

COURSE CONTENTS

1. The context of system Analysis Design
2. Information System building blocks
3. Information System Development
4. System Analysis
5. Fact finding techniques for requirement discovery
6. Modeling system requirement with use cases
7. Data Modeling and Analysis
8. Process Modeling
9. Feasibility Analysis and the system proposal
10. System Design Methods
11. Project Management

- Course Code : CMP 224.3
- Text Book : System Analysis and Design method.
- (By Jeffery L. Witten & Lonnie D. Bentley Tata McGraw Hill, 7th edition)

THE CONTEXT OF SYSTEM ANALYSIS AND DESIGN

Objectives

- Define information system and name seven types of information system application.
- Identify different types of stakeholders who use or develop information system and give examples of each.
- Define the unique role of system analysis in the development of information systems.
- Identify those skills needed to successfully function as an information system analyst.
- Describe current business drivers that influence information system development.
- Briefly describe a simple process for developing information systems.

SYSTEM

- The term "System" is derived from the Greek word "Systema", which means an organized relationship among functioning units or components. A system is an orderly group of interrelated components linked together that function together to achieve a desired result.
- Systems are created and designed to solve problems, to achieve one or more objectives.
- It is the combination of people, devices and methods interrelated in working towards a common goal. The component may be simple or complex, basic or advanced.
- We come into daily contact with the transportation system, telephone system, accounting system, the production system and for over two decades, the computer system.
- Similarly, the business system and the organization as a system consists of interrelated departments (subsystems) such as production, sales personnel and an information system.
- There may be a single computer or even be a series of intelligent terminals linked to a mainframe.
- Each component is a part of total system and has to share work of the system to achieve the intended goal.

The Study of system concept has 3 basic implications:

- i. A system must be designed to achieve a pre-determined objective.
- ii. Interrelationships and interdependence must exist among the components.
- iii. The objective of the organization as a whole have a higher priority than the objectives of subsystem.

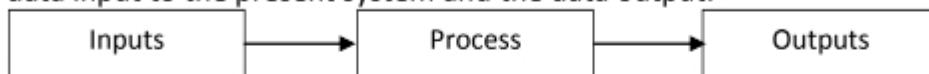
CHARACTERISTICS OF A SYSTEM

- Organization
- Interaction

- Inter dependence
- Integration
- Central Objective

ELEMENTS OF A SYSTEM

1. Basically, there are three major components in every system, namely Input, Processing & Output.
2. Every system has inputs and outputs and the system analyst needs to identify the data input to the present system and the data output.



3. The common elements of a system are listed below:

- Inputs and Outputs
- Process
- Control
- Feedback
- Environment
- Boundaries and Interface

Input and Outputs

- Inputs are the elements (material, human resources, information) that enter the system for processing.
- Output is the outcome of the processing.
- A system feeds on input to produce output in much the same way that a business brings in human, financial and material resources to produce goods and services.

Process

- The process is the element of a system that involves the actual transformation of the input into output.
- It is the operational component of a system.
- Process may modify the input totally or partially depending on the specifications of the output.

Control

- The control element guides the system.
- It is the decision making sub system that controls the pattern of activities governing input, processing and output.

Feedback

- The output is checked with the desired standards of the output set and the necessary steps are taken for achieving the output as per the standards. This process is called feedback.
- Feedback may be positive or negative, routine or informational.

Environment

- The environment is the “Super system” within which an organization operates. It often determines how a system must function.
- The organization environment consisting of vendors, competitors and others may provide constraints and consequently influence the actual performance of the business.

Boundaries and interface:

- The boundaries are nothing but the limit of the system setting up boundaries helps for the better concentration of the activities carried in the system.

Systems should be defined by its boundaries limits that identifies its components, process and inter relationships when it interfaces with another system.

TYPES OF SYSTEM

System is a set of interacting or interdependent component forming an integrate whole or a set of element and relationship which are different from relationship of the set or its elements to other elements or set.

Basically there are three types of system:

1. Physical or abstract system
2. Open or closed system
3. Man-made information system

Open or closed System:

The system which is not bounded by any boundary to interact with environment is called open system whereas a system which is enclosed under same boundary is called closed system. E.g. A cup of tea which is probably hot is a good example of open system because it can interact with environment but a cup of tea with a plate upon it is the example of closed system because the cup is closed by the plate and directly can't interact with the environment.

Man-made Information System:

The system which is based on the man-made or human interference then it is called man-made information system. There are various types of man-made information system. Some of them are:

- a. **Formal and informal system:** A system may be formal and informal according to need and variation of goal. Hence, it could be divided as formal and informal information system.
- b. **Computer-based information:** Any system which focuses on the computer system then it is said to be computer-based information system. Some e.g. of computer based information system are Expert system (AI), Search engine, global information system etc.
- c. **Management Information System:** The system based on management then it is called management information system. Suppose we are going to conduct a program then to manage the program we establish a committee which make a system to conduct the program, it is the management system.

DIFFERENCES BETWEEN OPEN SYSTEM AND CLOSED SYSTEM.

	Open System		Closed System
i.	These are the systems which allows users to contribute, manipulate, edit, use, reuse, create and alter the contents or the actual programming of the system.	i.	Closed systems are the systems which allows the users to use contents and minimum modification to the actual system or program.
ii.	System which interacts with the environment is open system.	ii.	System which does not interact with the outside environment is known as closed

			system.
iii.	An open system allows things to come and go from it.	iii.	A closed system allows nothing to enter or leave it.
iv.	In reality, completely open systems are common.	iv.	In reality, completely closed systems are rare.
v.	Examples of open system include WordPress, Unix, etc.	v.	Examples of closed system includes library catalogue software, MS office, Web browser, etc.

INFORMATION SYSTEM

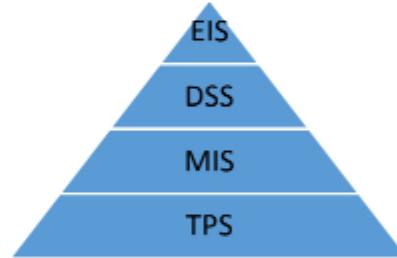
- Information is defined as processed data which has real or perceived value in current or prospective decisions.
- Information system is an arrangement of people, data, process and technology that interacts to collect, process, store and provide the information as the output needed to support an organization.
- Decision making, co-ordination control, analysis and visualization in an organization.
- Information system in organization capture and manage data to produce useful information that supports an organization and employees, customers, suppliers and partners.
- The main objective of information system is to provide information to its users.

TYPES OF INFORMATION SYSTEM

The types of information system are listed below:

- Executive Information system (EIS)
- Decision Support System (DSS)
- Management Information System (MIS)
- Transaction Processing System (TPS)
- Office Automation System (OAS)

Fig: Shows the hierarchical views of computer based IS



1. Executive Information System

- It is the top level management system.
- EIS is type of information system that supports the planning and assessment needs of executive manager.
- EIS tends to support decision oriented activities.

2. Decision Support System (DSS)

- It is also top level management system.
- It has to identify decision making opportunity or provides information to help make decisions.
- It tends to support the decision or activities like EIS.
- The new system of DSS is also known as group decision support system. (GDSS).

3. Management Information system:

- It is information system that provides management oriented reporting based system.
- It is middle level management system.
- It is computer based system that makes information available to the user.

- It is based on transaction processing and operation of the organization.

4. Transaction Processing system

- It is field level or bottom level or worker level management system.
- It is also called first line management system.
- It is information system that capture and processes data about business transactions.
- It includes data maintenance, updates on the stored data.
- It is a setup of computer based procedures for handling the transactions such as calculation, storage, retrieval, sorting and summarization, etc.

5. Office Automation System

- It is also bottom level or worker level management system.
- It supports wide range of business office activities that provide for the improved work flow between the workers.
- It is multifunctional, integrated computer system that permits most of the office activities to be executed in electronic mode.

INFORMATION TECHNOLOGY

- Information Technology is the system or method used to collect, store, process data, info and exchange that informs all over the worlds by using computer and communication technology.
- It is a widely used term that describes the combination of computer technology (hardware and software) with tele communication (data, image, voice and network)
- It can be used in various sector such as education, health, agriculture, tourism and other sectors.
- IT can be used to promote E-commerce, E-business, E-education, E-banking, E-health.
- This system can be used for development of knowledge based society, knowledge based industry and accessible of IT to the general purpose.
- In the context of Nepal, IT has been adopted from 2057 B.S.
- The vision of IT policy was to place Nepal on the global map of Information Technology within the next five years.
- The Nepalese government is also using IT and electronic medium to provide services and information to the business organization citizens etc. (which is also known as governance)
- It can be used as platform for exchanging information, providing services and transacting with citizens, business or other government bodies.
- It is the processing and distribution of data using computer hardware and software, telecommunication and digital electronics.
- It is also known as computer based information system (CBIS)
- It provides instructions, commands and feedback.
- It is also defined as a set of devices, procedure and OS designed around use based criteria to produce information.
- It communicates to the user for planning, control, performance, results and improvement.

INFORMATION SYSTEM PLAYERS/STAKE HOLDERS:

- Any person who has interest in an existing or proposed information system is known as stake holders.
- A stake holder in the architecture of a system in an individual, team, organization or classes, having an interest in the realization of the system.
- System stakeholders are also known as information workers, whose job involves the collection, processing, distribution and use of information.
- Stakeholders may include both technical and non-technical workers.
- They also may be the internal or the external one.
- Since one person can play several roles, it is possible for one person to be a member of several of the stakeholder classes.
- The different stakeholders are as follows:
 - i. System owner
 - ii. System user(s)
 - iii. System designer
 - iv. System builder
 - v. System analyst
 - vi. External Service Provider (ESP)
 - vii. The project Manager

1. System Owner:

- An individual, organization or enterprise that is legally and administrative responsible and accountable for the system are the system owners.
- S/he is responsible for the system's development, operation, products, by-products and outcomes and disposals.
- S/he is the information system's sponsors and executive advocates, usually responsible for funding the project of developing, operating and maintaining the Information System.
- For any larger or smaller Information System, there will be one or more system owners.

2. System user(s):

- The system users are the people who actually use the system on a regular basis capturing, validating, entering, responding and exchanging data and information.
- System users tend to be less concerned with cost and benefits of the system.
- The system users use the system to support the operation and management of the organization.
- System users come from all levels of the organization.
- Users may physically operate system or provide input to the system and await the results of the value added processing in the form of products service or information.
- Users may directly or indirectly include the system advocate, system owner or other users.

3. System designer

- The system designer is a technical specialists who translates system user's business requirements and constraints or rules into technical solutions.
- He/she designs the computer files, databases, inputs, outputs, screens, networks and software that will need the system user's requirements. System designers are

technical specialists who select appropriate technologies and make the essential requirements into practical requirements.

- Systems designers are technical specialists who select appropriate technologies and make the essential requirements into practical requirements.

Some system designers:

- a. Database administrator
 - b. Network architects
 - c. Web architects
 - d. Graphics artists
 - e. Security experts
 - f. Technology specialists

4. System Builders:

- System Builder is a technical specialist who construct information system and components based on the designs specifications generated by the system designers.
 - System builders are another category of technology specialist for Information System.
 - The role of the system builder is to construct the system according to the system designer's specifications.
 - In small level organizations or with the small Information system, system designers and system builders are often the same people.
 - But in the larger level organization and information systems, the system builder's job can be separated.

Some system builders:

1. Application programmers
 2. System programmers
 3. Database programmers
 4. Network Administrator
 5. Security Administrator
 6. Web Master
 7. Software Integrators

5. System Analyst (SA):

- System Analyst is a persons who conducts the system study and identifies the activities and objectives, formulate a set of rules to achieve the objects.
 - System analyst determines the requirements that must be achieved by the system to meet the needs of the customers, sponsors and users. A system analyst analyses the organization and design a business, government department and nonprofit organizations.
 - System analyst are employed by organizations of business to help them to improve their systems and so become more efficient and more profitable.

Skills needed for the system analyst (Imp)

1. Working knowledge of Information Technology
 2. Computer programming knowledge of expertise
 3. General business knowledge
 4. General problem solving skills
 5. Good inter personal communication skills
 6. Good interpersonal relational skills
 7. Flexibility and adaptability

8. Character and ethics

6. ESP (External Service Provider)

- ESP is a system analyst, system designer or system builder.
- He/she sells his/her experience and expertise to other business to help those business to purchase, developer or integrate their information system.
- Those may be affiliated with a consulting or services organizations.

7. Project Manager:

- Project Manager is an expert, an experienced professional.
- S/he accepts the responsibilities for the planning, monitoring, controlling project with respect to the schedule, budget deliverables, customer satisfactions, technical standards and system quality.
- It is a kind of leadership job which has a specialized role that requires distinctive skills and experience.

BUSINESS DRIVES FOR TODAY'S INFOSYS

Business drivers are those tools or requirement that are required to run any organization or institute smoothly and profitably. Some of the business drivers for today's Infosys are:

- Globalization of the Economy
- Electronic Commerce and business
- Security and privacy
- Collaboration and partnership
- Knowledge Assets Management
- Continuous Improvement and total quality management
- Business process redesign

Globalization of the Economy

- Global economy mainly brings the new and expanded international markets, new international competitors.
- Competitions become global with emerging industrial nations to fare lower cost or higher quality alternatives to many products.
- Information system and computer application must be internationalized.
- They must support multiple language currency, exchange rates, International trade regulations, accepts different culture practices, etc.

Electronic Commerce and Business

- Electronic Commerce means the process of buying and selling of goods/products and services by using computer and communication medium.
- It is the buying and selling of goods and services by using the internet.
- The transfer of funds and the simplification of day-to-day business processes through digital communication is e-commerce.
- It is also known as E-business or online business.
- In this type of business, the use of the internet to conduct and support day-to-day business activities.

Security and Privacy

- Security means the protective measure from the harm or harassment.
- Privacy means the protective measure from the unauthorized person.

- How will the business continue in the event of a security breach, terrorist attack, or disaster?
- How can the business protect its digital assets from outside threats?

Collaboration (Globalization) and Partnership

- Organization collaborate with outside business partners and even competitors.
- Need to pass data between different information systems.
- Need to provide secure, external access.

Knowledge Assets Management

- Data: Raw facts about people, places, events and things that are of importance in an organization.
- Information: Data that has been processed or reorganized into a more meaningful form for someone.
- Knowledge: Data and information that is further refined based on the facts, truths, beliefs, judgement, experiences, and expertise of the recipients.
- Recognizes that data, information and knowledge are critical business resources.

