System Analysis and Design

Slide 08

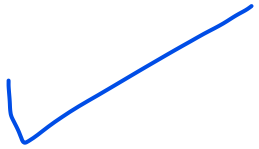
System Security, Disaster/Recovery

Definitions

- System **security** refers to the technical innovations and procedures applied to the hardware and operating systems to protect against deliberate or accidental damage from a defined threat.
- System **integrity** refers to the proper functioning of hardware and programs, appropriate physical security, and safety against external threats.
- **Privacy** defines the rights of the users or organizations 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.
- The term **confidentiality** is a special status given to sensitive information in a data base to minimize the possible invasion of privacy.

Threats to System Security

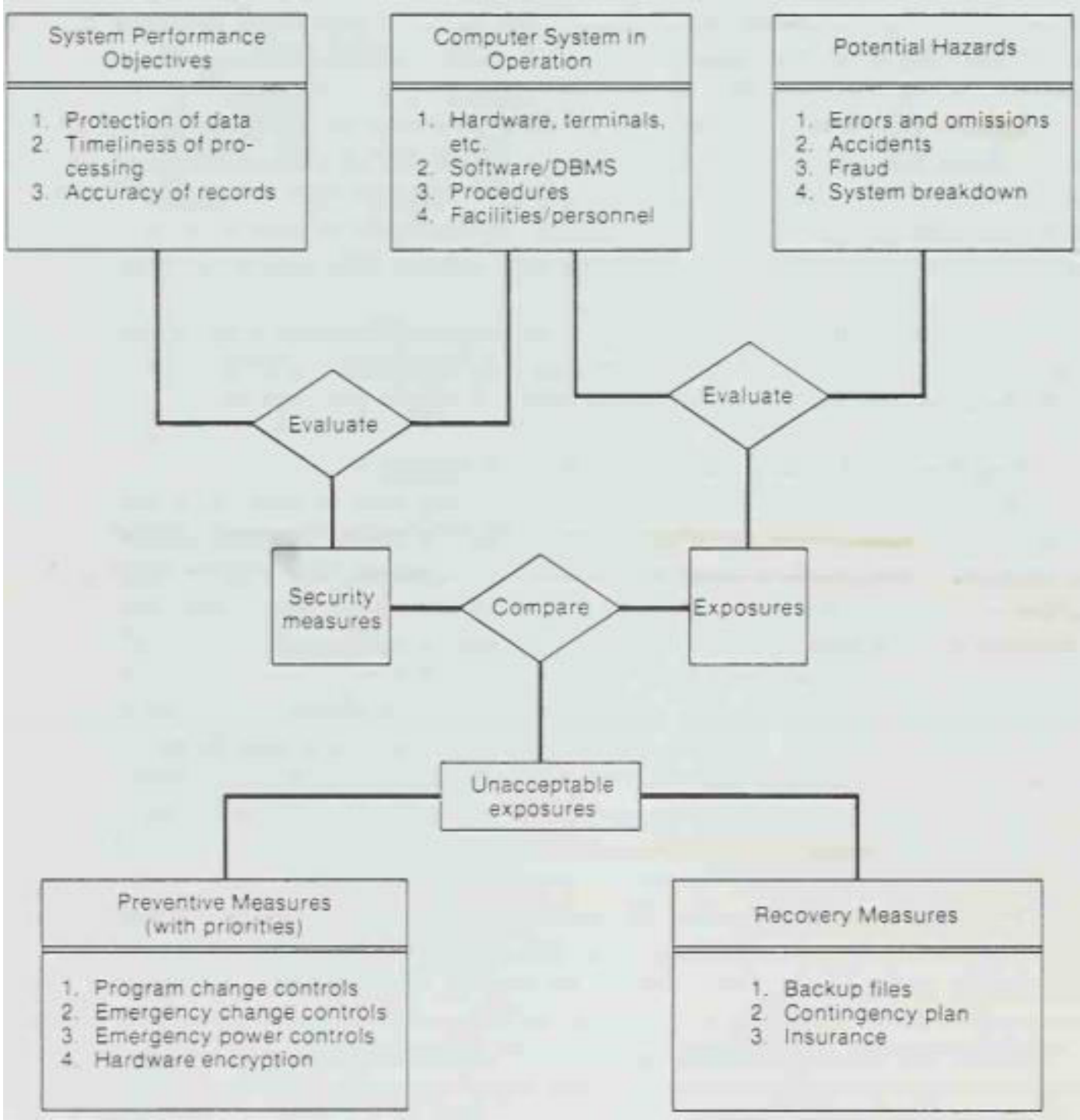
- The list of potential threats is:
  1. **Errors and blunders.**
  2. **Disgruntled and dishonest employees:** Dishonest employees have an easier time identifying the vulnerabilities of a software system than outside hackers because they have access to the system for a much longer time and can capitalize on its weakness.
  3. **Fire:** Fire and other man-made disasters that deny the system power, air conditioning, or needed supplies can have a crippling effect.
  4. **Natural disasters:** floods, hurricanes, snowstorms, lightning, and other calamities.
  5. **External attack:** Hackers.



Risk Analysis

- The purpose of risk analysis is to determine the probability of problems occurring, the cost of each possible disaster, the areas of vulnerability, and the preventive measures to adopt as part of a security plan.

Risk Analysis: Illustration



Risk Analysis: Illustration

- The designer lists the objectives of the system and evaluates them against the existing computer facility to determine the security- requirements.
- It is then evaluated against the potential hazards to determine specific exposures. Security measures are then compared with specific exposures to pinpoint unacceptable exposures.
- The outcome is a draft specifying the preventive and recovery measures to be adopted for effective system security.

Control Measures

- After system security risks have been evaluated, the next step is to select the measures (layers of protection) that are internal and external to the facility.

- **Identification:** There are three schemes for identifying persons to the computer:

1. Something you know, such as a password. Another scheme under the "something you know" category is the picture badge, which identifies people who bring work to the center
2. Something you are, such as fingerprints or voice prints.
3. Something you have, such as the credit card, key, or special terminal.

Control Measures

- **Access Control:**

Encryption. An effective and practical way to safeguard data transmitted over telephone lines is by encryption. Data are scrambled during transmission from one computer or terminal to another. A system that assures that encryption and decryption are done without human intervention is virtually secure from unauthorized access.

