CHAPTER 1

SYSTEM CONCEPTS AND ENVIRONMENT

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	1.1	Introduction
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	1.3	Elements of System
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1.0 OBJECTIVES

After studying this chapter you will be able to

- explain fundamental concepts of system
- describe environmental features necessary to develop a full-fledged computerized system.

1.1 INTRODUCTION

By having crystal clarity of system relevant concepts one can

- 1. Identify the characteristics of the system.
- 2. One can analyze, categorize and confirm them in order to develop a computerize system with the help of elements discussed and explained which lay down foundation for structure of built up system.
- 3. Types of system help you to categorize the structure of your system in appropriate format.

What is system?

The word system is derived from the Greek word "systema" which means the organized relationship among the functioning units.

However the word system always comes with an adjective, whenever we talk about a system such as educational system, political system, accounting system etc. But if we carefully analyze these systems we can find that there are some features common to all the systems.

These are the characteristics of the system which help us to understand the working definition of the word system.

Definition

A system is an orderly grouping of independent components linked together according to plan to achieve a specific objective.

1.2 CHARACTERISTICS OF SYSTEM

The characteristics of the system are

- 1. Basic components
- 2. Interaction and structure
- 3. Goal
- 4. Behavior
- 5. Life cycle

1. Basic components

As per the definition of system the functioning units means the basic elements of the system which are interrelated, are the basic components of the system. So these basic elements are nothing but the identifiable and moving parts of the system. Following are some examples of system and its basic components.

SYSTEM

I. Educational system II. Computer system **BASIC COMPONENTS**

Students, teachers, books, computers. Monitor, CPU, keyboard.

2. Interaction and structure

An important feature of the system is the basic components must interact among themselves. It is not only collection or grouping of elements. If an organization is considered as a system then purchase department must interact with stores and production department, production with PPC and so on. Also they are interdependent on each other. If we consider, computer as a system then if some information is keyed it gets processed by arithmetic or logic unit or both and the final result is displayed on the screen. So this interrelation activity of the components makes the system dynamic.Such a relationship among the components which define the boundary between the system and environment is called as the **structure** of the system.

<u>3. Goal</u>

In order to achieve the goal of the system we should first understand the meaning of I. Central objective II. Integration III. Synergistic effect

I. Central Objective : Central objective means the common goal, because without common goal system will start moving in all directions. As a result coordination among all the parts (Components) will be lost.

II. Integration: It is combined work of all the components in order to achieve the goal of the system. There must be coordination among all parts of the system So in order to have such coordination the system must work as a' whole', integrating all its activities to achieve the desired result.

III. Synergistic effect: From the integration concept it is clear that the system has to be viewed as 'whole' rather than just as sum of its parts. This integrating effect is called as **synergistic effect.**

<u>4. Behavior</u>: Behavior is the way the system reacts to its surrounding environment. Behavior is determined by the procedures designed to make sure that components behave in ways that will allow system to achieve common goal.

For example: If we touch an object which is hot, the nervous system makes our body to withdraw immediately from the hot source. So heat is input from environment, reaction is the behavior and instruction in the nervous system (how to react) is the procedure. Procedure describes what ought to be done and behavior describes what is actually done.

5. Life cycle: Every system has life cycle and according to human life it has birth that is evolution, life, aging, repairs and finally the end of the existence of the system (death). So finally we can define system as follows.

Definition:

- i. System is integrated collection of the components which satisfy functions necessary to achieve the system goals and which have relationship to one another that defines **structure** of the system.
- ii. A system is a set of elements forming an activity or scheme seeking a common goal by operating on data in time reference to yield information.

1.1 -1.2 Check your Progress

A] Fill in the blanks

- 1) As per the definition of system themeans the basic elements of the system which are interrelated .
- 2) A relationship among the components which define the boundary between the system and environment is called as.....of the system.
- 3) A system is a set of elements forming an activity or scheme seeking a commonby operating on data in time reference to yield information.
- B] Match each of the following statement with appropriate characteristic given in bracket.

{Goal, structure, life cycle, components, interaction, behavior}

- a. Books of the library.
- b. Poor attendance of the students.
- c. Filling of feedback form for every lecturer to improve teaching quality for each term.
- d. Three years duration of BCA course
- e. To conduct seminars on different subjects to enhance knowledge of student force but in college premises only

1.3 ELEMENTS OF THE SYSTEM

All the characteristics of the system are determined by the system elements, their properties and relationships. The system elements are

- 1. Input
- 2. Processor
- 3. Output

These elements are common to all systems. These are the elements by which all systems are described. They are set in a fixed position which helps the system analyst to design & work with system more easily.

- 1. Input : It is defined as energizing or start up component on which system operates. It may be raw material, data, physical source, knowledge or any energy to decide the nature of output.
- 2. **Processor :** It is defined as the activity that makes possible the transformation of input to output. When data is processed through computer it is processed through logical steps. However these steps are required to be instructed in series to the computer.
- 3. Output : It is end result of the operation. In other words it is the purpose or the main objective for which the system is designed. Though output is largely dependent on input, its nature or format may vary vastly from the input.

For example: If data keyed is in numerical form it may display output which is in form of graph or pictorial form.

1.4 INFORMATION SYSTEM ENVIRONMENT

Following model represents a system with its elements which keeps the system in equilibrium.



In order to build any system only the knowledge of its elements does not serve the purpose, there should be fundamental clarity of some important concepts which are essential to build the efficient system & to keep it in equilibrium.

The major concepts are

- I. Boundary & environment
- II. Subsystem
- III. Interface
- IV. Feedback control
- V. Black box
- I. **Boundary & environment:** Every system has its limits that determine the sphere of influence & control is called as Boundary of the system. Everything within the circumscribed space is called system & everything outside it is environment. Flow from environment to the system is its input while a flow from system to its environment is the output. Boundary of the system may exist physically or conceptually.



II. Subsystem: A complex system is difficult to implement when consider as a whole. However if we divide it into smaller functional units which are of manageable sizes then every small function unit becomes a subsystem. In the formation of subsystem the components performing same or similar functions are grouped.

For example: In a business organization system, marketing, production, sales can be considered as subsystems.

Module: A collection of function or data. In other words module encapsulates related functions. Ideal module is that module which can be reused in other development projects.

III. Interface: The interconnections & interactions among the subsystems are termed as interfaces. In fact each interface implies a communication path. Number of interfaces increase with number of subsystems.

IV. Feedback control: In order to improve the performance of any system feedback control mechanism can be used as a tool or device to control or modify the input of the system after analyzing the output properly.

V. Black box: Black box is the subsystems at lowest level where the inputs are defined, outputs are determined but the processor of the system is not defined means it difficult to understand how the transformation of input to output takes place.

Processor not defined



1.3 - 1.4 Check your Progress

Fill in the blanks

- a. is end result of the operation.
- b. Every system has its limits that determine the sphere of influence & control is called asof the system.
- c. The interconnections & interactions among the subsystems are termed as

1.5 TYPES OF THE SYSTEM

We will have comparative study of different types of system.

1.5.1 Conceptual & Physical system

- 1. Conceptual (abstract) system is an orderly arrangement of independent ideas. For example: Economic theory, Theory of relativity.
- 2. Physical system: These are the concrete operational systems made up of people , material, machines energy & other physical things.

For example: Management information system.

Physical systems being operational systems can display activities or behavior. While conceptual system as it works on different ideas or concepts it displays theoretical structures.

1.5.2 Natural & Artificial systems

- 1. Natural systems: All the naturally occurring systems are called as natural systems For example: Solar system.
- 2. Artificial system: All man made systems are called as artificial systems.

1.5.3 Open & Closed systems

- 1. Open system: Open system is that system which interacts with its environment. For example: Any business organization system exchanges its material, manpower, money & information with its environment.
- Closed system: Closed system is that system which does not interact with its environment. It has only controlled & well defined input & output.
 For example: Television is itself is closed system which controls its sharpness, brightness automatically with sensors.

1.5.4 Deterministic & probabilistic system:

- Deterministic system: It is a system which operates in predictable manner.Stepwise execution is always possible & output is sure.
 For example: computer system.
- 2. Probabilistic system: It is a system which operates in unpredictable manner & degree of error is always possible. Also output is not sure.

For example: Weather forecasting system.

1.5.5 Integrated system

System integration is the combination of related subsystems to form a larger subsystem or total system.

For example: Airline reservation system.

1.6 MIS: MANAGEMENT INFORMATION SYSTEM.

Following pyramid represents different management levels of an organization.



This is integrated Man-Machine system that provides information to support planning & in decision making.

1. TPS: Transaction processing system

I.Functions:

- i) It updates history files.
- ii) It prepares summarized & processed transaction
- iii) It generates detailed transaction reports.

II. Application areas:

- i) Banking system
- ii) Sales accounting system.
- III.Users of the system:

Lower level management of the system.

IV.Benefits:

- i) Stores all transactions.
- ii) Helps to trace out the problem,
- iii) Gives current status of all the organizational entities.

2. MIS: Management information system

I. Functions:

It makes use of output from the TPS as input and generates meaningful reports

- **II. Application areas:** Marketing, production, personnel departments.
- III. Users: Middle level management
- IV. Benefits:
- i) Helps in planning.
- ii) Helps in decision making.
- iii) Suitable for analysis.

3. DSS : Decision support system

I Functions:

i) This system makes use of internal data from MIS for studying trends &

ii) External data collected from environment to understand the environment.

- II Benefits :
 - i) It helps to prepare analytical & planning models.
 - ii) It assists top level management in decision making.

III Application area:

Production planning control system

4. ESS: Executive information system

It is structured & automated system provides rapid access to timely information & management reports. This system is supported with online information services such as electronic mail to keep the management updated with all current happenings in major areas.

Main features:

- I. User-friendly
- II. Fast
- III. Updated with graphics & reports.

1.7 INTRODUCTION TO STRUCTURED METHODOLOGIES

A system development methodology is an orderly & integrated collection of various methods, tools & techniques. There are many approaches to the development of computer system, such as

- 1. System development life cycle(SDLC)
- 2. Structured system analysis & design method (SSADM)
- 3. System prototype method (SPM)

SDLC is traditional approach which is rigid, concentrates more on physical aspects than logical aspects for the system development & has to be done at the end of the project.

All these drawbacks have been overcome by SSADM which uses symbols than narrative description. It focuses on logical aspects of the system than physical aspects as it concentrates on 'what' occurs than 'how' it occurs. SSADM presents graphic model of the system which involves DFD that represents data movements, data stores & processes of the system. This methodology uses tools like DD, structured English, decision table, decision tree for system analysis.

System design in SSADM is transforming logical design into physical design. This includes –input-output design, file & database design program design & control design.

1.5 - 1.7 Check your Progress

A] Fill in the blanks

a.system is an orderly arrangement of independent ideas.

- bis a system which operates in unpredictable manner & degree of error is always possible. Also output is not sure.
- c System is that system which interacts with its environment.

B] Give the full forms of the following

- a. TPS
- b. DSS
- c. ESS

1.8 SUMMARY

- A system is set of elements which operate together to achieve a common goal or objective.
- Every system possesses a model & the model is composed of system elements.
- Basic system elements are input, process & output.
- The characteristics of a system are determined by a given set of system elements, their properties & relationships.
- The fundamental characteristics which are common to all system are goal, basic components, interaction & structure, life cycle & behavior.
- These characteristics make the system special to be considered under different categories, such as physical, conceptual, open & closed, integrated, MIS, deterministic & probabilistic.
- Knowledge & application of some more important concepts such as boundary &

environment, black box, subsystem, interface, feedback control is advised for better system development.

1.9 CHECK YOUR PROGRESS- ANSWERS

1.1&1.2 A]

1.2 Fill in the blanks

- 1) functioning units
- 2) the structure
- 3) goal

B] Match each of the following statement with appropriate characteristic given in bracket.

- a. Basic components
- b. Behavior
- c. Goal
- d. Life cycle
- e. Structure

1.3 and 1.4

Fill in the blanks

- 1. Output
- 2. Boundary
- 3. Interfaces.

1.5 and 1.7

A] Fill in the blanks

- 1. Conceptual (abstract)
- 2. Probabilistic system
- 3. Open

B] Give the full forms of the following

- 1. Transaction processing system
- 2. DSS : Decision support system
- 3. ESS: Executive information system

1.10 QUESTIONS FOR SELF - STUDY

- 1 Define system and its basic elements.
- 2 What do you mean by characteristics of the system?
- 3 FEEDBACK-CONTROL 'mechanism keeps the system in equilibrium'. Opine.
- 4 Differentiate between
 - 1) Deterministic & Probabilistic system
 - 2) Open & Closed system
- 5 CASE STUDY: Considering Star Hotel as a three star Hotel management system, Identify:
 - Subsystems
 - Interface
 - Input
 - Process
 - Output
 - Feedback control

1.11 SUGGESTED READING

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad

NOTES

NOTES	

CHAPTER 2

SOFTWARE DEVELOPMENT LIFE CYCLE

Objectives
Introduction
Figure SDLC
System Analysis
System Design
System Design Chart
Summary
Check your Progress - Answers
Questions for Self - Study
Suggested Readings

2.0 OBJECTIVES

Dear friends, after studying this chapter you will be able to

- explain system analysis & system design
- describe complete system development life cycle by elaborating both the phases with the help of three steps program for every phase, with figures, charts & graph diagrams make it easy to understand, how the development is taking place.

2.1 INTRODUCTION

Definition: System development life cycle (SDLC)

SDLC is well defined process by which the system can be conceived, developed & implemented. It can be performed in two stages. Each stage involves three steps. Two phases are 1.System Analysis 2.System Design



2.2 FIGURE SDLC SDLC

System analysis means identification, identification & critically examining the system & its parts(subsystem) for the purpose of achieving the goals(objective) set for the system as a whole, through modifications, changed interrelationships of components, deleting or merging & separating of components. It may involve upgrading of system as a whole.

System Analysis is important because

- 1. It helps to understand complex structures.
- 2. It specifies functional requirements of the subsystems to the total system.
- 3. It helps in understanding & comparing functional impacts of subsystem to the total system.
- 4. It provides inter-compatibility & unity of purpose of subsystems
- 5. Finally it helps in placing each subsystem in its proper perspective (place) so that system as a whole can effectively achieve the central objective with minimum resources.

System Analysis:

In order to analyze the system properly it is performed in three steps,

- I Problem identification
- I Feasibility study & cost benefit analysis
- III System requirement analysis

2.3.1 Problem identification:

Problem identification is the most difficult but important task in system analysis .Because, if the problem is not properly identified it may lead to wastage of time & energy in later stage. For problem identification the focus is on three aspects.

