

## Chapter one

### 1.1 Introduction

- A system is simply a group of activities and elements, which have been arranged to achieve a certain objective. Or

A system is a set of interrelated components that function together to achieve a common goal. The components of a system are called subsystems.

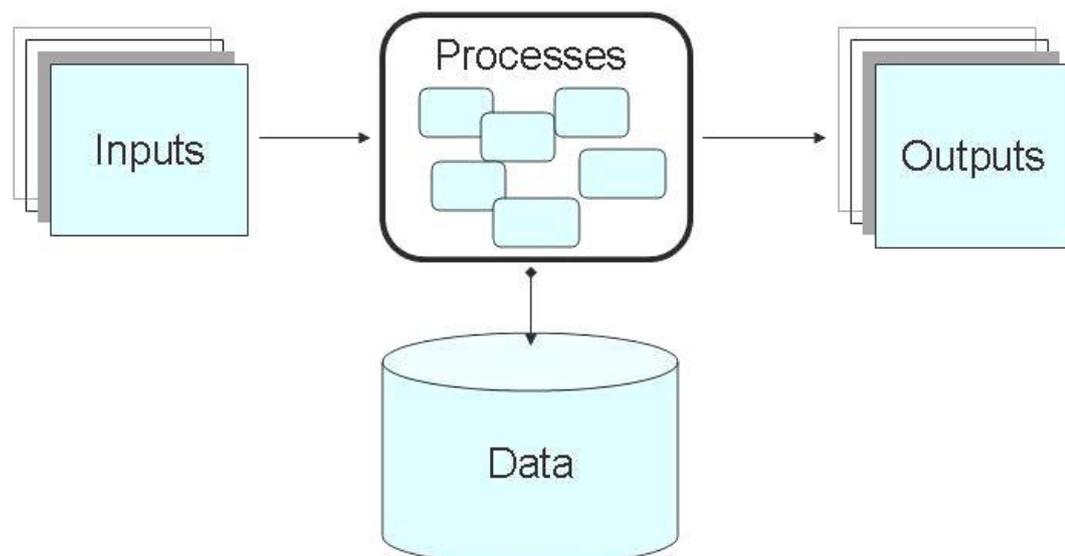
- The components of a system are interdependent; that is, the output of one subsystem is usually becomes the input of another subsystem. Thus, malfunctioning of one component affects the functioning of other components.

A system receives inputs from the outside environment, which are then processed by various subsystems, and then delivers required outputs to the outside environment.

A system also has control mechanisms to make certain decisions. This is usually performed as a feedback to the system user (or automated to the system environment) followed by certain decisions.

- An automated system control might be a heating and cooling thermostat which turns on and off at a presetting temperature.

- A library circulation system is another example of system control, which may require user interaction. When books are overdue, the system alerts the user. The user then has the option of printing an overdue notice. This process can also be automatic.



- An information system is a combination of hardware, software and telecommunication systems, which can support business operations to increase productivity, and help managers make decisions. In this age, the success of a business depends on the information system.