- **Audit controls**

Protect a system from external security breaches and internal fraud. Generalized audit software helps the auditor examine files and data bases for consistency, correctness, and completeness. Specialized audit software, on the other hand, probes into specifics. For example, financial analysis programs reduce the volumes of data in the data base to a manageable amount for analysis.

Control Measures

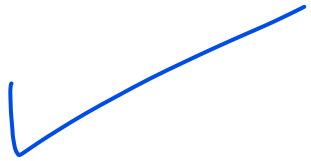
- **System Integrity**
- Concentrates on the functioning of hardware, data base and supportive software, physical security, and operating procedures. The most costly software loss is program error.
- Physical security provides safeguards against the destruction of hardware, data bases, and documentation; fire, flood, theft and loss of power through proper backup.
- The proper use of the file library is another important security feature.

Recovery/Restart Requirements.

- The rollforward approach involves updating a prior valid copy of the data base with the necessary changes to produce a current version of the data base.
- The rollback approach starts with the current invalid state and removes the record(s) of the activity (nail back) to produce the prior valid state of the data base
- Backup can be extremely important in a recovery/restart procedure

DISASTER/RECOVERY PLANNING

- Disaster/recovery planning is a means of addressing the concern for system availability by identifying potential exposure, prioritizing applications, and designing safeguards that minimize loss if a disaster occurs.
- In disaster/recovery planning, management's primary role is to accept the need for contingency planning, select an alternative measure, and recognize the benefits that can be derived from establishing a disaster/ recovery plan.
- Top management should establish the disaster/recovery policy and commit corporate support staff for its implementation.



The Plan

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

The Team

- A disaster/recovery team should include a cross section of system of designers, users, and computer operators.
- Under the leadership of a coordinator, the team's main functions are to organize the project, monitor progress on the plan, and oversee its completion.
- The team meets periodically to ensure that the plan is kept up to date, considers new vulnerabilities or exposures to loss, and implements new technology or procedures as needed.

Planning Tasks

- **Definition** phase sets the objectives of the disaster/recovery project.
- **Requirements** phase evaluates applications against disaster/recovery objectives
- **Design** phase evaluates design alternatives, potential vendors, and prices and chooses the final design.
- **Testing and implementation** phase runs backup systems, compares results, and corrects errors. During implementation, procedures are written, sites are prepared, and maintenance plans are developed.

The Manual

- Once the team has completed the assignment, a disaster/recovery manual is prepared and copies are made available to team members and management.
- All copies of the manual should be updated as needed. The number of manuals should be kept to a minimum with a log of holders and the number of each manual assigned.

ETHICS IN SYSTEM DEVELOPMENT

Consider the following examples of how a systems professional might

act unethically:

- The analyst knows that a user's requirement can be adequately met with a simple, inexpensive system yet installs a state-of-the-art system that takes twice the time (and consulting fees) to implement.
- A systems analyst accepts a microcomputer from a vendor in return for recommending a system sold or made by the vendor.
- A new client competes with a past client for whom the analyst has already installed a system. The analyst knows what system will give the new client the competitive edge and offers to install it in return for a gift of company stock.

System Analysis and Design

Slide 05

The Tools of Structured Analysis

What is Structured Analysis?

- Structured Analysis is a development method that allows the analyst to understand the system and its activities in a logical way.

- *"It is a set of techniques and graphical tools that allow the analyst to develop a new kind of system that is understandable to the user."*

- The traditional approach focuses on cost/benefit and feasibility analyses, project management, hardware and software selection, and personnel considerations. In contrast, structured analysis considers new goals and structured tools for analysis.

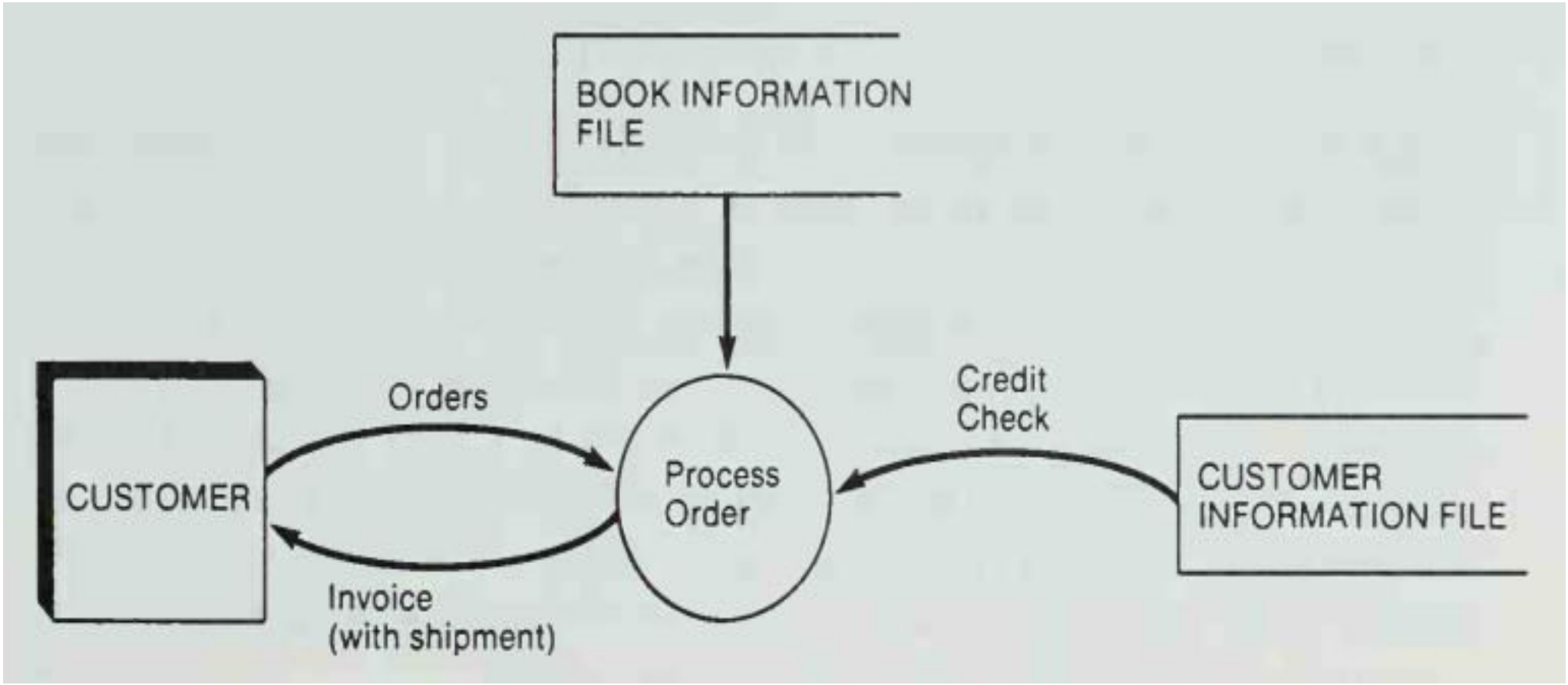
Structured Analysis Tools

- During Structured Analysis, various tools and techniques are used for system development. They are −
  - Data Flow Diagrams
  - Data Dictionary
  - Decision Trees
  - Structured English
  - Decision Tables

