



After studying this lesson, you will have better understanding of,

- What a System is
- Classification of system process
- Information Systems
- System Development Life Cycle
- Steps of System Development Life Cycle



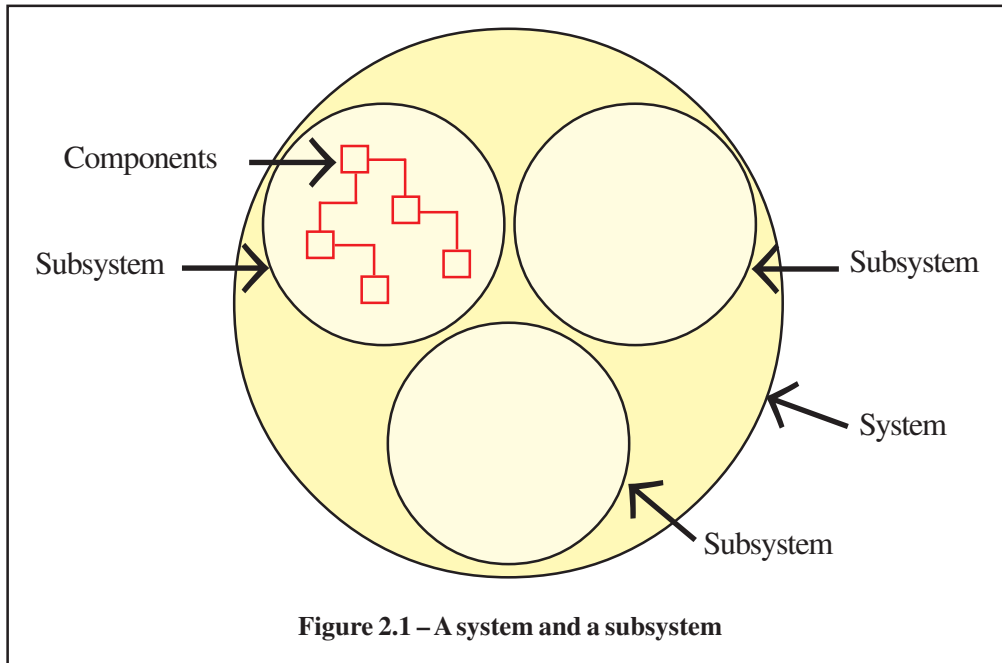
2.1 What is a System?

A system is a collection of various interrelated components which performs a particular task. A system can also be considered a collection of several interrelated subsystems.

For example, our Body System consists of subsystems such as Respiratory System, Gastro Intestinal System and Nervous System.

As far as Business Management Systems are concerned, such an information system can be considered a collection of all the subsystems such as Business Information System, Production Information System and Human Resources Management System. The Management information retrieved from such a system is used for the improvement of the company by the business administrators.

Each subsystem consists of a collection of inter-related components.



Classification of System Process

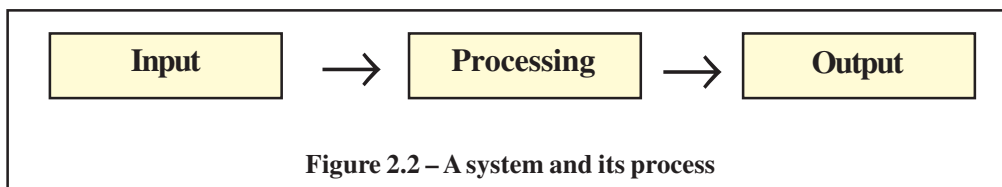
A system consists of three similar parts.

1. Input

2. Processing

3. Output

A system connects to the external world through Input and Output. Processing converts Input to Output.

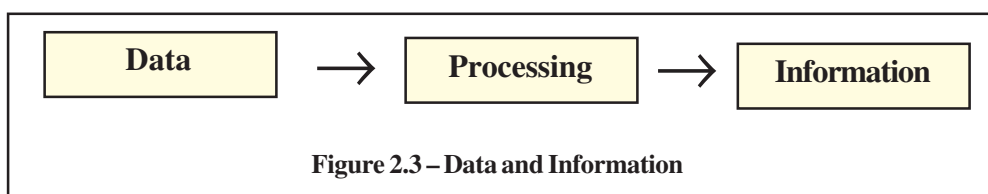


Final Output is released to the external world activating in the system as required and taking the Output of a component of the system as Input of another component. This is more important to identify the active boundary of the system.



Data and Information

Information can be retrieved when raw data are processed systematically.