TECHNOLOGY DRIVERS

- Networks and the internet
- Mobile and wireless technologies
- Enterprise applications

NETWORKS AND THE INTERNET

- Computer network is a global system of interconnected several computers and devices through guided and unguided media to share data and available resources.
- A computer in a network is able to share hardware, application software, peripheral devices, processing powers, etc.
- Networks include mainframe time-sharing systems, network servers and a variety of desktop, laptop, and handheld client computers.
- Internet is a global system of interconnected computers through guided or unguided media that uses the standard protocol suite (TCP/IP) to serve billions of users worldwide.
- Internet is also known as net.
- The most pervasive networking technologies and based on the internet:
 - i. XHTML and XML.
 - ii. Scripting Languages
 - iii. Web-specific programming languages
 - iv. Intranets
 - v. Extranets
 - vi. Portals
 - vii. Web services

MOBILE AND WIRELESS TECHNOLOGIES

Some mobile and wireless technologies:

- i. PDAs (Personal Desktop Assistant)
- ii. Smart Phones

- iii. Bluetooth
- iv. Wireless networking

Impact on Information Systems

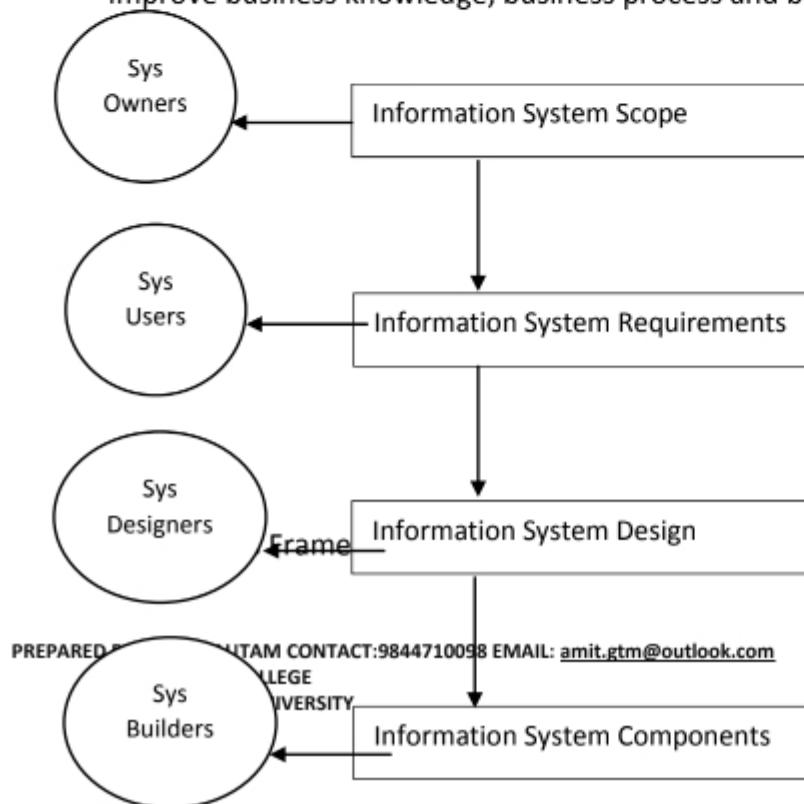
- Wireless connectivity must be assumed
- Limitations of mobile devices and screen sizes must be accommodated.

ENTERPRISE APPLICATIONS

- Virtually all organizations require a core set of enterprise applications.
- Financial management, human resources, sales, etc.
- Frequently purchased.
- Frequently need to have custom elements added.
- **System Integration:** The process of building a unified Info sys out of diverse components of purchase software, custom-built software, hardware and networking.
- Enterprise Resource Planning (ERP)
- Supply chain Management (SCM)
- Customer relationship management (CRM)
- Enterprise application integration (EAI)

A FRAMEWORK FOR INFORMATION SYSTEM ARCHITECTURE

- An Info Sys architecture serves as a higher level framework for understanding different views of the fundamental building blocks of an information system.
- Information System architecture provides a foundation for organizing the various components for any developing info sys.
- The three basic goal-oriented perspectives or views of an info sys are the goal to improve business knowledge, business process and business communication.



Knowledge Building Blocks

- Improving business knowledge is a fundamental goal of an information system.
- Business knowledge is derived from data and information.
- Data is refined to produce information that results as knowledge.
- Knowledge is that strength which enables a company to achieve its mission or vision.

Process Building Blocks

- Improving the business and service process is the fundamental goal of an information system.
- Process represents the work in a system.
- Process deliver the desired functionality of an information system.
- People may perform the same processes and computers/machine perform others.

Communications Building Blocks

- It is the final building block of information system.
- A common goal of most organization is to improve the business communications and collaboration between employees and other constitutes.
- The communication should promote team work and coordinate of activities.
- The communication should interface effectively and efficiently with other business information systems.

Network Technologies and Information System Building Blocks

- Network is the system of inter connected computers and devices to share data information and resources with each other.
- Today's information systems are built on networks.
- Network Technology allows properly designed information system to separate the knowledge, process and communication building blocks.
- It forces these building blocks to communicate across the network.
- Network technology can be database technology, software technology, interface technology.
- This technology supports to perform operations easily and fast.
- Network technology tends to use the information system in minimum cost.
- Network technology supports to use information system worldwide without any extra labor and cost.
- Remote accessing system also can be used for the use and process of data.

Information System Development

Objectives:

- Describe the motivation for a system development process in terms of the capability Maturity Model (CMM).
- Differentiate between the system life cycle and a system development methodology.
- Describe 10 basic principles of system development.
- Describe the essential phases of system development. (For each phase, describe its purpose, inputs and outputs).
- Describe cross life cycle activities that overlap multiple system development phases.
- Describe typical alternative “routes” through the basic phases of system development. Describe how routes may be combine or customized for different projects.
- Describe various automated tools for system development.

System Development Process:

- It is a set of activities, best practices, deliverables, and automated tools that stakeholders use to develop and continuously improve information system and software.
- A set of activities that applies to all software projects regardless of their size or complexity.
- Includes activities, methods, best practices, deliverables and tools that stake holders use to develop and maintain information system and software.
- There is no “ONE PROCESS STANDARD”
- Matured organizations have ‘more’ consistent process.
- Experience show that ‘well managed’ software processes lead to “least cost more qualities” software development.
- Promotes quality.
- Creates efficiencies that allow management to shift resources between projects.
- One of the most well-known Framework is the CMM.

Capability Maturity Model (CMM):

- It is a standardized framework for accessing the maturity level of an organizations information system development and management processes and products.
- Developed by the software engineering Institute.
- It is used for quality management of the information system.
- Process maturity is specified in 5 levels:
 - a. Level 1 Initial
 - b. Level 2 Repeatable
 - c. Level 3 Defined
 - d. Level 4 Managed
 - e. Level 5 Optimizing
- f. Level 5 indicates most matured software development process.
- g. Maturity level is considered as an effective indicator.

CMM levels:

- Initial:** It is also called anarchy or chaos. At this level system development projects follow prescribed process.
- Repeatable:** At this level project management processes and practices established to track project costs, schedules and functionality.
- Defined:** Standard system development process (methodology) is developed. Documented process of software management and engineering. Standardization of process and engineering parties.
- Managed:** Measureable goals for quality and productivity are established. Detailed measurement of product quality and process, quantitative evaluation methods and tools.
- Optimizing:** The standardized system development process is continuously monitored and improved based on measures and data analysis established in level 4. Continuous process improvement, defect prevention, Technology change management, process change management, feedback loop.

Life Cycle Vs methodology

	SDLC		Methodology
1.	A system life cycle is the life on an information system.	1.	A system development methodology is a very formal and precise system development process.
2.	SDLC refers to a stage all system naturally undergo.	2.	A methodology refers to an approach invented by human to manage the events occurring in the SDLC.
3.	This approach essentially refers to a linear sequence of stages to develop a system from planning to analysis to design to implementation.	3.	A methodology is in simple terms, a set of steps, guidelines activities or principles automated tools follow in a particular situation.
4.	It is normal system development system/stage/phase collection.	4.	It is used to develop and continuously improve information system and software.
5.	Problem definition, Requirement analysis, designing the solution, construction and testing, Installation and delivery, maintenance etc. are the phase of SDLC.	5.	Architected Rapid Application Development (Architecture RAD), Dynamic systems, Development Methodology (DSDM), Joint Application Development (JAD), Information Engineering (IE), Rapid Application Development (RAD), Rational Unified Process (RUP), structured Analysis and design, extreme programming (XP).

PRINCIPLES FOR SYSTEM DEVELOPMENT

- Get the system users involved.
- Use a problem-solving approach.
- Establish phases and activities.

- Document through development
- Establish standards.
- Manage the process and the projects.
- Justify systems as capital investments.
- Don't be afraid to cancel or revise scope.
- Divide and conquer.
- Design systems for growth & change.

Where do system development project come from?

- **Problem:** An undesirable situation that prevents the organization from fully achieving its purpose, mission, vision, goals and/or objectives.
- **Opportunity:** A chance to improve the organization even in the absence of an identified problem.
- **Directive:** A new requirement that is imposed by management, government or some external influence.

Problem Solving Approach

- Study and understand the problem, its context and its impact.
- Define the requirements that must be met by solution.
- Identify candidate solution that fulfill the requirements and select the "best solution".
- Design and/or implement the chosen solution.
- Observe and evaluate the solution impact and refine the solution correspondingly.

PIECES

The PIECES problem-solving framework:

P	:	The need to improve or correct <u>performance</u>
I	:	The need to improve <u>information</u> and data.
E	:	The need to improve economics, control costs, or increase profits.
C	:	The need to improve <u>control</u> or security.
E	:	The need to improve <u>efficiency</u> of people and processes.
S	:	The need to improve <u>service</u> to customers, suppliers, partners, employ, etc.

THE FAST PROJECT PHASES

- It is a system development methodology.
- This term FAST is widely used in information system engineering.
- FAST stands for Framework for the Application System Thinking.
- It is a hypothetical methodology used to demonstrate a representative systems development process.
- Each methodology will use different project phases.
- It is not real world commercial methodology.
- It is developed as a composite of the best practices encountered in many reference and commercial methodologies.
- It is also referred to as eight step methodology.
- Number of phases vary from one methodology to another.

- Each phase produces deliverables that are passed to the next phase.
- The FAST methodology employs eight phases:
 - Scope definition
 - Problem analysis
 - Requirement analysis
 - Logical design
 - Decision design
 - Physical design
 - Construction and testing
 - Installation and delivery

CROSS LIFE CYCLE ACTIVITIES

Cross life cycle activities are activities that overlap many or all phases of the methodology.

- Fact-finding (Problem analysis, data analysis, testing, etc.)
- Documentation and presentation
- Feasibility analysis
- Process and project management
- Change management Quality

Fact finding

- Also called information gathering or data collection.
- It is the formal process of using research, interviews, meetings, questionnaires, sampling, and other techniques to collect information about systems, requirements, and preferences.

Documentation and Presentations

- Communication skills are essential to the successful completion of a project.
- Two forms of communication that are common to systems development projects are documentation and presentation.
- Documentation is the activity of recording facts and specifications for a system.
- Presentation is the related activity of formally packaging documentation for review by interested users and managers. Presentations may be either written or verbal.

Feasibility Analysis

- A system development life cycle that supports our creeping commitment approach to systems development recognizes feasibility analysis as a cross life cycle activity.
- Feasibility is a measure of how beneficial the development of an information system would be to an organization.
- Feasibility analysis is the activity by which feasibility is measured.

Project management and process management

- Project management is the ongoing activity by which an analyst plans, delegates, directs, and controls progress to develop an acceptable system within the allotted time and budget.
- The systems development life cycle provides the basic framework for the management of systems projects.

- Project management tools help to plan system development activities, estimate, and assign resources, schedule activities.
- Process management's intent is to standardize both the way we approach projects, and the deliverables we produce during projects.
- Process management is an ongoing activity that establishes standards for activities, methods, tools, and deliverables of the life cycle.
- Process management tools help us document and manage a methodology, routes and quality management standards.
- It is concerned with phase's activities, deliverables quality standard that should be consistently applied to all projects.

	Sequential Development		Iterative Development
1.	It is an approach for a system development that completes each phase one after another.	1.	It is an approach for a system development that completes entire information system in successive iterations.
2.	It is system for developing software where in development flows, waterfall-like. (only once each stage)	2.	It follows the full life cycle several times within a single project.
3.	It is sometimes called waterfall model.	3.	It is sometimes called Incremental development process.
4.	It has principle of completing in detail, each stage before moving on to next.	4.	It has principle of risk analysis and risk management.
5.	<p>The diagram illustrates a sequential development process. It starts with a green rounded rectangle labeled "Requirements Gathering". An arrow points from this box to a blue rounded rectangle labeled "System Design". Another arrow points from "System Design" to a red rounded rectangle labeled "Implementation". A fourth arrow points from "Implementation" to a grey rounded rectangle labeled "Testing". Finally, an arrow points from "Testing" to a computer monitor icon labeled "The entire information system". Below the monitor, a small arrow points back to the "Requirements Gathering" box, indicating a feedback loop.</p>	5.	<p>The diagram illustrates an iterative development process. It shows a horizontal timeline with three vertical dashed lines dividing it into "Iteration 1", "Iteration 2", and "Iteration n". Each iteration consists of a series of blue rectangular boxes connected by arrows, representing a cycle of work. At the bottom of the timeline, there is a double-headed red arrow labeled "Risk", indicating that risk management is an ongoing concern throughout the iterative process.</p>

Alternative Route and strategies

THE MODEL DRIVEN STRATEGIES:

Model Driven development is a system development strategy that emphasizes the drawing of system models to help visualize and analyze problems, define business requirements, and design info sys.

It is more effective development methodology for systems for which requirements are well understood.

This approach is suitable for the system in which main focus is to fulfill the expectation of user, quality than cost and schedule.

This strategy includes: Process modeling, Data modeling and object modeling.

Advantages:

- Requirements often more thorough easier to analyze alternatives.
- Design specifications often more stable.
- Systems can be constructed more correctly.

- It is easier to identify, conceptualize and analyze alternative technical solution.

Disadvantages:

- Time Consuming
- Reduces user's role
- Can be inflexible

Rapid Application Development strategy

- It is a system development strategy that emphasizes speed of development.
- It supports the development through extensive user involvement in the rapid iterative and incremental construction of series of functioning prototypes of a system.
- Often uses prototyping approach.
- Prototyping technique require that we build a “prototype” of the proposed system using modern tools rapidly.
- The prototype itself may become the system, or may serve as the model for the system.

Activities of RAD:

- Define the scope.
- Define, design, construct and re-exercise.
- Exercise the system.
- Continue until users are satisfied.
- Move onto the next level of scope and repeat process.

Advantages:

- User requirements focused.
- Encourages active user and management participation.
- Projects get higher visibility and support.
- Stakeholders see working solutions more rapidly.
- Errors detected earlier.
- Testing and training are natural by products.
- More natural process because change is expected.

Disadvantages:

- May discourage analysts from considering alternatives.
- Stake holders reluctant to throw away prototype.
- Emphasis on speed can adversely impact quality.
- Premature commitment to design.
- Reduce creativity in design.

Commercial Application Package Implementation strategy

- This strategy focuses on the purchase and integration of a software package to support one or more information system.
- It customized to meet business requirements of a large number of organization or specific industry.
- A synonymy is commercial off-the-shelf (COTS) system.
- This system initially includes technology market research.
- Request for Proposal (RFP)

- Request for quotation (RFQ)
- Gap analysis

Advantages

- Systems usually implemented more quickly.
- Avoids staffing required to develop in house solutions.
- Generally less expensive.
- Many business functions more similar for all business in a given industry.