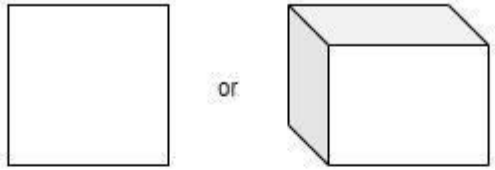
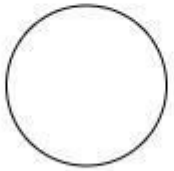
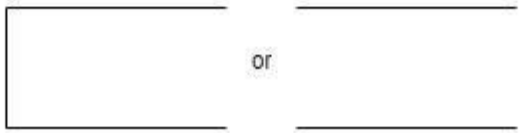
1. Data Flow Diagram

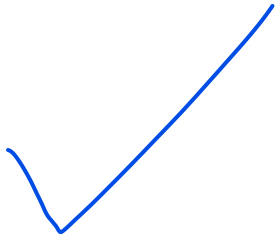
- It was first developed by Larry Constantine as a way of expressing system requirements in a graphical form.
- It shows the flow of data between various functions of system and specifies how the current system is implemented.
- Its graphical nature makes it a good communication tool between user and analyst or analyst and system designer

Example of DFD



Basic Elements of DFD

Symbols Name	Symbols	Meaning
Square		Source or Destination of Data
Arrow		Data Flow
Circle		Process
Open rectangle		Data Store



Basic Elements of DFD

- **Circle or a bubble** represents a process that transforms incoming data flow into outgoing data
- **Open rectangle** is a data store, or data at rest, or a temporary repository of data
- External Entity is shown as a **square**. An external entity can be a person, system, or application. It's where data starts or ends.
- **Arrow** identifies data flow, means the data in motion. It is a pipeline through which information flows.

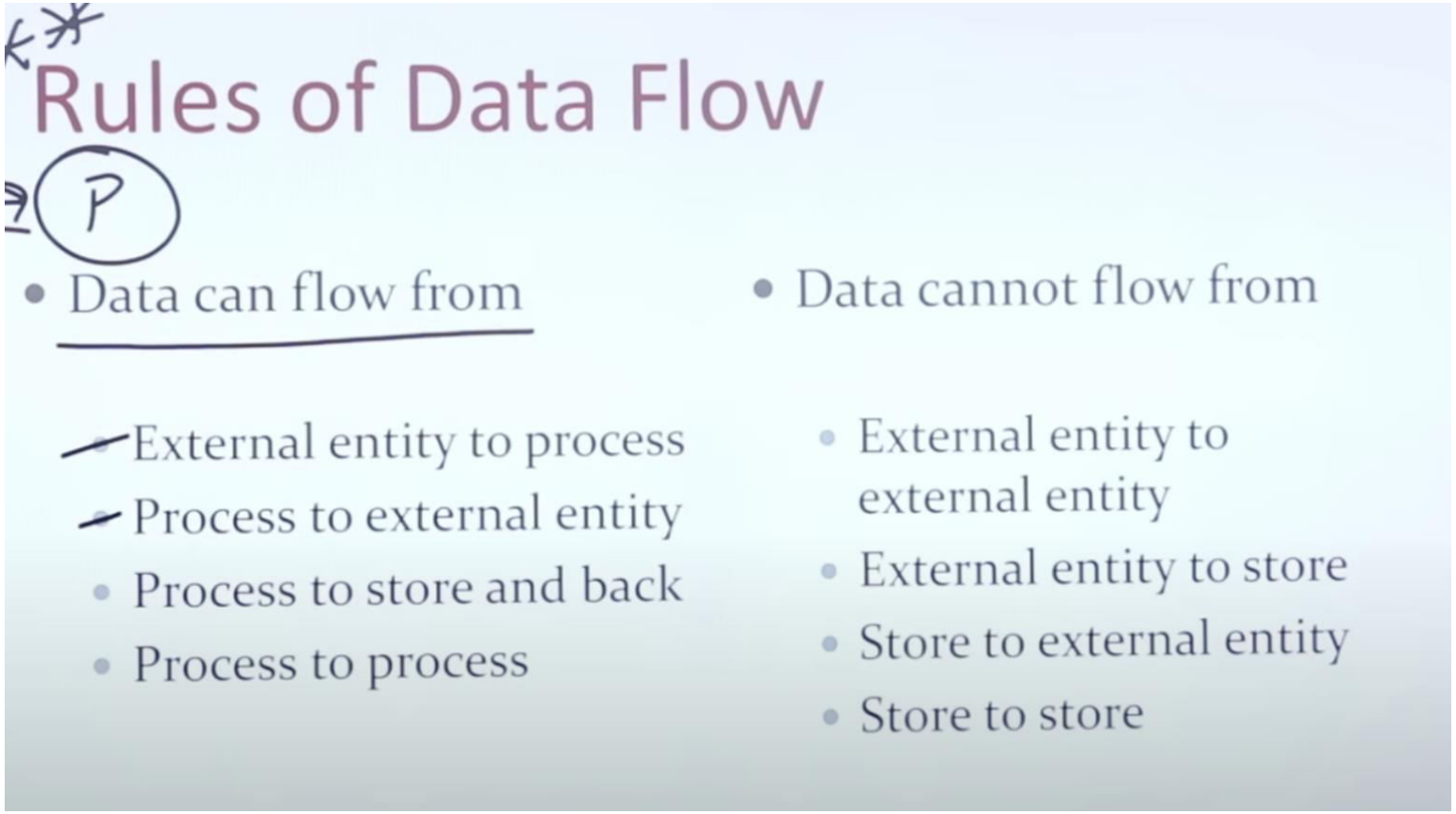
Rules for Constructing a DFD

- **Data can not flow between two entities** - Data flow must be from entity to a process or a process to an entity. There can be multiple data flows between one entity and a process.