- 1. Source (cause) of the problem
- 2. Type of the problem
- 3. Nature of the problem

1.Source (cause) of the problem : The root cause of the problem may be internal or external. Sources listed in different environments

Internal Environment

External Environment

- 1) Company Management
- 2) Employs of different department
- 3) Internal auditors
- 4) Financial services

2. Types of the problem:

The normally encountered problems in the system are related to the

- I Reliability of the system.
- II Validity
- III Accuracy
- IV Economy
- V Timeliness
- VI Capacity
- VII Throughput
- I Reliability: This problem arises, if for the same procedures the system gives different results or it may not work properly all the time.
- I Validity: Reports show misleading information or results.
- III Accuracy: Reports display many errors.
- Iv Economy: The system is costly to maintain. Timeliness: Reports are late or queries are not answered in time.

- 1) Customer
- 2) Consultancy services
- 3) External auditors
- 4) Government policies

- v Capacity: Inadequate processing, transmission or storing capacity.
- VI Throughput: Exactly contradictory problem of capacity means more capacity is available but less work is being done, which affects the efficiency in other way.

3. Nature of problem :

Some questions must be posed to find out the exact nature of the problem such as,

- I What is the actual problem?
- I How complex it is?
- III What are the causes of the problem?
- IV What are the likely solutions?
- V Once the problem is solved what type of benefit is expected?

Answers to all these questions provide the exact nature of the problem. Once the exact nature of the problem with its cases & type is identified, the possible opportunities or solutions are checked and here the feasibility study starts.

2.3.2 Feasibility study

Feasibility study is useful to evaluate the cost & benefits of the system requested. There are three major aspects of feasibility study.

- I. Technical feasibility: It focuses on the existing computer hardware, software & personnel. The need of these three factors is verified & procurement or installation is done accordingly.
- **II. Economical feasibility:** It considers cost & benefit analysis of the proposed system. If the benefit overweighs the cost then only project is approved. The economic feasibility helps to find out development cost.

Development cost can be categorized under two heads.

- i) One time cost such as
 - Investigation or survey cost,
 - Cost of converting present system to new one
- ii) Recurring cost such as
 - Salaries of personnel,
 - Training of staff,
 - equipment maintenance

III. <u>Operational or Behavioral feasibility</u>: It considers the acceptability of the system. It checks pre & post implementation procedures & thereby tries to find out the troubleshooting areas of the system. If any business is to be computerized then proposed system requires efforts to

- i) Convince the user of the system for the acceptance
- ii) Educate the staff means to give knowledge of the system
- iii) Train the staff means to provide all the skill set for the required system.

2.3.3 Requirement Analysis

Requirement analysis is basically determination of requirements for new system. Determination of requirements means studying the existing system & collecting the details about it to find out the users requirement first. Requirement analysis can be done with the help of three activities,

- 1. Identification of basic requirements
- 2. Investigation of basic requirements
- 3. Specification of basic requirements
- 1. Identification of basic requirements: In order to identify the basic requirements it is necessary to find out how the system works & where the improvement is required. This can be done by imposing major questions such as
 - I What are the problems in existing system?
 - I What users expect from proposed system?
 - III What are the various process involved related with the problem?
 - Iv What data is used & produced during the process?
 - v Which controls are used currently?

2. Investigation of requirements : Requirement investigation uses fact finding methods

- such as
 - Interview
 - I Questionnaire
 - III Observations
 - Iv Record review

- v Brainstorming
- vl Desk research

These fact finding techniques are used for gathering information about the system. This activity is very important and documentation description of features of the system is also done for future analysis. Requirements are documented & presented using special tools like system flow charts, data flow diagrams and presentation graphics which in turn helps the designer to design the system.

3. Specification of requirements: Requirement specification is a deal between developer & end user. The data collected from end-user is not always sufficient. So it has to be analyzed to verify whether it meets the organization's demands or not. Sometimes user may specify additional features that should be included in new system. This process of requirement specification is done by identifying

- I Data used in various activities
- I Different controls needed in system
- III User's transactional requirements
- Iv User's decisional requirements
- v User's organization dependent requirements

This activity requirement specification can be well demonstrated with help of following case.

Case study: Material Procurement System



In Material Procurement System

- i. Data used is:- Sales forecast annual requirement, ordering cost, storing cost, lead time.
- ii. Controls required such as reorder level.
- iii. Transactional requirement:- Lead time
- iv. Decisional requirement-Some decisions are structured that is rule based, manageable and some decisions are unstructured that is not as per rule.

Decisions are taken by considering present or future situations. Important is right decisions should be taken at right time.

For example in material procurement system, if material reaches re-order level then purchase indent must be raised that is the structured decision which must be taken in appropriate time.

2.3.4 ADVANTAGES: System Analysis

- 1. It helps in setting proper system goals
- 2. Determines the boundary of the project by giving due consideration to the limitations of the available resources.
- 3. It focuses on the boundary and scope of the project undertaken.
- 4. Also checks limitations of available resources.

2.1 ,2.2 & 2.3 Check Your Progress			
A. Answer in one Line a. Define SDLC.			
b. Enlist the 2 phases of SDLC?			
c. Enlist the 3 major aspects of feasibility study?			
d. Define system analysis.			
B. Fill in the Blanks.			
 specification is a deal between developer & end user. Feasibility study is useful to evaluate the &of the system requested. 			
3 System Analysis is important because It helps to understand			
4 In order to analyze the system properly it is performed in three steps; Problem identification, Feasibility study & cost benefit analysis and			
5is useful to evaluate the cost & benefits of the system requested.			
6is basically determination of requirements for new system.			

2.4 SYSTEM DESIGN

System analysis defines 'What is to be done, and system Design defines 'How it is to be done' System design is the most challenging and creative phase of SDLC. System analysis is the fundamental process of the system development life cycle while design is the concluding phase of SDLC. System design processes through following three steps,

- System design specification and programming
- System testing ,implementation & follow-up
- System maintenance & Evaluation of the system.

2.4.1 System Design Specification

System design has to focus on four important aspects

- 1. Architecture design
- 2. Interface design
- 3. Database design
- 4. Program design

<u>1.Architecture design</u>: Architecture design focuses on the basic infrastructure hardware, software & networking infrastructures that the system will use.

<u>2.Interface design</u>: Interface design specifies how the user will move through the system. It means the navigation methods such as menu, forms, and reports.

<u>3.Database design</u>: The database & file design defines what data will be stored & where it will be stored.

<u>4.Program design</u>: Program design defines the programs that are required to be written & exactly what is program will do.

The collection of derivable such architecture design, interface design program design and file design is the system specification.

Program Specification: (Coding)

i.

Once the design is completed it must be translated into machine language. Proper choice of software is made on the basis of

I. Clearly outlined software specification provided by designer.

II. Need & cost of the software, availability of programmers.

The basic activities involved in this phase are

Checking of program specification

- ii Expanding (detailing) of specification.
- iii Breaking the system modules into smaller programs.
- iv Allocating these programs to the respective team members of the development team
- v Writing codes in selected software language.
- vi Documentation of each program.

2.4.2 Testing:

Basic objective of testing is to find the errors. Testing gives the guarantee that the software does not fail & it will run according to the specification and in the way the user expects it.

- 1. The basic activities involved in testing are Testing individual program, its logic and interfaces among the various programs.
- 2. Running on specific data so as to check quality of code and thereby establishes the standards.
- 3. To check accuracy of desired result.

Implementation :

Once the system is tested it is ready for implementation. Implementation includes following activities.

- I Planning the implementation schedule.
- I Procurement of hardware.
- III Installation of software.
- IV Recruitment of operating personnel.
- V Motivation and training to the personnel.
- VI Educating user through meetings & seminars.
- VII Conversion of data files from old one to new one.
- VIII After final change over gradually phasing out of the old system.

Follow-up:

There is need to have personnel to look after the system during operation and production which we call as follow-up.

2.4.3 Maintenance:

After new system has been Implemented problems and errors appear as no system can be considered as full proof. This requires system maintenance which is ongoing process. Normally hardware and software venders look after their products. Since documentation helps in maintenance, documents maintenance is the demanding task of system analyst. Maintenance 'tail end 'of the life cycle but it is the most expensive as it consumes energy, cost time in long run which can be made clear by the graph.



When system maintenance becomes more costly and time demanding it leads the urge (birth) of new system. Here SDLC gets completed.

Types of maintenance:

- 1. Corrective maintenance: It has to do with the diagnosis and the removal of residual errors in the system when it is delivered (means immediate problems till operational set up) as well as the intentionally introduced errors in software during maintenance.
- 2. Adaptive Maintenance: It is concerned with adjustment of the application with the environment .For example: newly introduced hardware or operating system.

3. Perfective maintenance: It involves changing the software to improve some of its qualities. For example: To add more features related to usability of software such as userfriendlyness etc.

Evaluation of the System:

Evaluation is done to estimate the weakness and strength of the system.

- I Development evaluation: This decides whether the system is developed on time and within the budget.
- I Technical evaluation: It includes assessment of development methods & tools.
- III Operational evaluation: It focuses on 1) response time for getting results, 2) ease to use, 3) reliability of process,4) adequacy of storage capacity 5) assessment of users attitudes.

2.5 SYSTEM DESIGN CHART

STEPS IN SYSTEM DESIGN:



2.4 And 2.5 Check your Progress

A. Fill in the Blanks.

a.specifies how the user will move through the system.

b.Basic objective of testing is to find the

c.defines how it is to be done.

e.System analysis defines 'What is to be done, and system Design defines

f. Thedefines what data will be stored & where it will be stored.

g.Basic objective of testing is to find the

h type of Maintenance is concerned with adjustment of the application with the environment .

B. Answer in one line.

a. Why testing is needed?

b. What is mean by Perfective maintenance?

c. Enlist the 4 important aspects of system design?

Comparative study of system analysis and system design can be done with the help of following points of distinction. System analysis:

System analysis:

- It is examination of the problem.
- It is concerned with identifying all constrains & influences.
- Analysis deals with data collection & evaluation of present system.
- Analysis portrays logical existence of the system data flow diagrams, entity relationship diagrams.

System design:

- It is creation of solution of the problem.
- It is concerned with procedures, their coordination& equipment utilization.
- It deals with design specification, coding testing & user acceptance.

• System design phase portrays physical existence of system through technical specifications & output displays by reports as a solution of the problem.

2.7 CHECK YOUR PROGRESS - ANSWERS

A. Answer in one Line

2.1, 2.2, and 2.3

- a. SDLC is well defined process by which the system can be conceived, developed & implemented.
- b. Two Phase are:
 - 1. System Analysis
 - 2. System Design
- c. 1. Technical feasibility
 - 2. Economical feasibility
 - 3. Operational or Behavioral feasibility

d. System Analysis Means Identification & Critically Examining The System & Its Parts(subsystem) For The Purpose Of Achieving The Goals(objective) Set For The System As A Whole, Through Modifications, Changed Interrelationships of Components, Deleting or Merging & Separating of Components.

B. Fill in the blanks

- 1. Requirement
- 2. Cost & benefits
- 3. complex structures
- 4. System requirement analysis
- 5. Feasibility study
- 6. Requirement analysis

2.4 and 2.5

A. Fill in the Blanks

- a. Interface design
- b. Errors.
- c. System Design

d.How it is to be done e.database & file design f.errors g.Adaptive

B. Answer in one Line

- a. Basic objective of testing is to find the errors. Testing gives the guarantee that the software does not fail & it will run according to the specification and in the way the user expects it.
- b. Perfective maintenance: It involves changing the software to improve some of its qualities. For example: To add more features related to usability of software such as user friendliness.
- c. Architecture design Database design Interface design Interface design Program design

2.8 QUESTIONS FOR SELF - STUDY

- 1. Draw and discuss various phases of SDLC.
- 2. Differentiate between system analysis & system designs.
- 3. Discuss various systems related to management levels.
- 4. Explain why & how system evaluation is done.

2.9 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad



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CHAPTER 3

Role of System Analyst

3.0	Objectives
3.1	Introduction
3.2	Multifunctional Role
3.3	Figure Illustrating Multifunctional Role
3.4	Multifunctional Role of System Analyst
3.5	Skill Set Required by an Analyst
3.6	Graphs for Skill Set
3.7	MIS Organization
3.8	Summary
3.9	Check Your Progress - Answers
3.10	Questions For Self - Study
3.11	Suggested Readings

3.0 OBJECTIVES

Dear friends after studying this chapter you will be able to

- describe the key person in the development of the system.
- explain important multifaceted role of system analyst in total system development
- state functional requirements of the system illustrated with charts & graph

3.1 INTRODUCTION

The system analysis is concerned with:

- 1. Investigating
- 2. Analyzing
- 3. Designing
- 4. Implementing
- 5. Evaluating information system in organizations.

The system analyst is the key person who is brain of the system development life cycle who acts as interface between user (client) and the organization. System analyst is not a mere programmer of the system but more like a manager who

- I. Determines the design of the overall system
- II. Obtains the necessary technical help from programmers, specialist and equipment engineers.
- III. Follows the system through design, implementation and evaluation.

3.2 MULTIFUNCTIONAL ROLE OF SYSTEM ANALYST

System analyst is a multitasking personality. He has to perform different roles at different stages of the system development. His task can be divided into five important areas of efforts where he has to do various roles.

1. Problem identification:

System analyst is the middle man between end user and the development team. So he has to communicate between the two ends as well as to understand customer's needs, identify the exact nature of the problem. Then he discusses it with the development team in order to have different solution alternatives.

2. Evaluation & synthesis:

After having various alternatives from the development team a good analyst should be able to evaluate the solution on the basis of cost, time and technology which is called as feasibility test.

3. Modeling:

Once a proper choice of the alternatives is done by end user a model or prototype is prepared by system analyst with the help of development .Good logical and analytical mind helps him to understand the information contents of the data, functional processing, and behavioral operations and control flow of the system in order to model the system.

4. Verification of the model:

The system analyst evaluates the length of the model with respect to cost & time required for the implementation of the system and these parameters are checked with the customer & then testing details are sent to the development team. Once the model is accepted by the user, the development team sends the tested system to the analyst for verification of the result.

5. Modification:

Then the system is sent to the user for acceptance. Many times it happens that at the beginning the user is not very clear about all of his needs. So after acceptance of the system when the user starts working on it he requests the analyst for the modifications. Here again the analyst has to evaluate the request on the scale of same parameters. Then the modification specifications are prepared and sent to the development team. Again the team works on the system and the modified & tested system is sent to the analyst for verification. And after having verified the modified system is finally delivered to the client.

Functions of system analyst

- · Collects the facts of the existing system,
- Analyses the collected information, basic methods and procedures of current system
- Determines and specifies the needs
- Designs the information system
- Prepares the model
- Modify redesigns, verifies and integrate according to required specifications.

Thus the main objective of a system analyst is to provide right type of information at right time in right quality and right quantity in right way and right cost to the management and the client.



