in DFDs: Yourdon & De Marco, Gene & Sarson, Structured systems analysis and design methodology (SSADM), and Unified. All four methods employ the same labels with different shapes to represent the four basic elements of a DFD namely external entity, process, data store, and data flow. Figure 6.1 presents these four elements concerning four categories as mentioned above. Among these, the notations belonging to Yourdon & De Marco method are widely used to construct DFDs. Unified modeling notations are specially used for defining a system in an object-oriented concept.

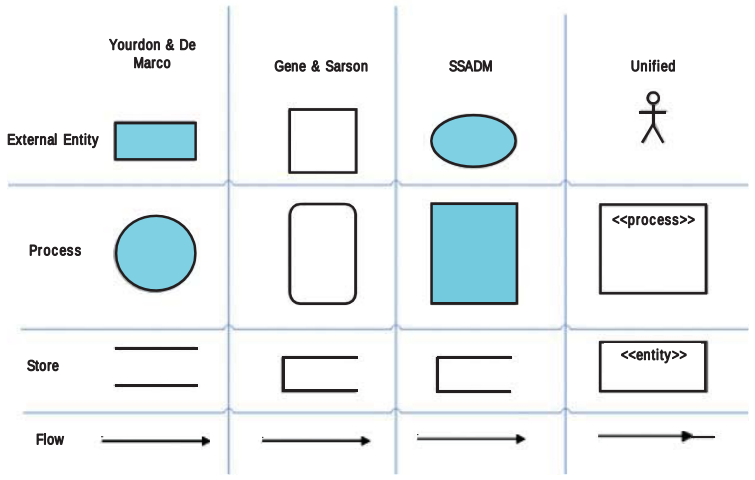


Figure 6.1: Four fundamental notations used in DFDs

External Entity

An external entity, which is also known as the terminator, source, or sink, represents an external user or an external system that feeds or receives data to and from the system. Entities are represented by rectangles with specific names. They are usually placed on the data flow diagram's edges.

Process

Process refers to an operation that can compute and manipulate the data. The corresponding data is fed either by the external user through data flow to the process or the process receives data from data sources to compute or change. Subsequently, it produces an output. Activities and actions taken on the data by processes are represented by circles.

Software Requirements Specification (SRS).This information can be categorized into 3 types:

a) **Information about the Firm/Organization:** These are the guidelines for how the system should operate. This guideline includes business policies, goals, objectives, and the organization of the system.

b) **Information about the User Staff:** It is about the organization of the user staff who manages the system. It includes job functions of different staff members, their authority level, information requirement at each user level, etc.

c) **Information about the Workflow**: It refers to the workflow of the system or how the system works. It includes information like interrelationship between different system components, system entities with their attributes, system operations with interrelatedness.

5.5 ORIGIN OF INFORMATION

So, the next important aspect of the discussion is from where we will get all of this information. Most of this information can be gathered from two principal resources: (a) written documents from the organization (b) the organization's environment.

These written documents can be external such as Government policies, vendor policies, public opinion about the system, or internal such as system documentation and manuals, User reports, financial reports, etc.



CHECK YOUR PROGRESS

Q.1: In which part of SDLC, information gathering fall?

Q.2: What does Business policiesdefine?

Q.3: What is an attribute?

5.6 REVIEW OF LITERATURE

The process through which we gather information from the written document is called a literature review. A literature review surveys written

documents and any other sources relevant to a particular domain. It provides a description, summary, and critical evaluation of these works concerning the problem being investigated. The main purposes of literature review are:

- place each work in the context of its contribution to understanding the problem.
- describe the relationship of each work to the others under consideration.
- identify new ways to interpret prior works.
- resolve conflicts amongst seemingly contradictory previous works
- point the way in fulfilling a need for new and additional works towards the problem.

There is not a fixed methodology to gather information from the organization's environment. Some of the technique used for this has been mentioned below.

5.7 PROCEDURE AND FORMS

Procedural manuals can give a good picture of the system to be studied. For example: (a) how the existing system works (b) what are the assumptions (c) what information flows in and flows out (d) what are the dependencies of the external system, etc. Problems that one can encounter are the lack of updated manuals or documents, or sometimes they need for possession of the correct documents. Hence, this is just one of the means of gathering information. However, procedural forms can capture some important information like: (i) Who are the users of the forms? (ii) Do the forms have all the necessary information? (iii) How readable and understandable are they? (iv) How does the form help other users to make better decisions?

On Site Visits and Observations:

The main objective of an onsite visit is to get as close to the system as possible. The person who visits onsite is a keen observer and is knowledgeable about the activities that can occur within the system. Various types of observation methods are used:

6.2 INTRODUCTION

Structured analysis is a development method that allows the analyst to understand the system and its activities logically. After gathering the required information for a system, it is to analyze them with some analysis tools. Following a systematic approach, structured analysis employs some graphical as well as textual tools that analyze and refine the objectives of an existing system and design a new system specification that will be easily understandable for the user and also for the programmer. In this unit, we will discuss various analysis tools like data flow diagram, decision tree, decision table, etc. which can visualize a system to the users in a much easier way. In the next unit, we will explore the topics related to feasibility study.