- **Data can not flow between two data stores** **-** Data flow must be from data store to a process or a process to an data store. Data flow can occur from one data store to many process.

- **Data can not flow directly from an entity to data store** - Data Flow from entity must be processed by a process before going to data store and vice versa.

Rules for Constructing a DFD



Rules for Constructing a DFD

- **A process must have at least one input data flow and one output data flow -** Every process must have input data flow to process the data and an output data flow for the processed data.

- **Two data flows can not cross each other.**

- **All the process in the system must be linked to minimum one data store or any other process.**

2. Data Dictionary

- **A data dictionary is a structured repository of data elements in the system. It stores the descriptions of all DFD data elements that is, details and definitions of data flows, data stores, data stored in data stores, and the processes.**

- A data dictionary improves the communication between the analyst and the user.

- It plays an important role in building a database.

- Most DBMSs have a data dictionary as a standard feature.

Data Dictionary – An example

PROJECT DATA ELEMENT SHEET

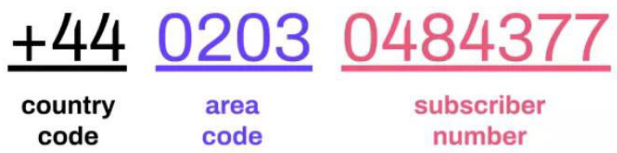
PROJECT NAME _____ DATE _____

DATA ELEMENT DESCRIPTION	DATA ELEMENT ABBREVIATION	ELEMENT PICTURE	ELEMENT LOCATION	ELEMENT SOURCE

Data Dictionary

- **Data Elements-** Smallest unit of data that provides for no further decomposition. For example: date consists of day, month and year

- **Data Structure-** A group of data elements handled as a unit. For example: phone is a data structure consisting of four data elements: area-code-exchange-number-extension.



- **Data Flows and Data Stores-** data flows are data structures in motion, whereas data stores are data structures at rest. A data store is a location where data structures are temporarily located.

3. Decision Tree

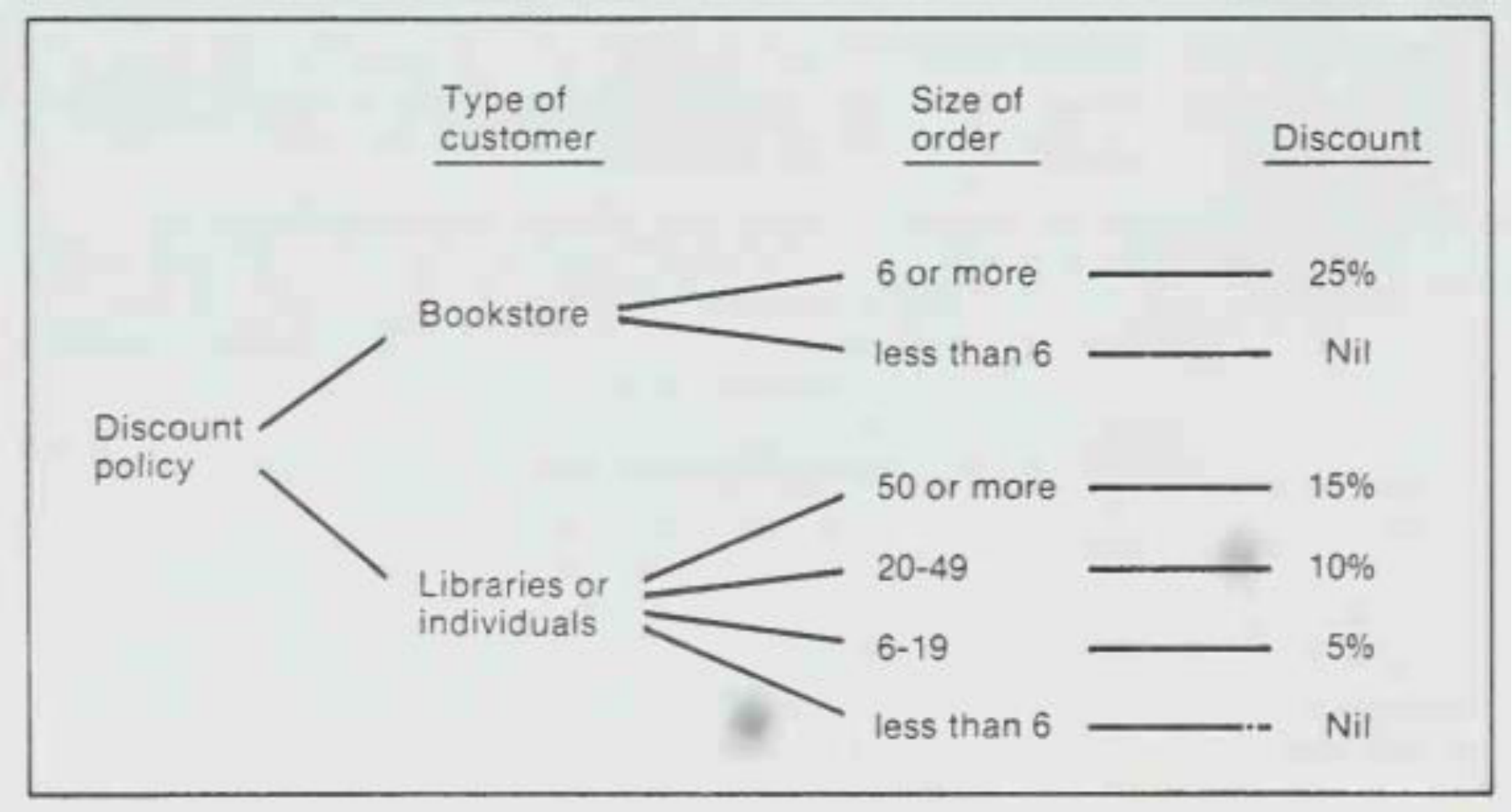
- A decision tree is a diagram that shows alternative actions and conditions within horizontal tree framework.