3.3 FIGURE ILLUSTRATING MULTIFUNCTIONAL ROLE

3.1-3.3Check your Progress

1) The system analyst is the key person who is brain of the system development life cycle who acts as interface between user (client) and

- 2) System analyst is not a mere programmer of the system but more like.....
- β) System analyst is the middle man between end user and
- A good analyst should be able to evaluate the solution on the basis of cost, time and technology which is called as
- 5) The system analyst evaluates the length of the model with respect to cost & time required for the implementation of
- 6) The main objective of a system analyst is to provide right type of information at right time in right quality and

3.4 MULTIFACED ROLE

In order to perform all these tasks at every functional level of system development system analyst has to perform many roles such as

- 1. Architect
- 2. An agent of change
- 3. Investigator & motivator
- 4. organizer
- 5. Motivator & Psychologist

1. An architect:

An analyst is creator of physical design of the system as per user requirements. He formulates the abstract ideas of user into detailed format of the system which in turn helps the development team to build the end product. So he is the brilliant architect of the system.

2. An agent of change:

System analyst works towards the future which is uncertain. The only thing which is permanent is the change. So analyst has to prepare model in this changing environment. The strong hurdle is the resistance of the user. So system analyst has to secure user's acceptance through the participation from designing till implementation phase of the system. Since an analyst is responsible for bringing the change in system, he is an agent of the change.

3. Investigator & monitor:

An analyst should have fair capacity to investigate the problem. He should be able to go to the root cause of the problem. In other words he should have digging attitude to uncover the problematic trends that have direct impact on an organization.

Monitor: In order to complete the task the analyst must have leading capacity, technical skills and project management capacity so that, right from understanding the information contents of data till functional processing and behavioral operations, he can control the flow of the system and thereby <u>monitor</u> the system as a 'whole'.

4. An organizer:

Analyst should have clear idea of all the activities of the system rather he should be able to put all the activities in sequence & clear about their purpose and the consequences. He is responsible for execution of the activities and hence the result. He himself is an evaluator of the system.

5. Motivator & psychologist:

System acceptance is achieved through user participation right from the beginning that is from designing phase to implementation stage. This can be made possible by effective training & proper motivation to use the system.

Physiologist: Good motivator has to be good physiologist because he has to reach people, understand the client's environment, dig out the exact nature of the problem, and interpret it correctly to the developer team, asses the behavior draw the conclusion.

3.4 Check your Progress

- 1)is creator of physical design of the system as per user requirements.
- 2) Analyst is responsible for bringing the change in system, he is an agent of

3.5 SKILLS REQUIRED BY SYSTEM ANALYST

In order to fulfill the responsibilities an analyst must have

- 1. Abroad & flexible outlook.
- 2. An orderly mind
- 3. Disciplined approach & logical neatness
- 4. Ability to express thoughts, ideas & proposals clearly both orally & in writing.

The skill sets required by system analyst can be observed under two categories,

I. Interpersonal Skills II. Technical Skills

I Interpersonal Skills:

i Initiative & good communication skill

Since analyst has to gather maximum information in less time, he should have initiative attitude to ask detailed queries and should have good communication skill so as to interact with managerial level people as well as team members & end users.

ii Well understanding capacity:

Analyst should be able to identify the exact problem of customer and should have fair understanding of organization structure, system techniques. policies & control.

iii Teaching:

For providing perfect solutions of a problem an analyst must have ability to train the development team members. Also must be able to train users of the system to operate the system efficiently.

iv Motivation:

By active participation & moral building techniques analyst must motivate the users as well as development team members to give effective results.

II Technical Skills:

- i Creativity: Analyst must have ability to give innovative ideas in designing system, screen reports.
- ii Logical reasoning: Analyst must move forward towards the problem logically and should solve it using computer system .For that he should have fair knowledge of data processing, computer operations and programming languages.
- iii Project management: Analyst must be aware of various management techniques. He should design the system, develop the system with proper modification (such as by updating or deletion of existing subsystem or procedure) and thereby prepare planning and controlling policies and procedures, also should be able to implement the system within time limit.
- iv Computing: Analyst should have working knowledge of equipments used in the system. He should be conversant with the information regarding various computer systems available In market, their cost benefits versatility.
- Knowledge of fact finding methods: System analyst must be aware of fact finding methods and capable of proper use of them, to gather the required information from the customer.



3.5 - 3.6 Check Your Progress

- 1) Ability to express thoughts, ideas & proposals clearly both orally & in.....
- 2) Analyst should be able to identify the exact problem of customer and should have fair understanding of
- 3) By active participation & moral building techniques analyst must motivate the users as well as
- 4)must be aware of fact finding methods and capable of proper use of them, to gather the required information from the customer.

3.7 MIS ORGANIZATION

Organization implies structure and order of the system. It is an organized arrangement of the components that portrays

- 1.System-subsystem relationship 3.Specifies formal flow of communication
- 2.Defines authority structure
- 4.Formulizes the chain of command

This helps to achieve the centralized objective.

Type Of Information Required By MIS Organization



In MIS organization different types of information is required at different management levels .Information analysis clearly indicates that data and information are not same. Data is raw material for information system with which the system starts. The data entered is input for the system and information is processed data which is used to trigger certain action.

Types of information:

I Strategic information: Information needed for long range planning and directing the course the business should take is called as strategic information. The information required to take one of the following decision can be considered as strategic information. For example: Whether to work on small profit margin to expand sales or whether to open new branch or expand business by stocking new variety. This type of information is less structured also the volume of useful information for planning is small.

Il Tactical information: Such type of information is useful to take short range decisions to run the business efficiently.

For example: for fast and slow running items in business, the information for running the business is tactical when it is used to take decisions for stoking the items. Means whether more stock should be made for fast running items or discount should be given for slow moving items. Such information requires

Specially designed processing of data which can be easily collected from day to day routine.

• Volume of information (useful) that is tactical information is greater than strategic data.

III Operational information: It is required by day to day operations of organization. For example: i) List of customers for unpaid bills beyond due date would be used to send reminders for outstanding payments.

ii) same in case of stock of items in stores department. If it goes beyond below reorder level reminds to raise purchase indents. Such information is collected from clerical processing of data. Also the volume is greater than tactical information.

IV Statutory information: Information and reports which are required by law to be sent to government authorities are normally, clearly specified and required straight forward processing of data.

For example: Information regarding income tax returns.

3.7 Check your Progress

- 1) Information needed for long range planning and directing the course the business should take is called as
- type of information is useful to take short range decisions to run the business efficiently.
- 3).....is required by day to day operations of organization

3.8 SUMMARY

- An analyst has to perform multifunctional role in SDLC which in turn leads to multifaceted role of system analyst.
- In order to give best of performance in every role an analyst should have some important qualities.
- These qualities demand some inbuilt characteristics such as interpersonal characteristics and some are to be acquired such as technical skills and working knowledge of the system.
- One most important aspect which is last but obviously not least is analyst-user interface with reference to the role of system analyst in system development .Evaluation of systems for failure or success leads to the conclusion that there should be strong interaction, and participation of user at every phase of development, through meetings, seminars, telephonic or paper interaction, which will resolve the conflicts or misunderstanding issues that may lead to system failure.

3.1 , 3.2 , 3.3

- 1) the organization
- 2) a manager
- 3) the development team
- 4) feasibility test
- 5) the system
- 6) right quantity

3.4

- 1) An analyst
- 2) the change

3.5 3.6

- 1) writing
- 2) organization structure
- 3) development team members
- 4) System analyst

3.7

- 1) strategic information
- 2) Tactical information
- 3) Operational information

3.10 QUESTIONS FOR SELF - STUDY

- Q.1 What is the role of system analyst in SDLC?
- Q.2 What are the qualities and qualification expected of a system analyst?
- Q.3 Discuss the multifaceted role of system analyst.
- Q.4 Explain various types of information required at different levels of management in an organization.

3.11 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad



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4.0 OBJECTIVES

After studying this chapter you will be able to

- explain various types of software development models which provide different but unique approach to software development.
- describe functional orientation of software development models along with advantages and drawbacks.

4.1 INTRODUCTION

Software development is a layered technology which is based on its commitment to quality at bottom line. Software process is the way; the software is produced as a product. It uses tools and techniques to give high quality software product. Evolution of software development can be studied with the help of different software development models such as waterfall model, spiral model, prototyping and many more. Most of them are based on structured methodology such as SDLC and some are having totally different approach such as object oriented model. The interesting part of it is most of them work under the impact of feedback control mechanism while some have strong foundation of integration such as RAD.

4.2 WATERFALL MODEL

In waterfall model the process is structured as a cascade of phases, where the output of one phase is the input to the next one. Each phase in turn is structured as a set of activities that might be executed by different people concurrently. As waterfall model prescribes a sequential linear flow among phases, output each phase must be produced using standards. If output of any phase is wrong, it may affect the subsequent phases. Waterfall model is also useful to measure the progress of the project. Preliminary investigation

Figure representing waterfall model

- 1. Preliminary investigation: Preliminary investigation is done to find out the root cause of the problem for which the system is supposed to be developed.
- 2. Requirement analysis:- Requirement of both system and software is documented and reviewed with the customer.
- 3. System design; It is multistep process which focuses on attributes such as
 - Data structure

i.

- ii Software architecture
- iii Interface representation
- vi Procedural details



Fig: Waterfall Model

- 4] System coding: At this step the logical aspect of the design is converted into machine readable form. Special focus of this step is on logical internals.
- 5] System testing; This step of the waterfall model is to uncover the errors and ensure that the defined input can generate expected results.
- 6] Implementation: In implementation phase proper schedule of the following aspects is done and then it is implemented.
 - I Procurement of hardware
 - I Installation of software
 - III Recruitment of human ware
 - Iv Educating & Training the staff
 - v Conversion of data structure into required format
 - vI Finally operational implementation of the system.
- 7] Maintenance: Maintenance step of waterfall model takes care by implementing all types of maintenance of the system such as
 - I Corrective maintenance for removal of residual errors.
 - I Adaptive maintenance for hardware.
 - III Perfective maintenance to enhance the quality of the software.

4.1-4.2 Check your Progress

- 1) Inthe process is structured as a cascade of phases, where the output of one phase is the input to the next one
- 2) Waterfall model prescribes a sequential linear flow among phases, output each phase must be produced using
- At step the logical aspect of the design is converted into machine readable form
- 4) of waterfall model takes care by implementing all types of maintenance



4.3 SPIRAL MODEL

When development of the project starts, it may be possible that the work may be stopped due to any reason whatever hurdles are there in future work must be studied initially and steps must be taken to solve such problems. The spiral model is useful in such situations, which guides the risk in the project. Risks are concerned with future. The spiral model is useful for identifying and eliminating high risk problems by careful process design.

The model represented by spiral (cycle) contains four stages and each stage is represented by one quadrant of the Cartesian diagram. The radius of the spiral represents the cost incurred so far in the process. The four major activities are

- i) Planning;- In this stage identification of the objectives, alternatives and constraints of the portion of the product under consideration is done.
- ii) Risk Analysis:- The alternatives are evaluated and potential risks areas are identified and efforts are made to resolve the risks.
- iii) Engineering;- Development and verification of the next level product is done using the activities like prototyping or simulation.
- iv) Customer evaluation:- The customer evaluates the engineering work and makes suggestion for modification.

The spiral model is an evolutionary model having most realistic approach to the development of the large system. This model enables the developer to apply the prototyping approach & customer evaluation is done after that. So whatever the final product is made it is as per customer specifications.

4.3 Check your Progress

- 1) The model represented by spiral (cycle) containsstages and each stage is represented by one quadrant of the Cartesian diagram.
- is the system development methodology which enables the developer to construct a working model of the final system.

4.4 PROTOTYPING

Prototyping is the system development methodology which enables the developer to construct a working model of the final system. Prototype gives just the idea about the final system and it does not contain all the features or perform all the necessary functions.

Customer or user evaluates the prototype and they suggest, what is to be added or modified. Prototyping is an iterative process as it is revised to satisfy the needs of the customer until the satisfactory design is evolved.

Need of prototyping;- It is useful when

- The requirements are difficult to specify in advance.
- If there is possibility of changing the requirements significantly during the development.
- A totally novel system is proposed.
- 1] Requirement gathering & Refinement:- Both developer (system analyst & customer (user) work together and define the overall objectives for the software and identify the requirements to be satisfied.
- 2] Develop working model:- Developer and user jointly identify the data that are needed in the system and specify the output that the application must produce. Analyst estimates a prototyping cost and give idea to management about the expenditure that are incurred. Prototypes are prepared to represent input screens format and output formats.
- 3] Customer evaluation of prototype:- User works on prototype to evaluate its features and operations.
- 4] Review prototype:- The prototype is reviewed after getting information from user to check their likes and dislikes. Developer should understand the need of the customer properly for making modifications in the prototype.
- 5] Implementation:- The process is repeated till both the user and developer find that all the necessary features are fulfilled and there is no benefit in further repeating the steps. Once both are convinced then only prototype becomes ready for implementation.



BENEFITS OF PROTOTYPING:-

- Saves time in system development.
- Encourages the development team through ongoing communication with the user.
- Missing user services and nonuser friendly services may be identified.
- Helps to build the system as per customer's satisfaction and avoid wrong system delivery.
- If proper tools are used, low cost is required for development of prototype. This cost is affordable as compared to reworking when customer rejects the work.
- System can be delivered in time and delays are minimized.

4.4 Check your Progress

1)..... is the system development methodology which enables the developer to construct a working model of the final system

2)..... is an iterative process as it is revised to satisfy the needs of the customer until the satisfactory design is evolved

4.5 RAD

RAD: - RAPID APPLICATION DEVELOPMENT MODEL

The RAD model is proposed when requirements and solution can be modularized as independent system or software components each of which can be developed by different teams.



Once smaller modules are developed they are integrated to form the larger software system solution. Thus modularization can be on the basis of functionality, technology or can be on architectural basis. Since each module is distributed or handed over team wise .Each team works simultaneously for same development and obviously the time required for completion of the task/system is very short period.

RAD is also recommended when system components have been already developed by organization in context to other software system and these can be used again in new system with minor changes or sometimes with no modification.

Due to this reusability feature, again the time of system development is saved. So in both the ways system development takes place in very short period. That is why this model / approach is called as Rapid Application Development Model.

Object Oriented Modeling :Object oriented modeling is totally new approach of system development where the focus on the problem is by using models organized around real world concepts. Object oriented models are useful for understanding problems, communicating with application experts, modeling expertise's, preparing documents and designing programs and database. This is done by using object modeling technique (OMT) which extends from analysis through design to implementation. The fundamental construct is the object, which combines both the data structure and behavior in single entity. Object oriented models are prepared by adopting object oriented methodology which is based on OMT. The methodology has the following stages.

- Analysis:- Starting from statement of the problem, the analyst builds a model of the real world situation showing its important properties, but it does not have the implementation decisions.
- Design:- The system designer makes high level decisions about overall architecture. During system design the target system is organized into subsystems based on both the analysis structure and the proposed architecture.
- The object design: The object designer builds a design model based on the analysis model but continuing implementation details. The focus of object design is the data structures and algorithms needed to implement each class.
- Implementation:- The object classes and relationship developed during object design are finally translated into a programming language, database or implementation.

The OMT methodology uses three kinds of models to describe a system. The complete description of system requires all three models.