Let us consider a weather forecasting system for example. A lot of raw data such as temperature, wind direction, humidity should be given to the system as Input. When these data are processed properly, a forecast about tomorrow’s weather can be gained. This information is very important. For another example, when you Input marks the students of a class have got as raw data, various information, such as pattern of the average marks of the class and the competencies of the students for various subjects, can be obtained through a system. This information can be obtained as graphs and tables as well.



The Importance of Information

We cannot make decisions observing raw data. But, we can make decisions with the information we gain when we process these data through a system. In the example mentioned above, the forecast of tomorrow’s weather is very important information and we can plan other tasks accordingly. Further, with the information such as the average mark of a student, standard deviation and bar graphs, we can make decisions about the progress of the students and the subjects which should be paid special attention.

Moreover, the administrative information retrieved from a business administrative system helps the administrators to make decisions about the progress of the company. The annual graphs and tables about the company sales, income and expenditure reports, and payment reports on salary payment for employees can be considered examples of this type of information.



Information Systems

An information system which consists of people, data, network, equipment and technology, is a system from which we can retrieve information. These systems can be Manual or Computer based.



Manual Systems

In these systems, people do all the processing manually. All the calculations also should be done manually and data and information written in papers should be stored as files in envelopes and lockers.

The main disadvantage of these systems is the problem of accuracy. Further, it is difficult to retrieve information quickly.



Computer Based Information Systems

Computer based information systems enable us to retrieve information very quickly, on time, accurately and the way we want avoiding the shortcomings which we experience in manual systems. In this subject, we pay attention only to such systems.

The main parts of a computer based information system are

- Hardware
- Software
- Programmers, Users
- Procedures
- Data and Information



Types of Information Systems

According to the application of the information systems, they can be mainly categorized as follows;

- Transaction Processing Systems
- Management Information Systems
- Decision Support Systems
- Expert Systems



Transaction Processing Systems

Transaction Processing Systems are the systems used to prepare daily transactions. For example, an information system used in a bank for transactions such as payments and deposits can be considered a Transaction Processing System. Information related to daily transactions, long term transaction patterns and other necessary reports can be obtained by Transaction Processing Systems.



Management Information Systems

In a Management Information System, all the data related to an organization (E.g.: data related to employee salary, expenditure, sales, income) can be saved in a data base. When these data are processed as required, information which is necessary for administration is given by the system as output. This information is important for the administrators to gain knowledge about the progress or decline of the organization while it enables the administrators to make decisions based on this information. The pattern of the annual sales, tables of income and expenditure, pattern of the increase of employee salary can be considered examples of management information.



Decision Support Systems

The main objective of a Decision Support System is to give information, which is necessary to take decisions, to the users as required. First, the information should be given to these systems about how to make decisions, administrative law,

procedures and mechanisms. When the necessary data is input, the information related to the decision is output by the system. This information helps the user to take decisions and decision making should be done by the user.



Expert Systems

All the knowledge related to a particular field should be entered first in these systems. Then, according to the situation, instructions are given by these systems exploring the knowledge base. Normally, computers do not have the ability to think. Computers follow the given instructions as it is. However, Artificial Intelligence can be given to a computer by giving knowledge to a particular computer related to a field.

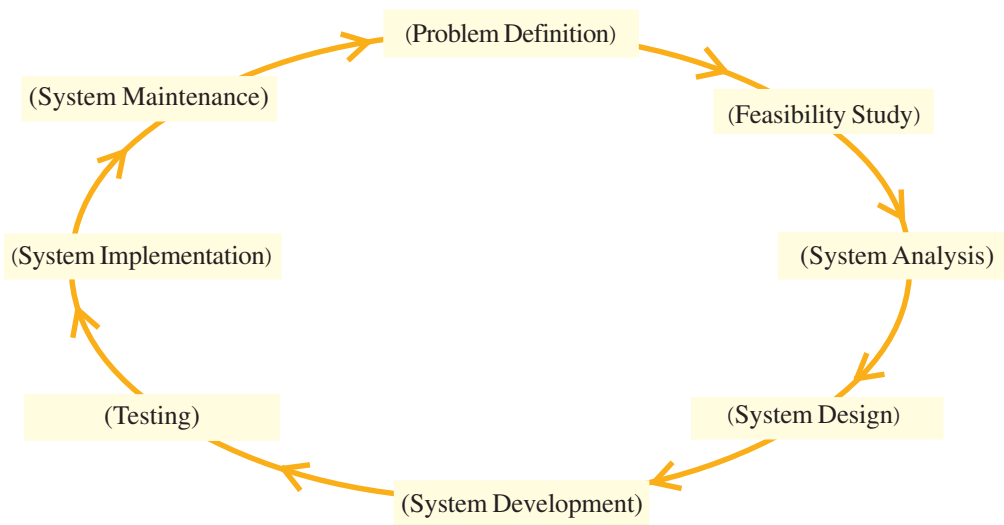
For example, a doctor possesses a wealth of knowledge about diseases, symptoms and tests. If this knowledge can be given to a computer as a knowledge base in a way, expert systems to provide medical assistance can be developed.



