Advantages of a good functional decomposition:

1. It helps in understanding the breakdown of processes or functions.
2. Specifying the requirements and features of each function becomes easier.
3. It helps in localizing errors and minimizing system faults.
4. It allows customers to view and discuss the system in way that can easily deal with.

Disadvantages of poor functional decomposition:

1. Hinders understanding of the system when functions and processes overlap.
2. Creates unnecessarily numerous complex interfaces.
3. Requires extensive rework of other process modeling methods such as Data Flow Diagrams.

Structured chart

The documentation tool for structured design is called the structured chart. It is a recommended tool to design a modular, top-down structure. It helps to define the various modules of the system development and helps to establish relationship between every module. It is a graphical tool for representing hierarchy. The symbols that are used in the construction of structured chart are explained below.

Module:

The process or task of the system is represented by a module. There are three types of modules which are shown in figure 9.3.

- Control module: It has branches to more than one sub module.
- Sub module: It is a child of another module.
- Library module: They are reusable and can be invoked from any module.

- The decision to adopt an alternative system can be highly subjective depending on the analyst's or user's confidence in the estimated cost and benefit values.



8.7 FURTHER READINGS

1. System analysis and Design – Elias M. Awad - Galgotia Publications Pvt Ltd
2. System analysis, design and development – Charles S. Wasson-Wiley InterScience
3. Analysis and Design of Information Systems- Rajaraman-PHI.



8.8 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q No 1: i. D ii. B iii. C

Ans. to Q No 2: i. D ii. B

Ans. to Q No 3: i. Break-even analysis

ii. Net benefit

iii. Cash flow



8.9 MODEL QUESTIONS

Q1. What cost elements are measured in cost/benefit analysis? Which element is found to be most difficult to estimate and why?

Q2. Describe the procedure for cost/benefit determination.

Q3. How are tangible costs different from direct costs?

Q4. Why is it necessary to conduct cost/benefit analysis?

Q5. Compare the various evaluation methods.

Q6. What are the various cost benefit categories?

Q7. How is it easy to identify the costs and benefits of a system?

*** ***** ***

UNIT 9 : THE PROCESS AND STAGES OF SYSTEM DESIGN

UNIT STRUCTURE

9.1 Learning Objectives
9.2 Introduction
9.3 System Design
9.4 Types of System Design
  9.4.1 Logical Design
  9.4.2 Physical Design
9.5 Design Methodologies
  9.5.1 Structured Design
  9.5.2 Functional Decomposition
  9.5.3 Factors Effecting System Complexity
9.6 Form-driven Methodology
  9.6.1 HIPO and IPO Chart
9.7 Let Us Sum Up
9.8 Further Readings
9.9 Answers to Check Your Progress
9.10 Model Questions

9.1 LEARNING OBJECTIVES

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

- learn the different types of system design
- design the structured chart
- discuss about functional dependencies
- understand about coupling and cohesion
- design HIPO/IPO charts

9.2 INTRODUCTION

We have already been acquainted with the various phases of a system development life cycle. In the previous chapters, we have learnt

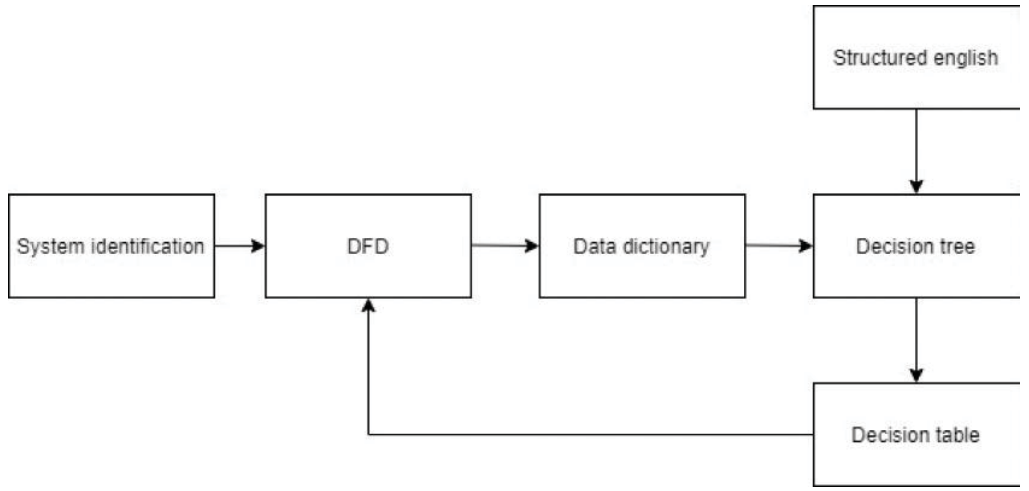


Figure 9.2: Structured design

Structured design partitions a program into small, independent modules. They are arranged in a top-down hierarchy. This method is useful in minimizing complexity and making a problem manageable by subdividing it into smaller segments. This approach is known as modularization or decomposition. Design is said to be top down if it consists of hierarchy of modules each having a single entry and single exit subroutine.

Advantages of modularization:

1. Tests critical interfaces first.
2. Provides abstraction.
3. Allows multiple programmers to work simultaneously.
4. Allows code reuse.
5. Provides control and improves morale.
6. Makes identifying structures easier.

9.5.2 Functional Decomposition

Functional decomposition is a fundamental technical analysis. It breaks down a complex problem into successive layers that are manageable and comprehensive. In functional decomposition, the lower-level functions completely describe the parent. A function or process at lower level cannot exist unless it is included within the parent function or process.

