Systems Development Life Cycle (SDLC) adheres to important phases that are essential for developers of computer IS, such as

1. **Planning** (identification), process of thinking about the activities required to create a desired system is a fundamental property of any intelligent behavior. Time used to describe the formal procedures used in such an endeavor, such as the creation of documents, diagrams, or meetings to discuss the important issues to be addressed, the objectives to be met, and the strategy to be followed.

2. **Analysis**, is the process of breaking a complex topic or substance into smaller parts to gain a better understanding of it.
   - Feasibility study
   - Investigation of the current environment
   - Business system options
   - Requirements specification
   and 3 others – less interesting for us now

3. **Design**, is the process or art of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements.

4. **Implementation** (synthesis), is a realization of a technical specification of the system

5. **Maintenance** of the implemented system

   Adaptive maintenance:
   Modification of a software product performed after delivery to keep a software product usable in a changed or changing environment.

   Perfective maintenance:
   Modification of a software product after delivery to improve performance or maintainability.
Any system development effort will be too large to proceed without any control. The control is needed in 4 different areas - areas of:
- FUNCTIONS
- BUDGETS
- SCHEDULES
- QUALITY

To make sure that a system is being developed with the proper and really necessary functions, within planned budget, in accordance with assumed schedule and up to quality expectations of all system users, a number of so called CHECKPOINTS are needed.

The traditional systems development life cycle (originated in the 1960s to develop large scale functional business systems) by splitting the whole development process into 4 phases gave the possibility to see where the checkpoints should be – between every two phases.

**Systems Development Life Cycle (SDLC)**

- is the process of CREATING or ALTERING systems, and the models and methodologies that people use to develop these systems.
- is a type of methodology used to describe the process for building information systems.

**SDLC Models**

- waterfall model
- Iterative & incremental model
- spiral model
- prototype model
- RAD model
- cocomo model
- v-model
- fish model
- agile software development frameworks

**The Waterfall Model**

- describes a development method that is linear and sequential.
- It has distinct goals for each phase of development.
- Once a phase of development is completed, the development proceeds to the next phase and there is no turning back.
The Waterfall Model cont.

- **ADVANTAGES.**
  - Simple and easy to use
  - A schedule can be set with deadlines for each stage of development
  - Phases are processed and completed one at a time
  - Works well for smaller projects where requirements are very well understood

- **DISADVANTAGES**
  - No working software is produced until late during the life cycle.
  - Poor model for long and ongoing projects.
  - Poor model where requirements are at high risk of changing.

The Iterative & Incremental model

- **ADVANTAGES**
  - Higher chance of success over the waterfall model due to the development of test plans early on during the life cycle.
  - More flexible – **less costly** to change scope and requirements.
  - Each iteration is an easily managed milestone.
  - Easier to manage risk.

- **DISADVANTAGES**
  - Very rigid, like the waterfall model.
  - Model doesn’t provide a clear path for problems found during testing phases.
  - Software is developed during the implementation phase, so no early prototypes of the software are produced.
The Rapid Application Development Model cont.

- is a linear sequential software development process model that emphasizes an extremely short development cycle using a component-based construction approach.
- combines prototyping, Joint Application Development, and implementation of CASE tools (structural or object-oriented).

The Rapid Application Development Model cont.

- ADVANTAGES:
  - incorporates short development cycles.
  - is flexible and adaptable to changes.
  - uses prototyping.
  - involves user participation.
  - realizes an overall reduction in project risk.
  - reduces the costs to create a custom system.

The V-model

**OBJECTIVES:**

- minimization of project risks
- improvement and guarantee of quality
- reduction of total cost over the entire project and system life cycle

The V-model

**ADVANTAGES:**

- Simple and easy to use.
- Each phase has specific deliverables.
- Higher chance of success over the waterfall model due to the development of test plans early on during the life cycle.
- Works well for small projects where requirements are easily understood.
The V-model

- **DISADVANTAGES**
  - Very rigid, like the waterfall model.
  - Little flexibility.
  - Adjusting scope is difficult and expensive.
  - Software is developed during the implementation phase, so no early prototypes of the software are produced.
  - Model doesn’t provide a clear path for problems found during testing phases.

**Fish Model**

The 7 phases of SDLC

1. **Determining human information requirements**
   - The analyst will use interactive methods such as: interviewing, sampling and investigating hard data, the questionnaires, along with observing decision makers’ behavior and prototyping.
   - The analyst is trying to understand what information users need to perform their jobs.
   - The people involved in this phase are analysts and SYSTEM MANAGERS – typically operational managers & workers.
   - The analyst must find out why the business uses the current system? What are the good reasons for doing business using the current methods? May be the methods should be also used in new system.