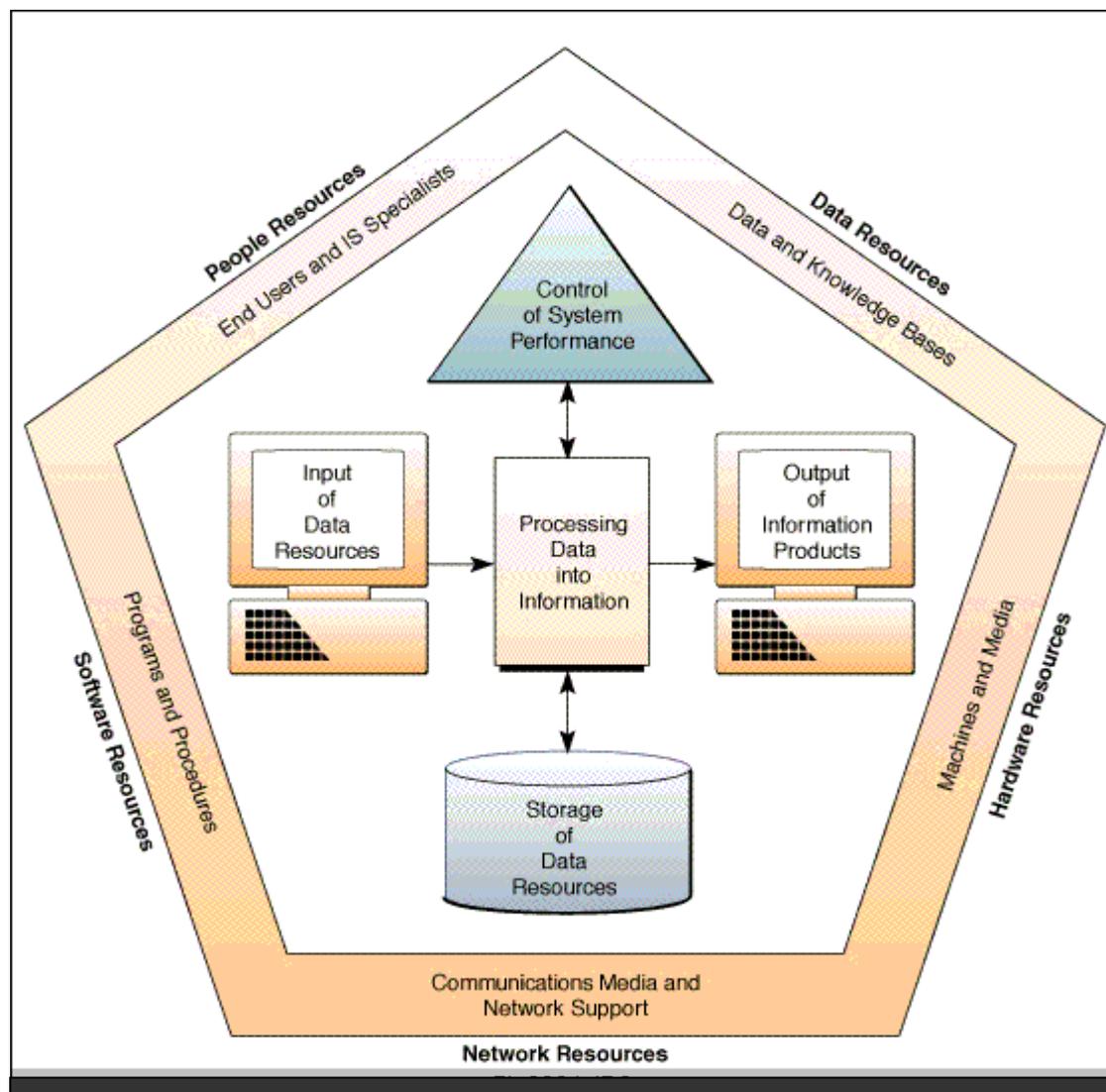
- Many organizations today use information systems to offer services with greater satisfaction to customers, to access a wider range of information, to handle business changes at a greater speed, and to increase the productivity of workers.

Based on a number of researches, an effective information system should be able to exceed customer expectations and fulfil business needs.

As an example, business transactions at a supermarket, bank, and hotel require information systems that are different and unique.

- An organization deals with various types of information systems, such as, transaction processing systems, management information systems, decision support systems, and expert systems. Each of these systems requires many subsystems to accomplish its goals.

A computer-based information system deals with the organizational data, computer hardware, software, network, people, and procedures.



**Computer Based Information system**

## 1.2 System Analysis & Design

Systems analysis and design is a complex, challenging, and stimulating **organizational process** that a team of business and system professionals uses to develop and maintain computer-based information systems.

Systems are built and rebuilt in an organization to increase value to the business of an organization. Thus, system analysis and design is a process that is used to analyze, design, and implement improvements in the functioning of business that can be accomplished through the use of computerized information systems.

System analysis and design uses a methodological approach to develop a computer-based information system.

## 1.3 Role of systems analyst

The roles and the names used to describe them may vary from organization to organization

- In smaller organizations, one person may play several of these roles. But in complex organization and system we need several types of system's analyst.

The *systems analyst* role focuses on the issues surrounding the system.

This person develops ideas and suggestions for ways that IT can support and improve business processes, helps design new business processes supported by IT,

designs the new information system, and ensures that all IS standards are maintained.

The systems analyst will have significant training and experience in analysis , design and in programming.

- **The *business analyst* role focuses on the business issues surrounding the system.**

1. This person helps to identify the business value that the system will create, develops ideas for improving the business processes,
2. and helps design new business processes and policies.
3. The business analyst will have business training and experience, plus knowledge of analysis and design.