- Object model:- It describes the static structure of the objects in a system and their relationships. The object models are represented by object diagrams which are the graphs whose nodes are object classes and arcs are relationships among the classes.
- Dynamic model: It describes the aspects of the system that change over a time. It contains state diagram which is a graph whose nodes are states and the arcs are the transition between the states caused by events. These models are used to specify control aspects of the system.
- Functional model: This model describes the data value transformations within a system, It contains data flow diagram whose nodes are processes and arcs are data flows.

In object oriented modeling first an analysis model is built to abstract essential aspects of the application domain without regard for eventual implementation. This model contains objects found in the application domain, including a description of properties of the object and the behavior. Then design decisions are made and details are added to the models to describe and optimize the implementation. The application-domain objects form the framework of the design model, but they are implemented in terms of computer-domain objects. Finally the design model is implemented in a programming language, database or hardware.

4.5 & 4.6 Check your progress

A] Fill in the blanks

- 1) The is proposed when requirements and solution can be modularized as independent system or software components
- 2)is also recommended when system components have been already developed by organization in context to other software system
- 3) Object oriented models are prepared by adopting object oriented methodology which is based on
- 4) model describes the data value transformations within a system, It contains data flow diagram whose nodes are processes and arcs are data flows.
- B] Assign the following features of each of software development model with appropriate names given in bracket.

(Spiral model, Waterfall model, RAD, Object oriented, Prototyping)

- a. Model has cascade like structure of processes for software development.
- b. Continuous participation of user in every phase of development is expected.
- c. It represents working model of proposed system.
- d. This model prominently uses the integration feature of system development.
- e. This model uses OMT (object modeling techniques) for software development.

4.7 SUMMARY

Following are some summarized features for comparative study of the software development model. Models are compared on the basis of parameters such as

- Nature of requirement
- Customers interaction
- Risk level
- Technology
- Domain knowledge
- Focus

1] Waterfall model:

- Nature of requirement-Demands progressive introduction of functions and features
- Customer's interaction-On continuous basis for confirmation.
- Risk level-Medium
- Technology-Configuration management
- Domain knowledge-High
- Focus-Solution implementation strategy

2] Spiral model:

- Nature of requirement- Complex, customer specific.
- Customer interaction-Continuous to move together.
- Risk level- High
- Focus- Technology, customer satisfaction
- Technology-Integrated technology solution
- Domain knowledge- Very high

3] Prototype:

- Nature of requirement- Simple but needs testing on technology aspects
- Customer interaction-rigorous ,till prototype is approved.
- Risk level- Very low
- Technology- Proven
- Domain knowledge-Technological
- Focus-Prototype progress & solution.

4] RAD :

- Nature of requirement- Simple, can be divided into modules & then integrated
- Customer interaction-Only initially to confirm the scope
- Risk level-Low
- Technology-Team management skills

- Domain knowledge-Generally acquired by customer interaction.
- Focus-On architecture

4.8 CHECK YOUR PROGRESS - ANSWERS

4.1 & 4.2

- 1) waterfall model
- 2) standards
- 3) System coding
- 4) Maintenance step

4.3

- 1) four
- 2) Prototyping

4.4

- 1) Prototyping
- 2) Prototyping

4.5 4.6

- A] 1) RAD model
 2) RAD
 3) OMT
 4) Functional
 B] a = Waterfall model
 b = Spiral model
 c = Prototyping
 d = RAD
 - e = Object oriented model

4.9 QUESTIONS FOR SELF - STUDY

- 1] Draw and discuss spiral model for system development.
- 2] Explain how waterfall model works on feedback control mechanism with illustrative diagram.
- 3] "RAD represents strongly the integration feature of system development". Opinion.
- 4] Write short notes on:
 - a) Object oriented model
 - b) Prototyping.

4.10 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad
| NOTES |
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NOTES

CHAPTER 5

STRUCTURED SYSTEM ANALYSIS TOOLS AND TECHNIQUES

5.0	Objectives
5.1	Introduction
5.2	Fact Finding Tools & Techniques
5.3	Functional Decomposition Diagram (FDD)
5.4	Data Flow Diagram (Process Modeling)
5.5	E-R Model (Data Modelling)
5.6	Summary
5.7	Check Your Progress - Answers
5.8	Questions For Self - Study
5.9	Suggested Readings

5.0 OBJECTIVES

Dear friends, after studying this chapter, you will be able to

- describe & illustrate basic phases of software development.
- explain system concept, methodology and tools & techniques.
- discuss role of software development in structured system development.

5.1 INTRODUCTION

System analysis and design which are the basic phases of software development requires three sets of knowledge and skills

- System concepts and principles
- System methodology
- System tools and techniques

Till this chapter we have discussed and studied system concepts and principles essential for system development. But the concepts alone can not build the system. For the development of the software particular methodology is to be adopted and followed. A methodology consists of tools and techniques. The basic objective of this chapter is to discuss and illustrate these methodologies, tools and techniques and their role in structured system development.

Methodology – Methodology is nothing but the linking stone between the concepts and tools & techniques .It is an organized set of tools and techniques for development of system as per the systems requirement.

Tool- Tool is a device used to improve the performance of the task in development of system.

Technique- How to use and how to implement a particular tool in a particular situation is a technique. In order to have fair knowledge of the tools and techniques and methodologies in system development we are going to focus on main functioning areas such as,

1. Application system modeling-It involves

- Data modeling: Entity Relationship method
- I Process modeling; Data flow diagram

2. Database design method

- I Mapping ER model to arrive at the database design.
- II Normalization technique for database design.

3. System documentation technique

- Fact finding technique
- I Functional decomposition diagram(FDD)

In this chapter we will be discussing at least one tool of every technique.

4. Logic representation technique

- I Decision Trees
- I Decision Tables
- III Pseuodocode & Structured English.

5.1 Check your progress

1)is nothing but the linking stone between the concepts and tools & techniques.

2).....is a device used to improve the performance of the task in development of system.

5.2 FACT FINDING TOOLS AND TECHNIQUES

To study the system, facts are collected. Facts expressed in quantitative form can be termed as data. Success of any requirement investigation depends upon availability of accurate and reliable data. This depends on the appropriateness of the method chosen for data collection. The specific techniques used for collecting data are called as fact finding techniques. Following are some of the major fact finding techniques.

- 1. Interview
- 2. Questionnaire
- 3. Record review
- 4. Observation
- 5. Desk research
- 6. Brainstorming
- 7. Group Discussion

1. Interview:- This technique is used to collect information from individuals or from groups. It is an invaluable technique to gather qualitative information, opinions, policies, suggestions underlying problems etc.General rules for conducting an interview are

- I Obtain prior permission.
- I Prepare oneself as regards to objective and methods.
- III Put the interview at ease.
- IV Explain in advance about the subject of interview and don't try to cover too much ground in one interview.
- V Avoid arguments.

i) Steps In Interview

Set the stage for the interview

It is a platform to share the views, express opinions & clear the doubts. Therefore the system analyst has to exhibit excellent interpersonal skills to establish support with the user of proposed software solution. It heavily depends upon the support between them.

- Be a good listener, avoid arguments.
- Put the interviewee at ease- In order to make interview more meaningful and structured the objective must be set and it must be stated in one or two sentences. Setting the objective before the interviewee allows the system analyst to make sure that the discussion does not drift away on the other topics.
- Phrase questions clearly-The system analyst always must form the questions which are closed ended to get precise answers
- Evaluate the outcome of the interview- System analyst must be able to identify the problems through discussion with the help of tools like checklist, queries to the user well in advance to give him adequate time to think and provide correct answers This method is useful when system is complex or to keep the system analyst on right track.
- There are two types of interview 1} Structured and 2} Unstructured interview

Structured Interveiw Interveiw

Unstructrured

asked

Different type of questions

Not simple to administer

Possibility of unnecessary

No limit on interview period

Cost of preparation is less

Evaluation is lengthy

- Fixed type of questions are asked are
- 2) Simple to administer
- 3) Evaluation is more objective
- 4) Specific information is collected information
- 5) Interview period is short
- 6) Lot of study & preparation is required No such preparation is required
- 7) So cost of preparation is high

ii) Advantages:-

- Information collected is more accurate and reliable as interview can clear up the doubts.
- Helps to trace out areas of misunderstandings, unrealistic expectations and future problems of the proposed system.
- Underlying problems come to surface.
- On many occasions as the interviewee is not asked to commit in writing he offers many tips which are difficult to obtain in normal process.

iii) Disadvantages:-

- This method is time consuming
- It is very costly if the number of respondents is large and widely distributed.

2. Questionnaire:-

At times the system analyst and the user of the proposed systems are geographically separated from each other. It is not always possible to arrange personal interview with all the users. At times the number of users may be large making it impractical for the system analyst to interview each user. In such cases the system analyst makes use of questionnaire. The questionnaire designing has a direct impact on the quality and quantity of information that is collected. There are two types of questions that can be framed in questionnaire.

- I. Open ended question:-These are used to learn about opinions and feelings and general experience about the problem. and
- II. Closed ended questions contain specific questions and responses from which respondent has to choose the best one.

Closed ended questions have fixed responses such as

- i) Dictomous [yes /no type]
- ii) Ranking scale {according to order}
- iii) Rating scale

While constructing questionnaire following aspects should be well considered

- Question contents
- Question wording
- Question format
- Procedure of construction

Finally editing of questionnaire must be done before administration to ensure technical defects that reflects personal values. Questionnaire is useful for

- Gathering numerical data
- Getting relatively simple opinion from a large number of people
- Obtaining collective opinion
- Useful to get feedback in post implementation audit
- This method is useful when respondent are widely spread and are in

large number.

3. Record Review:-The main principle is to believe in records than in people. An existing system can be better understood by examining existing documents, forms and files.

This is used as a tool for post implementation procedure. Record review may include

- I Written policy manuals
- I Rules and regulations
- III Standard operating procedures used in organization
- IV Forms and documents

While analyzing the forms following aspects should be well considered.

- i Users of the forms
- ii Information included in the forms
- iii It should be readable and easy to follow.
- iv It should be ideal for inference.

4. Observation:-

Т

The analyst role should be strictly to obtain information as a detached observer. He can observe people procedure objects, documents and occurrences of events. Onsite observation provides close view of working of real system. Observation can bring in missed facts, new ways to improve the existing procedures, duplicate work done etc.lt is useful in order to trace out

- Operational inefficiencies
 - I Alternate rules and procedures
 - III Interruption in normal flow of work
 - IV The usage of files and documents
 - V Informal communication channels.

5. Desk Research:-

It is a research or study carried out by the system analyst at his open desk. The input for this tool are the procedures, formats, guidelines and documents that provide the work methods. It is often used as a tool to confirm the input and output formats and data elements to be included in the data structure It may be used as a tool between two interviews. Information gathered in first interview is analyzed, studied and questions and queries are noted through desk research. These are used as an input for subsequent interviews in which doubts can be clarified and answers to questions can be sought. This is used as tool for pre- implementation procedures.

6. Brainstorming:-It is a technique used for generating new ideas, and obtaining general information requirements. This method is appropriate for finding non conventional solution to problems. A guided approach to brainstorming asks each participant to define ideal solution and then selects the best feasible one. It works well for users who have system knowledge but have difficulty accepting new ideas.

7. Group Discussion:- Group discussion asks participants for their expectations regarding specific variables. According to Delphi technique each participants fills out a questionnaire. The results are summarized and fed back to the participants. This debate by questionnaire continues until participant responses have converged enough. This method has a advantage over brainstorming, as participants are not subjected to psychological pressure from others with presumed authority or influences.

5.2 Check your Progress

- 1) expressed in quantitative form can be termed as data.
- 2) The specific techniques used for collecting data are called as
- Open ended question are used to learn about opinions and feelings and general experience about

5.3 FUNCTIONAL DECOMPOSITION DIAGRAM (FDD)

Functional decomposition diagram {FDD} is an analytical tool used to represent the various functions of the system and its decomposition up to the lowest level/function. It is diagrammatic representation in hierarchal format of the system. Each function is numbered using level numbering convention. Diagrammatically it has inverted tree like structure.



5.3 Check your Progress

1) Functional decomposition diagram {FDD} is an analytical tool used to represent the various functions of

2)is decomposition of system up to the lowest level/function

5.4 DATA FLOW DIAGRAM (DFD)

Data flow diagram represents flow of data through system.

- 1. DFD is a graphic tool which defines input, output and processes of the system.
- 2. It helps analyst to explain his understanding of the system to user.

5.4.1 Symbols used:- Different symbols represent different system elements. But use of symbol associated with each element depends upon which approach is used. There two types of popular symbol ling styles.

5.4.2 Rules For Constructing Data Flow Diagrams

- 1. Procedures should be named and numbered for easy reference.
- 2. Process should be numbered if exploded into lower level.
- 3. Names of data sources, destination & stores should be in capital letters.
- 4. Process and data flow names should have first letter capital.
- 5. The direction of flow is from left to right and top to bottom. Traditional flow of data is
- from source (upper left corner) to the destination (lower right corner)

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5.4.3 Guide lines for drawing context level (0th level diagram)

- a) It contains and represents single process and determines the boundary of the system.
- b) Name of the process usually represents the name of the system.
- c) All entities are shown at context level and should remain the same (even the name)through all the level.

5.4.4 do's and dont's in data flow diagram:

- Dataflow should reflect the data not the documents on which it resides
- Process name should fully describe the action taking place and should be able to explain inflows & out flows of the data.
- Avoid usage of vague names to the activity such as Review, Handle.
- Assign unique process names to the activity.
- Data stores should represent logical names indicating what kind of data is stored.
- Don't assign program specific names like STUDENT.DBF to document names.
- No new entity or data store at any level which does not papers at a level previous to that level.
- No data flow should cross over through all the levels in the DFD.
- 5.4.5 Important guide lines for data stores and entities:
 - Data stores mainly are of two types
 - 1} Master
 - 2} Transaction.
 - Data store should have only related data stored in them.
- All data stores appearing at the first level should also appear at lower levels.
- Entities which get repeated right from context level to the lower levels are shown by



• Data stores which are used to access stored data more than once are shown by

- Data flows going onto a process and coming out of a process should have different names
- For example Verify student's details

Students -- mast student details verified student's details



Case Study:

Draw context level, first level for following system. A star company procures the material against the requisition received from stores. Purchase department prepares a purchase order and sends a copy of it to stores for ready reference. Stores department receives the material from the vendor and prepares GRN [goods receipt note]. Stores department updates the stock of the items for the accepted quantity mentioned in GRN.

Solution : Context Level Dfd



First Lvel Dfd For Purchase Order System



5.4 Check your Progress

- 1)is a graphic tool which defines input , output and processes of the system.
- 2) The direction of flow is from left to right and top to
-should represent logical names indicating what kind of data is stored.

E-R Model means entity relationship model represents conceptual way of data modeling. For every business system conceptual modeling is the intermediate phase that leads to physical data base design. First step of conceptual data modeling is semantic analysis which focuses on entities and their relationships. Some important basic concepts for drawing E-Diagrams are as follows.