2. **Identifying problems, opportunities, and objectives**
   - The analyst should look honestly at what is occurring in business. Problems are the reason the analyst was called in.
   - Opportunities are situations that can be improved through the use of computerized IS.
   - Objectives should answer the question: what the business is trying to do?
   - The people involved in this phase are USERS, analysts, and system managers coordinating the projects.
   - This phase consists of interviewing users management, summarizing the knowledge obtained, estimating the scope of the project and DOCUMENTING the results in form of report containing problem definition and summarizing the objectives.
   - FEASIBILITY STUDY
   - Management must then make a decision on whether to proceed with the project.

3. **Analyzing system needs**
   - The people involved in this phase are, analysts and USERS – typically operational managers & workers.

4. **Designing the recommended system**

5. **Developing and documenting software**

6. **Testing and evaluating the system**

7. **Implementing and maintaining the system**

For better understanding of SDLC, it will be useful to enumerate 7 phases:
3. **Analyzing system needs**

- Analyst uses DATA FLOW DIAGRAMS to chart the input processes, and output of the business’s functions. He develops a DATA DICTIONARY that lists all the data items used in the system as well as their specifications.
- Analyst also analyzes the structured decision processes.
- Analyst:
  - prepares the SYSTEM PROPOSALS what has been found out about the: users, usability, and usefulness of current system
  - provides costs/benefits analyses of alternatives
  - makes recommendations on what (if anything) should be done.
- If one of the recommended solution is acceptable to management starts the next phase

4. Designing the recommended system
5. Developing and documenting software
6. Testing and maintaining the system
7. Implementing

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**C. Categories of Information Systems**

**Information in Organization**

- Organizations produce and access ever-growing amounts of information and use
- Computerized Information Systems
  - Information System = Information Base(s) + Applications + Interfaces

**The Organization Model by Leavitt**

- **Information bases** developed through File, Database or Web technology, using DBMSs, file, database and website design methodologies and tools.
- **Applications** developed in terms of programming languages, fourth generation languages (4GLs), using programming methodologies such as structured or object-oriented programming, and corresponding tools.
- **Interfaces** for end-users and other systems developed in terms of generic programming tools (such as compilers), or, more recently, in terms of other sets of specialized tools (HCI) tools and data servers
Front- and Back-Office Information Systems

- **Front-office information systems** support business functions that reach out to customers (or constituents).
  - Marketing
  - Sales
  - Customer management

- **Back-office information systems** support internal business operations and interact with suppliers (of materials, equipment, supplies, and services).
  - Human resources
  - Financial management
  - Manufacturing
  - Inventory control

**Another focus on IS**

An information system (IS) is an arrangement of people, data, processes, communications, and information technology that interact 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 users.

**Levels of Management**

- **Operational**
- **Supervisory**
- **Tactical**
- **Strategic**

**Vertical vs Horizontal Integration**

<table>
<thead>
<tr>
<th>Levels of Authority</th>
<th>Levels of Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top management</td>
<td>Strategic</td>
</tr>
<tr>
<td>Middle management</td>
<td>Tactical</td>
</tr>
<tr>
<td>Lower management</td>
<td>Supervisory</td>
</tr>
<tr>
<td>Operational</td>
<td>Functional</td>
</tr>
</tbody>
</table>

**Levels of Management**

- **Top management**
- **Middle management**
- **Lower management**
- **Operational**
Categories of Information Systems

- Transaction processing systems
- Office automation systems
- Management information systems

Intelligence Support Systems:
- Decision support systems
- Expert systems

Transaction Processing

Transaction processing systems (TPS) automate the handling of data about business activities or transactions, which can be thought of as simple, discrete events in the life of an organization.

The Goal of TPS

to improve transaction processing by;
- speeding it up,
- using fewer people,
- improving efficiency and accuracy,
- integrating it with other organizational information systems
or
- providing information not previously available.

Types of TRANSACTION PROCESSING

Input Transactions
- CUSTOMER ORDERS
- ACCOUNTING VOUCHERS
- COURSE REGISTRATIONS
- TIME CARDS
- AIRLINE RESERVATIONS
- PAYMENTS
- CHANGE CARD SLIPS
- BANK DEPOSIT SLIPS

Output Transactions
- CUSTOMER INVOICES/BILLS
- COURSE SCHEDULES
- PAY-CHECKS
- AIRLINE RESERVATION CONFIRMATIONS
- AIRLINE TICKETS
- PAYMENT RECEIPTS
- SALES RECEIPTS

Office Automation Systems

Office automation (OA) systems support the wide range of business office activities that provide for improved work flow and communications between workers, regardless of whether or not those workers are located in the same office.