- The *requirements analyst* role focuses on eliciting the requirements from the stakeholders associated with the new system. Requirements analysts understand the business well, are excellent communicators, and are highly skilled in an array of requirements elicitation techniques .

The *infrastructure analyst* role focuses on technical issues surrounding the ways of the system will interact with the organization's technical infrastructure (hardware, software, networks, and databases). This person ensures that the new information system conforms to organizational

standards and helps to identify infrastructure changes that will be needed to support the system.

Over time, an experienced infrastructure analyst may assume the role of *software architect*, who takes a holistic view of the organization's entire IT environment and guides application design decisions within that context.

- The *change management analyst* role focuses on the people and management issues surrounding the system installation. This person ensures that adequate documentation and support are available to users, provides user training on the new system, and develops strategies to overcome resistance to change. The *project manager* role ensures that the project is completed on time and within budget and that the system delivers the expected value to the organization.

The project manager is often a seasoned systems analyst who, through training and experience, has acquired specialized project management knowledge and skills.

#### **1.4 Systems Development Life Cycle**

The systems development life cycle (SDLC) is a process by which systems analysts, software engineers, and programmers build systems.

It is a phased approach to analysis and design of a system, which holds that systems are best developed through the use of a specific cycle of analyst and user activities.or is the process of determining how an information system (IS) can support business needs, designing the system, building it, and delivering it to users.

In its simplest form, SDLC consists of five phases:

- systems planning
- systems analysis
- systems design
- systems implementation
- systems operation and support

Each phase is divided into multiple steps or activities that need to be completed.

#### **Note**

The systems analyst is a key person in the development of information systems. The systems analyst helps to

- analyze the business situation,
- identify opportunities for improvements,
- and design an information system that adds value to the organization.

The systems analyst serves as a change agent, and this complex responsibility requires a wide range of skills, including technical, business, analytical, interpersonal, management, and ethical.

In some organizations, systems analysts may develop a specialization such as business analyst, requirements analyst, infrastructure analyst, change management analyst, or project manager a system analyst spends most of his or her time in analyzing and designing a system before the programmers actually develop the system; although program coding takes about three-fourth of the total time of the system development life cycle.

- A methodology provides a sequential approach of traversing the activities or tasks of designing and developing a system. There can be multiple methodologies of developing a system; however, there is only one systems development life cycle.

Example: You wish to fly from one place to another; however, you can go through various routes to reach your destination. Going from one location to another is SDLC, and taking various routes are methodologies.

The number and names of the SDLC phases varies from author to author, but the analysis, design and implementation phases are common. Some authors break the planning, design, and implementation phases .