Disadvantages

- Dependent on long-term viability of vendor
- Rarely reflects ideal solution
- Often resistance to changes business processes to adapt to software

Hybrid strategy

- For development of any good information system there can need to use of combination or variation of more than one strategy or route.
- The route to be used in information system development is always selected during scope definition.
- Incremental strategy is commonly applied with both model driven and RAD strategy.
- According to necessary of the info sys. Development there can be used other combination strategies.

Automated Tools and Technology

- Automated tools have been developed, marketed and installed to assist systems developers.

Computer-Assisted Software Engineering (CASE)

- CASE is an automated software tools that supports the drawing and analysis of system models and associated specifications.
- Some CASE tools also provide prototyping and code generation capabilities.
- CASE can significantly help developers to improve productivity, quality and documentation.
- CASE repository: System developers database where developers can store system models, detailed descriptions and specifications, and other products of system development. Synonyms: dictionary and encyclopedia.
- Forward Engineering: CASE tool capability that can generate initial software or database code directly from system model.
- Reverse Engineering: CASE tool capability that can generate initial system models from software or database code.

Application Development Environment:

- ADE is an integrated software development tool that provides all the facilities necessary to develop new application software.
- -It supports to develop the software with maximum speed and quality.
- A common synonym is integrated development environment. (IDE)

ADE facilities may include:

- Programming languages or interpreters.
- Interface construction tools.
- Middleware
- Testing tools
- Version control tools
- Help authoring tools
- Repository links

Process and Project Manager Tools:

- **Process manager application:** An automated tool that helps document and manage a methodology and routes, its deliverables, and quality management standards. An emerging synonym is method ware.
- Project manager application: An automated tool to help plan system development activities (preferably using the approved methodology), estimate and assign resources (including people and costs), schedule activities, schedule and budget, control and modify schedule and resources, and report project progress.

Chapter 5

Information System Analysis

Objectives:

- Define system analysis.
- Describe a number of system analysis approaches for solving business system problems.
- Define scope definition, problem and analysis, requirements analysis, logical design, and decision analysis phases.
- Describe activities associated with each phase of information system analysis and development.

System Analysis Approaches

- System analysis approaches are the ways or techniques to be used to examine the aspects of the information system development.
- These approaches are also viewed as competing alternatives of information system development.
 - Model-driven approaches
 - Accelerated System Analysis approaches
 - Requirement Discovery methods
 - Business process redesign methods

Model-Driven Approaches

- A picture is worth a thousand words, most models use pictures to represent reality or vision of the system.
- It is a problem-solving approach.
- It emphasizes the drawing of pictorial system models to document and validate both existing and/or proposed systems.

- By using this approach the system model becomes the blueprint for designing and constructing an improved system.
- Three model driven approaches are:
 - Structured analysis (Process) : DFD
 - Information Engineering (Data) : ER-Diagram
 - Object oriented analysis (integrates data and process concerns into objects) : UML diagram

System Analysis

- A problem solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose.

Accelerated System Analysis Approach

- This approach emphasizes the construction of prototypes to more rapidly identify business and user requirements for a new system.
- Prototyping is an engineering technique used to develop partial, but functional versions of a system or applications.
- This approach places much emphasis on the communication in information system framework.
- These approaches are common in RAD Methodologies.
- Accelerated system analysis approaches are:
 - Discovering Prototyping
 - Rapid Architected Analysis

Requirement Discovery Methods

- It is the process used by system analysts for identifying or extracting system problems and solutions.
- It is the process of identifying problems, opportunities and solution requirements of the info system.
- It is information gathering method.
- There are two approaches of requirement discovery methods.
- Fact finding techniques.
- Joint Requirement planning (JRP)

Business Process Redesign (BPR)

- It is also called business process reengineering.
- It focuses on simplifying and streamlining fundamental business processes before applying information technology to those processes.
- This creates new application development projects.
- It is used for changing and improving the fundamental business processes of an organization, independent of information technology.

System Analysis Phases

[FAST system analysis strategies]

Scope Definition Phase:

- It is the first phase of the classic system development process.
- It is also called preliminary investigation phase, initial study phase or survey phase.

- This phase defines the scope of the project, perceived problems, opportunities and directives that triggered the project.
- This phase also establishes the project plans in the terms of scale, development strategies, schedules, resource requirements and budget.

Tasks/Activities:

1. Identify baseline Problems and opportunities
2. Negotiate baseline scope
3. Access baseline project worthiness
4. Develop baseline schedule and budget
5. Communicate project plan

1) Identify baseline problems and opportunities

- Each problem, opportunity and directives are accessed with respect to urgency, visibility, benefits and priority.
- It is useful to list perceived constraints on the project like budget general technology or deadlines.
- No more analysis only involvement of system owner.

2) Negotiate baseline scope

- Scope defines the boundary of the project.
- The aspects of the business which will be included or not that also defines by the scope.
- Project scope can be described in terms of:
 - What types of data describe the system being studied?
 - What business processes are included in the system being studied?
 - How must the system interface with the users, location and other system?
 - What business processes are included in the system being studied?

3) Access Baseline Project Worthiness

- In this task the scope is concern to the worthiness of the designing project.
- There are several alternative decisions.
- The project can be approved or cancelled task is depends on the worthiness of the project.

4) Develop baseline schedule and budget

- If project has been decided worthy to continue we can plan the project in depth.
- The initial plan should consist of at least the following:
 - Preliminary master plan which includes schedule and resources for the entire project.
 - Detail plan and schedule for completing next phase of project.

5) Communicate project plan

- It is equally important to launch project and communicate the project goals and schedules.

- This task is triggered by the completion of baseline project plan and schedule.
- The project charter is usually a document which defines the project elements.
- Effective interpersonal and communication skills are keys of this task.

Problem Analysis Phase

- This phase provides the analyst with a complete understanding of the problems, opportunities and directives.
- This phase may be known as study phase, study of current system, detail investigation phase or feasibility analysis phase.
- This phase includes the following tasks:
 - Task 1: Understanding the problem domain.
 - Task 2: Analyze the problems and opportunities.
 - Task 3: Analyze the business process.
 - Task 4: Establish system improvement objectives.
 - Task 5: Update or refine project plan.
 - Task 6: Communicate finding and recommendations.

Requirement Analysis Phase

- This phase defines the business requirements.
- This can be defined in the terms of building blocks or in terms of PIECES frameworks.
- It is also called logical design phase.

The requirement analysis phase includes following tasks:

1. Identify and express system requirements.
2. Prioritize system requirements
3. Update or refine project plan
4. Communicate requirement statement

Logical Design Phase

- The purpose of logical design phase is to document business requirements using system models for the purposed system.
- The models depict various aspects of building blocks.
- Logical design illustrate data structure, business process, data flows and user interface.
 - Structure functional requirements
 - Prototype functional requirements
 - Validate functional requirements
 - Define acceptance test cases

Decision Analysis Phase

- The purpose of decision analysis phase is to identify candidate solutions, analyze those solutions and recommended a target system that will be designed and constructed.
- In this phase task is to identify solution options, analyze those options and set best option on the basis of the analysis.

- Purpose is to transition the project from business concerns to technical solutions by identifying, analyzing and recommending a technical system solution.
- Tasks of the Decision analysis phase:
 - Identify candidate solution
 - Analyze candidate solution
 - Compare candidate solution
 - Update the project plan
 - Recommend a system solution

Fact Finding Process for Requirement Discovery

Objectives:

- Define system requirement
- Differentiate between functional and non-functional requirements
- Criteria for system requirements and results of incorrect requirements identification.
- Understand process of requirements discovery.
- Understand the concept of requirement management.
- Identify and characterize seven fact finding techniques.
- Describe JRP, its benefits and JRP as fact-finding technique.

Requirement Discovery

- It is the process used by systems analysts for identifying or extracting system problems and solutions.
- It is the process of identifying problems, opportunities and solution requirements of the information system.
- It is information gathering method.
- The purpose of requirement discovery and management is to correctly identify the data, process and communication requirements for the new system.
- System requirement is concerned to something that the information system must do or a property that it must have. Also called a business requirement.
- There are functional requirements and non-functional requirements.

	Functional Requirement		Non-Functional Requirement
1.	It is something the information system must do.	1.	It is a property or quality the system must have.
2.	It is concern to the operational activities of the system.	2.	It is concerned to the software performance requirements, software external interface requirements and software quality attributes.
3.	Functional requirements are the statements of services that the system should provide.	3.	NFRs are the requirements are the statements of constraints on the services or functions offered by the system.
4.	E.g. Specification of permanent storage area, Database, etc.	4.	E.g. Reliability, policy, Ethical, Concept security, etc.

Results of Incorrect Requirements Identification

- The system may cost more than projected.
- The system may be delivered later than promised.
- The system may not meet the users' expectation and they may not use it.
- Costs of maintaining and exchanging system may be excessively high.
- The system may be unreliable and prone to error and downtime.
- Reputation of IT staff is tarnished as failure will be perceived as a mistake by the team.

Criteria for System Requirements:

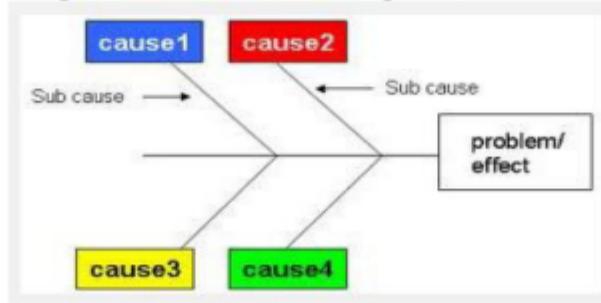
- Consistent – not conflicting or ambiguous.
- Complete – describe all possible system inputs and responses.
- Feasible – can be satisfied based on the available resources and constraints.
- Required – truly needed and fulfill the purpose of the system.
- Accurate – stated correctly.
- Traceable – directly map to functions and features of system.
- Verifiable – defined so can be demonstrated during testing.

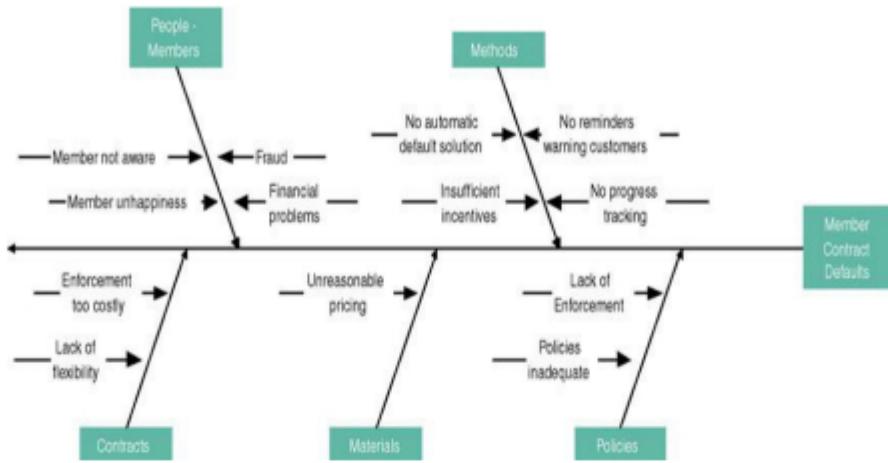
Process of Requirement Discovery:

- Problem discovery and analysis
- Requirement discovery
- Documentation and Analyzing requirements
- Requirements management

Problem discovery and Analysis:

- A Popular tool used by system development team to identify, analyze and solve problems is an Ishikawa diagram.
- Ishikawa diagram is a graphical tool used to identify, explore and depict problems and the causes and effects of those problems.
- It is referred to as cause-and-effect diagram.
- It is also referred to as fishbone diagram. (It resembles the skeleton of a fish).
- This diagram developed by Kaoru Ishikawa.
- He was the pioneer of Quality Mgt. Process in Kawasaki shipyard, Japan.
- He was the founding father of Modern management.





Documentation and Analyzing Requirements

- Documenting the draft requirements
 - Use cases
 - Decision Tables
 - Requirements table
- Analyzing requirements to resolve problems
 - Missing requirements
 - Conflicting requirements
 - Infeasible requirements
 - Overlapping requirements
 - Ambiguous requirements
- Formalizing requirements
 - Requirements definition document
 - Communicated to stakeholders or steering body.

Sample Requirements Definition Report Outline

Requirements Definition Report

1. Introduction
 - 1.1 Purpose
 - 1.2 Background
 - 1.3 Scope
 - 1.4 Definitions, Acronyms and Abbreviations
 - 1.5 References
 2. General Project Description
 - 2.1 Functional Requirements
 3. Requirements and Constraints
 - 3.1 Functional Requirements
 - 3.2 Non-functional Requirements
 4. Conclusion
 - 4.1 Outstanding Issues
- Appendix (Optional)**

Requirement Management

- Requirements management is the process of managing change to the requirements.
- A systematic approach for Eliciting, Organizing, Documenting and managing the requirements of a software project.
- It encompasses the policies, procedures and processes.
- It specifies how a change request should be analyzed and submitted.
- Over the lifetime of the project it is very common for new requirements to emerge and existing requirements to change.
- Studies have shown that over the life of a project as much as 50 percent or more of the requirements will change before the system is put into production.

Requirement Management Skills

- Six essential management skills:
 - Analyze the problem.
 - Understand the user needs.
 - Define the system.
 - Manage the scope of the system.
 - Refine the system definition
 - Manage the changing requirements

Requirement Management

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7 Fact Finding Techniques:

1. Sampling of existing database, documentation and forms
2. Research and site visits
3. Observation of the work environment
4. Questionnaires

5. Interviews
6. Prototyping
7. Joint requirements planning (JRP)

1. Sampling and existing documentation, forms and database

- It can provide many facts and details without directly personal communication.
- The analyst should collect historical documents, business operation manuals, forms and information system documentation collecting of documentation helps analyst to get the feel about the activities and processes of the organization.
- Collection of documentation can be done in two stages:
 - a. Collects facts from existing documents
 - b. Collecting facts from stockholders
- During the study of documentation there must not miss the following facts.
- Organizations mission, objectives, policies and strategic plan statements.
- Standard operating procedures, computerized databases, reports, flowcharts and diagrams.
- Sampling techniques, design documentation program documentation.

2. Research and site visits

- The second find-finding technique is researching the problem domain.
- Computer trade journals and reference books are a good source of information.
- Research involves visiting other companies or departments.
- Another convenient way of research and site visiting is Internet surfing and exploring intranet. The web sites are special form of research.
- Membership in professional societies like Association for Information Technology Professionals (AITP) and Association for Information System (AIS).

3. Observation

- Observation is the process or watching about something carefully.
- A fact finding technique wherein the systems analyst watches the activities performed about the system.
- Observation allows analysts to gain information they cannot obtain by any other fact finding method.
- This method is most useful when analysts need to actually observe how documents are handled, how processes are carried out.