- 1. Entity: An entity is an object that has its own unique identity.
- For example: Any car, book, person, dream.[Important: Entity can be concrete or abstract.]
- 2. Attribute: An attribute is an aspect, characteristic or quality of either an entity or relationship.

For example: color, size shape of a car can be the attributes.

- 3. Relationship: A relationship is a meaningful association, linkage or connection between entities.
- Entity set: Entity set is a set of entities of same kind.
 For example: Accounts holder of same bank can form an entity set.
- 5. Relationship set: A relationship set is collection of relations of same type.

5.5.1 Symbols of E-R diagram:



Technically if a relationship set contains a primary key it is called a strong entity set otherwise it is called weak entity set. An entity may appear in

- I One- one relationship
- II One many relationship
- III Many many relationship (m-n)

1] One- one relationship: (1:1) For a given occurrence of an entity there is exactly one occurrence of another entity.

Identified by

For example: - Any one employee of an organization is identified by identity card.



2] One - many relationships: (1: M) For a given (value) occurrence of any entity there can be more than one (value) occurrences of another entity.



3] Many to many relationship: (m:n) There can be multiple occurrences of both the entities that are being related

For example: Subjects opted by students for a particular course.



5.6 SUMMARY

In this chapter though the intention was to focus on all types of tools and techniques required for system development the main considerations given to system application modeling and especially the documentation techniques.

So for in system application modeling mainly two types of techniques are well discussed and illustrated

1) Process modeling-Data flow diagrams and

2) Data modeling-Entity relationship diagram

Explanation and demonstration of system documentation techniques is done with the help of two documentation tools, such as

1] Fact finding method used as investigation tool and

2] Functional decomposition diagram.

5.7 CHECK YOUR PROGRESS - ANSWERS

5.1

- 1) Methodology
- 2) Tool
 - 5.2
- 1)Facts
- 2) fact finding techniques
- 3) the problem

5.3

- 1) the system
- 2) FDD

5.4

- 1) DFD
- 2) bottom
- 3) Data stores

5.5

- 1) data modeling
- 2) An entity
- 3) A relationship
- 4) A diamond

5.8 QUESTIONS FOR SELF - STUDY

- 1] Draw context level diagram for railway ticket reservation system.
- 2] Consider BCA course as a system and draw first level data flow diagram for the system.
- 3] Identify entities and establish proper relationship among them for the library system of your college.
- 4] Describe the suitable approach to collect the user's requirements When users are not in a position to interact properly with the analyst.

5.9 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad



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CHAPTERS 6

DATABASE DESIGN METHODS

-		
	6.0	Objectives
	6.1	Introduction
	6.2	E-R Model
	6.3	Entity Model
	6.4	Conversion of E-R Diagram To E-R Data Model
+	6.5	What Is Normalization
	6.6	Why Is Normalization
	6.7	Levels of Normalization
	6.8	Summary
	6.9	Check Your Progress - Answers
	6.10	Questions For Self - Study
	6.11	Suggested Readings

6.0 OBJECTIVES

Dear friends, after studying this chapter you will be able to

- Describe the proper methods of designing the database
- explain conversion of E-R Diagram to E-R Data model
- explain Conversion of E-R Diagram to E-R data Model
- explain normalization : The way of filtration of huge data to organize it in required format in data tables

6.1 INTRODUCTION

For any organization a bit complex and challenging task is to analyze and organize the data in required format which becomes database design for the system. It requires technical database design methods such as Entity modeling method and Normalization which helps to put every datum of data structure in its perspective and provides neat and well defined & designed database.

Entity:-Everything that is having individual existence which can be recognized by its characteristics is called as entity. Characteristics or properties of an entity represent its attributes.

6.2 E-R Model

Rules For E-R Model:

- Every entity must be represented in the model.
- Every entity must have at least one relationship{1-1,1-m,m-n}
- Every entity must have a unique identifier.
- Many to many relationships are to be avoided.
- Entity models are logical, not physical; they represent logical groups of data called entities and the relationships between the entities.
- The technique complements data flow diagram.
- Note that many to many relationships can be split as N-1 &1-M relationships.

Illustrative Case For E-R Model:

Draw E-R diagram for the computer course conducted for the students which involves some compulsory subjects and some optional subjects. Students refer different books for studying those subjects.



- 1] Each entity is mapped into a table. The name of the entity becomes the name of the table.
- 2] The attributes of the entity becomes the fields of the table.
- 3] The key attribute of the entity becomes the primary key of the table.
- 4] The table which is mapped from the weak entity will have the key attribute of weak entity and also have the key attribute of the strong entity on what it depends. This attribute is known as foreign key.
- 5] In case of 1: m relationship the entity having the 'm' relationship borrows the key attribute from the '1' relationship. In illustrative case:
- 1] Course table {strong entity}: course no (pk), course -nm, add, uni-nm, sub-cont, students-
- 2] Student table {weak entity}: stu-id (Pk), stu-nm, stu-add, ph-no, course-no (fk), subno.
- 3] Subject table: sub-cd (pk), sub-nm, cors-cd, book-pres-no, stu-id (fk).
- 4] Book table: Book-no (pk), book-nm, sub-cd (fk).

6.1 & 6.2 Check Your Progress

- 1) is the way of filtration of huge data to organize it in required format in data tables.
- 2) Everything that is having individual existence which can be recognized by its characteristics is called as
- 3) Entity models arenot physical; they represent logical groups of data called entities and the relationships between the entities
- 4) Each entity is mapped into a table. The name of the entity becomes the name of



6.3 ENTITY MODEL

6.4 CONVERSION OF E-R DIAGRAM TO E-R DATA MODEL

To convert E-R diagram to setoff relationship (E-R data model) we replace each set in E-R diagram by a table. Thus each entity set and each relationship set becomes a table or relation, the name of the set becomes the name of the table and the attributes of the set become the table columns.

COURSE TABLE

Course-no	Course-nm	Uni-nm	Sub-no	Stu-no

SUBJECT TABLE

SUB-NO	Course-no	Sub-nm	Stu-no	Book-pre-no

STUDENT TABLE

STU-NO	Course-no	Sub-nm	add	Sub-no

BOOK TABLE

Book-pre-no	book-nm	Sub-no	Course-no

6.3, 6.4 Check your Progress

1) To convert E-R diagram to set of relationship (E-R data model) we replace each set in E-R diagram by

2) the name of the set becomes the name of the table and the attributes of the set become

6.5 WHAT IS NORMALIZATION?

Normalization is the decomposition of complex data structures into 'flat files' called relations. Decomposition refers to the breaking down of one table into multiple tables. The main difference between decomposition and normalization is that decomposition can not be used for redundancy if it leads loss of information. If we are not able to take back the data in original forms means there is loss of information from original database design.

Normalization is not very different from decomposition. The only difference between the two is that decomposition is not abide by any formal rules, where as normalization does .When we apply a normalization rile the database design takes the next original form called the normal form.

6.5 Check Your Progress

- 1) is the decomposition of complex data structures into 'flat files' called relations.
- 2) refers to the breaking down of one table into multiple tables.
- 3) When we apply a normalization rule; the database design takes the next original form called

6.6 WHY IS NORMALIZATION NECESSARY?

Following Normalization is necessary to structure the data for following reasons

- 1. Data structure should be easily understood by user.
- 2. New data items, records and associations can be added to the data structure without changing the existing structure.
- 3. It provides maximum flexibility to different levels of users to handle the queries.
- 4. To provide maximum flexibility and ease for data maintenance.

6.6 Check Your Progress

- 1) New data items, records and associations can be added towithout changing the existing structure
- 2) Data structure should be easily understood by

6.7 LEVELS OF NORMALIZATION

We are going to focus mainly three levels of normalization:

- 1. 1NF: First normal form It is data structure without internal repeating groups.
- 2. 2NF: Second normal form- It is data structure in which all non key elements are fully and functionally dependent on the primary key.
- 3. 3NF: Third normal form- Third normal form eliminates transitive dependencies. That is the dependencies of some non key elements on other non key elements.

Illustrative Case study: Consider a case where a order is placed by a customer for some items. Order is fulfilled and on the basis of rate & quantity bill is generated. Now for this case the data in raw state that is in un -normalized form is as follows: Ord-no,ord-dt,cust-no,cust-nm,cust-add,item-no,item-nm,rate,qty,amt,ph-no,fax.

1] 1NF:- In first normal form we eliminate repeating data groups, means redundancy is eliminated.

Order table

Ord-no	Ord-dt	Cust-no	Cust-nm	Cust-add	fax

Item table

ltem-no	ltem-nm	rate	qty	am

This is the case of decomposition of data where we loose the data due to lack of integrity, since there is no commonality between two tables. So we can add another column to second table so that item sold can be linked up with particular order. Thus referential integrity relationship is achieved .In simple words adding the joining column to another table means foreign key. SO modified table structure is as follows



2] 2NF: In second normal form, we move all columns to another table that do not fully and functionally depend on primary key. So now the data in 2NF form is as follows

Order table	order-item table	item table
Ord-no ĸ	item-no 🗲 🗕 🗕	item-no
Ord-dt	qty	item-nm
Cust-no	amt	rate
Cust-add	ord-no	

Fax

3) 3NF: For 3NF transitive dependencies are eliminated. To find out the non key elements depending upon some other no key elements, extract the elements which can be directly calculated. In this case we can get rid of the field amt which can be calculated with the help of rate and quantity. So the data structure in 3 NF Form is

Order table	order-item table	item table	customer table	
a .				
Ord-no -	♦ ord-no	🖈 item-no	cust-no	
Curet me	itom no t	itom and	a vation	
Cust-no	item-no 🥿	item-nm	cust-nm	
Ord_dt	Otv	rate	cust_add	
Ulu-ul	Qiy	Tale	Cust-auu	

Order Table

Order-item table

Item table

Ord-no	ltem-no	qty

Ord-no Cust-no Ord-dt

Customer table

ltem-no	Item-nm	rate

Cust-no	Cust-nm	Cust-add

	6.7 Check Your Progress
A] Fill in the blanks	-
1) 2)	is data structure without internal repeating groups. eliminates transitive dependencies.
B] Answer the follow	ving in one sentences
a. Define 'Entity,' and '	Attribute'.

. ...

b. Explain various types of relationships among the entities.
c. What is normalization?

6.8 SUMMARY

Following diagram summarizes the flow from conceptual model to physical database model.



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Analysis of system data is one of the important aspects of business environment. However any real business system must start with description of entities which interact with each other and thereby establish the relationships. Entity relationship is one of the conceptual modeling methods which involve two levels 1] first level is semantic level which represents major entities of the system along with their relationships. 2] Second level represents normalized model which removes the redundancies to arrive at basic data structure that leads finally to physical database design.

6.9 CHECK YOUR PROGRESS-ANSWERS

6.1 and 6.2

- 1) Normalization
- entity
- 3) logical
- 4) the table

6.3 & 6.4

- 1) a table
- 2) the table columns

6.5

- 1) Normalization
- 2) Decomposition
- 3) the normal form

6.6

- 1) the data structure
- 2) user

6.7

- 1) First normal form
- 2) Third normal form
- 1. Everything is having its individual, existence recognized by its characteristics is called entity, Properties of entities represent its attributes.
- 2. There are 3 relationships (1-1, 1-m,m-1)M-N relation is split as V-1 & 1-m , In 1-m., m relation bowrrows keyattributes from relation.
- 3. It is decomposition of complex data structures in to flat files called relations. breaking down of 1 table into many tables.

6.10 QUESTIONS FOR SELF- STUDY

CASE STUDY: For your college admission procedure

- 1) Identify entities and establish their relationships, draw E-R diagram for the same.
- convert the E-R diagram into Entity model to generate the data and normalize the data.

6.11 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad

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NOTES

CHAPTER 7

LOGIC REPRESENTATION TECHNIQUE

7.0	Objectives
7.1	Introduction
7.2	Decision Table
7.3	Decision Table Type-1
7.4	Decision Table Type-2
7.5	Decision Table Type-3
7.6	Decision Tree
7.7	Structured English
7.8	Summary
7.9	Check Your Progress - Answers
7.10	Questions For Self - Study
7.11	Suggested Readings

7.0 OBJECTIVES

Dear friends, after studying this chapter you will be able to

- Explain various types of decision tables
- Describe decision tree structured english

7.1 INTRODUCTION

Whenever a system analyst or programmer is required to take a logical decision for the case where there are repetitive situations, then they take the help of the tools like decision table and/or decision tree that leads or concludes to the appropriate solution for the particular situation.

7.2 DECISION TABLE

In order to find out solution of a problem which demands logical decision for the situation this involves various conditions and possible actions can be represented in form of table, called as decision table. Physical layout of decision table is as follows.

Header (H)	Ruler R (Identifiers)			
Condition Statements (CS)	Conditions Entry Stub (CE)			
Action Statements (AS)	Action Entry (AE)			

CASE 1: Consider a case of a bank which grants loan to the customer under the following conditions

- 1] If a customer has an account with the bank and has no previous loan outstanding, the loan will be granted.
- 2] If a customer has an account with the bank but some amount is outstanding from previous loans then new proposal's loan will be granted if special management approval is there.

3] In all other situations loan applications are rejected.

Draw decision table and decision tree for the same.

Decision table: 1} List of conditions:

- Customer has an account.
- Customer had no dues.
- Customer has management approval.

2} Action list:

Grant loans.

Reject loans.

Н	Decision table for discount		R1	R2	R3	R4
	C1:	Customer has an account	Y	Y	Y	Ν
CS	C2:	Customer has no dues	Y	Ν	N	
	C3:	Customer has management	Y	Y	N	
		Approval				
4.0	A1:	Grant loans	\checkmark	~		
AS	A2:	Reject loans			~	~

This case is solved by limited entry decision table.

7.3 DECISION TABLE TYPE 1

Limited Entry Decision Table

This type of decision table expects 'YES ' or 'NO' answer for the condition statements as well as action statements are marked by symbols representing write or wrong.

Case 2: The discount policy of a manufacturer producing two products

1. Mechanical typewriter and

2. Electronic typewriter and who has three types of customers(R) Retailers,(D) Dealers,(I) institutes is given below.

Rules: Incase of mechanical typewriter

- 1] If the order is from retailer for amount up to Rs.5000/, allow 6% discount.
- 2] If the order is from Dealer for amount up to Rs. 5000/7.5 discount is given.
- 3] On retail order exceeding Rs. 5000/- 7.5 % discount is given.
- 4] If the order is from Dealer for an amount exceeding Rs.5000/-,11% discount is allowed.
- 5] In all the above cases flat discount of 7.5% is given to institutes.
- 6] In case of electronic typewriter a flat discount of 6% is given regardless of amount or customer.