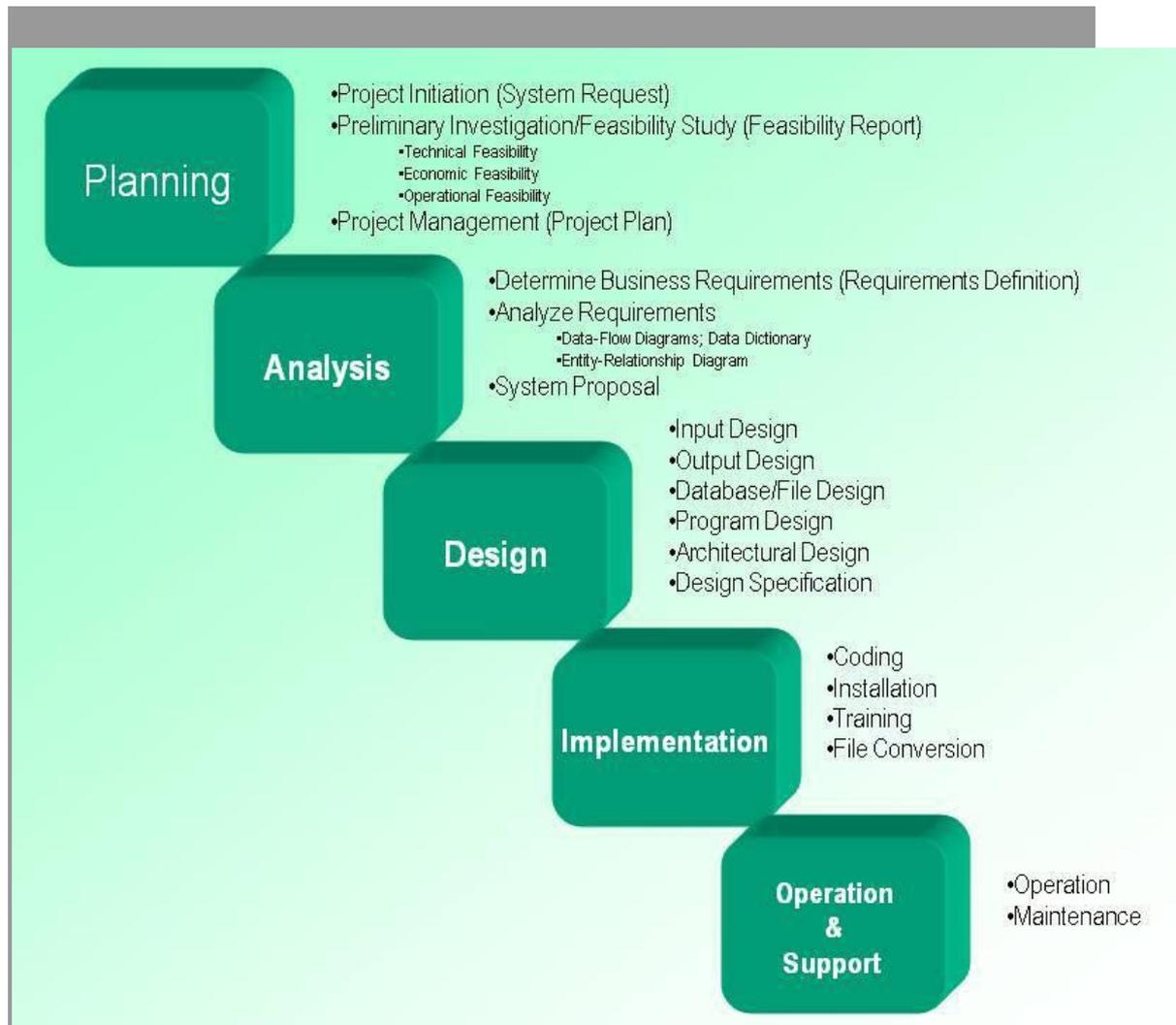
In some cases, systems maintenance is not considered as part of the SDLC. But in all cases, the following issues are addressed in developing a system:

- Identify a project
- Determine end-user's requirements
- Analyze system needs
- Acquire computer hardware and software (if required)
- Design the new system
- Construct the new system
- Install the new system
- Maintain and improve the system

In each phase of the SDLC, certain steps are performed to complete the phase. In a particular project, all steps in a particular phase may not follow a logical path, but the steps are fitted according to the need of the system.

- An important outcome of each phase of the SDLC is a document. The document from one phase provides a structure for the development of the next phase. At each phase the system gets more elaborate and refined.

The *systems analysis and design* course is mainly designed to cover the methodologies used in the *analysis* and *design* phases of a systems development life cycle.



## 1.5 Phases of SDLC

### Planning

The *planning phase* is the fundamental process of understanding

1. *why* an information system should be built and
2. determining how the project team will go about building it. It has two steps:

1. During *project initiation*, the system's business value to the organization is identified—how will it lower costs or increase revenues?

Most ideas for new systems come from outside the IS area (from the marketing department, accounting department, etc.) in the form of a system request.

A *system request* is a document that describes

- the business reasons for building a system and
- the value that the system is expected to provide.

The project sponsor usually completes this form as part of a formal system project selection process within the organization.

Most system requests include five elements: project sponsor, business need, business requirements, business value, and special issues

The IS department works together with the persons department generating the request (called the *project sponsor*) to conduct a feasibility analysis. The *feasibility analysis* examines key aspects of the proposed project:

- The technical feasibility (Can we build it?)
- The economic feasibility (Will it provide business value?)
- The organizational feasibility (If we build it, will it be used?)

The system request and feasibility analysis are presented to an information systems *approval committee* (sometimes called a *steering committee*), which decides whether the project should be undertaken.

1. During project management, the *project manager* creates a *work plan*, staffs the project, and puts techniques in place to help the project team control and direct the project through the entire SDLC. The deliverable for project management is a *project plan* that describes how the project team will go about developing the system.