9.5 DESIGN METHODOLOGIES

For developing a system, the logical design must be specified clearly so that the user requirements are met. It needs to lead to technologies and methodologies that do the following functions:

1. Productivity of analyst and programmer should be improved.
2. Documentation and subsequent maintenance and enhancement should be improved.
3. Cost overruns and delays should be reduced.
4. Communication among the users, analyst, designer and programmer should be improved.
5. Approach to analysis and design should be standardized.
6. Design by segmentation should be simplified.

9.5.1 Structured Design

It is a data flow-based methodology. It allows identifying the input and output of the developing device. The main goal of structured design is to minimize the complexity of the system and increase the modularity. The structured design also describes the useful factors of the system.

The first step is to give a system specification that identifies inputs, outputs and describes the functional aspects of the system. Then the graphical representation will be done which is based on the system specification. The graphical representation can be done using Data Flow Diagram (DFD). From the DFD, the definition of the modules and their relationship to one another is formed using a structured chart. The structured chart is formed using a data dictionary and other structured tools. The flow of structured design is depicted in figure 9.2.

about the system analyst, initial investigation and how to do the planning. The various types of feasibility that need to be considered are already explained. Also, we have got the concept up to the analysis phase of a system development life cycle.

In this unit, we will learn about the system design process in a system development life cycle. The most creative and challenging phase of system development life cycle is the system design. The next unit will explore the topics related to input/output and form design.

9.3 SYSTEM DESIGN

System design is the process of defining and developing a system in order to satisfy the specified requirements of the user. It defines the components, architecture, modules, interfaces and data for a system. It describes the approach in order to create a new system. The methods that are needed to implement the system given in the feasibility study are provided by system design. It tries to transform the requirements of the user to design specifications. The system design phase describes both the final system and the process by which the system is developed.

9.4 TYPES OF SYSTEM DESIGN

The system design gives emphasis on the detailed implementation of the recommended system in the feasibility study. It helps in the transition from a user-oriented document to a new document that is oriented to the programmers.

There are two types of system design

- Logical design
- Physical design

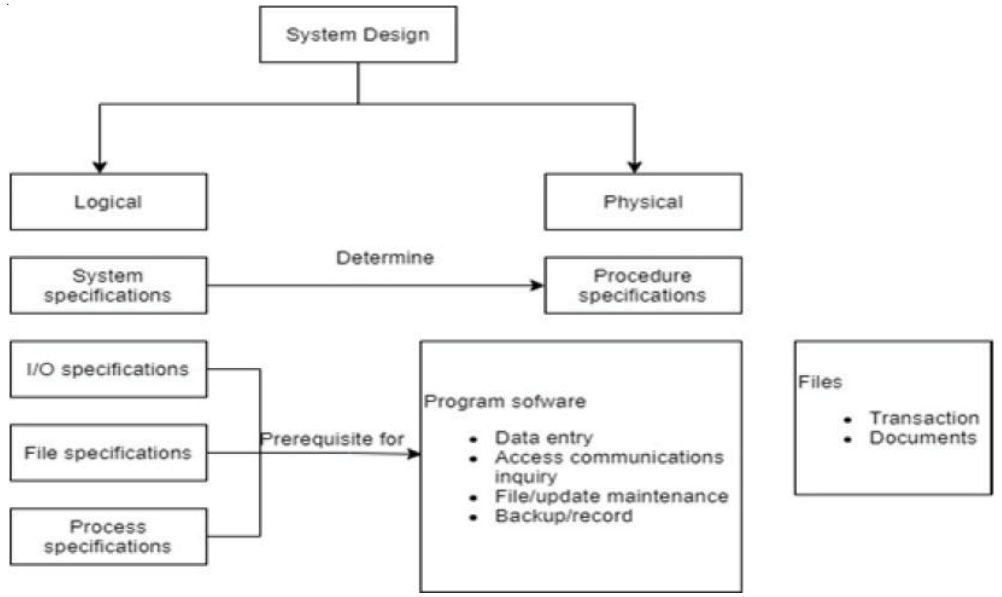


Figure 9.1: Overview of System Design

9.4.1 Logical Design

Logical design shows the logical representation of data flow, input and output of the system. This is achieved by conducting modeling using over-abstract and sometimes graphical model of the actual system. The logical design of a system can be represented by using different diagrams like Entity-Relationship Diagram.

The logical system design represents the user needs at a very detailed level that clearly shows the required information flow into and out of the system. It specifies the required data resources.

The logical design of any system should cover the following:

1. Review the data flow, file content, volumes, frequencies, etc of the current physical system.
2. Prepare the output specifications. The format, content, frequency of reports including terminal specifications and locations should be determined.
3. Prepare the input specifications. The format, content and the input data function, flow of document from the input data source to the actual input location should be determined.

4. Prepare edit, security and control specifications.
5. Specify the implementation plan.
6. Prepare a logical design that specifies the flow of information, output, input, controls and implementation plan.
7. Review the benefits, costs, target dates and system constraints.

9.4.2 Physical Design

Logical design is followed by physical design. Here the working system is produced by defining design specifications that tells the programmer exactly what the system should do. In turn, the programmers write the necessary programs or modify the software package so that the system can accept inputs from the user. The system performs the necessary operations on the existing file or database. The output is a report which is produced as a hard copy or displayed on the screen. The system maintains an updated database all times.

Physical design of any system consists of the following steps:

1. Design the physical system
   a. Specification of input and output media.
   b. Design of the database and specification of the backup procedures.
   c. Design of the physical information flow through the system and a physical design walkthrough.
2. Plan system implementation
   a. Preparation of conversion schedule and a target date.
   b. Determination of the training procedure, courses and timetable.
3. Devise a test and implementation plan. Specify any hardware or software.
4. Update costs, benefits, system constraints and conversion dates.