System Analysis And Design

Chapter One: Basic concepts in Information System development

Topics

- System Analysis and design, System, Information systems, System thinking
- Types of Information Systems
- Participant in Information System Development
- Roles and qualities of System Analyst
- System development methodologies, Processes/Phase

Some basic definitions

- Systems Analysis and Design: *What is it?*
  - Systems analysis

    Process of studying an existing system to determine how it works and how it meets user needs

  - Systems design

    Process of developing a plan for an improved system, based upon the results of the systems analysis

Cont…

- System analysis and design is a step by step complex method where by computer based **information systems** that can perform basic business functions are developed and maintained.
- It can also be defined as a standard set of activities, methods, best practices, deliverables, and automated tools that stakeholders use to develop and maintain information systems.
- System AD is used to analyze, design and implement **improvements in the functioning of businesses** that can be accomplished through use of computerized information systems.

Cont…

- **It is based on two skills/knowledge**
  - Understanding of organizations objectives, structure and process (domain Knowledge)
  - Knowledge of how to exploit information technology for advantage
- **Out come of such SAD**
  - An application software (information systems) to improve users/employee efficiency
- *From the definition it is easy to understand that ‘System’, specifically ‘information system’ is a core concept.*

System

- A system is an interrelated set of components with an identifiable boundary, working together for some purpose.

Cont…

- **Characteristics of a system**
  - **Components** - either an irreducible part or an aggregate of parts (subsystem)
  - **Interrelated Components-** the function of one is tied to the function of the other
  - **Boundary-** the limits of the system with in which the system is contained, and that separates it from other systems.
  - **Purpose-** The components work together to achieve some overall purpose: the system's reason for existence
  - **Environment-** Everything outside the system's boundary
  - **Interfaces-** the point at which the system meets its environment
  - **Input-** What the system takes in from the environment to function
  - **Output-** The result of the function of the system
  - **Constraints-** limits to the system in terms of its capacity

Example

- Viewing a car as a system helps us determine what the problem is and fix it by breaking the system down in to its components.
- It is also important to consider the relationship one subsystem has with another in doing so.

Exercise

- Identify something as a system
- Identify and describe its characteristics (the 9 characteristics discussed)

Other Important system concepts

- **Decomposition-** being able to break down a system into its components**.** It also helps to build different parts of the system at different times or by different individuals.
- **Modularity-** relatively uniform size components or chunks.

Cont…

- **Coupling-** the extent to which subsystems are dependent on each other**.** Subsystems should be as much independent from each other as possible.
- **Cohesion-** the extent to which a module or a subsystem performs a single function. When we have highly cohesive modules, each module accomplishes one and only one function. This makes the module reusable in future programs. Take a biological system as an example**.** It has highly cohesive modules**.** It is possible to transplant a heart or kidney.

Cont…

- **Systems thinking**
  - Is a mind set or way of viewing a world as a system. Actually, systems thinking is just one part of the skills a systems analyst requires
  - it helps to see the big picture; it also helps to break problems down to their components to avoid complexity.
  - It minimizes the effect a change in one module will have on another.
  - It emphasizes on the relationship and the process that goes inside rather than constituent parts or just the sum of the parts. Accordingly
    - **“A system is bigger than the sum of its components”**