4. Questionnaires

- Questionnaire is a special-purpose document that allows the analyst to collect information and opinions from respondents.
- The use of questionnaires allows analysts to collect information about various aspects of a system from a large number of persons.
- Types of questionnaires:
- Free-format questionnaire: a questionnaire designed with question is asked then the respondent records the answer in the space provided after the question.

- Fixed-format questionnaire: a questionnaire containing questions that require selecting an answer from predefined available responses. There are three types of fixed format questions: Multiple-choice questions, ratingquestions, ranking questions.

5. Interviews

- Interview is a fact-finding technique whereby the systems analysts collect information from individuals through face-to-face interaction.
- The system analyst is the interviewer who is responsible for organizing and conducting the interview.
- The personal interview is generally recognized as the most important and most often used fact-finding technique.
- This method is frequently the best source of qualitative information like opinions, policies, and subjective descriptions of activities and problems.

Guidelines for conducting Interview

a. Select Interviewees

- End users
- Learn about individual prior to the interview

b. Prepare for the Interview

- Interview guide

c. Conduct the Interview

- Summarize the problem
- Offer an incentive for participation
- Ask the interviewee for assistance

d. Follow Up on the Interview

- Memo that summarizes the interview

Types of Interview:

- **Unstructured interview:**Conducted with only a general goal or subject in mind and with few, if any, specific questions. The interviewer counts on the interviewee to provide a framework and direct the conversation.
- **Structured interview:** Interviewer has a specific set of questions to ask of the interviewee.
- **Open-ended question:**Question that allows the interviewee to respond in any way.
- **Closed-ended question:** A question that restricts answers to either specific choices or short, direct responses.

6. Discovery Prototyping

- Discovery prototyping is the act of building a small-scale, representative or working model of the users' requirements in order to discover or verify those requirements.

7. Joint Requirements Planning (JRP)

- A process whereby highly structured group meetings are conducted for the purpose of analyzing problems and defining requirements.
- JRP actively involves users and management in the development project (encouraging them to take "ownership" in the project).
- JRP reduces the amount of time required to develop system.
- When JRP incorporates prototyping as a means for confirming requirements and obtaining design approvals, the benefits of prototyping are realized.
- Brainstorming is a technique for generating ideas by encouraging participants to offer as many ideas as possible in a short period of time without any analysis until all the ideas have been exhausted.

Guidelines for conducting a JRP session

- Do not unreasonably deviate from the agenda
- Determine the reasonable agenda of meeting.
- Stay on schedule
- Ensure that facts are consulting clearly.
- Avoid the use of technical and difficult words.
- Encourage group consensus (agreed opinion).
- Encourage user and management participation without allowing individuals to dominate the session.
- Make sure that attendees abide by the established ground rules for the session.
- Manage the negotiation under boundary and rules.

Benefits of JRP

- Encourages for actively involvement and ownership for the project.
- Reduces development time of the system.
- Uses Brainstorming techniques to encourage participants to generate ideas.

Question Collection

- What is the importance of conducting the requirements discovery process?
- What are the possible consequences if you fail to identify system requirements correctly and completely?
- What are the types of survey questionnaires that systems analysts can use to collect information and opinions?
- What is JRP? Why is it popular?

Chapter 6

Modeling System requirements with use case

Objectives

- Define use case and describe the benefits of use-case modeling.
- Define actors and describe the relationship that can appear on a use case model diagram.

- Describe the step for preparing a use case model.
- Describe the various sections of a use case narrative.
- Define the purpose of the use case ranking and priority matrix and the use case dependency diagram.

Introduction to use case Modeling

- Use case is a method of documenting the system requirements.
- A formal way of representing how a business system interact with its environment.
- Illustrates the activities that are performed by the users of the system.
- It is first built in the Requirements Analysis phase and then used in the Logical Design phase.
- Use case diagrams are used to visualize, specify, construct, and document the (intended) behavior of the system, during requirements capture and analysis.
- Use-case modeling is the process of modeling a system's functions in terms of business events, who initiated the events, and how the system responds to those events.
- Use case diagram depicts the interactions between the system and external systems and users.
- Use case diagram graphically depicts the system as collection of use cases, actors (users) and their relationship.
- Use-case narrative –is a textual description of the business event and how the user will interact with the system to accomplish the task.

Use Case Modeling History

- It was originally conceived by Dr. Ivar Jacobson in 1986.
- This method gained popularity after the publishing the book: Object Oriented Software Engineering in 1992.
- It was the framework for his objector methodology which he successfully used for developing object oriented information systems.
- It is now widely recognized for defining, documenting, and understanding the functional requirements of information system.

Benefits of Use-Case Modeling

- Provides tool for capturing functional requirements.
- Assists in decomposing system into manageable pieces.
- Provides means of communicating with users/ stakeholders.
- Provides means of identifying, assigning, tracking, controlling, and management system development activities.
- Provides aid in estimating project scope, effort, and schedule.
- Provides baseline for user documentation.
- Provides specifications for designing user and system interfaces.

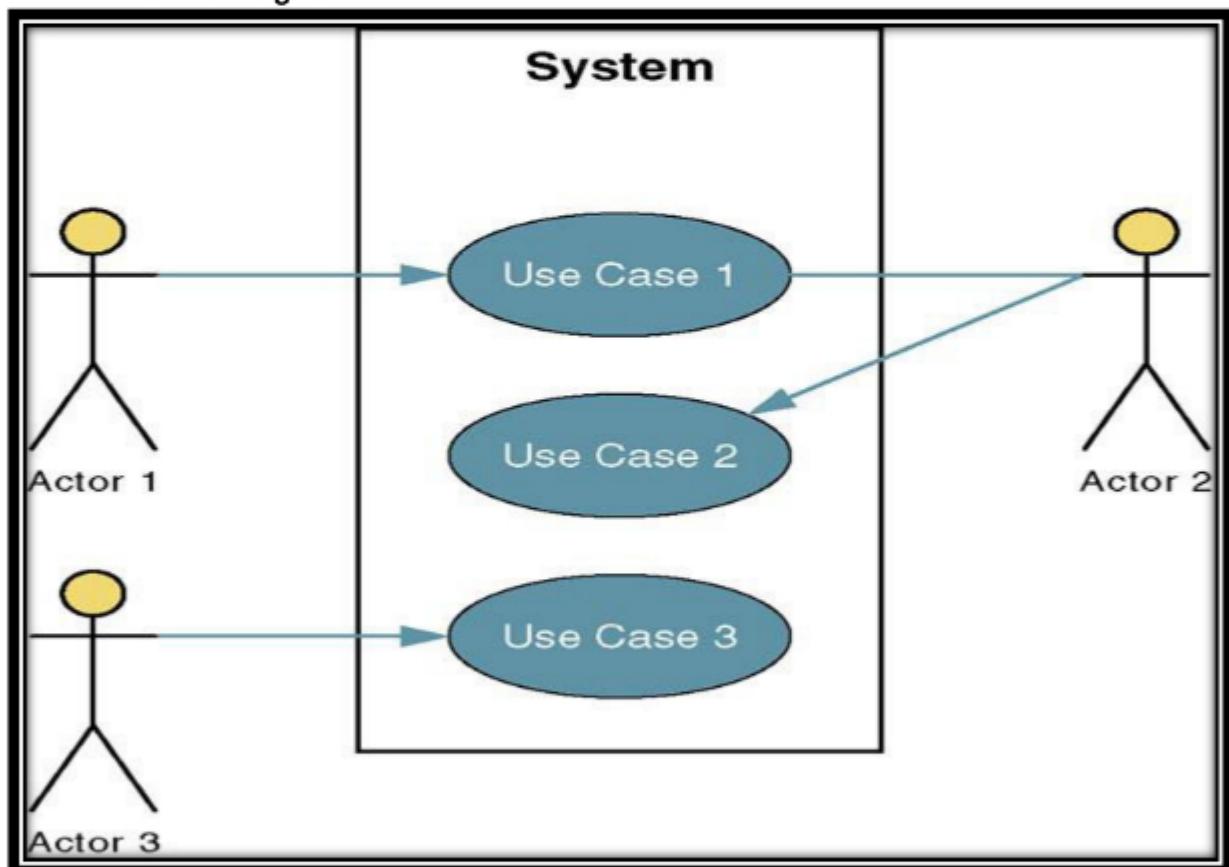
System Concept

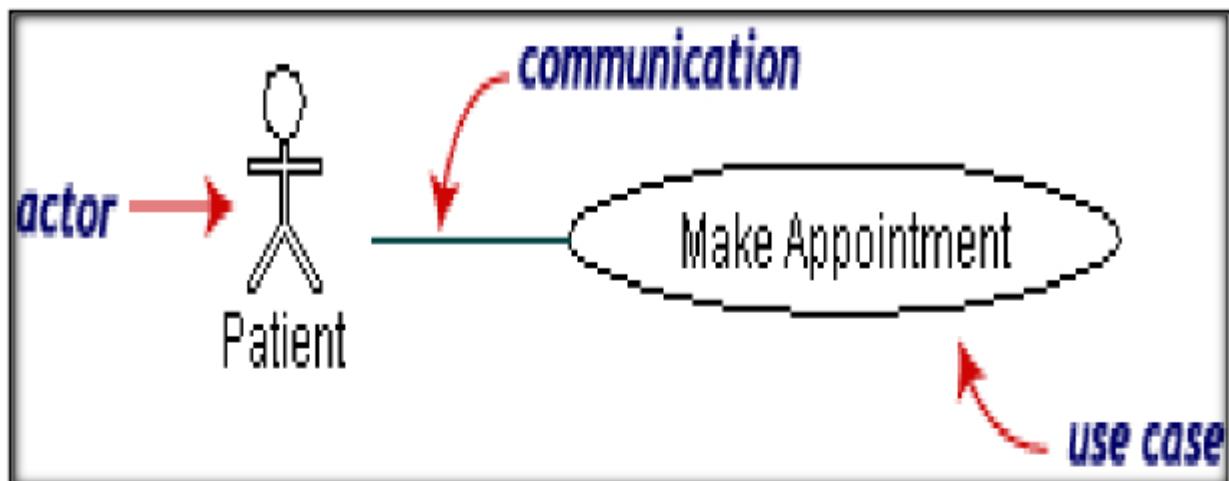
S.N	Symbol	Name	Description
1.	Use Case Symbol	Use Case	It is a subset of overall system

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			functionally which is represented by a horizontal ellipse with name of use case above, below or inside the ellipse.
2.	 Actor Symbol	Actor	Actor is anyone or anything that needs to interact with the system to exchange information. Human organization, another information system, external device, even time.
3.		Relationship	It describes the interaction between actor and use case. A relation may be unidirectional or bidirectional.

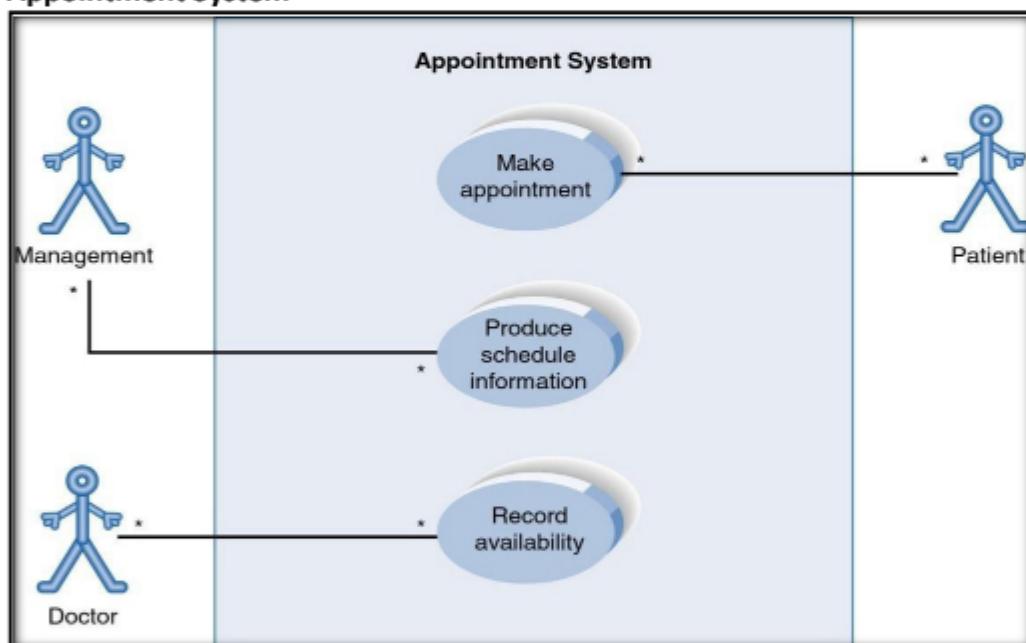
Use-Case Model Diagram





Actors are stick figures. Use cases are ovals. Communications are lines that link actors to use cases. In the figure A Make Appointment use case for the medical clinic. The actor is a Patient. The connection between actor and use case is a communication association.

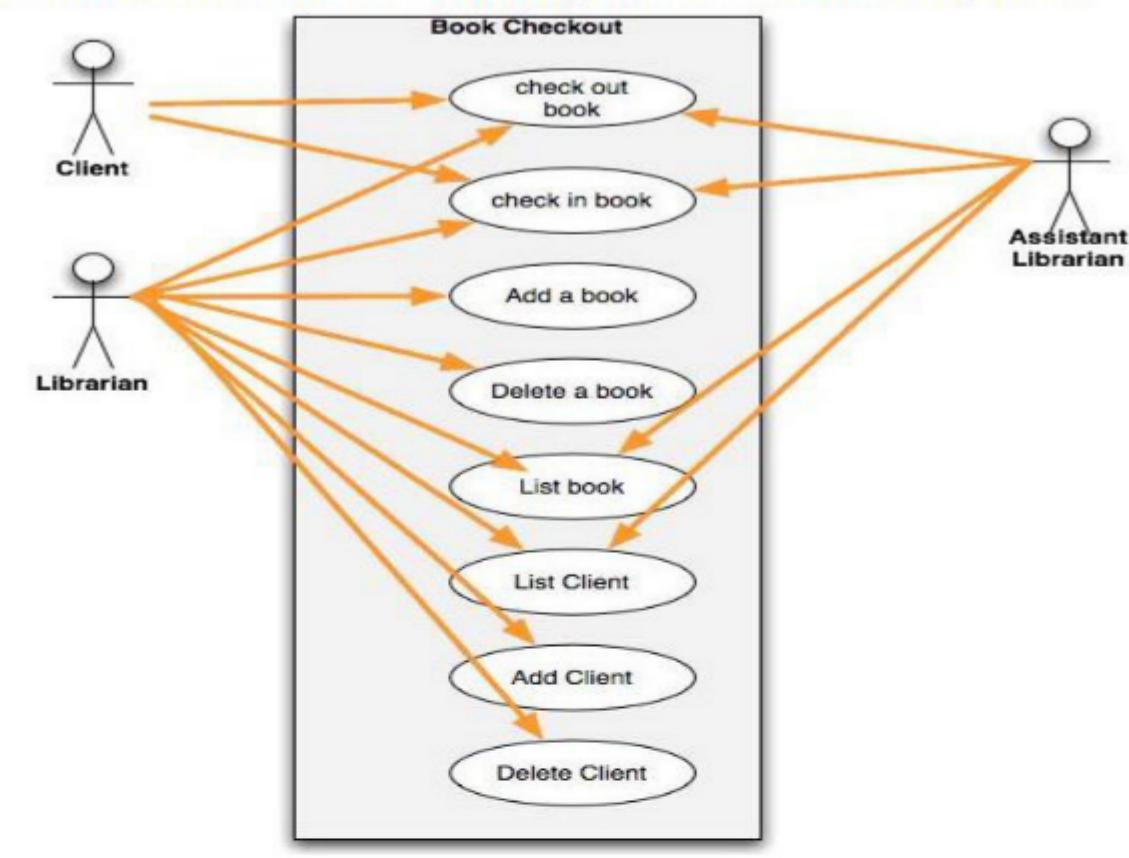
Appointment System



A use case diagram is a collection of actors, use cases, and their communications.