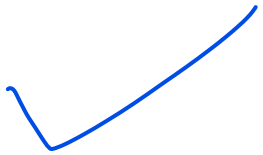
- A decision tree has as many branches as there are logical alternatives. It simply sketches the logical structure based on the stated policy.

An Example

- **Discount policies:** Bookstores get a trade discount of 25% on orders of at least 6 copies. For orders from libraries and individuals, 5% allowed on orders of 6-19 copies per book title; 10% on orders for 20-49 copies per book title; 15% on orders for 50 copies or more per book title.

Decision tree – An example





4. Structured English

- Structures English is like structured programming, it uses logical construction and sentences designed to carry out instructions
- Designs are made through IF, THEN, ELSE, and SO statements.

Structured English – An Example

```
COMPUTE-DISCOUNT
Add up the number of copies per book title
IF order is from bookstore
   and-IF     order is for 6 copies or more per book title
      THEN: Discount is 25%
   ELSE       (order is for fewer than 6 copies per book title)
         SO: no discount is allowed
ELSE (order is from libraries or individual customers)
   so-IF      order is for 50 copies or more per book title
              discount is 15%
      ELSE IF order is for 20 to 49 copies per book title
              discount is 10%
      ELSE IF order is for 6 to 19 copies per book title
              discount is 5%
      ELSE    (order is for less than 6 copies per book order)
        SO:   no discount is allowed
```

5. Decision Tables

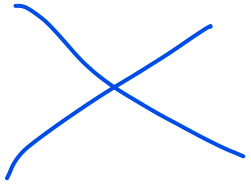
- Decision tables are a method of describing the complex logical relationship in a precise manner which is easily understandable.
- It is useful in situations where the resulting actions depend on the occurrence of one or several combinations of independent conditions.
- It is a matrix containing row or columns for defining a problem and the actions.

Components of a Decision Table

- **Condition Stub** – It is in the upper left quadrant which lists all the condition to be checked.
- **Action Stub** – It is in the lower left quadrant which outlines all the action to be carried out to meet such condition.
- **Condition Entry** – It is in upper right quadrant which provides answers to questions asked in condition stub quadrant.
- **Action Entry** – It is in lower right quadrant which indicates the appropriate action resulting from the answers to the conditions in the condition entry quadrant.

Decision Table - Discount Policy

	Condition Stub	Condition Entry					
		1	2	3	4	5	6
IF (condition)	Customer is bookstore?	Y	Y	N	N	N	N
	Order-size 6 copies or more?	Y	N	N	N	N	N
	Customer librarian or individual?			Y	Y	Y	Y
	Order-size 50 copies or more?			Y	N	N	N
	Order-size 20–49 copies?				Y	N	N
	Order-size 6–19 copies?					Y	N
THEN (action)	Allow 25% discount	X					
	Allow 15% discount			X			
	Allow 10% discount				X		
	Allow 5% discount					X	
	No discount allowed		X				X
	Action Stub	Action Entry					



Pros and Cons of Each Tool

- The primary strength of the DFD is its ability to represent data flows. It may be used at high or low levels of analysis and provides good system documentation. However, the tool only weakly shows input and output detail.
- The data dictionary helps the analyst simplify the structure for meeting the data requirements of the system. It may be used at high or low levels of analysis, but it does not provide functional details, and it is not acceptable to many nontechnical users.
- Structured English is best used when the problem requires sequences of actions with decisions.

Pros and Cons of Each Tool (Cont'd)

- Decision trees are used to verify logic and in problems that involve a few complex decisions resulting in a limited number of actions.
- Decision trees and decision tables are best suited for dealing with complex branching routines such is calculating discounts or sales commissions or inventory control procedures.

Practice Problem

- Suppose a student took an exam. If the student attended the exam and scored within certain ranges, they will receive corresponding grades: 80 or above corresponds to an A+ grade, 75-79 corresponds to an A grade, 70-74 corresponds to an A- grade, 65-69 corresponds to a B+ grade, 60-64 corresponds to a B grade, 55-59 corresponds to a B- grade, 50-54 corresponds to a C+ grade, 45-49 corresponds to a C grade, and 40-44 corresponds to a D grade. However, if the student did not attend the exam, they will receive an F grade.

  - Draw a decision tree based on the statement.
  - Develop a decision table.

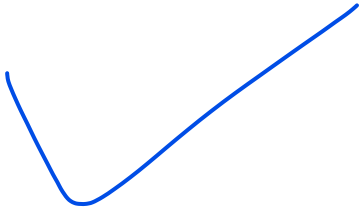
System Analysis and Design

Slide 06

Feasibility Study

Feasibility Study

- Feasibility Study can be considered as preliminary investigation that helps the management to take decision about whether study of system should be feasible for development or not.
- It identifies the possibility of improving an existing system, developing a new system, and produce refined estimates for further development of system.
- It is used to obtain the outline of the problem and decide whether feasible or appropriate solution exists or not.



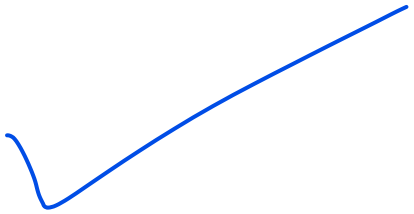
Feasibility Study

- Feasibility study is to serve as a decision document. it must answer three questions:
  1. Is there a new and better way to do the job that will benefit the user?
  2. What are the cost and savings of the alternatives?
  3. What is recommended?

Types of Feasibilities

Economic Feasibility

- It is evaluating the effectiveness of candidate system by using cost/benefit analysis method.
- It demonstrates the net benefit from the candidate system in terms of benefits and costs to the organization.
- The main aim of Economic Feasibility Analysis (EFS) is to estimate the economic requirements of candidate system before investments funds are committed to proposal.
- It prefers the alternative which will maximize the net worth of organization by earliest and highest return of funds along with lowest level of risk involved in developing the candidate system.



Types of Feasibilities

Technical Feasibility

- It investigates the technical feasibility of each implementation alternative.
- It analyzes and determines whether the solution can be supported by existing technology or not.
- The analyst determines whether current technical resources be upgraded or added that fulfill the new requirements.
- It ensures that the candidate system provides appropriate responses to what extent it can support the technical enhancement.

Types of Feasibilities

Behavioral Feasibility

- It evaluates and estimates the user attitude or behavior towards the development of new system.
- It helps in determining if the system requires special effort to educate, retrain, transfer, and changes in employee's job status on new ways of conducting business.