2.4 System Development Life Cycle

The following factors should be considered when a particular system is selected to be computerized.

1. Problem Definition
2. Feasibility Study
3. System Analysis
4. System Design
5. System Development
6. Testing
7. System Implementation
8. System Maintenance



System Development Life Cycle [SDLC]



1. Problem Definition

A simple document should be prepared here about the objectives of the system, tasks expected from the system, input and output, and the other features of the system such as efficiency, interface and system security. This document should be prepared using a natural language and it does not have to be technical.



2. Feasibility Study

Before developing a System, a basic study should be made to check whether the company has the required resources to develop the system and what the financial advantages and disadvantages expected from the system are.

Technical Feasibility

Whether technical ability is present to build the system with the tasks expected from the system and the other factors should be studied.

Operational Feasibility

Whether the company possesses the required human resources to operate such a system is studied here.

Economic Feasibility

The monetary resources required to build the system is studied here and whether the benefits expected of the system is worth the monetary investments should be studied here.



3. System analysis

Before a computerized system is created, factors such as the requirements of the system, tasks expected, features that should be present and operational requirements should be studied in depth. In this study while there should be discussion with the various stakeholders there is the need to study various files, systems and processes.

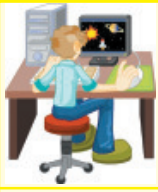
Requirements of the System

There should be a perfect, detailed study of the requirements of the system before it is built. These requirements can be mainly categorized into two areas:

- Functional requirements
- Non-functional requirements

Functional requirements

Functional requirements are the tasks expected to be performed using the system. For example, among the tasks we expect from the word processing system, there can be tasks such as inserting words, formatting a page which consists of words, spell checking, inserting a paragraph, and printing. Further, among the tasks expected of a bank transaction system, there can be tasks such as depositing money, withdrawing money, requesting a monthly transaction report and checking the balance.



Activity 2.1

Prepare a functional list if a computerized system is being built for your school library.

Non-functional requirements

All the other requirements except the system requirements are considered as Non-functional requirements of a computerized system. For example, efficiency (the time span output should be given), reliability (can the system provide output without any obstruction or failure?), interface requirements of the system (an interface which is easy to use on the system – buttons, menus and icons should be there for example), security of the system (unauthorized people should not be able to enter the system) can be shown.

After identifying all the requirements (functional and non-functional requirements) which are needed to build the system requirement specifications of the expected computerized system, these requirements should be documented. This document is called the System Requirements Specification (SRS).

The requirements should be mentioned very clearly and in order in this document. For example, when the efficiency requirement of the system is mentioned, the time span output that should be given has to be mentioned clearly.

One or several methods of the following are used as necessary to collect data in analyzing system;

1. Record Searching
2. Interviewing
3. Questionnaire
4. Observation
5. Sampling



4. System Design

The main tasks of the system design can be considered as follows

- Identifying the components of the software
- Identifying the software architecture of the system
- Designing an interface
- Designing a database

Identifying components of the software and software architecture of the system

Designing software is very important in creating a computerized system. A system does not consist of a single computer program. Software of the computer system consists of several components. Identifying these components is the main task of system designing. The main objective of designing a system is to build a design where all these components are interrelated. This is called software architecture. Using computer languages and computer programs, this software architecture should be converted to a system which can be operated in the computer.

Interface Design

The user can connect with the system through a system interface and do the necessary tasks using the system. Therefore, designing a good interface is essential and it enhances the convenience of using the system. In designing an interface, attention should be paid to factors such as input, tasks and output. For the user to get the tasks done easily, a good interface should be designed containing icons, menus and buttons.

Database Design

When a computerized system is designed, how the data, necessary for that system are saved has to be identified. If a system is designed for the school library,

several data types can be identified as necessary data, such as data about the books CD's and cassettes in the library, data about the students who use the library and data about the staff. Further, when a student borrows a book, data should be saved about that borrowing as well. Each of these data is called tables and we can build a complete database when we build the relationship between tables after identifying how these tables are interrelated.