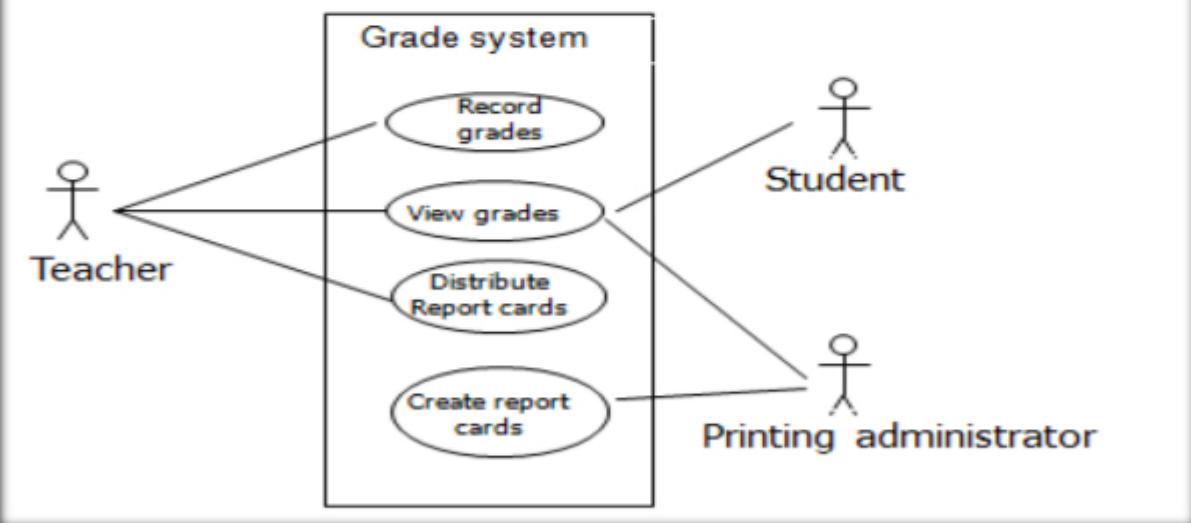
Use Case Diagram for library Book Check out System

Use-Case Diagram for Library Book Checkout System



Student Assessment Management System

Use-Case Diagram for Student Assessment Management System



Description of Use-Case Elements

1. USE CASE

- A Use Case represents a single goal of the system.

- It describes a sequence of activities and user interactions in trying to accomplish the goal.
- During requirements discovery, use cases are used to capture the essence of the business problems and to model the functionality of purposed system.

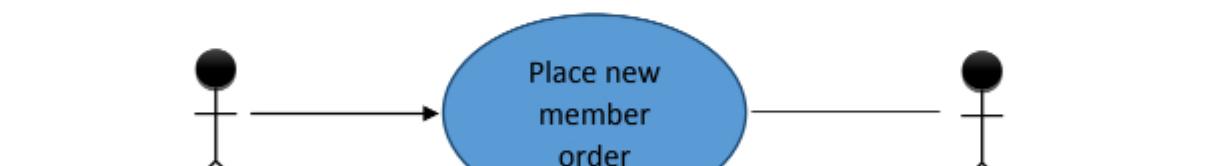
2. ACTORS

- A user or outside system that interacts with the system being designed in order to obtain some value from that interaction.
- Actor initiated the system activity.
- Actors may be both at input and output ends of a use case.
- Four types of Actors: Primary Business Actors, Primary system Actors, External Server Actors and External receiver Actors.

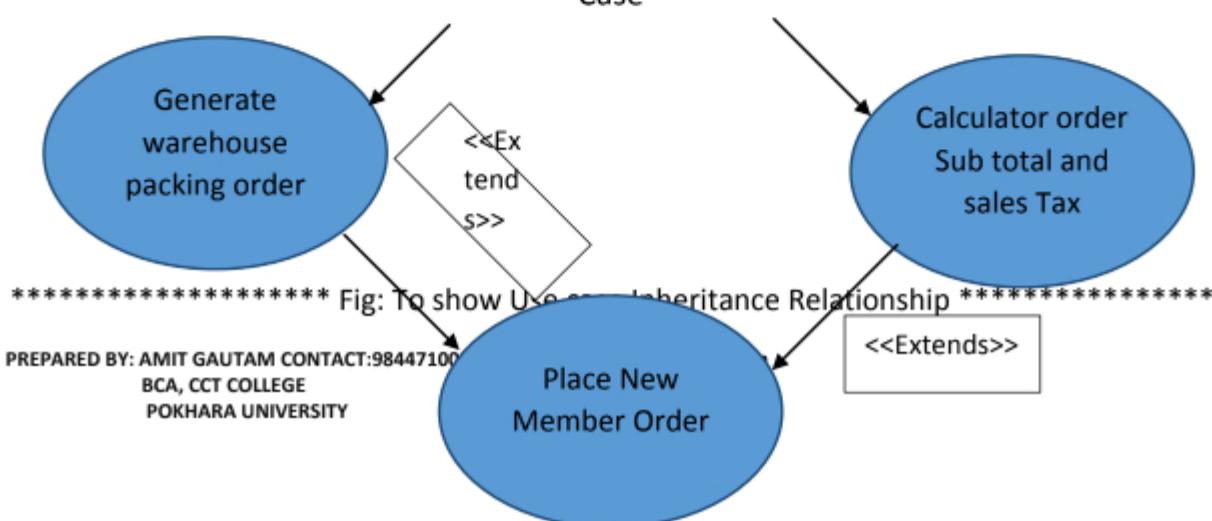


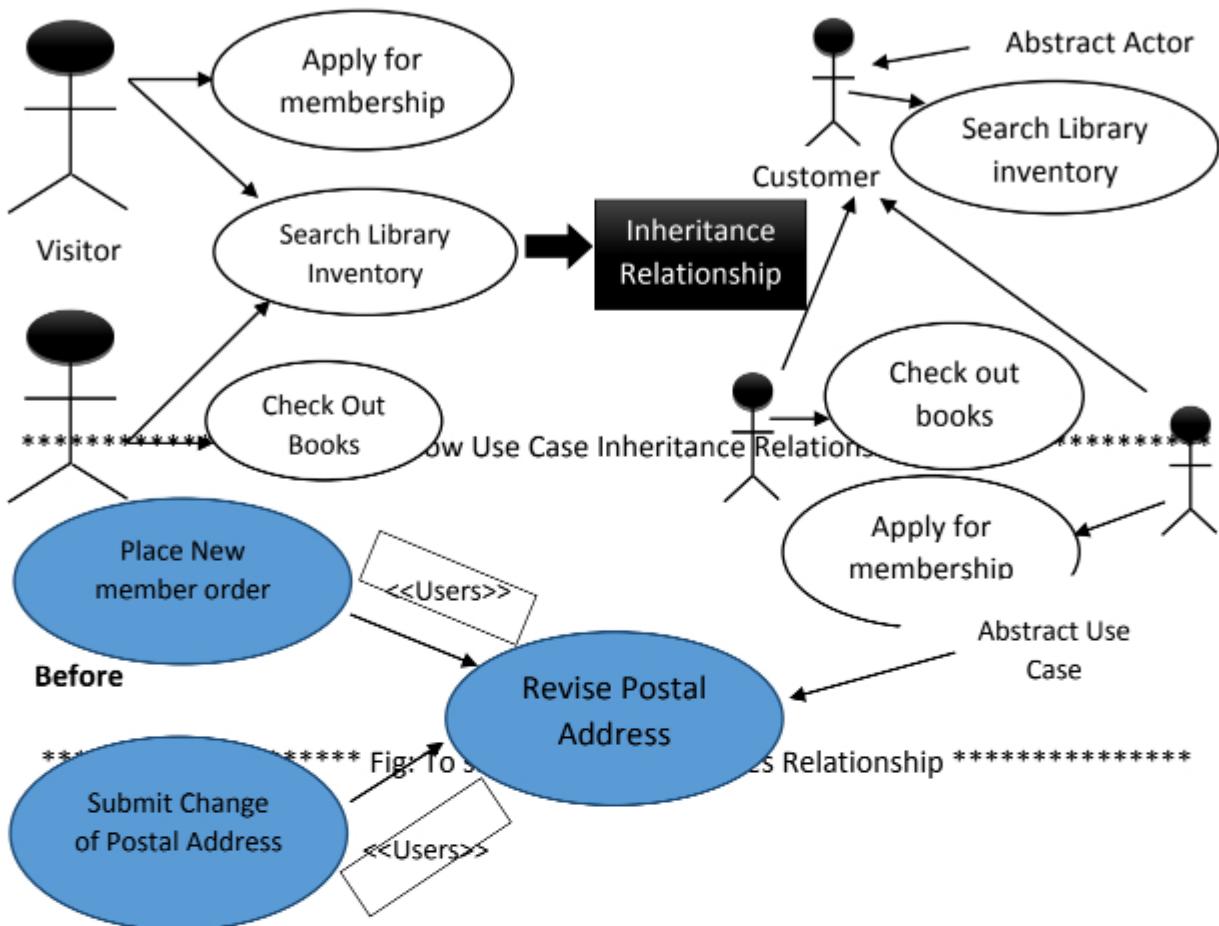
3. Relationship

- It is a link between the functions and actors in the Use Case diagram.
- An Association Relationship is a relationship between an actor and a use case. Association means communication with the use case. It can be bidirectional and unidirectional.
- An Extends Relationship is the relationship between resulting use case (extension use case) and use case.
- An Includes Relationship (Uses Relationship) is the relationship between Abstract use case and use case.
- A Depends on Relationship is the relationship which shows the dependencies between one use case with another.
- An Inheritance Relationship is the relationship occurs when an actor inherits the ability to initiate a use case from another.



Extensive Use Case





***** Fig: To show Use Case Depends on Relationship *****

The Process of Use-Case Modeling

- Step 1: Identify business actors.
- Step 2: Identify business use cases.
- Step 3: Construct use-case model diagram.
- Step 4: Documents business requirements use-case narratives.

Use-Case and Project Management

- Use Case model can drive entire development effort.
- Use Case ranking and priority matrix and use case dependency are the tools used for prioritizing and scheduling use case development.
- The project manager or system analyst uses use cases to plan (Estimate and schedule) to build the cycles of project
- Use case ranking and priority matrix is a tool that used to evaluate use cases and determine their priority.
- Use case ranking and priority matrix completed with input from stakeholders and development team.

- Use case ranking and priority matrix tool is used to determine the importance of use case.
- Use case Dependency diagram is a graphical tool which is used to determine the dependencies among the use cases.

Benefits

- Enhances understanding of system functionality
- Helps identify missing use cases
- Helps facilitate project management by depicting which use cases are more critical.

Chapter 7 **Data Modeling Analysis**

Objectives

- Define Data Modeling and its benefits.
- Define ER-Diagram and its elements.
- Explain the process of Logical Data Modeling.
- Understand How to construct data models.
- Discover or invent keys for entities and classify the types of keys.
- Describe the concept of Normalization.

Data Modeling

- Data Modeling is a process for defining business requirements for a database.
- It is a conceptual representation of the data which must make sense, and be usable by other people.
- It is a technique for organizing and documenting a system's data.
- It is also called database modeling.
- A simple data model is an Entity Relationship Diagram or ER-Diagram or ERD.
- Data modeling techniques are also called as Data Modeling Languages.
- Data Modeling is concerned with the data and how data is independently captured and used.

Benefits of Data Modeling

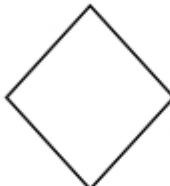
- Clarifies functional specification
- Confirms business requirements
- Facilitates business process improvement
- Decreases system development time and cost
- Facilitates data re-use and sharing
- Focuses communication for data analysis.

ER-Diagram

- Entity Relationship Diagram is a data modeling language or data modeling notation.
- It depicts data in terms of the entities and relationships described by that data.
- E-R Model was introduced by P.P. Chen in 1976 as the data diagramming technique.
- ER diagram is widely used in database design:
 - Represent conceptual level of a database system

- Describe things and their relationships in high level

ER-Diagram Components

S.N	Component	Symbol	Name	Description
1.	Entity		Rectangle	Rectangle is used to represent entity sets like persons, places, objects, events, concepts, etc.
2.	Attribute		Oval	Oval represents attributes which are the characteristics of an entity like element, property or field.
3.	Relationship		Diamond	Diamond represents the relationship among entity sets. Relationship is the natural business association between one or more entities.
4.	Links		Line	Line links attributes to entity sets and entity sets to relationship.

Entity

- Entity is a class of persons, places, objects, events, or concepts about which we need to capture, process and store data.
- An Entity can be shown by using a rectangle symbol.
- It identifies classes of entities and is distinguishable from the other entities.
- It is named by a singular noun.
- A school system includes data that describes things like STUDENTS, TEACHERS, COURSES and CLASSROOMS.

