

INFORMATION SYSTEM ANALYSIS AND DESIGN

Key Ideas

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- Many failed systems were abandoned because analysts tried to build wonderful systems without understanding the organization.
- The primary goal is to create value for the organization.

Recent Significant IT Failures

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Company	Year	Outcome
Hudson Bay (Canada)	2005	Inventory system problems lead to \$33.3 million loss.
UK Inland Revenue	2004/ 5	\$3.45 billion tax-credit overpayment caused by software errors.
Avis Europe PLC (UK)	2004	Enterprise resource planning (ERP) system cancelled after \$54.5 million spent.
Ford Motor Co.	2004	Purchasing system abandoned after deployment costing approximately \$400 M
Hewlett-Packard Co.	2004	ERP system problems contribute to \$160 million loss.
AT&T Wireless	2004	Customer relations management system upgrade problems lead to \$100M loss

System Analysis and Design

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- Systems development can generally be thought of as having two major components:
- **Systems analysis** – system analysis is understanding the system thoroughly, gathering and interpreting facts, diagnosing problems, and using the information to recommend improvements to the system.
- **Systems design** – *System design* is the process of planning a new business system or one to replace or complement an existing system.

System concept

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- The term **system** is derived from the Greek word *systema*, which means an organized relationship among functioning units or components. A system is designed to achieve one or more objectives.
 - transportation system,
 - the telephone system,
 - the accounting system,
 - the production system, and,
 - the computer system

What is an Information System?

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- An information system is an arrangement of people, data, processes, interfaces, networks, and technology that interact for the purpose of supporting and improving both day-to-day operations in a business (sometimes called data processing), as well as supporting the problem solving and decision making needs of management (sometimes called information services).

Information System Example

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- ❑ Transaction processing system (TPS)
- ❑ Manufacturing and production systems
- ❑ Office automation system (OAS)
- ❑ Management information system (MIS)
- ❑ Executive information system (EIS)
- ❑ Decision support system (DSS)

Objective of a System

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- The study of systems concepts has three basic implications:
 1. A system must be designed to achieve a *predetermined objective*.
 2. *Interrelationships and interdependence* must exist among the components.
 3. The objectives of the organization as a whole have a higher priority than the objectives of its subsystems.
 - For example, computerizing personnel applications must conform to the organization's policy on privacy, confidentiality and security, as well as making selected data (e.g. payroll) available to the accounting division on request.

Characteristics of a System

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1. Organization (order),
2. Interaction,
3. Interdependence,
4. Integration and
5. A central objective

Organization

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- Organization implies structure and order. It is the arrangement of components that helps to achieve objectives.
- Hierarchical relationships portrays a system – subsystem relationship, defines the authority structure, specifies the formal flow of communication and formalizes the chain of command.

Interaction

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- Interaction refers to the manner in which each component functions with other components of the system. In an organization, for example, purchasing must interact with production, advertising with sales and payroll with personnel.

Interdependence

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- Interdependence means that parts of the organization or computer system depend on one another. They are coordinated and linked together according to a plan. One subsystem depends on the input of another subsystem for proper functioning: that is, the output of one subsystem is the required input for another subsystem. This interdependence is crucial in systems work.

Integration

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- Integration refers to the holism of systems. Synthesis follows analysis to achieve the central objective of the organization. Integration is concerned with how a system is tied together.

Central Objective

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- The last characteristic of a system is its central objective. Users must know the central objective of a computer application early in the analysis for a successful design and conversion. Political as well as organizational considerations often cloud the real objective. This means that the analyst must work around such obstacles to identify the real objective of the proposed change.

Types of systems

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- 1) Physical or abstract,
- 2) Open or closed, and
- 3) Man –made information systems.

Physical or Abstract Systems

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- Physical systems are tangible entities that may be static or dynamic in operation. For example, the physical parts of the computer center are static. A programmed computer is a dynamic system. Data, programs, output, and applications change as the user's demands or the priority of the information requested changes.
- Abstract systems are conceptual or non-physical entities. They may be like abstract conceptualization of physical situations. A model is a representation of a real or a planned system. The use of models makes it easier for the analyst to visualize relationships in the system under study.

Open or closed Systems

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- An open system has many interfaces with its environment. It permits interaction across its boundary; it receives inputs from and delivers outputs to the outside. An information system falls into this category, since it must adapt to the changing demands of the user. In contrast, a closed system is isolated from environmental influences.
- In systems analysis, organizations, applications and computers are invariably open, dynamic systems influenced by their environment.

Man-made Information System

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- An information system may be defined as a set of devices, procedures and operating systems designed around user based criteria to produce information and communicate it to the user for planning, control and performance. In systems analysis, it is important to keep in mind that considering an alternative system means improving one or more of these criteria.
- A business has several information systems; each is designed for a purpose and works to accommodate data flow, communications, decision making, control and effectiveness. The major information systems are formal, informal and computer based.

SDLC life cycle

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- ❑ The system development life cycle method is classically thought of as the set of activities that analysts, designers and users carry out to develop and implement an information system.
- ❑ Stages of SDLC:
 - 1) Planning
 - 2) Analysis
 - 3) Design
 - 4) Implementation
 - 5) Post Implementation and Maintenance

SDLC life cycle

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- Each of the phases include a set of steps, which rely on techniques that produce specific document files that provide understanding about the project.