## Analysis

The *analysis phase* answers the questions of

- *who* will use the system,
- *what* the system will do, and
- *where* and *when* it will be used.

the project team investigates any current system(s), identifies improvement opportunities, and develops a concept for the new system. This phase has three steps:

1. An *analysis strategy* is developed to guide the project team's efforts. Such a strategy usually includes a study of the current system (called the *as-is system*) and its problems, and envisioning ways to design a new system (called the *to-be system*).
2. The next step is *requirements gathering* (e.g., through interviews, group workshops, or questionnaires). The analysis of this information in conjunction with input from the project sponsor and many other people

leads to the development of a concept for a new system. The system concept is then used as a basis to develop a set of business *analysis models* that describes how the business will operate if the new system were developed. The set typically includes models that represent the data and processes necessary to support the underlying business process.

3. The analyses, system concept, and models are combined into a document called the *system proposal*, which is presented to the project sponsor and other key decision makers (e.g., members of the approval committee) who will decide whether the project should continue to move forward.

The system proposal is the initial deliverable that describes what business requirements the new system should meet. Because it is really the first step in the design of the new system,

however,

that the deliverable from the analysis phase is both an analysis and a high-level initial design for the new system.

### **Design**

The *design phase* decides *how* the system will operate in terms of the hardware, software, and network infrastructure that will be in place; the user interface, forms, and reports that will be used; and the specific programs, databases, and files that will be needed. Although most of the strategic decisions about the system are made in the development of the system concept during the analysis phase, the steps in the design phase determine exactly how the system will operate. The design phase has four steps:

1. The *design strategy* must be determined. This clarifies whether the system will be developed by the company's own programmers, whether its development will be outsourced to another firm (usually a consulting firm), or whether the company will buy an existing software package.

2. This leads to the development of the basic *architecture design* for the system that describes the hardware, software, and network infrastructure that will be used. In most cases, the system will add to or change the infrastructure that already exists in the organization. The *interface design* specifies how the users will move through the system (e.g., by navigation methods such as menus and on-screen buttons) and the forms and reports that the system will use.

The Systems Analyst and Information Systems Development

3. The *database and file specifications* are developed. These define exactly what data will be stored and where they will be stored.

4. The analyst team develops the *program design*, which defines the programs that need to be written and exactly what each program will do.

This collection of deliverables (architecture design, interface design, database and file specifications, and program design) is the *system specification* that is used by the programming team for implementation. At the end of the design phase, the feasibility analysis and project plan are reexamined and revised, and another decision is made by the project sponsor and approval committee about whether to terminate the project or continue. (See Figure 1-3.)

### **Implementation**

The final phase in the SDLC is the *implementation phase*, during which the system is actually built (or purchased, in the case of a packaged software design and installed). This is the phase that usually gets the most attention, because for most systems it is the longest and most expensive single part of the development process.

This phase has three steps:

1. System **construction** is the first step. The system is built and tested to ensure that it performs as designed. Since the cost of fixing bugs can be immense, testing is one of the most critical steps in implementation. Most organizations spend more time and attention on testing than on writing the programs in the first place.
2. The system is installed. **Installation** is the process by which the old system is turned off and the new one is turned on. There are several approaches that may be used to convert from the old to the new system. One of the most important aspects of conversion is the *training plan*, used to teach users how to use the new system and help manage the changes caused by the new system.
3. The analyst team establishes a **support plan** for the system. This plan usually includes a formal or informal post-implementation review.

## Chapter two

### 2.1 Requirements Determination

*Requirements determination* is performed to transform the system request's high level statement of business requirements into a more detailed, precise list of what the new system must do to provide the needed value to the business

- A *requirement* is simply a statement of what the system must do or what characteristics it needs to have. During a systems development project, requirements will be created that describe what the business needs (*business requirements*); what the users need to do (*user requirements*); what the software should do (*functional requirements*);

characteristics the system should have (*nonfunctional requirements*); and how the system should be built (*system requirements*).

The

International Institute of Business Analysis (IIBA) defines functional requirements as “the product capabilities, or what product must do for its users.”it begins to define how the system will support the user in completing a task.

The final category of requirements is *nonfunctional requirements*. The IIBA defines this group of requirements as “the quality attributes, design, and implementation constraints, and external interfaces which a product must have

The ability to access the system through a mobile device would be considered a nonfunctional requirement. Nonfunctional requirements are primarily used in the design phase when decisions are made about the user interface, the hardware and software, and the system's underlying architecture. Many of these requirements will be discovered during conversations with users in the analysis phase, however, and should be recorded as they are discovered.