LIMITED ENTRY DECISION TABLE FOR DISCOUNT POLICY FOR CASE 2

Decision table for discount policy	R1	R2	R3	R4	R5	R6
C1: Product = 1	Y	Y	Y	Y	Y	N
C2: Customer = R	Y		Y			
C3: Customer = D		Y		Y		
C4: Customer = I					Y	
C5: Order amt< = 5000?	Y	Y	Ν	Ν		
A1: Discount =6%	х					х
A2: Discount = 7.5%		х	х		х	
A3: Discount = 11 %				х		

7.4 DECISION TABLE TYPE 2

Extended Entry Decision Table

In such type of decision table the statements made in stub portion are incomplete. Both the stub and entry portion of any particular row in the table must be considered together to decide if a condition or action is relevant to a given rule. An extended entry is either descriptive or quantified.

Now we will solve case number 2 by extended entry decision table method. **Extended Entry Decision Table For Case 2:-**

Decision table for discount policy	R1	R2	R3	R4	R5	R6
C1: Product code	1	1	1	1	1	2
C2: Customer code	R	D	R	D	I	
C3: Order amount	<=5000	<=5000	>5000	>5000		
Discount	6%	7.5%	7.5%	11%	7.5%	6%

Note: R=Retailer, D=Dealer, I-Institute.

7.5 DECISION TABLE TYPE 3

MIXED ENTRY DECISION TABLE

Decision table for discount policy	R1	R2	R3	R4	R5	R6
C1: Product code	Y	Y	Y	Y	Y	Ν
C2: Customer code	R	D	R	D	I	
C3: Order amount<= 5000?	Y	Y	N	N		
Discount	6%	7.5%	7.5%	11%	7.5%	6%

Note: D=Dealer R=Retailer, I=Institute

Limited entry format and extended entry format can both be used in a single table for individual conditions and actions, where a table contain both types of formats is called as mixed entry decision table.

Mixed Entry Decision Table For Case 2:

7.1 -7.3, 7.5 Check your Progress

1) The basic objective of drawing decision table or decision tree is to provide substitute or supplement the flow chart to arrive at perfect logical solution of

- 2) is graphical representation of decision tables.
- 3) and decision trees are the means of expressing process logic.

7.6 DECISION TREE

Decision tress is graphical representation of decision tables. Actually decision tables and decision trees are the means of expressing process logic. This tool is used especially when number of alternatives is less. Starting point of the decision sequence is the root of the tree which is shown at left hand side. The conditions and actions are represented sequentially, where the branches represent conditions and action for each relationship is given at the end of the branch.



7.6 Check your Progress

A] Fill in the blanks.

B] Draw decision tree for case number 1

7.7 STRUCTURED ENGLISH

It is a specification tool that provides simple English statements embedded in the construct of structured programming. It consists of

1. English verbs 2. Terms from DD 3. Reserved words to denote logic. Statements are written in structured way.

- I. Sequence structure-Closed ended sequences.
- II. Iteration structure-which has closed ended repetitions.
- III. Decision structure-contains closed ended decisions.

While using structured English no particular format or symbol is followed or used. Only the analyst has to focus on conditions and actions. Advantages: -

i. It is used to describe conditions and actions clearly.

- ii. Programming becomes easier if the processing logic is already explained using structured English.
- iii. Since it helps to define any process in DFD and useful for reference to DD, it can complement DFD and DD.

iv. It also helps to communicate business requirements effectively to computer programs. **Example :**

Consider a situation, where a student comes to return a book and it is cheeked for overdue/fine.

Duration= current date- book issue date.

If duration is less than 8 day

Fine amt=0

Else if duration is more than 8 days and less than 16 days then

Fine amt= Rs 10

Else if duration is more than 16 days

And less than 60 days hen

Fine amt=50 Rs

Else fine amt =Rs 100

End if.

7.8 SUMMARY

Decision tool is a useful mean to apply to the situation where you are bound to take proper decision due to various situations emerged out of numerous conditions and relevant action plans that those are appropriate for the set of rules.

ADVANTAGES:

- 1. Decision table is powerful tool of documentation that can be easily prepared, changed or updated.
- 2. DT is summarized form to represent standard and structured decisions.
- 3. It is a powerful mean of communication for the team working on project.
- 4. It can give relief up to certain extent to management from routine decision making procedure.



7.6

A] 1) Reserved words2) Iteration structure

B] DECISION TREE DRAWN FOR CASE NUMBER NO 1



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	CHAPTER 8
JSER I	NTERFACE DESIGN
8.0	Objectives
8.1	Introduction
8.2	Input Design
8.3	Output Design
8.4	Form Design
8.5	Summary
8.6	Check Your Progress - Answers
8.7	Questions For Self - Study
8.8	Suggested Readings

8.0 OBJECTIVES

Dear friends, after studying this chapter you will be able to

- describe the importance of user interface from the point of view of user.
- explain input design, output design and form design with given guidelines

8.1 INTRODUCTION

The user interface is the most important part of the system to the user as it is the only part which the user can see and interact with the system. So design of user interface should be not only informative to the user but along with that it should be appealing, user friendly and attractive. The steps for designing the interfaces are

- Make the summary of the interfaces to be required for the system.
- Identify the human computer operational boundary in the data flow {means what to input as data and what to be computed by the computer}.
- Interface wise get the review of the data elements to be included in each screen, form document or report.

User interface design (UID) must take into account the needs, experience and capabilities of system's users.(physical and mental limitations of the human being who uses the computer system. The most important need is to recognize the short term memory and avoiding overloading the user with information. Some of the design principles which should be embedded in any user interface design are

- 1. Consistency:- The design should work uniformly in all parts of the system. This allows user to learn something once and apply that knowledge again and again. For example: windows interface.
- 2. **Robustness:-** The interface should not fail, because of some actions taken by the user or by a user's errors. This requires check that prevents users from making incorrect entries.
- **3.** Aesthetic integrity:- Design should not have loud graphics, dark backgrounds which can interrupt the user rater than helping.
- 4. Usability:- Effectiveness and efficiency are the best ways to evaluate the interfaces. For example: input must be well laid- out so that fewer keystrokes can bring desired result, names must be precised, abbreviations must not lead to confusions.
- 5. Visual effects for the interfaces:- Means documents on the screen must look in the same way they will look even when they are printed. E.g. when we want bold fonts we can see it on screen and get it in the same way when we print.
- 6. Provide immediate feedback: Invalid message is displayed for wrong entry number.
- 7. Make interface forgiving:- Means user's action should be easily reversed if we make a mistake we should be able to come back to initial position without causing any damage. This helps the user to learn by trials and error.
- 8. Avoid modes:- Means whenever user is in mode the user interface should make it obvious by providing good visual cues. E.g. in cut and paste mode that operation should be highlighted and at the same time all other modes are avoided i.e. other options become faint to show or express that it cannot be activated.

To get the data into the computer an analyst has to design the form, design the input record and design methods for getting the data into the computer. The computer accepts the data which is in machine sensible form. If it is not it has to be brought in that form. **8.2.1 Input consists of data and instructions.** So input design involves data capturing and data validation. Following are the important aspects of input design.

- Data collection: The process of getting the data to the computer for processing is called as data collection.
- Data capture: The objective of data capturing is to reduce the volume of input up to the extent possible and to minimize manual efforts. It involves
- Recording of data: It is collection of data at its source means preparation of source documents by applying manual checks.
- Data transmission: If main processor has many terminals, the transfer of data from a particular terminal to the main can be considered as data transmission.
- Data preparation: The transcription of source document on to an input media is referred as data preparation.
- Sorting; Sorting is the process of arranging the data into some desired format or sequence.
- Data validation: The objective of data validations to detect errors at the earliest possible stage of system development. It can be done up to certain extent by manual verification in data capturing stage. In spite of this, still there may be incorrect batches of input data, missing data or redundancy of data. So it is necessary that before the data is first input to the computer for processing different checks are carried out. These checks classify valid and invalid data.
- Data entry: Is the process of translating the source document into machine readable format.
- Data input: It comes to the computer only after the data has been entered into one of the machine readable format.
- 8.2.2 Validation checks: Various validation checks applied to data are:

1. Field checks:

- Limit check-It ensures that every data item of record lies within predefined size.
 - Picture check-lt detects entry of incorrect characters in the field.
 - I Valid code check-It is used to validate input against predefined transaction code.
- 2. Transaction checks:
 - Sequence check-It is used to detect missing transaction.
 - I Combination check-Can be applied to various fields of a file
 - especially to cross check the values.
 - III Password check- To detect unauthorized entry of data.or

In input design screens and forms are the main aspects of focus. Forms are the source documents to collect the data and data entry screens are used to enter the data into computer files. Format of data entry screen is as follows.

Date	e: Heading Screen no:
	BODY
	Instructions & Comments for function keys:F1-Help,F2-Next screen, F9 - Exit.
or	Add Delete Save Next Previous Exit

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8.2.3 Guidelines for designing input for the system:

Due consideration should be given to following features of input design.

- 1. Input specifications describe the manner in which the data enters the system. So proper selection method for inputting input into a form that the system can process should be done.
- 2. Input design also determines whether the user can interact efficiently with the system.
- 3. The design of documents and forms for the collection of data prior to submission for processing is properly discussed.

The objectives guiding design of input focuses on

- I. Controlling the amount of input required since the cost of preparing and entering the data is directly proportional to the human ware factor of system reducing the amount of data means reducing lobour cost.
- II. Avoiding delays: By using turnaround type of documents can avoid bottlenecking situations means in tern avoiding delays which directly affects the profit in tern.
- III. Avoiding errors in data: This can be achieved
 - i by reducing volume of data
 - ii Checking and detecting errors as they do occur.
 - iii By input validation technique
 - iv Taking efforts and effectively on way (manner) the data is entered.
- 4. What not to enter is equally important .Input produced should not require entry of the following type of data such as constant dater means the data that are same for every entry.{ since the date of the transaction is identical for every transaction, one can use clock/calendar from computer or it can be system generated data element.

8.0-8.2 Check Your Progress

- 1) The process of getting the data to the computer for processing is called as
- 2) is collection of data at its source means preparation of source documents by applying manual checks
- 3) is the process of arranging the data into some desired format or sequence.
- 4)describe the manner in which the data enters the system

8.3 OUTPUT DESIGN

Output design principles:

- 1. Principle of simplicity: Format of the output should be self explanatory & should be as simple as possible.
- 2. Principle of acceptability: End-user's participation should be there in output design phase to get greater response of acceptability to the reports.
- 3. Principle of timeliness: An output in time leads to the success of the overall system.
- 4. Principle of promoting the decision making process: Output should be designed in such a manner that it should help in decision making and accelerate the process of decision making.
- 5. Principle of economy: Reports should be precise, should avoid redundancy of information which in tern reduces cost of processing and achieves the principle of economy.

8.3.1 Output Design Objectives:

- 1. An output must convey information about past activities, current status as well as future projections.
- 2. An output can be designed to confirm an action.
- 3. An output should be used to trigger an alarm(to remind an immediate activity to be used)
- 4. It may be utilized to signal events (such as to focus on variance between the planed & expected result and actually experienced output)

8.3.2 Types Of Output:

System requires following types of output.

- 1. Operational outputs: These are the normal routine reports based on day to day functions or activities.
- 2. External outputs: Such reports or documents are to be submitted to the authorities outside the organization.
- 3. Internal outputs: These are to be carefully designed as they act as main interface within the organization.
- 4. Periodic outputs: Such type of reports are required to be generated timely such as weekly, monthly, quarterly or yearly.
- 5. Turnaround outputs: For these reports data is added to the document before it is returned for further processing.

8.3.3 Guidelines For Output Design:

Due consideration should be given to the following features before designing the output.

- 1. Objective of the output {that has been already discussed.}
- 2. Type of the output {according to the need of the system.}
- 3. Contents :{ data fields, heading, data types etc.}
- 4. Format of the output {arrangement of the information, its presentation in vertical or horizontal form etc.}
- 5. Frequency: It focuses on the fact that how many times it is required to be generated, within a particular span.
- 6. Volume: It considers number of documents required to be generated within a particular span.
- 7. Medium of output: It determines whether the output is in form of hard copy, audio, audiovisual, interactive screen or microfilm.
- 8. Location of output: Whether it is to be processed, transported, local, transmitted, or stored.

Version r	10.	EMPLOYEE PROMOTION REPORT				
	Mor	Month: mm / dd / yy Dept. No.:				
Emp.no.	Emp name	Grade	Designation	Promoted to	With effect from date	New basic
Department wise total no. of employees promoted:						
Prepared by: Digital sign Approved by: Embedded email						

OBJECTIVE : Form is important mean of communication. The basic purpose of form is to collect and/or convey the information quickly and completely to the respected authority. Forms are used for both input and output purpose.

8.4.1 Principles of form design:

1.Simplicity: Form should be simple to understand.

2.Logical sequence of the entries should be maintained.

3.Usability: ease of use should always be there to fill the form quickly and correctly.

4.Data redundancy should be avoided wherever possible.

8.4.2 Guidelines for form design:

1. Objective of the form should be well defined.

2. Specification of data contents helps the design process.

3. Format and layout of the form are determined.

5. Due consideration should be given to participation of user for quantifying the data and submission for approval.

Illustrative example: Design a form of common entrance test conducted by XYZ University for admission to various management courses.

XYZ UNIVERSITY ADMISSION FORM Common entrance test			
Course: (Tick the appropriate option) Form no.			
Date:dd / mm / yy			
CANDIDATE NAME:			
Surname / First name / Middle name CANDIDATE ADDRESS:			
PIN CODE : CITY : STATE :			
CONTACT NO: EMAIL ID			

8.3, 8.4 Check Your Progress

- 1) Format of the output should be self explanatory & should be as simple as possible is
- 2) An output in time leads to the success of the overall system is
- 3) An output must convey information about past activities, current status as well as
- 4) are the normal routine reports based on day to day functions or activities.
- 5) type of reports are required to be generated timely such as weekly, monthly, quarterly or yearly
- 6) The basic purpose of form is to collect and/or convey the information quickly and completely to
- 7) User interface design for a system mainly focuses on input design, output design, and

8.5 SUMMARY

User interface design for a system mainly focuses on input design, output design, and form design.

Input for a system is the starting point of the system which involves data capturing and data validation. Data entry forms and data entry screens are used for collection of data and for inputting the data.

Output design incorporates design of documents, design of various types of forms and reports for interaction or submission to the relevant end user of the system. So design of the form is according to its use for input or output purpose.

8.6 CHECK YOUR PROGRESS - ANSWERS

8.0 ,8.1 ,8.2

- 1) data collection
- 2) Recording of data
- 3) Sorting
- 4) Input specifications

8.3, 8.4

- 1) Principle of simplicity
- 2) Principle of timeliness
- 3) future projections
- 4) Operational outputs
- 5) Periodic outputs
- 6) the respected authority
- 7) form design

8.7 QUESTIONS FOR SELF - STUDY

Case Study: Draw and design data entry screen for patient admission system of general hospital and draw a standard layout for a bill of patient at the time of discharge. Do necessary assumption wherever possible.