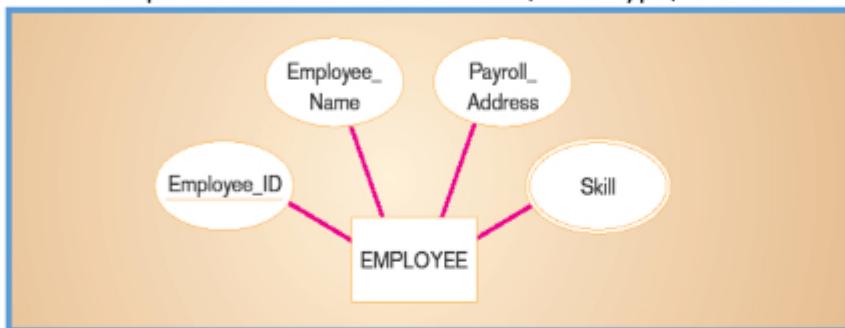
Student

Categories of Entities

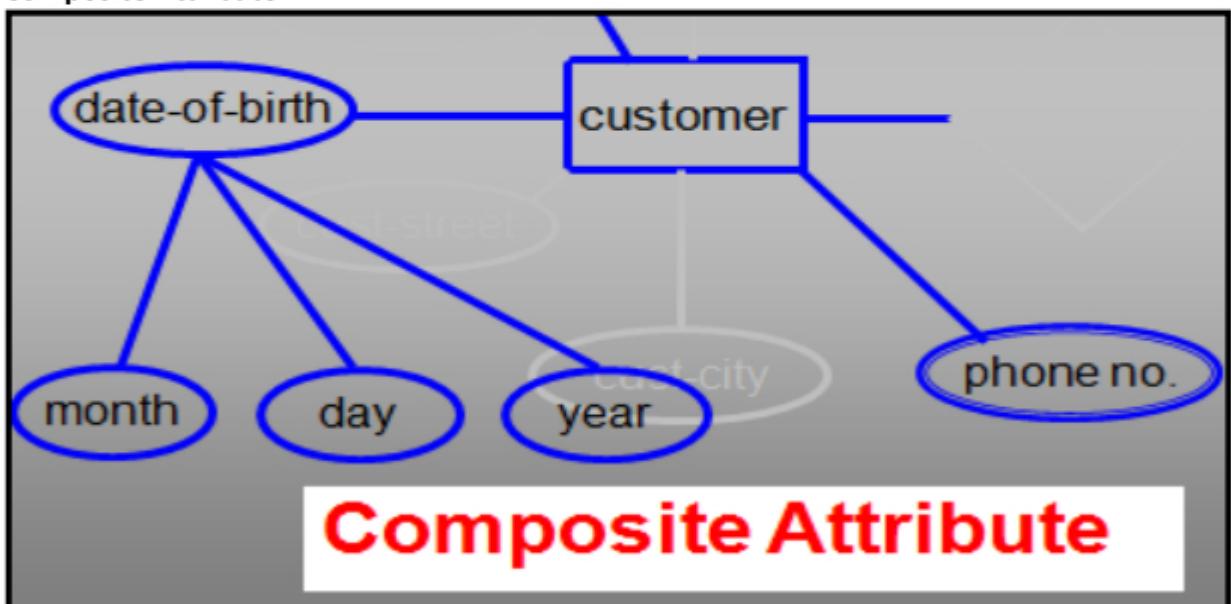
- **Persons:** agency, contractor, customer, department, division, employee, instructor, student, supplier.
- **Places:** sales region, building, room, branch office, campus.
- **Objects:** book, machine, part, product, raw material, software license, software package, tool, vehicle model, vehicle.
- **Events:** application, award, cancellation, class, flight, invoice, order, registration, renewal, requisition, reservation, sale, trip.
- **Concepts:** account, block of time, bond, course, fund, qualification, stock.

Attributes

- Attribute is a descriptive property or characteristic of an entity. Synonyms include element, property, and field.
- An attribute is a sub-group of information within an entity.
- The attribute can be represented by Oval symbol.
- The STUDENT entity includes attributes like Student number, Name, Date of Enrollment, Date of Birth, Address, Gender, Phone Number etc.
- Compound attribute is an attribute that consists of other attributes.
- Synonyms in different data modeling languages are numerous: concatenated attribute, composite attribute, and data structure.
- Properties of Attributes: Domain, Data type, Default value and Key.



Composite Attribute



- Domain is a property of an attribute that defines what values an attribute can legitimately take on.
- Data type is a property of an attribute that identifies what type of data can be stored in that attribute.
- Default value is the value that will be recorded if a value is not specified by the user.

Key

- Key is an attribute or group of attributes that assumes a unique value for each entity instance.

- It is sometimes called an identifier. In Data Base concept it is also known as Data constraint.
- To maintain uniqueness of data, to reduce data complexity and ambiguity key is used.
- Concatenated key is a group of attributes that uniquely identifies an instance of an entity. It is also known as composite key or compound key.
- Candidate Key is one of a number of keys that may serve as the Primary key of an entity.
- Primary key is a candidate key that most commonly used to uniquely identify a single entity instance.
- Alternate Key is a candidate key that which is not a primary key. It is also called secondary key.

Relationship

- Relationship is a natural business association between one or more entities.
- An association of several entities in an Entity Relationship model is called relationship.
- The relationship may represent an event that links the entity and the logical affinity exists between the entities.
- There are three types of Relationship:
 - One-to-One Relationship (Unary)
 - One-to-Many Relationship (Binary)
 - Many-to-Many Relationship(Ternary)

Figure to show 1:1 Relationship Between PROFESSOR and DEPARTMENT



Figure to show 1:M Relationship Between PROFESSOR and CLASS



Figure to show M:M Relationship Between STUDENTS and COURSES



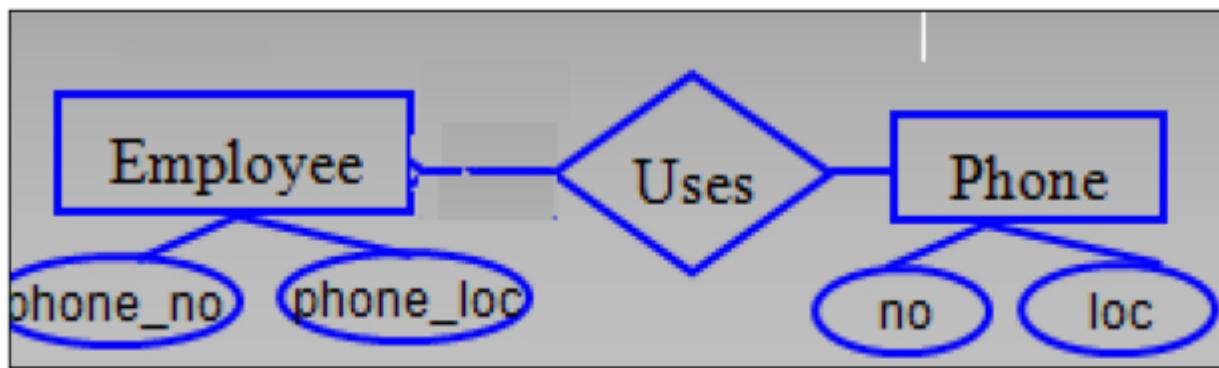
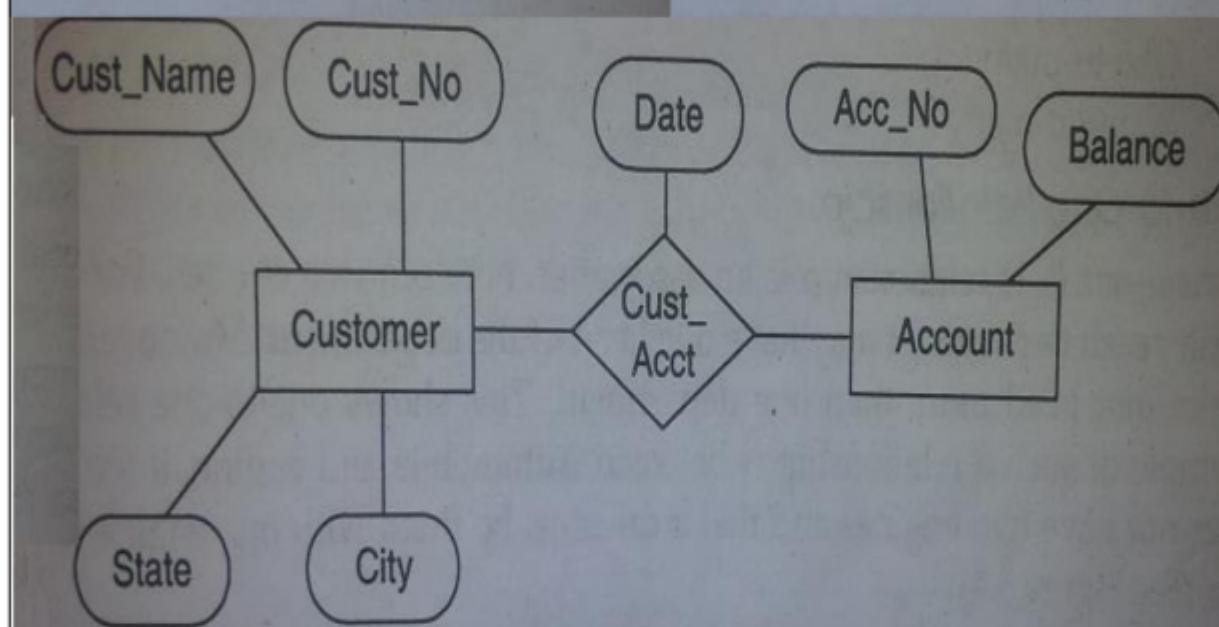
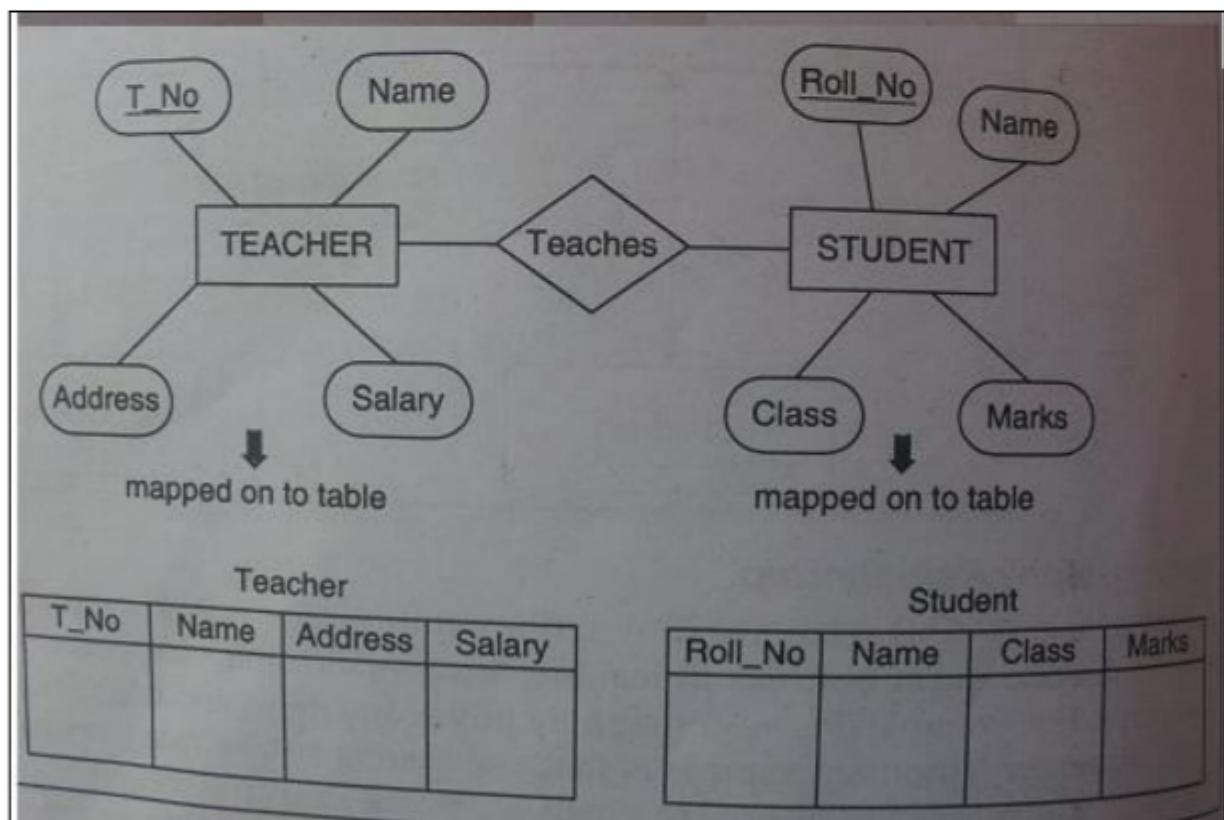
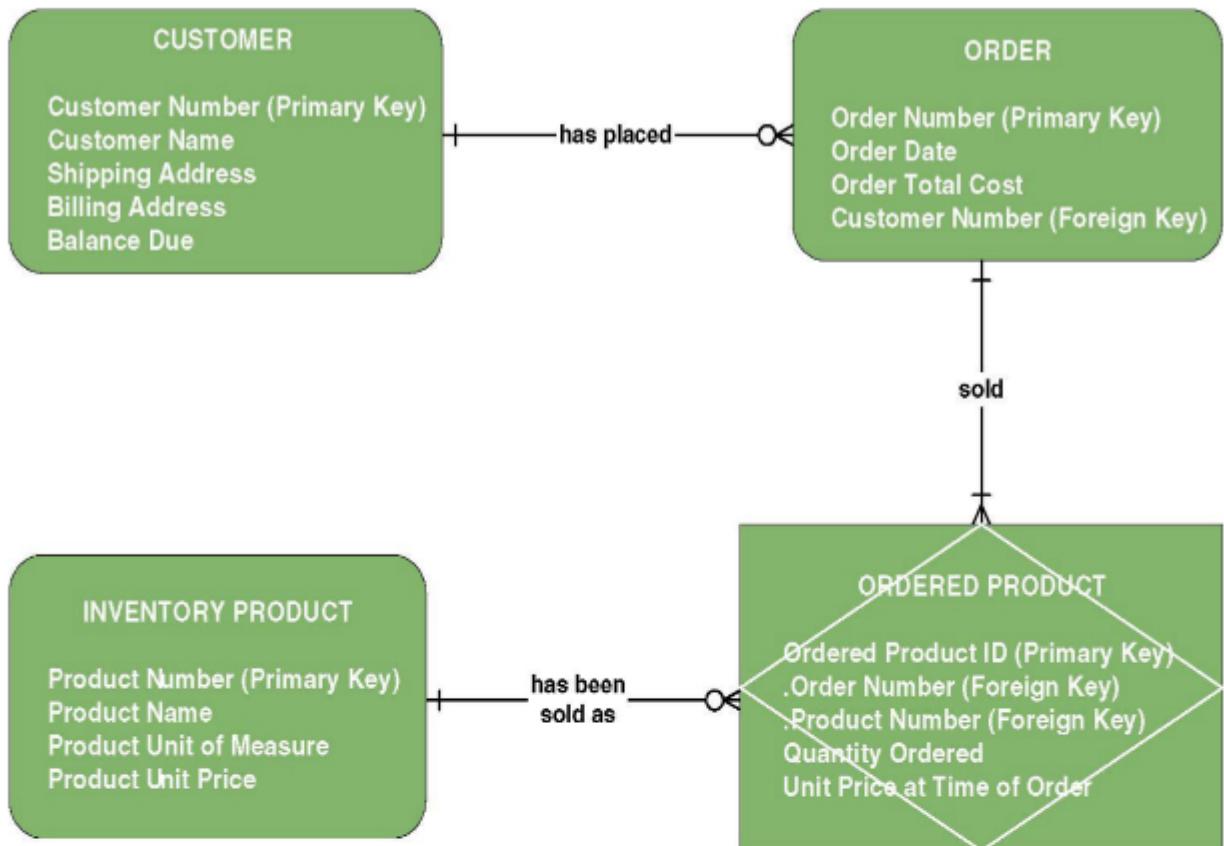


Figure to show Entity-Relationship Diagram of Bank Account System



There are two entity sets CUSTOMER and ACCOUNT and this diagram relates through a binary relationship.