**For example**

Fig.1 shows a sample requirements definition for Holiday Travel Vehicles, a fictitious recreational vehicle dealership.

**Functional Requirements**

**1. New Vehicle Management**

- 1.1 The system will allow managers to view the current new vehicle inventory.
- 1.2 The system will allow the new vehicle manager to place orders for new vehicles.
- 1.3 The system will record the addition of new vehicles to inventory when they are received from the manufacturers.

**2. Vehicle Sales Management**

- 2.1 The system will enable salespersons to create a customer offer.
- 2.2 The system will allow salespeople to know whether an offer is pending on a specific vehicle.
- 2.3 The system will enable managers to record approval of a customer offer.
- 2.4 The system will prepare a sales contract.
- 2.5 The system will prepare a shop work order based on customer requested dealer options.
- 2.6 The system will record a customer deposit.
- 2.7 The system will record a customer payment.
- 2.8 The system will create a record of the customer's vehicle purchase.

**3. Used Vehicle Management**

- 3.1 The system will record information on a customer trade-in vehicle ...  
etc.

**Nonfunctional Requirements**

**1. Operational**

- 1.1 The system should run on tablet PCs to be used by salespeople.
- 1.2 The system should interface with the shop management system.
- 1.3 The system should connect to printers wirelessly.

**2. Performance**

- 2.1 The system should support a sales staff of 15 salespeople.
- 2.2 The system should be updated with pending offers on vehicles every 15 minutes.

**3. Security**

- 3.1 No salesperson can access any other salesperson's customer contacts.
- 3.2 Only the owner and sales manager may approve customer offers.
- 3.3 Use of each tablet PC should be restricted to the salesperson to whom it is assigned.

**4. Cultural and Political**

- 4.1 Company policy says that all computer equipment is purchased from Dell.
- 4.2 Customer personal information is protected in compliance with the Data Protection Act.
- 4.3 The system will conform to the state's "lemon law."

## 2.2 Requirements elicitation techniques

There are five most commonly used requirements elicitation techniques: interviews, JAD sessions, questionnaires, document analysis, and observation.

### 2.2.1 Interviews

The *interview* is the most commonly used requirements elicitation technique. If you need to know something, you ask someone. In general, interviews are conducted one on one (one interviewer and one interviewee), but sometimes, due to time constraints, several people are interviewed at the same time. There are five basic steps to the interview process:

- 1) selecting interviewees,

An *interview schedule* should be created, listing who will be interviewed, the purpose of the interview, and where and when it will take place.

- 2) designing interview questions,

There are three types of interview questions:

closed-ended questions, open-ended questions, and probing questions. *Closed-ended questions* require a specific answer. You can think of them as being similar to

multiple choice or arithmetic questions on an exam.

Open-ended questions are designed to gather rich information and give the interviewee more control over the information that is revealed during the interview. Sometimes the subjects the interviewee chooses to discuss uncover information that is just as important as the answer

- 3) preparing for the interview,
- 4) conducting the interview, and
- 5) post-interview follow-up.

### 2.2.2 Joint application development (or JAD)

It allows the project team, users, and management to work together to identify requirements for the system. JAD is a structured process in which 10 to 20 users meet under the direction of a *facilitator* skilled in JAD techniques.

The facilitator is a person who sets the meeting agenda and guides the discussion, but does not join in the discussion as a participant. Also, must be an expert in both group process techniques and systems analysis and design techniques. One or two *scribes* assist the facilitator by recording notes, making copies, and so on. Often, the scribes will use computers and CASE tools to record information as the JAD session proceeds.

The JAD group meets for several hours, several days, or several weeks until all of the issues have been discussed and the needed information is collected.

Most JAD sessions take place in a specially prepared meeting room that is usually arranged in a U shape so that all participants can easily see each other.

At the front of the room (the open part of the “U”), there is a whiteboard, flip chart and/or overhead projector for use by the facilitator, who leads the discussion.

One problem with JAD is that it suffers from the traditional problems associated with groups: Sometimes people are reluctant to challenge the opinions of others.

**Electronic JAD, or e-JAD**, attempts to overcome these problems by the use of groupware. In an e-JAD meeting room, each participant uses special software on a networked computer to submit ideas, view all ideas generated by the group, and rate and rank ideas through voting.

