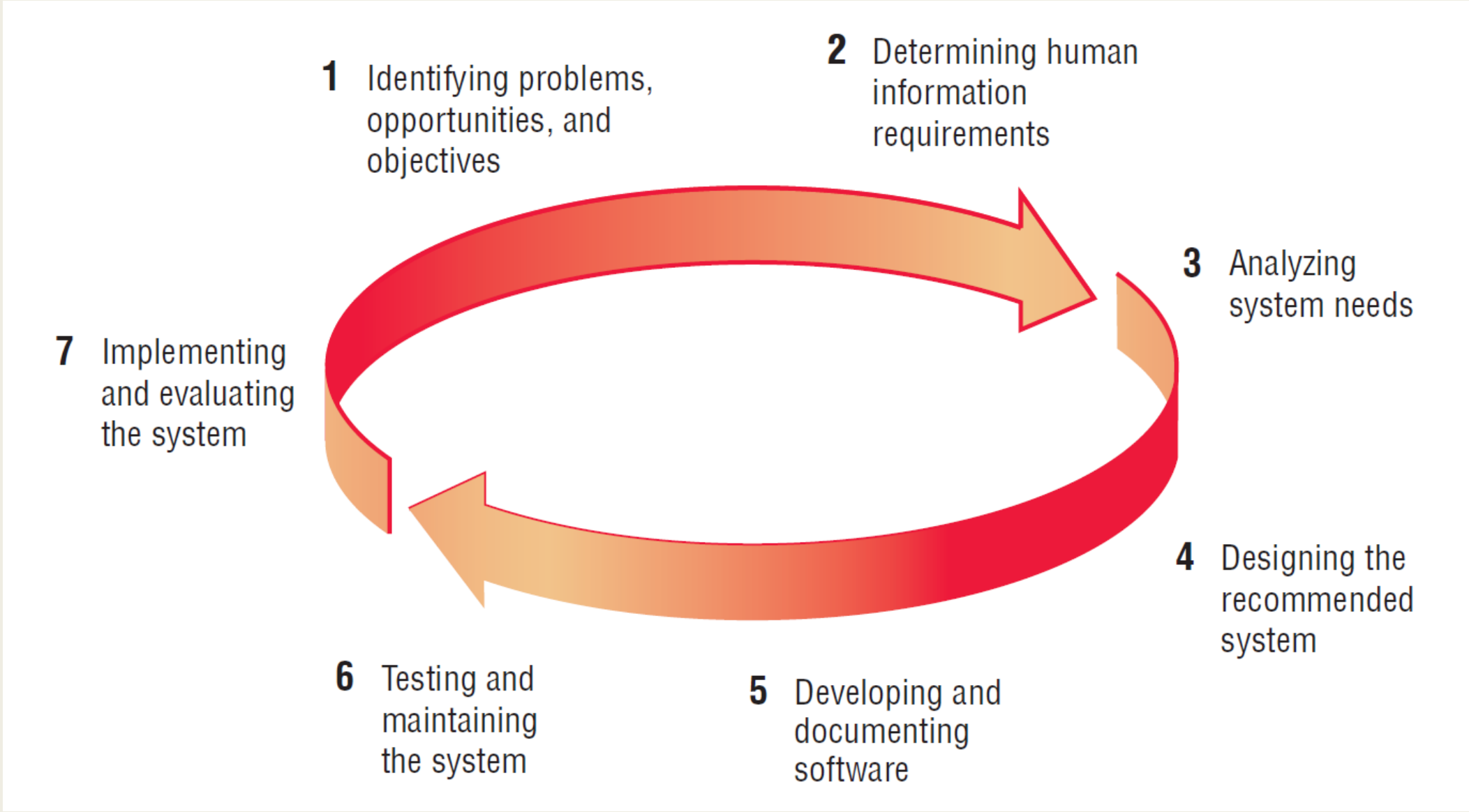
Strategic Level (1)

- **Executive Support Systems (ESS)**
  - *Helps executives address unstructured decision problems by creating an environment that helps them think about strategic problems in an informed way*
  - *Drill-down analysis, status access*
- **Group Decision Support Systems (GDSS)**
  - *Permit group members to interact with electronic support*
  - *Email, Lotus Notes*

Strategic Level (2)

- **Computer-Supported Collaborative Work Systems (CSCWS)**
  - *A more general term of GDSS*
  - *May include software support called "groupware" for team collaboration via network computers*
  - *Video conferencing, Web survey system*

THE SYSTEMS DEVELOPMENT LIFE CYCLE (SDLC)



Systems Analysis and Design by Kendall and Kendall

7 phases (Kendall/Kendall)

- Identifying problems, opportunities and objectives
- Determining human information requirements
- Analyzing system needs
- Designing the recommended system
- Developing and documenting software
- Testing and maintaining the system
- Implementing and evaluating the System

Phase 1: Identifying problems, opportunities and objectives

- Activities:
  - *Interviewing user management*
  - *Summarizing the knowledge obtained*
  - *Estimating the scope of the project*
  - *Documenting the results*
- Output/Milestone:
  - *Feasibility report containing problem definition and objective summaries from which management can make a decision on whether or not to proceed with the proposed project*

Phase 2: Determining human information requirements (1)

- Activities:
  - *Interviewing*
  - *Sampling and investing hard data*
  - *Questionnaires*
  - *Observe the decision maker's behavior and environment*
  - *Prototyping*
  - *Learn the who, what, where, when, how, and why of the current system*

Phase 2: Determining human information requirements (2)

- Output: The analyst will
  - *understand how users accomplish their work when interacting with a computer*
  - *formulate ideas on how to make the new system more useful and usable*
  - *know the business functions in the company and have complete information on the people, goals, data and procedure involved*

Phase 3: Analyzing system needs

- Activities:
  - *Create data flow diagrams (DFD)*
  - *Complete the data dictionary*
  - *Analyze the structured decisions made*
  - *Prepare and present the system proposal*
- Output:
  - *Recommendation on what, if anything, should be done*

Phase 4: Designing the recommended system

- Activities:
  - *Design procedures for data entry*
  - *Design the human-computer interface*
  - *Design system controls*
  - *Design files and/or database(s)*
  - *Design backup procedures*
- Output
  - *Model of the actual system*

Phase 5: Developing and documenting software

- Activities:
  - *The systems analyst works with*
    - programmers to develop any original software
    - users to develop effective documentation
  - *Programmers design, code, test and debug computer programs*
  - *The systems analyst develop document for the software*
    - online help , procedure or user manuals, FAQs (Websites)
- Output:
  - *The new system (a set of computer programs)*
  - *Documentation*

Phase 6: Testing and maintaining the system

- Activities
  - *Testing the new system (with sample data then with actual data)*
  - *System maintenance*
  - *Creation of a maintenance documentation*
- Output:
  - *Correction of problems, if any*
  - *Updated programs*
  - *documentation*

Phase 7: Implementing and evaluating the System

- Activities:
  - *Train users*
  - *Plan the smooth conversion from the old to the new system*
  - *Review and evaluate the system*
- Output:
  - *Trained personnel*
  - *Installed system*

The Impact of Maintenance

- Some researchers estimate that the amount of time spent on system maintenance may be **as much as 60%** of the total time spent on systems projects
- Maintenance is performed for two reasons:
  - ***Removing software errors***
  - ***Enhancing existing software***
    - Users often request additional features after they become familiar with the computer system and its capabilities
    - The business changes overtime
    - Hardware and software are changing at an accelerated pace

END OF PRESENTATION