Information system

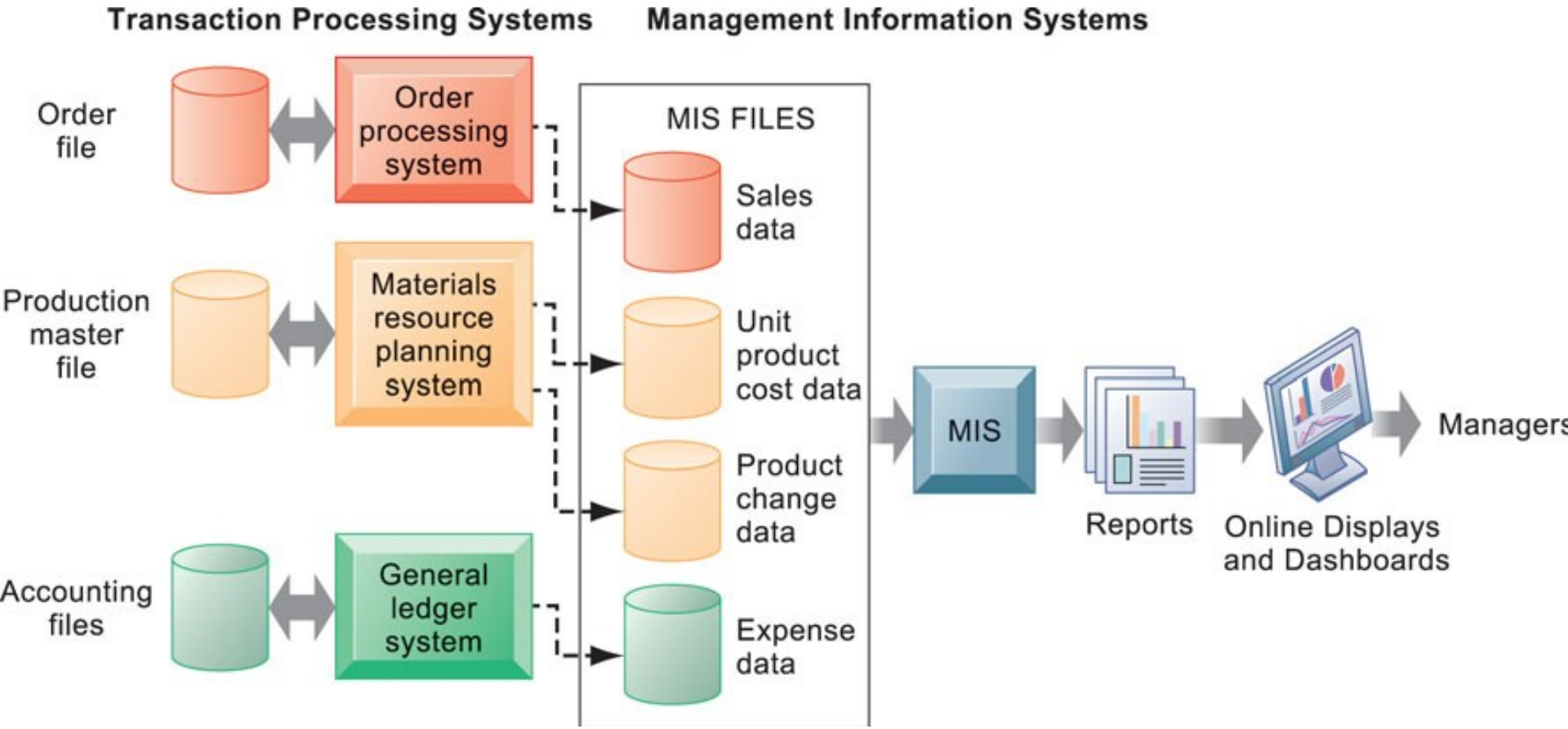
- Is an arrangement of people, data, processes, communication, and information technology that interact to capture, transmit, store, retrieve, manipulate and/or display information needed to support and improve day-to-day operations in a business as well as support the problem solving and decision making needs of management and other users.

Types of information systems

- IS can be classified into various types based on their function:
  - ***TPS***
  - ***MIS***
  - ***DSS***
  - ***ESS***

- **Transaction Processing Systems (TPS)**
  - perform and record the daily routine transactions necessary to conduct business, such as sales order entry, hotel reservations, payroll, employee record keeping, and shipping.
  - TPS are the foundation of other information systems

- **Management Information Systems (MIS)**
  - provide middle managers with reports on the organization's current performance.
  - the information is used to monitor and control the business and predict future performance
  - MIS summarize and report on the company's basic operations using data supplied by transaction processing systems.
  - Most MIS use simple routines, such as summaries and comparisons, as opposed to sophisticated mathematical models or statistical techniques.


Transaction Processing Systems
Management Information Systems
Order file
Order processing system
MIS FILES
Sales data
Production master file
Materials resource planning system
Unit product cost data
Product change data
Accounting files
General ledger system
Expense data
MIS
Reports
Online Displays and Dashboards
Managers

- **Decision Support System (DSS)**
  - support more non-routine decision making
  - They try to answer questions such as these:
    - What would be the impact on production schedules if we were to double sales in the month of December?
    - What would happen to our return on investment if a factory schedule were delayed for six months?

- **Executive Support Systems (ESS)**
  - help senior management make strategic decisions
  - In addition to drawing summarized information from internal MIS and DSS, ESS are designed to incorporate data about external events, such as new tax laws or competitors.

Cont…

- ***Other Systems***
  - E-commerce Applications: Business to Customer, Business to Business, and Customer to Customer
  - Enterprise Resource Planning (ERP) systems- integrate many ISs existing at various levels of management and used for various functions.

Participants in Information System Development

- Usually system development is a team work and project based.
- Who do you think are the stakeholders (participates) in IS design and development?
- How do each of these stakeholders participate?

Cont…

- **System owners**- pay for the system to be built and maintained.
  - They own the system, set priorities for the system, and determine policies for its use. In some cases, system owners may also be system users.
- **System users**- are the people who actually use the system to perform or support the work to be completed.
  - System users define the business requirements and performance expectations for the system to be built.