The facilitator uses the electronic tools of the e-JAD system to guide the group process, maintaining anonymity and enabling the group to focus on each idea’s merits and not the power or rank of the person who contributed the idea.

In this way, all participants can contribute at the same time, without fear of reprisal from people with differing opinions. Initial research suggests that e-JAD can reduce the time required to run JAD sessions by 50%–80%.

### 2.2.3 Questionnaires

A questionnaire is a set of written questions for obtaining information from individuals. It’s used when there is a large number of people from whom information and opinions are needed. In our experience, questionnaires are commonly used for systems intended for use outside of the organization (e.g., by customers or vendors) or for systems with business users spread across many geographic locations. Most people automatically think of paper when they think of questionnaires, but today more questionnaires are being distributed in electronic form, either via e-mail or on the Web. Electronic distribution can save a significant amount of money, compared with distributing paper questionnaires.

### 2.2.4 Document Analysis

Project teams often use *document analysis* to understand the as-is system. Under ideal circumstances, the project team that developed the existing system will have produced documentation, which was then updated by all subsequent projects. In this case, the project team can start by reviewing the documentation and examining the system itself.

### 2.2.5 Observation

*Observation*, the act of watching processes being performed, is a powerful tool to gain insight into the as-is system. Observation enables the analyst to see the reality of a situation, rather than listening to others describe it in interviews or JAD sessions.

Several research studies have shown that many managers really do not remember how they work and how they allocate their time. (Quick, how many hours did you spend last week on each of your courses?) Observation is a good way to check the validity of information gathered from other sources such as interviews and questionnaires.

Observation is often used to supplement interview information. The location of a person’s office and its furnishings gives clues as to their power and influence in the organization, and such clues can be used to support or refute information given in an interview.

In most cases, observation will support the information that users provide in interviews. When it does not, it is an important signal that extra care must be taken in analyzing the business system.

types of information	interview	JAD	questionnaires	document analysis	observation,
Depth of Information	High	High	Medium	Low	Low
Breadth of Information	Low	Medium	High	High	Low
Integration of information	Low	High	Low	Low	Low
User involvement	Medium	High	Low	Low	Low
Cost	Medium	Low–Medium	Low	Low	Low–Medium

**Comparator between requirements eliciting techniques**

**2.3 Requirements Analysis Strategies**

Analysts often have to help the business users think critically about their new system requirements. Several strategies are helpful.

1. **Problem analysis** (means asking the users and managers to identify problems with the as-is system and to describe how to solve them in the to-be system.
2. **Root cause analysis** it focuses on problems first rather than solutions. The analyst starts by having the users generate a list of problems with the current system,then prioritizes of the problems in order of importance. Starting with the most important, the users and/or analysts generate all possible root causes for the problem)

**problem analysis and root cause analysis are two strategies that can assist the business users in understanding the problems and issues of the current system that require fixing.**

3. **Duration analysis** requires a detailed examination of the amount of time it takes to perform each process in the current as-is system. The analysts begin by determining the total amount of time it takes, on average, to perform a set of business processes for a typical input. They then time each of the individual steps (or sub processes)

in the business process. The time to complete the basic steps are then totaled and compared with the total for the overall process.

4.**Activity-based costing**, The analysts identify the costs associated with each of the basic functional steps or processes, identify the most costly processes, and focus their improvement efforts on them.

and

5.**Informal benchmarking** are refers to studying how other organizations perform a business process in order to learn how your organization can do something better. Benchmarking helps the organization by introducing ideas that employees may never have considered, but that have the potential to add value.

**three popular analysis strategies that help the team discover processes most in need of redesign.**

Finally,

6.**outcome analysis** focuses on understanding the fundamental outcomes that provide value to customers.,

7.**Technology analysis**(starts by having the analysts and managers develop a list of important and interesting technologies. Then the group systematically identifies how each and every technology could be applied to the business process and identifies how the business would benefit), and

8.**Activity elimination**( The analysts and managers work together to identify how the organization could eliminate each and every activity in the business process, how the function could operate without it, and what effects are likely to occur. Initially, managers are reluctant to conclude that processes can be eliminated, but this is a “force-fit” exercise in that they must eliminate each activity.

**three strategies that can be used to “force” the business users to think about the business processes in new, novel ways, perhaps discovering completely new ways to accomplish the business processes.**