Types of Feasibilities

Operational Feasibility

- It determines whether the system is operating effectively once it is developed and implemented.
- It ensures that the management should support the proposed system and its working feasible in the current organizational environment.
- It also ensures that the computer resources and network architecture of candidate system are workable

Types of Feasibilities

Schedule Feasibility

- It ensures that the project should be completed within given time constraint or schedule.
- It also verifies and validates whether the deadlines of project are reasonable or not.

Steps Involved in Feasibility Analysis

- Form a project team and appoint a project leader.
- Develop system flowcharts.
- Identify the characteristics (deficiencies) of current system and set goals.
- Enumerate the alternative solution or potential candidate system to meet goals.
- Determine the feasibility of each alternative such as technical feasibility, operational feasibility, etc.
- Weight the performance and cost effectiveness of each candidate system.
- Rank the other alternatives and select the best candidate system.
- Prepare a system proposal of final project directive to management for approval.

Feasibility Report

The report is a formal document for management use, brief enough and sufficiently nontechnical to be understandable, yet detailed enough to provide the basis for system design.

- Cover letter formally presents the report and briefly indicates to management the nature, general findings, and recommendations to be considered.
- Table of contents specifies the location of the various parts of the report.
- Overview is a narrative explanation of the purpose and scope of the project, the reason for undertaking the feasibility study.
- The department(s) involved or affected by the candidate system.
- Included are the names of the persons who conducted the study, when it began, and other information that explains the circumstances surrounding the study.

Feasibility Report (Cont.)

- Detailed findings outline the methods used in the present system. The section also provides a description of the objectives and general procedures of the candidate system.
- Economic justification details point-by-point cost comparisons and preliminary cost estimates for the development and operation of the candidate system.
- Recommendations and conclusions suggest to management the most beneficial and cost-effective system.
- Appendixes document all memos and data compiled during the investigation.

Weight the performance and cost effectiveness

Evaluation Criteria	Candidate 1	Candidate 2	Candidate 3
Performance			
System Accuracy	**Excellent**	**Excellent**	**Excellent**
Growth Potential	**Very Good**	**Good**	**Good**
Response Time	**Very Good**	**Very Good**	**Very Good**
User Friendly	**Excellent**	**Very Good**	**Very Good**
Costs			
System Development	**Good**	**Very Good**	**Good**
User Training	**Excellent**	**Good**	**Good**
System Operation	**Very Good**	**Fair**	**Very Good**
Payback	**Very Good**	**Good**	**Excellent**

Rank the other alternatives

Evaluation Criteria	Weighting Factor	Candidate 1		Candidate 2		Candidate 3	
		Rating	*Score*	*Rating*	*Score*	*Rating*	*Score*
Performance							
System Accuracy	3	5	15	5	15	5t	15
Growth Potential	4	4	16	3	12	3	12
Response Time	2	4	8	4	8	4	8
User Friendly	2	5	10	4	8	4	8
Costs							
System Development	5	3	15	4	20	3	15
User Training	3	5	15	3	9	3	9
System Operation	2	4	8	2	4	4	8
Payback	3	4	12	3	9	5	15
Total			99		85		90

System Analysis and Design

Slide 07

Cost/Benefit Analysis

What is Cost/Benefit Analysis?

- A cost-benefit analysis (CBA) is the process used to measure the benefits of a decision or taking action minus the costs associated with taking that action.
- Cost–benefit analysis (CBA), is a systematic approach to estimating the strengths and weaknesses of alternatives used to determine options which provide the best approach to achieving benefits while preserving savings (for example, in transactions, activities, and functional business requirements).
- Cost benefit determines the benefits and savings that are expected from the system and compares them with the expected costs.

Cost Elements

- to estimate the costs of a system there are several types of cost elements−
  - Hardware Cost
  - Personnel Cost
  - Facility Cost
  - Operating Cost
  - Supply Cost

Cost Elements

- **Hardware costs** relate to the actual purchase or lease of the computer and peripherals (for example, printer, disk drive, tape unit).
- **Personnel costs** include staff salaries and benefits (health insurance, vacation time, sick pay, etc.) as well as pay for those involved in developing the system. Costs incurred during the development of a system are one-time costs and are labeled developmental costs. Once the system is installed, the costs of operating and maintaining the system become recurring costs.
- **Facility costs** are expenses incurred in the preparation of the physical site where the application or the computer will be in operation. This includes wiring, flooring, lighting, and air conditioning.

Cost Elements

- **Operating costs** include all costs associated with the day-to-day operation of the system; the amount depends on the number of shifts, the nature of the applications and the caliber of the operating staff.
- **Supply costs** are variable costs that increase with increased use of paper, ribbons, disks, and the like. They should be estimated and included in the overall cost of the system.

Cost/Benefit Determination

- Identify the costs and benefits relating to a given project.
- Categorize the various costs and benefits for analysis.
- Select a method of evaluation.
- Interpret the results of the analysis.
- Take action.

1. Costs and Benefits Identification

Certain costs and benefits are more easily identifiable than others.

- Direct costs such as the price of a hard disk are easily identified from company invoice payments or checks.
- Direct benefits often relate one-to-one to direct costs.
- A category of costs or benefits is not easily noticeable is opportunity costs and opportunity benefits.

2. Classifications of Costs and Benefits

Tangible or Intangible Costs:

- Tangible cost and benefits can be measured. Hardware costs, salaries for professionals, software cost are all **tangible costs**. They are identified and measured. The purchase of hardware or software, personnel training and employee salaries are example of tangible costs.
- Costs whose value cannot be measured are referred as **intangible costs**. Example- employee morale problems caused by a new system or lowered company image.

2. Classifications of Costs and Benefits

Tangible or Intangible Benefits:

- Benefits are also tangible or intangible. For example, more customer satisfaction, improved company status etc. are all intangible benefits.
- Whereas improved response time, producing error free output such as producing reports are all tangible benefits. Both tangible and intangible costs and benefits should be considered in the evaluation process.