Process of Logical Data Modeling

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- Strategic Data Modeling
- Data Modeling During System Analysis
- Looking Ahead to Systems Design
- Automated tools for data modeling

Strategic Data Modeling

- It defines overall vision and architecture for information system.
- This approach used in information engineering.
- This approach includes enterprise data model.

Data Modeling During System Analysis

- It focuses on the logical data model.
- The logical data modeling can be done in these stages as
 1. Establish context data model
 2. Draw key-based data model
 3. Construct full attributed data model
 4. Analyze and complete normalized data model

Looking Ahead to Systems Design

- In this approach the logical data model converted to physical data model.
- It is also called database schema.
- This model reflects technical capabilities and performance running requirements.

Automated tools for data modeling:

- Data models are stored in repository.
- CASE products (like Logic Works' ER win) support data modeling and database design.
- CASE provides powerful analytical tools for handling mechanical errors, completeness, flexibility and consistency
- Also supports reverse engineering of existing files and database structures.

How to construct Data Models?

1. Entity Discovery
2. Establish context data model
3. Draw key-based data model
4. Construct fully attributed data model

Analyzing the data Models

What is a good data model?

- Simple and understandable
- Accuracy and completeness
- Non redundancy
- Enforcement of business rules
- Data Reusability
- Stability and Flexibility
- Communication Effectiveness
- Simplicity

- Adoptable of future changes

Data Analysis

- The technique used to improve a data model in preparation for database design is called Data analysis.
- Data Analysis is a process of preparing a data model for implementation as a simple, flexible and adoptable database.
- The specific technique for data analysis is Normalization.
- Normalization is a data analysis technique that organizes and group's data attributes for stable, flexible, non-redundant and adoptable entities.

Normalization

- First normal form (1NF) – an entity whose attributes have no more than one value for a single instance of that entity
 - Any attributes that can have multiple values actually describe a separate entity, possibly an entity and relationship.
- Second normal form (2NF) – an entity whose non-primary-key attributes are dependent on the full primary key.
 - Any non-key attributes that are dependent on only part of the primary key should be moved to any entity where that partial key is actually the full key. This may require creating a new entity and relationship on the model.
- Third normal form (3NF) – an entity whose non-primary-key attributes are not dependent on any other non-primary key attributes.
 - Any non-key attributes that are dependent on other non-key attributes must be moved or deleted. Again, new entities and relationships may have to be added to the data model.

Hierarchy Generalization

- A generalization hierarchy is a structured grouping of entities that share common attributes.
- It is a powerful and widely used method for representing common characteristics among entities while preserving their differences.
- The entity being refined is called the super type and each refined version is called the subtype.
- Generalization occurs when two or more entities represent categories of the same real world object.
- For example, Wages Employees and Classified Employees represent categories of the same entity, Employees. In this example, Employees would be the super type; Wages Employees and Classified Employees would be the sub types.

Generalization hierarchies should be used when.....

1. A large number of entities appear to be of the same type
2. Attributes are repeated for multiple entities
3. The model is continually evolving.

Mapping Data requirements to Locations

- While a logical data model is effective for describing what data is to be stored for a new system.
- We need to identify what data and access rights are needed at which locations.
- Data-to-location CRUD matrix is a matrix that is used to map data requirements to locations.
- CRUD stands for C=Create, R=Read, U=Update or modify and D=Delete or Deactivate.
- A Data-to-location CRUD matrix is a table in which the rows indicate entities and the columns indicate locations.

Entity . Attribute	Location	Customers	Kansas City	Marketing	Advertising	Warehouse	Sales	A/R	Boston	Sales	Warehouse	San Francisco	Sales	San Diego	Warehouse
		INDV					ALL	ALL		SS	SS		SS		SS
Customer	INDV					R	CRUD	R		CRUD	R		CRUD		R
.Customer Number	R					R	CRUD	R		CRUD	R		CRUD		R
.Customer Name	RU					R	CRUD	R		CRUD	R		CRUD		R
.Customer Address	RU					R	CRUD	R		CRUD	R		CRUD		R
.Customer Credit Rating	X						R	RU		R		R			
.Customer Balance Due	R						R	RU		R		R			
Order	INDV		ALL		SS	ALL				SS	SS		SS		SS
.Order Number	SRD		R	CRUD	R	CRUD	R			CRUD	R		CRUD		R
.Order Date	SRD		R	CRUD	R	CRUD	R			CRUD	R		CRUD		R
.Order Amount	SRD		R	CRUD		CRUD	R			CRUD	R		CRUD		R
Ordered Product	INDV	ALL		SS	ALL					SS	SS		SS		SS
.Quantity Ordered	SUD		R	CRUD	R	CRUD	R			CRUD			CRUD		
.Ordered Item Unit Price	SUD		R	CRUD		CRUD	R			CRUD			CRUD		
Product	ALL	ALL	ALL	ALL	ALL					ALL	ALL		ALL		ALL
.Product Number	R		CRUD	R	R	R				R	R		R		R
.Product Name	R		CRUD	R	R	R				R	R		R		R
.Product Description	R		CRUD	RU	R	R				R	R		R		R
.Product Unit of Measure	R		CRUD	R	R	R				R	R		R		R
.Product Current Unit Price	R		CRUD	R		R				R	R		R		R
.Product Quantity on Hand	X				RU	R				R	RU		R		RU
		INDV = individual		ALL = ALL		SS = subset		X = no access							
		S = submit	C = create	R = read	U = update	D = delete									

Un-normalized File for Sale

SalesPerson				Sales		
EmpNo	EmpName	StoreBranch	Department	ItemNo	Itemdescp	Saleprice
E0010	Sujan B.	Downtown	Hardware	TR10	Router	350.00
				SATA01	Hard Disk	2400.00
				PT06	Drill	210.00
				AB16	Lawnmover	245.00
E0020	Bibek G.	Midpoint	Home appliance	TT1	Humidfier	114.00
				DS10	Dishwasher	262.00
E0021	Binod B.	TowerLine	Auto parts	MC16	Snow Tire	180.00

				AC146	Alternator	65.00
				BB100	Battery	400.00
E0050	Suraj R.	Fashion Spot	Men's clothing	HS10	Suit	1000.00

SalesPerson Data File

*\ EmpNo	EmpName	StoreBranch	Department
E0010	Anand K.	Downtown	Hardware
E0020	Zombo D.	Midpoint	Home appliances
E0021	Balwant S.	TowerLine	Auto parts
E0050	Smith John	Fashion Spot	Men's clothing

SalesPerson Item File

*\ EmpNo	*\ ItemNo	Itemdescp	SlaePrice
E0010	TR10	Router	350.00
E0010	SATA01	Hard disk	2400.00
E0010	PT06	Drill	210.00
E0010	AB16	Lawnmover	245.00
E0020	TT1	Humidfier	114.00
E0020	DS10	Dishwasher	262.00
E0021	MC16	Snow tire	180.00
E0021	AC146	Alternator	65.00
E0021	BB100	Battery	400.00
E0050	HS10	Suit	1000.00

Here * Symbol is Key.

Figure: First Normalized file for sales

SalesPerson Data File

* Employee#	EmpName	StoreBranch	Department
E0010	Anand K.	Downtown	Hardware
E0020	Zombo D.	Midpoint	Home appliances
E0021	Balwant S.	TowerLine	Auto parts
E0050	Smith John	Fashion Spot	Men's clothing

1

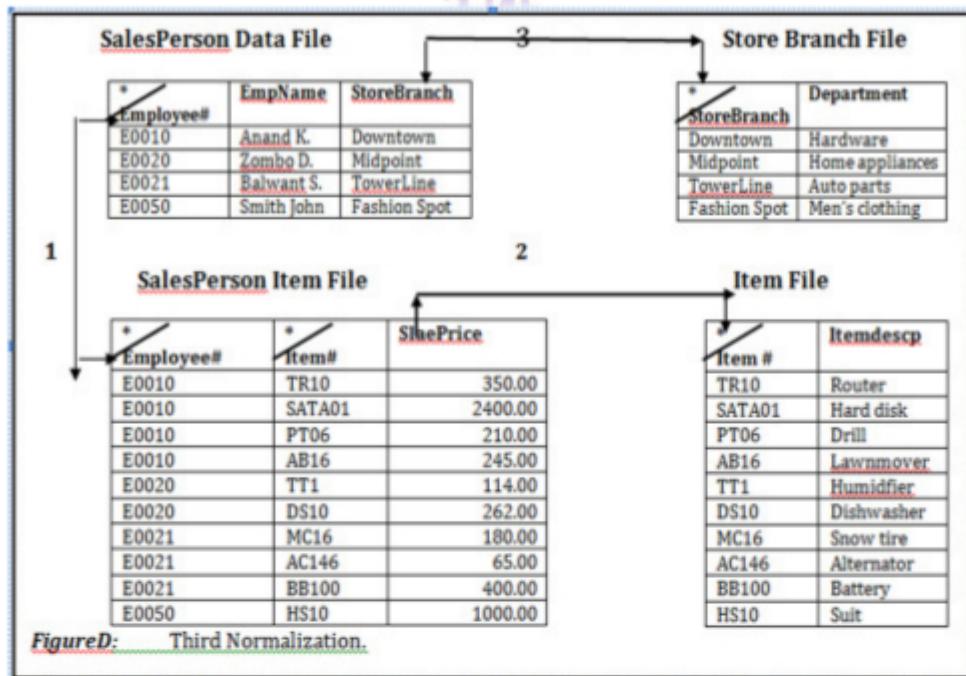
SalesPerson Item File		
* Employee#	* Item#	SlaePrice
E0010	TR10	350.00
E0010	SATA01	2400.00
E0010	PT06	210.00
E0010	AB16	245.00
E0020	TT1	114.00
E0020	DS10	262.00
E0021	MC16	180.00
E0021	AC146	65.00
E0021	BB100	400.00
E0050	HS10	1000.00

Item File

* Item #	Itemdescp
TR10	Router
SATA01	Hard disk
PT06	Drill
AB16	Lawnmover
TT1	Humidfier
DS10	Dishwasher
MC16	Snow tire
AC146	Alternator
BB100	Battery
HS10	Suit

Figure C: Second Normalization.

3 NF



Chapter 8 DFD Elements

- External Agents
- Processes
- Data stores
- Data flows

1. External Agents

- It is also called external Entities.
- The external entities either input information to the system, output information from the system or both.
- These are called sources if they are external to the system and provide data to the system, and sink if they are external to the system and receive information from the system.
- A person, organization or system that is external to the system but interacts with it.

2. Process

- Process is a work performed by a system in response to incoming data flows or conditions.
- A synonym is transform.
- It is also referred to as a black box.
- A process shows a transformation and manipulation of data flows within the system.
- It contains the business logic therefore it is also called business rules.

3. Data Stores

- A data store is a holding Data Source Processing for information within the system.

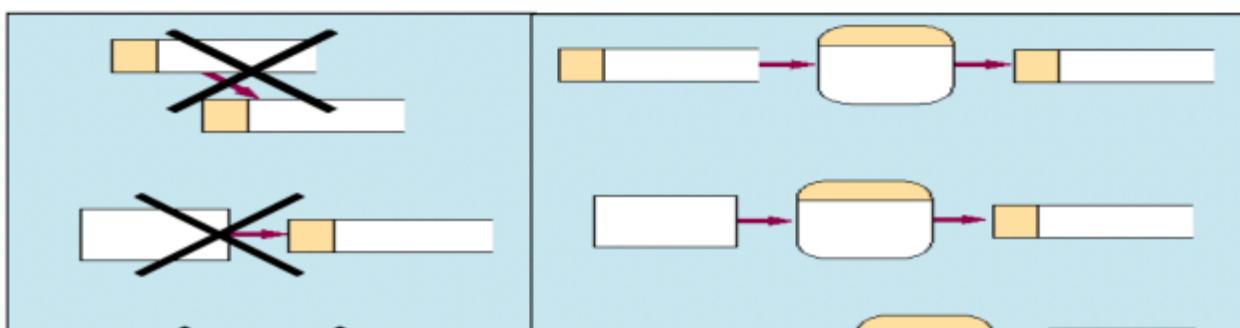
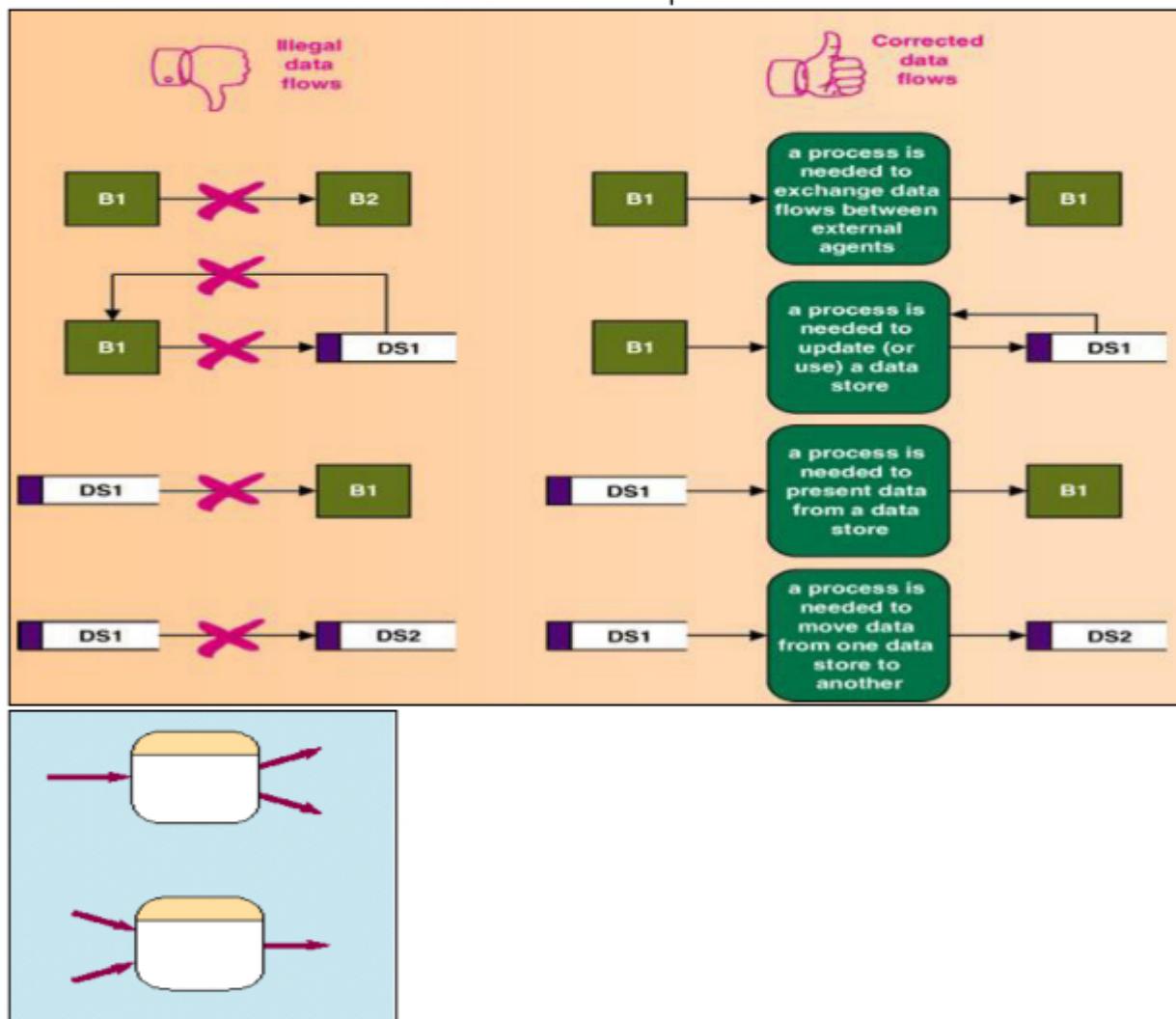
- It is represented by an open ended narrow rectangle.
- Synonyms are file and database.
- Stored data intended for future use.