Case Study : Design a data entry screen for a bank that accepts deposits from its customers for a period of 1, 2, and 3 years at the interest of 8%, 8.5% and 9%.Draw data entry screen and validate it if minimum and maximum limit of deposit is Rs 5000 and RS.50,000 respectively

8.8 SUGGESTED READINGS

1. System Analysis and Design - V. Raja Raman

2. System Analysis and Design - Elias M. Awad

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NOTES


SYSTEM TESTING & QUALITY ASSURANCE

9.0	Objectives
9.1	Introduction
9.2	Nature Of Test Data & Test Plan
9.3	Levels & Approaches Of Testing
9.4	Types Of Testing
9.5	Quality Assurance And Audit Trail
9.6	Summary
9.7	Check Your Progress - Answers
9.8	Questions For Self - Study
9.9	Suggested Readings

9.0 OBJECTIVES

Dear friends, after studying this chapter, you will be able to

- explain testing process of executing a programme.
- discuss levels & approaches of testing
- describe types of testing

9.1 INTRODUCTION

DEFINITION: Testing is the process to detect the defects and minimizing the risk associated with the residual defects.

The testing process is an iterative process. The source code is converted into an executable code and various test inputs are given. For every test input, the output is analyzed to check whether the program is functioning correctly. If the re is defect ("bug" is the commonly used word), the defect is reflected in terms of wrong output. The defect is analyzed, and the source code is modified and again testing is carried out with the test inputs. This process is repeated till the source code is defect free.

9.2 NATURE OF TEST DATA & TEST PLAN

The software is tested for both write and wrong inputs for checking the functionality as well as the performance parameters. This is the test data for that particular test plan.

Preparation of test data is bit difficult because:

1. Input is given in such a way that each and every line of code is tested.

2. Input is given randomly to check that the software never fails.

3. Input is given to verify whether the software satisfy all the

requirements specifications or not.

For carrying testing, the testing process is to be clearly defined, which involves

- I Development of a test plan,
- I Carrying out the testing as per the plan and
- III Documenting the test results in the form of test report.
- IV The test plan has to specify the resources required for testing,
- V the test tools to be used
- VI The test cases(the input or test data to be given)
- VII The types of testing to be done.



THE TESTING PROCESS

TEST PLAN: Test plan contains the details of the testing process and has to be prepared during the project planning stage itself. The test plan format for any software can be as follows.

Test Plan

- Project name:
- Estimated start date for testing: Estimated end date for testing:
- Actual start date for testing: Actual end date for testing
- Estimated effort in person hours/person month
- Test set up(including hardware, software, peripherals required and test equipment special tool required)
- Test personnel and their responsibility
- Types of testing to be carried out
- Test case specification for every test type
- Test schedule And finally the Defect report which should cover
- S.NO
- Defect found
- Type of defect
- Classification of defect
- Status of defect
- Time of removal of defect
- Stages at which defect was injected and removed
- Criteria's for completion of the testing

9.1,9.2 Check your progress

- 1)....is the process of executing a program with the intent of finding an error.
- 2)are pointed only to improve the quality of the software and not with the intention to create distraction to the process of software development.
- 3) contains the detail of the testing process and has to be prepared
- during the project planning stage itself.

9.3 LEVELS AND APPROACHES OF TESTING

9.3.1 Levels Of Testing:

Client needs During the design stage the software is divided into modules and each module is divided into units. A practical approach is to divide the testing process into different levels. To start with, each unit has to be tested separately, and then the modules have to be built form the units and the modules are tested. The modules are combined together and the system is built and tested. Following figure shows that each level of testing is for testing a specific entity.



9.3.2 TESTING APPROACHES

In large software project it is impractical to integrate all the modules in one shot and start testing the software as a whole. The system has to be built in stages and the product has to be built incrementally carrying out testing on each incremented software, such a systematic approach helps in easier debugging. The testing approaches are as follows:

TOP DOWN APPROACH: In this approach, testing is done from top to lowermost module .Dummy routines called studs that stimulate a module are introduced.

BOTTOM UP APPROACH: In this approach, testing is done from bottom of hierarchy. Dummy routines called drivers are introduced, that invoke the module.

9.4 TYPES OF TESTING

- 1] White box testing or Glass box testing: In this type of testing, structure of program is taken into consideration. Programmer uses this method to test the program during the coding stage.
- 2] Black box testing: It is called as behavioral testing also; it focuses on functional requirements of the software.
- 3] Structural testing: It is similar to glass box testing. It focuses on proper selection of the program.
- 4] Functional testing: Type of black box testing. Here functions are tested by feeding them input and examining the output.
- 5] Incremental testing: Under this strategy, each piece of code is first tested separately; this is also called as module testing or element testing.
- 6] Static testing: Code is examined that is tested without being executed. It can be done by reading lists of codes and finding errors.
- 7] Dynamic testing: Code is tested on execution such as tools interact with an execution program, checking path coverage values of variables along with execution of flow of program.
- 8] Desk checking: Means someone reads the program carefully and analyzes its behavior without running test cases at the computer.
- 9] Top down testing: Highest level modules are tested first. It uses test stub {it is dummy program inserted in a place of code not yet as written, to indicate that the right point in the program has been reached.

- 10] Bottom up testing: The lowest modules are tested first. It uses test drivers [test driver is a program which provides control and input data for testing a module.
- 11] Performance Testing: Can be done using white or black box testing technique objective is performance enhancement.
- 12] Regression testing: Again it can be done by white or black box testing for finding errors, fixing them and repeating the test to express the problem.
- 13] Acceptance testing: It should test mainstream functions with mainstream data.
- 14] Alpha testing: In this testing, most of the functionality is present but few functions may be missing or non-testable.
- 15] Beta testing: It is carried out at users premises in absence of development team. This notices some of the problems associated with the usability as well as performance.
- 16] Gorilla testing It is used to check whether defensive programming has been done or not to make the software strong to tolerate wrong input.

9.3-9.4 Check your Progress

- 1) is where code is examined that is tested without being executed.
- 2) InCode is tested on execution such as tools interact with an execution program, checking path coverage values of variables along with execution of flow of program.
- 3)Quality assurance is a process of delivery of the desired quality to
- 4)is essentially an audit of the individual processes that emphasizes quality assurance.

9.5 QUALITY ASSURANCE AND AUDIT TRAIL

Quality assurance is a process of delivery of the desired quality to the customer. Therefore it ensures the raw data; input process and output quality are the requisite standards. It is essentially an audit of the individual processes that emphasizes quality assurance. It is responsible for following services.

- 1. Review of services
- 2. Monitoring, evaluating and measurement of projects.
- 3. Make recommendation accordingly
- 4. Conducting analysis on schedule budget parameters.
- 5. Development of performance metrics.
- 6. Review and analyze project status report.
- 7. Analyze and provide input for project activities.
- 8. Review programming work product to ensure compliance to client standard expectation.
- 9. Review test plan techniques and test procedures and results
- 10. Conduct post implementation review.

9.6 SUMMARY

To summarize testing is a difficult job as it has to be performed at different levels with proper approach and by application of appropriate testing method. To carry out testing in limited with limited effort and resources and try to bring out all the possible hidden defects is a challenging and intelligent task.

To deliver quality software product, quality has to be assured in each and every phase of the development process. The output of a phase should not be described on qualitative terms; it should have quantitative measures or metrics. The product quality metrics are different from process quality metrics. The product quality metrics reflects the quality of the product while process quality metrics reflects how well the process is defined.

9.7 CHECK YOUR PROGRESS - ANSWERS

9.1 & 9.2

- 1) Testing
- 2) Bugs
- 3) Test plan

9.3 ,9.4

- 1) Static testing
- 2) Dynamic testing
- 3) the customer
- 4) quality assurance

9.8 QUESTION FOR SELF - STUDY

- 1. Discuss quality metrics of software product for software quality assurance.
- 2. What are different levels and approaches of testing a software system?
- 3. Discuss various types of testing.

9.9 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad



NOTES

SOFTWARE AND HARDWARE SELECTION AND SYSTEM MAINTENANCE

10.0	Objectives
10.1	Introduction
10.2	Hardware Suppliers
10.3	Software Suppliers
10.4	Service Suppliers
10.5	Procedure For Hardware Selection
10.6	Procedure For Software Selection
10.7	System Maintenance
10.8	Summary
10.9	Check Your Progress - Answers
10.10	Questions For Self - Study
10.11	Suggested Readings

10.0 OBJECTIVES

Dear friends, after studying this chapter you will be able to,

- describe the selection of computer hardware and software.
- explain the procedure for software selection.
- state the procedure for hardware selection.

10.1 INTRODUCTION

A major element in building systems is selecting compatible hardware and software. Hardware and software selection begins with requirement analysis, followed by a request for proposal and vendor evaluation. Selection of computer hardware and software environment frequently requires the preparation of a specification for distribution to hardware and software vendors and criteria for evaluating vendor's proposals. These specifications can be presented to the vendor in form of tenders.

10.2 HARDWARE SUPPLIERS

This group includes mainframe manufacturers, peripheral vendors, supplies vendors, and computer leasing firms and used computer dealers. IBM is the major supplier of mainframe computers. In microcomputers, IBM, Apple tops the list. Peripheral manufacturers supply drives disk, printers and other components.

10.1 - 10.2 Check your Progress

- 1) is group that includes mainframe manufacturers, peripheral vendors, supplies vendors, and computer leasing firms and used computer dealers.
- 2)supply drives disk, printers and other components
- 3) Prices and levels of complexity ofdepend on the computer and state of the competition
- 4).....including system specifications, programming language, price range, terms and time frame

10.3 SOFTWARE SUPPLIERS

Computer user can acquire programs either from the vendors or the software house virtually for every application. Prices and levels of complexity of software depend on the computer and state of the competition. Due consideration should be given to following aspects at the time of final selection of software supplier. Warranties and terms of licenses or contractual limitations.

- 1. Agreement including system specifications, programming language, price range, terms and time frame.
- 2. Financial statement of vendor
- 3. Availability of system support.

10.4 SERVICE SUPPLIERS

Service suppliers include the following

- 1. Computer manufacturer supply services such as system design, programming, education and training and hardware maintenance.
- 2. Small firms run business for simple applications and large firm contract for specialized applications
- 3. Facilities management (FM) concept has several BENEFITS, The user pays only for the services rendered. The user runs the system but calls on the service organization for developmental work and maintenance.

10.3 - 10.4 Check Your Progress

- 1)supply services such as system design, programming, education and training and hardware maintenance
- 2) Small firms run business for simple applications and large firm contract for
- 3) It is the understanding of user's requirements within the framework of organizations objectives and the environment in which the system is being installed
- 4)concentrates on the vendor proposals and evaluates one which matches with users needs

10.5 PROCEDURE FOR HARDWARE SELECTION

Precautions prior to system selection:

Define system capabilities with respect to cost. Time, services and profit.

- 1. Specify magnitude of a problem.
- 2. Consider hardware and software as a package.
- 3. Assess competency of the in-house staff.

Major phases in selection:

- I Requirement analysis: It is the understanding of user's requirements within the framework of organizations objectives and the environment in which the system is being installed. Consideration is given to the user's resources and finances.
- I System specifications: This should include system objectives, flowcharts, inputoutput requirements, file structure and cost. The system specification must also describe each aspect of the system clearly, consistently and completely.
- III Request for proposals[RFP]: RFP is drafted and sent to the vendor which should include
 - i. Complete statement of system specifications, programming language, price range, terms and time frame.
 - ii. Request for vendors responsibilities for conversion, training and maintenance.

- iii Warranties and terms of license or contractual limitations.
- iv Request for financial statement of vendor.
- v Size of staff available for system support.
- IV Evaluation and validation: The evaluation phase concentrates on the vendor proposals and evaluates one which matches with users needs. It is verified with respect to price, availability and technical support.
- V Vendor selection: Vendor selection is done on the basis of reliability, service record, training delivery time, and finance terms.
- VI Post installation review: Post evaluation review is carried out to determine, how closely the system confirms the plan on the basis of parameters such as economical, technical and operational.

10.6 PROCEDURE FOR SOFTWARE SELECTION

Software selection is a critical aspect of system development. Computer architecture is a layered structure. At the base of the hierarchy is the computer hardware, which includes some hard coded instructions [Firmware]. The next level up in the hierarchy comprises of the nucleus functions. Above the nucleus are various operating system processes that support users. System software is collection of computer programs used in the design, processing and control of all the computer applications. It ensures the integrity of the system controls the flow of programs and events in the computers and manages the interfaces with the computer. Software developed for the computer must be compatible with its operating system.

System software includes :

- 1. Operating system.
- 2. Access control software.
- 3. Data communication software
- 4. Program library management systems.
- 5. Tape and disk management system.
- 6. Network management software.
- 7. Job scheduling software.
- 8. Utility programs.

Criteria for software selection are :

- I Reliability-Gives consistent results.
- I Functionality-Functions to standards.
- III Capacity-Satisfies volume requirements.
- IV Flexibility-Adapts to changing needs.
- V Usability-Is user friendly.
- VI Security-Maintains integrity and prevents unauthorized access.
- VII Performance-Delivers as per expectations.
- VIII Ownership-Has the right to modify and share the use of package.
- IX Serviceability- Has good documentation and vendor support.
- X Economy-Is affordable for intended application.

10.5 & 10.6 Check your Progress

- 1)is collection of computer programs used in the design, processing and control of all the computer applications
- 2) Software developed for the computer must be compatible with its
- 3) Timely submission of hardware error reports, availability reports and utilization reports can help for monitoring the effective and efficient use of
- 4) It is mandatory that theshould coincide with the vendor's specifications
- 5) Unlike hardware software does not wear out; it is

10.7 SYSTEM MAINTENANCE

To ensure proper operations the hardware must be routinely cleaned and serviced. Maintenance requirements vary based on the size and complexity of the system. It is mandatory that the maintenance schedule should coincide with the vendor's specifications. Hard maintenance program is designed to document the performance of this maintenance. This program should include every information regarding the servicing of each hardware resource for routine maintenance, the maintenance schedule and the cost as well as the maintenance performance history, both planned and exceptional.

Is management should monitor, identify and document any deviation from vendor's maintenance specifications, as well as provide supporting documents for lack of performance. Proper inquiry and follow-up procedures should be performed if maintenance cost exceeds budget. Timely submission of hardware error reports, availability reports and utilization reports can help for monitoring the effective and efficient use of hardware.

10.7.1 Software Maintenance Procedure

Maintenance covers a wide range of activities. Including correcting coding and design errors, updating documentation and test data and upgrading user support. Many activities classified as maintenance are actually enhancements. Maintenance means restoring something to its original condition. Unlike hardware software does not wear out; it is corrected. Although software does not wear out it demands modifications which leads in cumulative maintenance. Over a period of time the integrity of the program, test data and documentation degenerates. Eventually it takes time and more efforts to maintain the application than to rewrite it.