Classifications of Costs and Benefits

Direct or Indirect Costs and Benefits:

- From the cost accounting point of view, the costs are treated as either direct or indirect. **Direct** costs are having dollar value associated with it. Direct benefits are also attributable to a given project. For example, if the proposed system that can handle more transactions say 25% more than the present system then it is **direct** benefit.
- **Indirect** costs result from the operations that are not directly associated with the system. Insurance, maintenance, heat, light, air conditioning are all indirect costs

Classifications of Costs and Benefits

Fixed or Variable Costs and Benefits:

- Some costs and benefits are fixed. **Fixed** costs don't change. Depreciation of hardware, Insurance, etc. are all fixed costs. **Variable** costs are incurred on regular basis. Recurring period may be weekly or monthly depending upon the system. They are proportional to the work volume and continue as long as system is in operation.
- **Fixed** benefits don't change. **Variable** benefits are realized on a regular basis.

3. Select Evaluation Method

- When all financial data have been identified and broken down into cost categories, the analyst must select a method of evaluation.

Net Benefit Analysis

- The time value of money is usually expressed in the form of interest on the funds invested to realize the future value. Assuming compounded interest, the formula is:

$$F = P(1 + i)^n$$

Where,

F = Future value of an investment.

P = Present value of the investment.

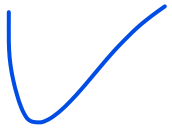
i = Interest rate per compounding period.

n = Number of years.

Net Benefit Analysis: Example

For example, $3,000 invested in Treasury notes for three years at 10 percent interest would have a value at maturity of:

$$
\begin{aligned}
F &= \$3{,}000(1 + 0.10)^3 \\
&= 3{,}000(1.33) \\
&= \$3{,}993
\end{aligned}
$$



Present Value Analysis

- In developing long-term projects, it is often difficult to compare today's costs with the full value of tomorrow's benefits. As we have seen, the time value of money allows for interest rates, inflation, and other factors that alter the value of the investment.
- The amount that we are willing to invest today is determined by the value of the benefits at the end of a given period (year). The amount is called the present value of the benefit.

Present Value Analysis

To compute the present value, we take the formula for future value ($F = P/(1 + i)^n$) and solve for the present value (P) as follows:

$$P = \frac{F}{(1 + i)^n}$$

So the present value of $1,500 invested at 10 percent interest at the end of the fourth year is:

$$P = \frac{1{,}500}{(1 + 0.10)^4}$$

$$= \frac{1{,}500}{1.61} = \$1{,}027.39$$

That is, if we invest $1,027.39 today at 10 percent interest

we can expect to have $1,500 in four years.

Net Present Value

- The net present value is equal to discounted benefits minus discounted costs (net present gain).

- $3,000 microcomputer investment yields a cumulative benefit of $4,758.51, or a net present gain of $1,758.51. The net present value is expressed as a percentage of the investment—in our example: 1758.51/3000 = 0.55 percent

Payback Analysis

- The payback method is a common measure of the relative time value of a project.
- It determines the time it takes for the accumulated benefits to equal the initial investment. Obviously, the shorter the payback period, the sooner a profit is realized and the more attractive is the investment.
- The payback method is easy to calculate and allows two or more activities to be ranked.

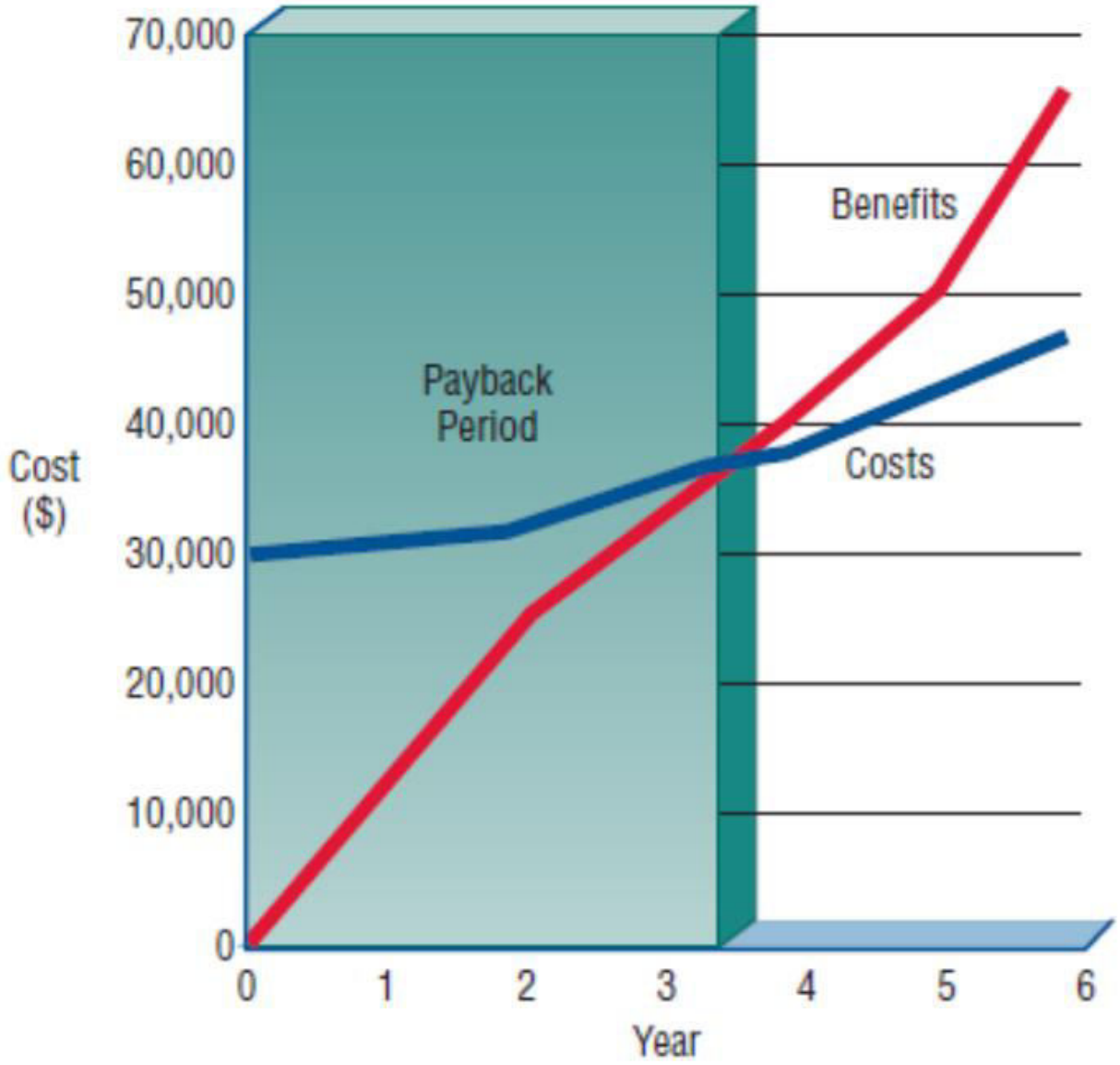


Figure: Payback Period chart

Break-Even Analysis

- Break-even is the point where the cost of the candidate system and that of the current one are equal.
- When a candidate system is developed, initial costs usually exceed those of the current system. This is an investment period. When both costs are equal, it is break-even. Beyond that point, the candidate system provides greater benefit (profit) than the old one—a return period.