SDLC Phases

Phase	Chapter	Step	Technique	Deliverable
Planning Focus: Why build this system? How to structure the project? Primary Outputs: — System Request with Feasibility Study — Project Plan	2	Identify Opportunity	Project Identification	System Request Feasibility Study
	2	Analyze Feasibility	Technical Feasibility Economic Feasibility Organizational Feasibility	
	3	Develop Workplan	Time Estimation Timeboxing Task Identification Work Breakdown Structure PERT Chart Gantt Chart	Project Plan — Workplan
	3	Staff Project	Scope Management Project Staffing Project Charter	— Staffing Plan
	3	Control and Direct Project	CASE Repository Standards Documentation Risk Management	— Standards List — Risk Assessment
Analysis Focus: Who, what, where and when for this system? Primary Output — System Proposal	4	Develop Analysis Strategy	Business Process Automation Business Process Improvement Business Process Reengineering	System Proposal
	4	Determine Business Requirements	Interview JAD session Questionnaire Document Analysis Observation	— Requirements Definition
	5	Create Use Cases	Use Case Analysis	— Use Cases
	6 7	Model Processes Model Data	Data Flow Diagramming Entity Relationship Modeling Normalization	— Process Models — Data Model
Design Focus: How will this system work? Primary Output: — System Specification	8	Design Physical System	Design Strategy	Alternative Matrix System Specification
	9	Design Architecture	Architecture Design Hardware & Software Selection	— Architecture Report — Hardware & Software Specification
	10	Design Interface	Use Scenario Interface Structure Interface Standards Interface Prototype Interface Evaluation	— Interface Design
	11	Design Programs	Data Flow Diagramming Program Structure Chart Program Specification	— Physical Process Model — Program Design
	12	Design Databases and Files	Data Format Selection Entity Relationship Modeling Denormalization Performance Tuning Size Estimation	— Database & File Specification — Physical Data Model
Implementation Focus: Delivery and support of completed system. Primary Output: — Installed System	13	Construct System	Programming Software Testing Performance Testing	Test Plan Programs Documentation Migration Plan
	14	Install System	Conversion Strategy Selection	— Conversion Plan — Business Contingency Plan
	14	Maintain System	Training Support Selection Support Maintenance	— Training Plan Support Plan Buglog Report

SDLC Phases: Planning

- This phase is the fundamental process of understanding why an information system should be built.
- The Planning phase will also determine how the project team will go about building the information system.
- The Planning phase is composed of two planning steps.

Planning Steps

1. During **project initiation**, the system's business value to the organization is identified (How will it lower costs or increase revenues?)
2. During **project management**, the project manager creates a work plan, staffs the project, and puts techniques in place to help the project team control and direct the project through the entire SDLC.


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	3	Develop Workplan	Time Estimation Timeboxing Task Identification Work Breakdown Structure PERT Chart Gantt Chart Scope Management	Project Plan — Workplan
	3	Staff Project	Project Staffing Project Charter	— Staffing Plan
	3	Control and Direct Project	CASE Repository Standards Documentation Risk Management	— Standards List — Risk Assessment

SDLC Phases: Analysis

- The analysis phase answers the questions of **who** will use the system, **what** the system will do, and **where** and **when** it will be used.
- During this phase the project team investigates any current system(s), identifies improvement opportunities, and develops a concept for the new system.
- This phase has three analysis steps.

Analysis Steps

1. **Analysis strategy:** This is developed to guide the projects team's efforts. This includes an analysis of the current system.
2. **Requirements gathering:** The analysis of this information leads to the development of a concept for a new system. This concept is used to build a set of analysis models.
3. **System proposal:** The proposal is presented to the project sponsor and other key individuals who decide whether the project should continue to move forward.

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- The system proposal is the initial deliverable that describes what business requirements the new system should meet.
 - The deliverable from this phase is both an analysis and a high-level initial design for the new system.

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	5	Create Use Cases	Use Case Analysis	— Use Cases
	6	Model Processes	Data Flow Diagramming	— Process Models
	7	Model Data	Entity Relationship Modeling	— Data Model
			Normalization	

SDLC Phases : Design

- In this phases it is decided how the system will operate, in terms of the hardware, software, and network infrastructure; the user interface, forms, and reports that will be used; and the specific programs, databases, and files that will be needed.

Design Steps

1. **Design Strategy:** This clarifies whether the system will be developed by the company or outside the company.
2. **Architecture Design:** This describes the hardware, software, and network infrastructure that will be used.
3. **Database and File Specifications:** These documents define what and where the data will be stored.
4. **Program Design:** Defines what programs need to be written and what they will do.

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SDLC Phases : Implementation

- During this phase, the system is either developed or purchased (in the case of packaged software).
- This phase is usually the longest and most expensive part of the process.

Implementation Steps

- **System Construction:** The system is built and tested to make sure it performs as designed.
- **Installation:** Prepare to support the installed system.

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SDLC Phases : Post Implementation and Maintenance

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Three steps:

- Evaluation
- Maintenance
- Enhancements

Book Reference

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- Systems Analysis and Design
- Elias M. Awad