10.7.2 Reduction In Maintainence Cost:

Reusing code is an error-prone process that is still perceived as it is more cost effective than writing program from scratch. A maintenance reduction plan consists of following three phases:

- 1. Maintenance management audit: This evaluates the quality of the maintenance effort through interviews and questionnaire.
- 2. Software system audit which includes an overall review of system documentation and an assessment of data files and database.
- 3. Each program is assigned with a ranking value for its functional assessment.
- 4. Software modification which involves, program rewriting for logic simplification, documentation updates and system level updating diagrams and flowcharts.

10.8 SUMMARY

Computer vendors are classified as hardware, software and service suppliers. They provide mainframe, operating system, application programs and service respectively. Software is classified as system software for controlling the system operations and application software for solving user oriented problems. There are some precautions to be taken before selection of hardware, software and services which are well discussed in the chapter. The selection process for hardware and software consists of several steps depending upon the various parameters according to systems requirement.

10.1 & 10.2

- 1) hardware suppliers
- 2) Peripheral manufacturers
- 3) software
- 4) Agreement

10.3 & 10.4

- 1) Computer manufacturer
- 2) specialized applications
- 3) Requirement analysis
- 4) The evaluation phase

10.5 & 10.6

- 1) System software
- 2) operating system
- 3) hardware
- 4) maintenance schedule
- 5) corrected

10.10 QUESTIONS FOR SELF - STUDY

- Q.A Write short notes on
 - 1] Service suppliers

2] Software suppliers

Q.B What is system maintenance?

10.11 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad



NOI	ES

SOFTWARE PROJECT MANAGEMENT AND IMPLEMENTATION

11.0	Objectives
11.1	Introduction
11.2	Project Management
11.3	Software Implementation Procedures
11.4	Causes for System Failure
11.5	Summary
11.6	Check Your Progress - Answers
11.7	Questions for Self - Study
11.8	Suggested Readings

11.0 OBJECTIVES

Dear friends, after studying this chapter you will be able to

- explain project Management with the help of managerial control methods and techniques.
- describe software implementation procedure and importance of post implementation reviews

11.1 INTRODUCTION

Definition: Project-A project can be defined as an endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of a given specification, within the constraints of cost and time so as to achieve a beneficial change defined by qualitative and quantitative objective.

Project Management can be defined as a combination of tools and techniques such as PERT, CPM and managerial control methods. Structured project management techniques provide a framework for project management tools to operate. correct level of information for each part of the project structure. When specific standard set of procedures are defined for the project, then it becomes methodology.

11.2 PROJECT MANAGEMENT

The process of planning, designing and implementing computer system is called as project. Project management is a technique used by a manager to ensure successful completion of a project. It includes the following functions.

- 1. Estimating resource requirements.
- 2. Scheduling task and events.
- 3. Providing for training site preparation.
- 3. Selecting qualified staff and supervising their work.
- 4. Monitoring the projects program.
- 5. Documenting
- 6. Periodic evaluating
- 7. Contingency planning.

From these functions it is clear that project management is a specialized area. It involves the application of planning, organization and controlling critical situations. Managing projects also requires the following

- I Top management commitment to setting project priorities and allocating resources to approved projects.
- I Active user participation to identify information needs, evaluate proposed improvements on cost/benefits basis, provide committed resources.

A framework for project management should have focus on following features

i) Understanding the problem using experienced staff for the initial investigation. Decision

should have delicate balance between risk and cost.

- ii) Specification of project responsibilities
- iii) Proper selection of project manager who is responsible for day to day operations for meeting the objectives within constraints of time, cost and quality.
- iv) Establish ground rules and set performance standards
- v) Task definition in preparation of project plan is very essential and should specify resource availability, time duration and allocation of responsibilities.

11.0 - 11.2 Check your Progress

- 1)can be defined as an endeavor in which human, material and financial resources are organized in a novel way
- 2)can be defined as a combination of tools and techniques such as PERT, CPM and managerial control methods
- 3)System software implementation involves identifying features, configuration options and controls for a standard configuration to apply across.....
- 4) All test results should be documented, reviewed and approved technically by qualified subject area experts prior to
- 5) A postreview measures the systems performance against predefined requirements

11.3 SOFTWARE IMPLEMENTATION PROCEDURES

System software implementation involves identifying features, configuration options and controls for a standard configuration to apply across the organization. Additionally implementation involves testing the software in nonproduction environment and obtaining some form of certification and accreditation to place the approved operating system software into production.

All test results should be documented, reviewed and approved technically by qualified subject area experts prior to production use. Change controlled procedures are designed to ensure that the changes do not disrupt processing, are authorized and that IS management and personnel involved are aware of and involved in the system software change process. Change control procedures should ensure that the changes have been appropriately assessed as to the impact on the production system [particularly impact of failure during installation] and that of appropriate recovery back-up procedures exits so that the impact of any failure during installation can be minimized.

11.3.1 Post Implementation Reviews:

Operational systems are quickly taken for granted. Every system requires periodic evaluation after implementation. A post implementation review measures the systems performance against predefined requirements. Unlike system testing which determines where the system fails so that the necessary adjustments can be made, a post implementation review determines how well the system continues to meet performance specifications. It is after the fact-after design and conversion are complete. It also provides information to determine whether major design is required.

11.3.2 Request For Review:

Unexpected changes in the system that affects the user or system performance is a primary factor that prompts the system review. Once the request is filed, the user is asked how well the system is functioning to specifications or how well the benefits measured have been realized. Suggestions regarding changes and improvements are also sought. This phase sets the stage for implementation review.

11.3.3 A Review Plan:

The review team prepares the review plan around the objectives of the review, the type of evaluation to be carried out and the time schedule required. An overall plan covers the following areas.

1. ADMINISTRATIVE PLAN:- Review area objectives, operating costs, actual operating performance and benefits.

- 2. PERSONAL PERFORMANCE:- Review performance objectives and training performance to date.
- 3. HARDWARE PLAN:- Review performance specifications.
- 4. DOCUMENTATION REVIEW PLAN :- Review the system development effort.

Once drafted the review should be verified and approved by the requester or the end user.

	11.3 Check your Progress
A] Fi	II in the blanks
1) W bou	hen everyone on project team hasobjectives the project is und to suffer.
2) Us	sers are reluctant to assume theirfor new system.
в] А	Answer the following in one sentences
a.	Define project
b.	What is project management?
C.	Discuss software implementation procedure.

11.4 CAUSES OF SOFTWARE FAILURE

Software failure leads to waste and delayed return on investment Despite high stakes, however, system projects often fail. Following are the reasons of failure:-

- 1. Conflicting objectives: When everyone on project team has conflicting objectives the project is bound to suffer.
- 2. Users lack of involvement and cooperation: Users are reluctant to assume their responsibilities for new system.
- 3. Inexperienced project management: Without having exposure to management tool or business experience, project managers are selected simply by conventional methods.

11.5 SUMMARY Following figure illustrates the causes of failure-



11.6 CHECK YOUR PROGRESS- ANSWERS

- 11.0 & 11.2
- 1) A project
- 2) project management

- 3) the organization
- 4) production use
- 5) implementation **11.3**

conflicting

- responsibilitie
- 2) responsibilities
- **a.** A Project can be defined as an endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of a given specification, within the constraints of cost and time.
- **b.**The process of planning, designing and implementing computer system is called as project. Project management is a technique used by a manager to ensure successful completion of a project.
- **c**. 1) Identifying Features
 - 2) Configuration options
 - 3) Controls for a standard configuration

1)

- 4) testing the software in nonproduction environment
- 5) Documentation, review of approval.
 - **11.7 QUESTIONS FOR SELF STUDY**
- QA. Illustrate causes of failure for software system.

11.8 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad

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12.0 OBJECTIVES

Dear friends, after studying this chapter you will be able to

- explain various types of security which are used to protect data and sensitive information
- explain protecting data as an asset and its useful in recovery planning

12.1 INTRODUCTION

The system security describes the physical protection of computer hardware, source documents and documentation manuals as well as the logical protection of computer files and programs. Security is critical in system development. The amount of protection depends on sensitivity of data, the reliability of the user and the complexity of the system.

12.2 SYSTEM SECURITY

The system security problem can be divided into four issues

- 1. **System integrity : -** It refers to the proper functioning of hardware and programs associated with and appropriate physical safety and security against external threats.
- 2. **Data integrity:-** It makes sure that data do not differ from the original form and have not been accidentally or intentionally disclosed, altered or destroyed.
- 3. Privacy :- It is right of the user or organization to determine what information they are willing to share with or accept from others and how the organization can be protected against unwelcome, unfair or excessive dissemination of information about it.
- 4. Confidentiality:- It is a special status given to sensitive information in a database to minimize the possible invasion of privacy.

12.3 LEVELS OF SECURITY

- 1. Physical security(protection from fire ,flood, earthquakes)
- 2. Database system(database integrity and control measures like passwords, encryption)
- 3. Human(man-made riots, strikes, industrial accidents, loss of power)
- 4. Logical (includes protection from logical errors, database consistency constraints)

12.0 -12.3 Check your Progress

- 1) refers to the proper functioning of hardware and programs associated with and appropriate physical safety and security against external threats.
- 2)is a special status given to sensitive information in a database to minimize the possible invasion of privacy.
- 3)security may include protection from fire ,flood, earthquakes
- 4)security may include protection from logical errors, database consistency constraints.
- 5).....errors that violate the assumption that transaction preserve the database consistency constraints are threats to system security.

12.4 THREATS TO SYSTEM SECURITY

The potential threats to system security are:

- 1. Errors and omissions
- 2. Disgruntled and dishonest employees
- 3. Fire
- 4. Natural disasters
- 5. External attacks

12.4.1 Security Violations

- I. Crashes during transaction processing
- II. Anomalies caused by concurrent access to the database.
- III. Anomalies caused by distribution of data over several computers.
- IV. Logical errors that violate the assumption that transaction preserve the database consistency constraints.
- V. Unauthorized reading or theft of data or information.
- VI. Unauthorized modification of data.
- VII. Unauthorized destruction of data.

12.4 Check your Progress

- 1)protection complies of Limiting logical computer access by control measures such as allocation of password, using fingerprint and voice prints as identification
- 2) addresses many issues such as legal and ethical issues, policy issues and system related issues

12.5 DIFFERENT METHODS FOR PROVIDING SECURITY

- 1. Provision for physical security: It includes provision of inter-gas extinguisher, restricting entry to unauthorized personnel, maintaining strict environmental controls to guard against excessive heat or cold, using separate shielded power lines to avoid wire tapping and overloading and provision of back-up generators.
- 2. Logical protection: Limiting logical computer access by control measures such as allocation of password, using fingerprint and voice prints as identification, using lockout systems. Data encryption audit controls and system integrity.
- Database security: This addresses many issues such as legal and ethical issues, policy issues and system related issues. For all these issues functional role of DAB is most important.

12.5.1 Responsibility Of DBA :

The person who has control over both programs and data of the system is called as data base administrator [DBA]. The functional responsibility of DBA is as follows.

- I Schema definition : The DBA creates the original database schema by writing a set of definitions that is translated by DDL compliers in a set of tables that are stored permanently in data dictionary.
- II Storage structure and access method definition: DBA creates appropriate storage structure and access methods by writing a set of definition which is translated by data storage and data definition language compiler.
- **III** Schema and physical organization modification: Programmers accomplish the modifications either to schema or physical storage organization by writing a set of definitions used by DDL or data storage compiler to generate modifications to appropriate internal system.
- IV Granting of authorization for data access: The granting of different types of authorities allows the database administrator to regulate which parts of the database various users can access.
- V Integrity constraint specifications: The data values stored in the database must satisfy certain types of consistency constraints. Such peculiar constraints must be defined explicitly by DBA.

12.6 DISASTERS / RECOVERY PLANNING

Disasters/recovery planning is a means of addressing the concern for system availability by identifying potential exposure, prioritizing applications and designing safeguards that minimizes loss if a disaster occurs. The plan ranges from having an entire facility in one location with a full redundancy of hardware to leasing a site with no computer but adequate electricity and air conditioning to support a computer facility on a temporary basis. Regardless of the alternatives, management and user support is critical. The master plan involves four phases.

- Appoint a team and a coordinator to develop the plan.
- Prepare planning tasks.
- Compile a disaster/Recovery manual.
- Dummy run to test the procedure.

Disaster recovery plan must include:

- Managing duplicate copies of files and programs
- Arranging to use alternate computer equipments to run.

12.5.1 Role and responsibilities of management and users in disasters/ recovery planning:

ROLE AND RESPONSIBILITIES OF MANAGEMENT:

Management's primary role is to accept the need of contingency planning, select an alternative measure and recognize the benefit that can be derived from establishing a disaster/recovery plan. Top management should establish the disaster/recovery policy and commit cooperate support staff for its implementation.

Role Of Users

User's responsibilities include the following:

- Identifying critical applications.[means identifying the intensity, such as why & how much it is going to affect the system]
- Approving data protection procedures and determining how long and how well operations will continue without data.
- Funding the cost of backup.

(12.5 Check Your Progress	
Fill	l in the blanks	
1) 2)	The master plan of Disaster planning involves phases. Disaster recovery plan must include managing duplicate copies of files and	
3) 4)	 3) Management's primary role is to accept the need ofapplications. 4) User's responsibilities include Identifyingapplications. 	
Answer the following in short		
Q.1	What is disaster/recovery planning?	
Q.2	2 List threats to security and explain in brief security violations.	

12.6 SUMMARY

In this chapter we have addressed the issues of data and system security and have suggested the precautionary measures against the threats and violations to system security. Also for unforeseen disasters, we have discussed various disaster recovery plans.

Disaster Recovery Plan Must Have

- Contingency planning for critical applications
- Approved data protection procedures.
- Should have special team consisting of system designers, users and computer operators.
- The disaster recovery plan manual should be prepared and made available to management and every team member.

12.7 CHECK YOUR PROGRESS - ANSWERS

12.0 12.3

- 1) System integrity
- 2) Confidentiality
- 3) Physical
- 4) Logical
- 5) Logical

12.4

- 1) Logical
- 2) Database security

12.5

- 1) four
- 2) programs
- 3) contingency planning
- 4) critical

Q.1 Disasters /recovery planning is a means of addressing the concern for system availability by identifying potential exposure, prioritizing applications and designing safeguards that minimizes loss if a disaster occurs.

Q.2 Threats to Security

- 1) Errors and Omissions 2) Disgruntled and dishonest employees
- 3) Fire 4) Natural disasters
- 5) External attacks Security Violations

- 1. Crashes during transaction processing.
- 2. Anomalies caused by concurrent access to the database.
- 3. Anomalies caused by distribution of data over several computers.
- 4. Unauthorized reading or theft of data or information.
- 5. Unauthorized modification of data.

12.8 QUESTIONS FOR SELF - STUDY

- 1. Discuss various methods providing security measures to system.
- 2. What are the responsibilities of DBA?

12.9 SUGGESTED READINGS

- 1. System Analysis and Design V. Raja Raman
- 2. System Analysis and Design Elias M. Awad

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