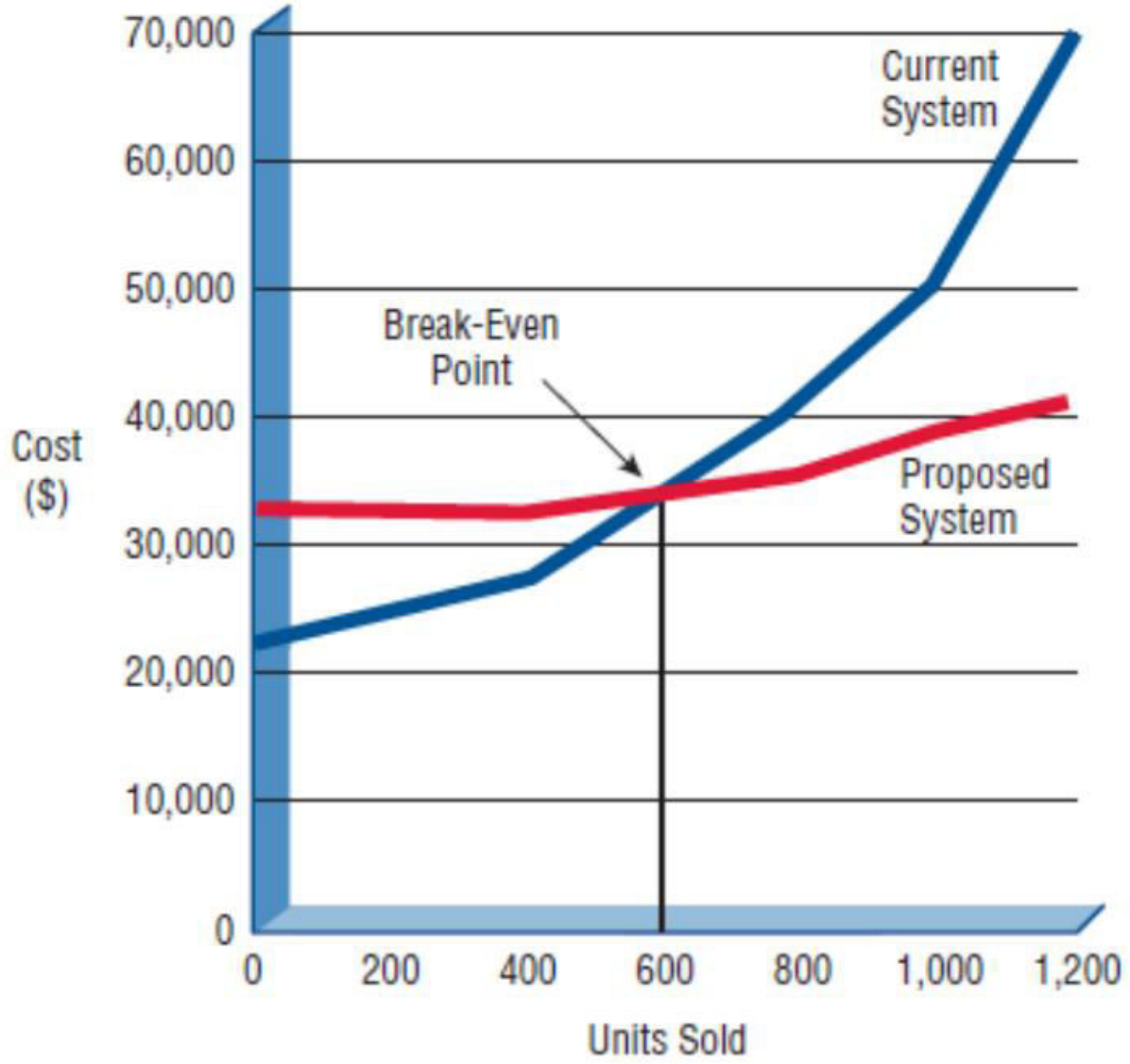


Fig: Break Even chart

Cash-Flow Analysis

- Cash flow analysis is a financial evaluation method used to assess the inflow and outflow of cash within a business or investment project over a specific period of time.
- Cash-flow analysis keeps track of accumulated costs and revenues on a regular basis.

	Year 1				Year 2
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1
Revenue	$5,000	$20,000	$24,960	$31,270	$39,020
Costs					
Software development	10,000	5,000			
Personnel	8,000	8,400	8,800	9,260	9,700
Training	3,000	6,000			
Equipment lease	4,000	4,000	4,000	4,000	4,000
Supplies	1,000	2,000	2,370	2,990	3,730
Maintenance	0	2,000	2,200	2,420	2,660
Total Costs	26,000	27,400	17,370	18,670	20,090
Cash Flow	–21,000	–7,400	7,590	12,600	18,930
Cumulative Cash Flow	–21,000	–28,400	–20,810	–8,210	10,720

Figure: Cash-flow analysis

4. Interpret Results of the Analysis

- When the evaluation of the project is complete, the results have to be interpreted.
- This involves comparing actual results against a standard or the result of an alternative investment.

5. Final Action

- The final decision following cost benefit analysis is to select the most cost effective and beneficial system for the user.
- The report is a detailed summary of the investigation that has been carried out. It outlines the options and recommendations.
- It is presented to management for determining whether a candidate system should be designed.

Practice Problem

- Mr. Ahmed made an initial investment of 4000 USD at 12% interest in a mango business. Determine the future value of the investment after 4 years.
- John wants $10,000 after three years. The interest rate available on a specific investment, which he is interested in, is 4%. How much should John invest today to receive the desired amount?