Cont…

- **System analysts-** facilitate the development of information systems and computer applications by bridging the communications gap that exists between non-technical system owners and users and technical system designers and builders.
- **System designers-** are the technical specialists who design the system to meet users' requirements. In many cases, system designers may also be system builders.

Cont…

- **System builders** are the technical specialists who construct, test, and deliver the system into operation.
- **IT vendors and consultants** who sell hardware, software and services to businesses for incorporation into their information systems.

Systems Analyst

- Professional computer employee who performs information systems analysis and design
- Change agent
  - Overcome reluctance of users to change

Systems Analyst
Functions

Coordination

- Schedules and system-related tasks
- Personnel
  - Manager
  - Programmers
  - Users
  - Vendors of computer equipment

Systems Analyst
Functions

Communication

- Oral presentations
- Written documentation

Planning and design

- Plans and designs new system
- Involved from beginning of project to final implementation of the system

System Analyst

Necessary skills required

- **Analytical skills**
- **Technical skills**
- **Management skills**
- **Interpersonal skills**

Cont…

- **Analytical skills**
  - **Systems thinking**
  - **Organizational knowledge-** how organizations work
    - Example a payroll system developed for a **Government Unit** wouldn't work for a **private company**
  - **Problem Identification-** a problem is the difference between an existing situation and a desired situation. Being able to see the real problem from an organizational perspective.
  - **Problem analyzing and solving-** finding out more about the problem, formulating alterative solutions, choosing the best alternative, devising a plan for its implementation.

Cont…

- **Technical skills-** programming languages, operating systems, database systems, data communication systems, system development tools, web development languages, CASE tools

Cont…

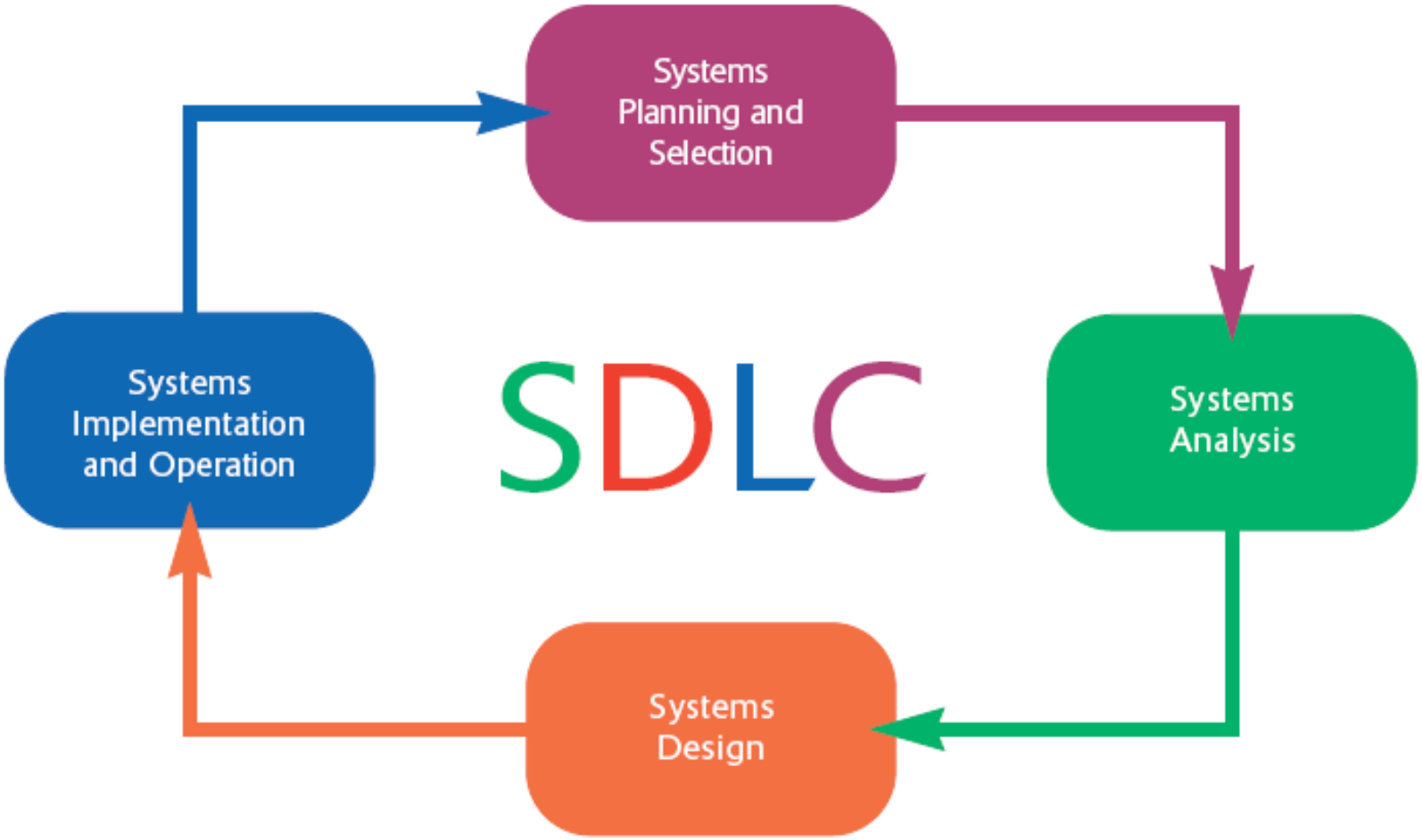
- **Management skills**
  - Project management- prevent projects from coming in late or going over budget
  - Resource management- delegating work, using resources effectively and efficiently
  - Risk Management- identifying risk in an IS development process and minimizing it. For instance, use of standard or commonly used technology will be less risky.
  - Change management- helps people make a smooth transition from one information system to another.