- Personal information systems are those designed to meet the needs of a single user. They are designed to boost an individual’s productivity.
- Work group information systems are those designed to meet the needs of a work group. They are designed to boost the group’s productivity.

Types of functions integrated by OAS

- electronic publishing;
- electronic communication;
- electronic collaboration;
- image processing;
- office management.

At the heart of these systems is often a local area network (LAN). The LAN allows users to transmit data, voice, mail, and images across the network to any
Knowledge Management System

- **(KM System)** refers to a (generally IT based) system for managing knowledge in organizations for supporting creation, capture, storage and dissemination of information.
- The idea of a KM system is to enable employees to have ready access to the organization's documented base of facts, sources of information, and solutions.

Management Information Systems

A management information system (MIS) is an information system application that provides for management-oriented reporting. These reports are usually generated on a predetermined schedule and appear in a prearranged format.

Intelligent support systems (ISS)

- Decision Support Systems
- Executive Information Systems
- Expert System

FUNDAMENTAL COMPONENTS of DSS

- the database (or knowledge base),
- the model (the decision context and user criteria),
- the user interface.

A data warehouse is a read-only, informational database that is populated with detailed, summary, and exception data and information generated by other transaction and management information systems. The data warehouse can then be accessed by end-users and managers with DSS tools that generate a virtually limitless variety of information in support of unstructured decisions.

Decision Support Systems

A decision support system (DSS) is an information system application that provides its users with decision-oriented information whenever a decision-making situation arises. When applied to executive managers, these systems are called executive information systems (EIS).

Benefits of DSS

- Improves personal efficiency
- Speed up problem solving
- Facilitates interpersonal communication
- Promotes learning or training
- Increases organizational control
- Generates new evidence in support of a decision
- Creates a competitive advantage over competition
- Encourages exploration and discovery on the part of the decision maker
- Reveals new approaches to thinking about the problem space
- Helps automate the managerial processes.
An **expert system** is a programmed decision-making information system that captures and reproduces the knowledge and expertise of an expert problem solver or decision maker and then simulates the “thinking” or “actions” of that expert.

Expert systems are implemented with **artificial intelligence** technology that captures, stores, and provides access to the reasoning of the experts.

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### Type of System

<table>
<thead>
<tr>
<th>Type of System</th>
<th>Input</th>
<th>Processing</th>
<th>Output</th>
<th>Users</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPS</td>
<td>-Transaction related data</td>
<td>-Uses procedures and rules</td>
<td>-Summarization of transaction</td>
<td>-Lower-level managers</td>
<td>-Sales transactions, credit card payments, insurance claims</td>
</tr>
<tr>
<td>MIS</td>
<td>-Input from TPS and other internal tables</td>
<td>-Measures and monitors</td>
<td>-Summary and exception reports</td>
<td>-Middle-level managers</td>
<td>-Monthly production reports</td>
</tr>
<tr>
<td>SIS (SSD, ES, EIS)</td>
<td>-Internal and external data and models</td>
<td>-Knowledge and experience</td>
<td>-Interactive and text reporting</td>
<td>-Top managers</td>
<td>-Knowledge workers</td>
</tr>
<tr>
<td>SER-KRM</td>
<td>-Data and information</td>
<td>-Summarizing, formulating, visualizing</td>
<td>-Documents, graphs, multimedia</td>
<td>-Knowledge and clerical workers</td>
<td>-Fax, multimedia, video conferencing</td>
</tr>
</tbody>
</table>

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### D. Strategic Planning for Information Systems

"**An information systems strategy** brings together the business aims of the company, an understanding of the information needed to support those aims, and the implementation of computer systems to provide that information. It is a plan for the development of systems towards some future vision of the role of information systems in the organisation."

"An IS strategy is something which is essentially a planning process in the minds of the decision makers, users and developers of the systems. It is supported with written reports and plans, but they are of secondary importance."
Lack of a coherent strategy for IS/IT investments leads to some problems:

- Business opportunities are missed
- Priorities are not based on business need
- Lack of integration of systems and ineffective information management
- Lack of understanding and agreed decisions between users, senior management and the IS/IT specialists
- Technology strategy is incoherent