Students Table

Student Number	Name	Class
.....
.....
.....

Book Table

Book Number	Title	Author	Price
.....
.....
.....

CD Table

CD Number	Title
.....
.....
.....

Issuing Table

Issuing Number	Student Number	Book / CD Number	Date issued
.....
.....
.....

In the Issuing Table, it is adequate to mention only the student number, book number or CD number. From the interrelationship between the tables, information about students and books can be obtained from the other tables.

After designing such a database, a database operational system (E.g.: Access, Oracle, MySQL) should be used to develop it.



5. System development

The task of building up a computerized system is done by coding. This is done after building up (constructing) the components and sub-systems, identified in Designing. The computer language we have selected can be used in coding. It is possible for us to get the computerized system after coding. Programs should be written in a way that they can be understood easily after reading. Since the computerized system should definitely be updated, programs should be built in a way that it can be understood and changed easily in the future.

Selecting a Programming Language to Develop the System

Development of the computer system should be started after designing it just as civil engineers start building a bridge after designing it. System processes are translated by the computer languages in such a way that it can be operated in the computer when a computerized system is built. A very important factor here is to select a suitable computer language for this development. The following factors should be considered here;

- Application Domain
- The dimension of the system and the assignments
- Facilities available in the language for operation
- Facilities available in the system for maintenance

There are several computer languages which are used today and it is appropriate to use these languages according to the various fields and the system used. For instance, if a small system needs to be developed quickly, a Visual language (e.g.: Visual Basic, Visual C++) can be used. Further, when an information system is developed based on Internet, languages like Java and PHP are more suitable. When an expert system with Artificial Intelligence is designed, a language like Prolog which has facilities for logical reasoning is more suitable.

When a system related to computer operation such as an operating system is designed, the more appropriate languages will be C and C++ as factors like computer Memory, Ports, Hardware relationships have to be considered when it is developed.

Further, the selected computer language should possess the ability to operate the software system as designed. It should also possess the ability to maintain the software system.

When building a computer software system, an appropriate software programming language should be selected considering all the above mentioned factors.



6. Testing

After developing a computerized system, it should be tested properly to check whether there are any errors. There can be coding errors, designing errors or requirement errors in this system. It is an essential task to identify and correct these errors. Every type of input should be given to the system here to test whether the expected output can be gained properly from the system. We should test not only the accuracy of the output, but also whether the non-functional requirements are fulfilled. The efficiency, reliability and security of the system should be tested here.

A system can be tested in three steps.

01. The components of the system should be tested separately. When input is given to the components, it should be tested to see whether the expected output can be received here. This is called Unit Testing.
02. It should be tested to ensure whether the components of the system are integrated and the tasks are done properly giving the proper input. This is called Integration Testing.
03. The input related to the complete system should be given to check whether the expected output can be received. This is called System Testing. The client of the system tests the system finally and this is called the Accepting Testing.



7. Implementation of the System

After testing and correcting all the errors of the new computerized system, it should be implemented on the computer systems of the relevant organization. All the data which were there in the initial system (can be a manual system) should be translated here in a way that it is related to the new system. The new system should be installed in the relevant computer system and it should be tested to check whether it is operated accurately.

When it is implemented in the new computer system, there are several ways it can be implemented to an institute.

The most popular ways are given below;

01. Direct implementation

Removing the existing system and implementing the new computerized system instead.

02. Parallel implementation

Implementing the existing system and the new computerized system parallel for a particular duration. If the new system is successful, the old system can be discontinued and the new system can be continued.

03. Pilot implementation

A selected part of the old system is directed to the new system and implement.

04. Staged/Phased Implementation

The selected parts of the old system are established in the new system step by step.



8. Maintenance of a System

When the computerized system is implemented and it is continued to be used it, it should be definitely maintained. Maintenance should be done for three reasons.

01. Correcting errors of the system not identified in the stage of testing
02. Users need to fulfill new requirements through the system, users need of a more user friendly interface, the need to implement new tasks, the need to increase the efficiency of the system, can be mentioned as a few reasons for this.
03. Due to the technological changes, the system has to be changed in such a way as to gain new benefits. For instance, changing the system in a way that the system can be operated under a new operating system can be cited. Further, changing the system to use it in a more productive way using the new graphic systems, sound systems and computer networks.