Cont…

- **Interpersonal skills**
  - Communication skills- interviewing, listening, written and oral presentations
  - Working in a team,
  - facilitating groups-guiding groups to work together
  - Managing expectations- educate pessimists and temper the expectations of others.

System Development Approaches, Methodologies and Phases/Processes

- Organizations use a standard set of steps, called a **systems development methodology,** to develop and support their information systems.
- The **systems development life cycle (SDLC)** is a common methodology for systems development in many organizations that marks the phases or steps of information systems development


Systems
Planning and
Selection
Systems
Analysis
Systems
Design
Systems
Implementation
and Operation
SDLC

Phase 1: Systems Planning and Selection

- The primary activities of this phase are:
  - identifying the need for a new or enhanced system and
  - Selection of projects that are perceived to meet the objectives of an organization
- Information system needs of an organization may result from:
  - Requests to deal with problems in current procedures
  - The desire to perform additional tasks
  - The realization that information technology could be used to capitalize on an existing opportunity

- Once a project is selected a plan is designed that lays out important issues such as:
  - *Feasibility study*
  - *Scope*
  - *Schedule*
- The plan is finally presented to the management to proceed to the next phase.

Phase 2: Systems Analysis

- During this phase, the analyst thoroughly studies the organization's current procedures and the information systems used to perform different tasks.
- The activities generally included in the analysis phase are:
  - determining the requirements of the system
  - Requirement structuring and elimination of redundencies
  - generating alternative initial designs to match the requirements
- The output of the analysis phase is a description of the alternative solution recommended by the analysis team

Phase 3: Systems Design

- During systems design, analysts convert the description of the recommended alternative solution into logical and then physical system specifications.
- Logical design is not tied to any specific hardware and systems software platform.
- During physical design decision is made regarding:
  - programming language
  - database systems
  - hardware platform
  - operating system, and
  - network environment the system will run under.
- The final product of the design phase is the physical system specifications

Phase 4: Systems Implementation and Operation

- During systems implementation and operation, you turn system specifications into a working system that is tested and then put into use.
- Implementation includes coding, testing, and installation.
- During operation, programmers make the changes that users ask for and modify the system to reflect changing business conditions.

Alternative approaches to development

- Prototyping
- computer-aided software engineering (CASE) tools
- joint application design (JAD)
- rapid application development (RAD)
- participatory design (PD)
- Agile Methodologies

Prototyping

- **Prototyping** is the process of designing and building a scaled-down but working version of a desired system
- The key advantages of the prototyping technique are:
  - it involves the user in analysis and design
  - it captures requirements in concrete, rather than verbal or abstract form

Computer-Aided Software Engineering (CASE) Tools

- **Computer-aided software engineering (CASE)** refers to automated software tools used by systems analysts to develop information systems.
- The general types of CASE tools include:
  - Diagramming tools
  - Computer display and report generators
  - Documentation generators
  - Code generators

Joint Application Design

- **joint application design (JAD)** is a process the purpose of which is to structure the requirements determination phase of analysis and the reviews that occur as part of the design
- Users, managers, and systems developers are brought together for a series of intensive structured meetings run by a JAD session leader

Rapid Application Development

- **Rapid application development (RAD)** is a Systems development methodology created to radically decrease the time needed to design and implement information systems.
- Focus is more on system functional and user interface requirements at the expense of detailed business analysis and concern for system performance issues

Participatory Design

- **participatory design (PD)** emphasizes the role of the user much more than do traditional techniques such as structured analysis and structured design
- Each user has an equal voice in determining system requirements and in approving system design

Agile Methodologies

- **Agile Methodologies** a family of development methodologies characterized by
  - short iterative cycles and extensive testing
  - active involvement of users for establishing, prioritizing, and verifying requirements and
  - a focus on small teams of talented, experienced programmers.