6.3 DATA FLOW DIAGRAM

A data flow diagram (DFD) is a graphical representation of the flow of data in an information system. It is also termed a bubble chart. It was proposed by American software engineer Larry Constantine to express all functional requirements of a system in a pictorial form. It can depict incoming data flow, outgoing data flow, and stored data throughout the system.

The objective of DFD is to provide an overview of the transformations of the input data within a system to produce the output. A DFD is defined by IEEE as 'a diagram that depicts data sources, data sinks, data storage and processes performed on data as nodes and logical flow of data as links between the nodes.' Since graphical representations are easier to interpret, any layperson/non-technical user can also be able to understand the system details easily and clearly by going through the DFDs. It states an overview of what data a system processes, what transformations are performed, what data are stored, what results are produced, and where they flow.

6.3.1 DFD Symbols

To construct DFD for a system, a set of symbols are used with standardized notations like external entity, process, data flow, data store, output, etc. There are four common methods of notation used

UNIT 6: TOOLS OF STRUCTURED ANALYSIS

UNIT STRUCTURE

6.1 Learning Objectives

6.2 Introduction

6.3 Data Flow Diagram (DFD)

- 6.3.1 DFD Symbols
- 6.3.2 Constructing a DFD

6.4 Data Dictionary

6.5 Structured English

6.6 Decision Tree

6.7 Decision Table

6.8 Let Us Sum Up

6.9 Further Reading

6.10 Answers to Check Your Progress

6.11 Model Questions

6.1 LEARNING OBJECTIVES

After going through this unit, you will be able to –

- describe about different structured analysis tools and techniques.
- use the process of defining and constructing a data flow diagram.
- use various notations used for designing DFDs.
- make a data dictionary for a system from the constructed DFDs.
- use decision table which can visualize a system in a tabular format.
- analyze a system by using a decision tree when complex branching occurs in a structured decision process.
- conceptualize a process in a sentence like form by using structured english tool.

Direct or Indirect:

The analyst can observe the subject or the system directly like how do the workers perform a job on the factory floor? Using some devices like video cameras or videotapes, indirect form of observations can be done.

Structured or Unstructured:

In a structured observation, the specific actions are recorded. For example, before a shopper buys a product, how many related products did he see before selecting the final product? An unstructured method would record whatever actions would happen at a given point in time.

5.8 INTERVIEWS AND QUESTIONNAIRES

The interview is a face-to-face interpersonal meeting designed to identify the relations and verify the information to capture information. An interview is a flexible and better tool than a questionnaire for the evaluation of the information. It is an art that requires experience in arranging the interview, setting the stage, and establishing rapport. The questions should be designed clearly, avoiding misunderstandings and carefully evaluating the responses. The disadvantage of this technique is that the preparation time required is more. Since only one person at a time can be engaged with the process, a longer time is required for gathering the results.

Types of Interviews

(a) **Structured Interview**

The skill of the interviewer helps in getting the interviewee to respond and move to the next questions without diversion. The questions are presented to the interviewee with similar wording and order.

(b) **Unstructured Interview**

In the unstructured Interview, the respondents are allowed to answer freely in their own words. The responses are not forced. They are self-revealing and personal rather than general and superficial. The interviewer has encouraged the respondents to talk freely.

Unstructured interviews provide an opportunity to delve more deeply into complex topics than is possible with surveys.

(c) **Questionnaire**

Questionnaire is a self-administered tool that is more economical and requires less skill to administer than the interview. At any point in time, unlike the interview, feedback from many respondents can be collected at the same time. Since questionnaires are usually self-administered, it is critical that questions be clear and unambiguous.



CHECK YOUR PROGRESS

Q. 4: What is literature review?

Q. 5: Mention two methods to gather information from the organization's environment.

Q. 6: Which type of interview is better for information gathering?



5.9 LET US SUM UP

- Information gathering is a part of the feasibility analysis process.
- Information can be categorized into 3 types:
  Information about the Firm/Organization, Information about the User Staff, and Information about the Workflow.
- This information can be gathered from two principal resources: - Written documents from the organization and from the organization's environment.
- There is not a fixed methodology to gather information. So, we use various methods like Literature Review, Procedure and Forms, Interviews and Questionaries to collect information



5.10 FURTHER READING

1. Awad, E. M. (1985). Systems analysis and design. Homewood, Ill: R.D. Irwin.
2. Chauhan A & Mishra R. (2009). System Analysis and Design. Pragati Prakashan.



5.11 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No. 1: Feasibility study.

Ans to Q No. 2: Business rules are guidelines that specify how the system should operate.

Ans to Q No.3: Attributes are the properties of entity by which we can describe an entity.

Ans to Q No.4: The process through which we gather information from written document is called literature review.

Ans to Q No.5: Interviews and Questionnaires.

Ans to Q No.6: Structured Interview.



5.12 MODEL QUESTIONS

Q 1. What type of information are required for the design and development of a system?

Q 2. Define literature review. Why is it required?

Q 3. How procedures and forms are useful in information gathering?

Q 4. How interview and questionnaires are used in information gathering process? Explain.