4. Data Flows

- A data flow shows the flow of information from its source to its destinations.
- A data flow is represented by a line with single or double arrowheads that swing the direction of flow.

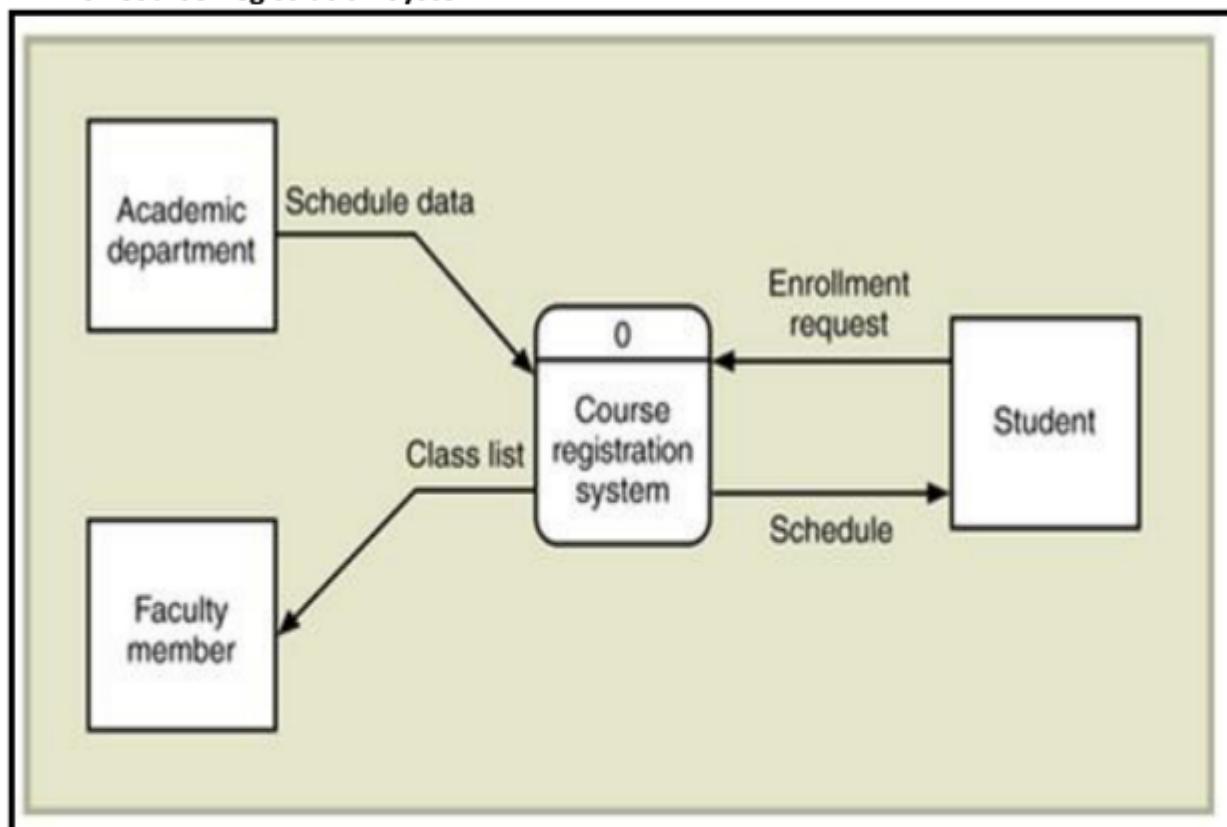
Guidelines for DFD

- All processes must have at least one data flow in and one data flow out.
- All processes should modify the incoming data, producing new forms of outgoing data.
- Each data store must be involved with at least one data flow.
- Each external entity must be involved with at least one data flow.
- A data flow must be attached to at least one process.



DFD Examples

DFD for Course Registration System



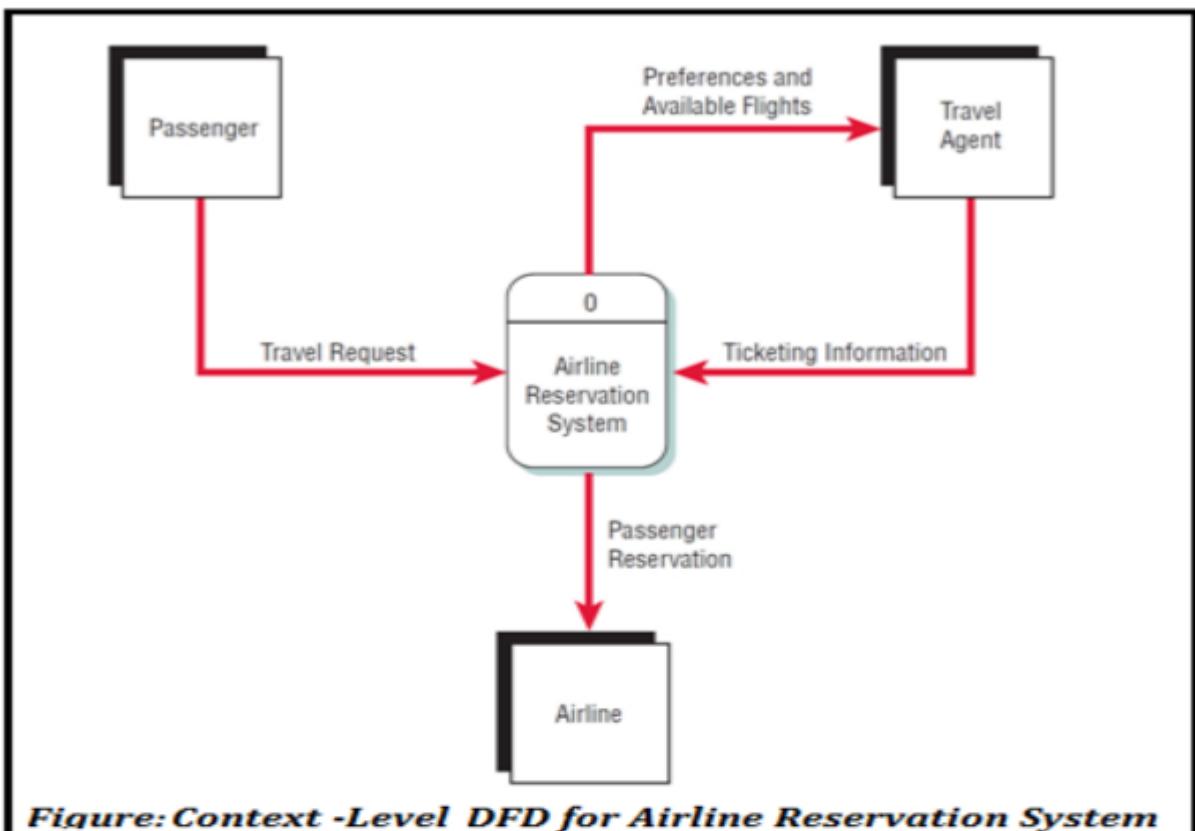
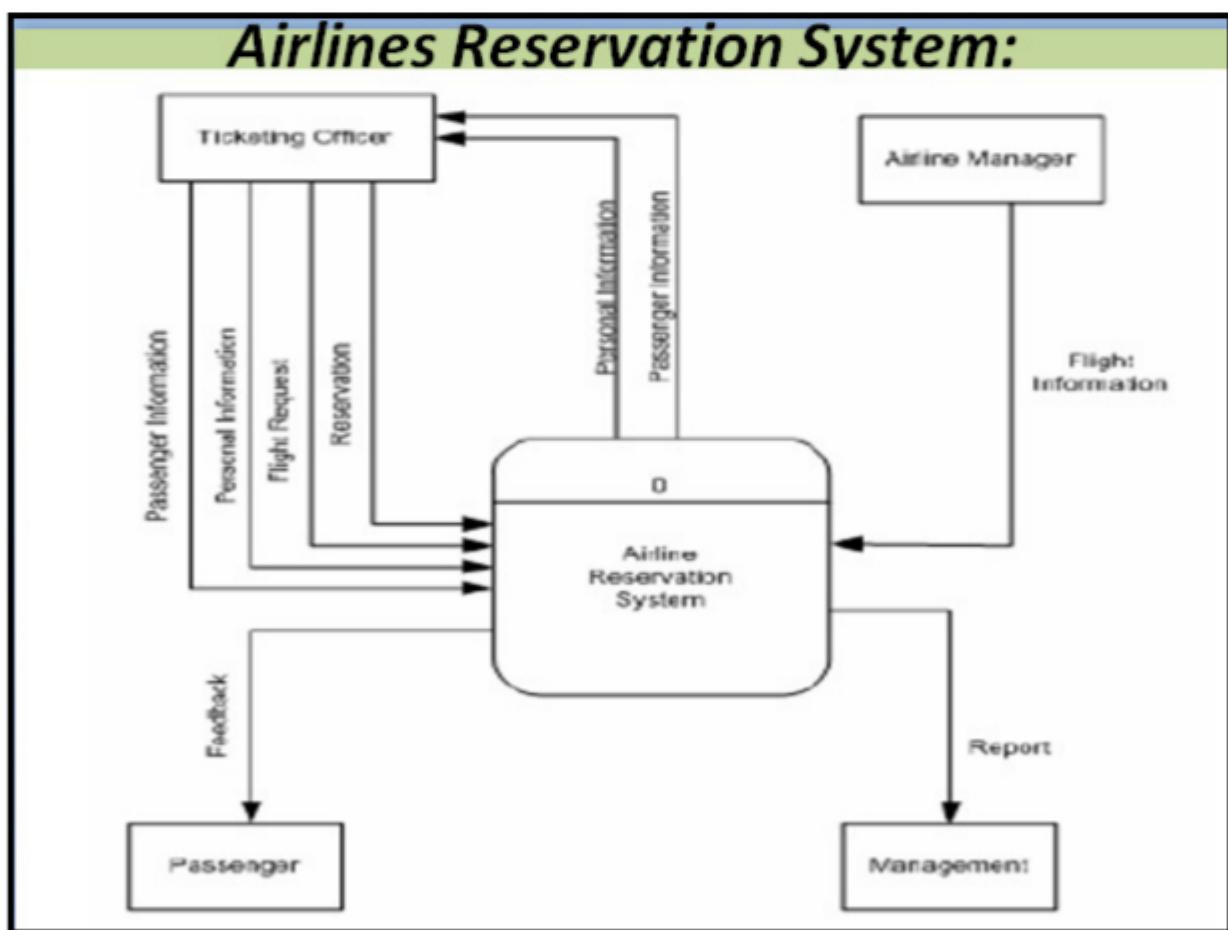
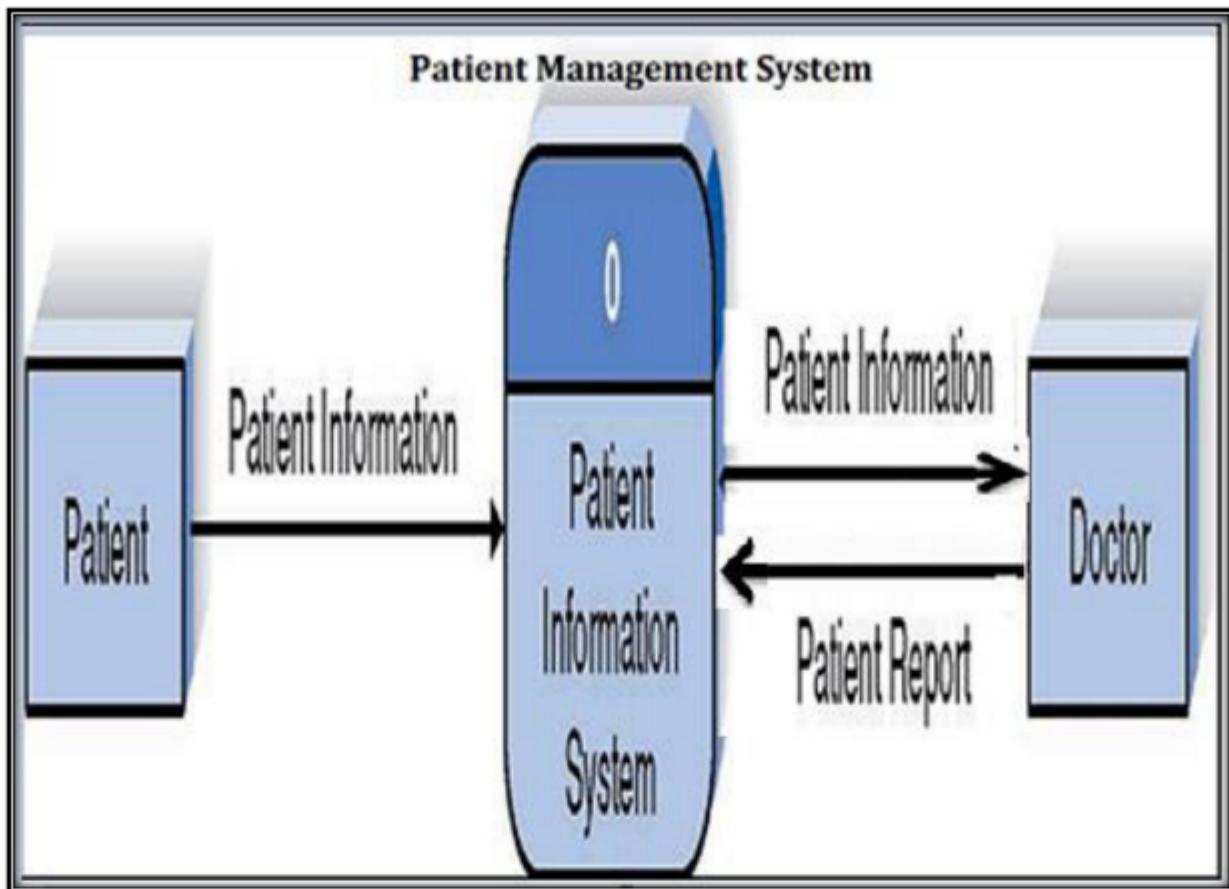


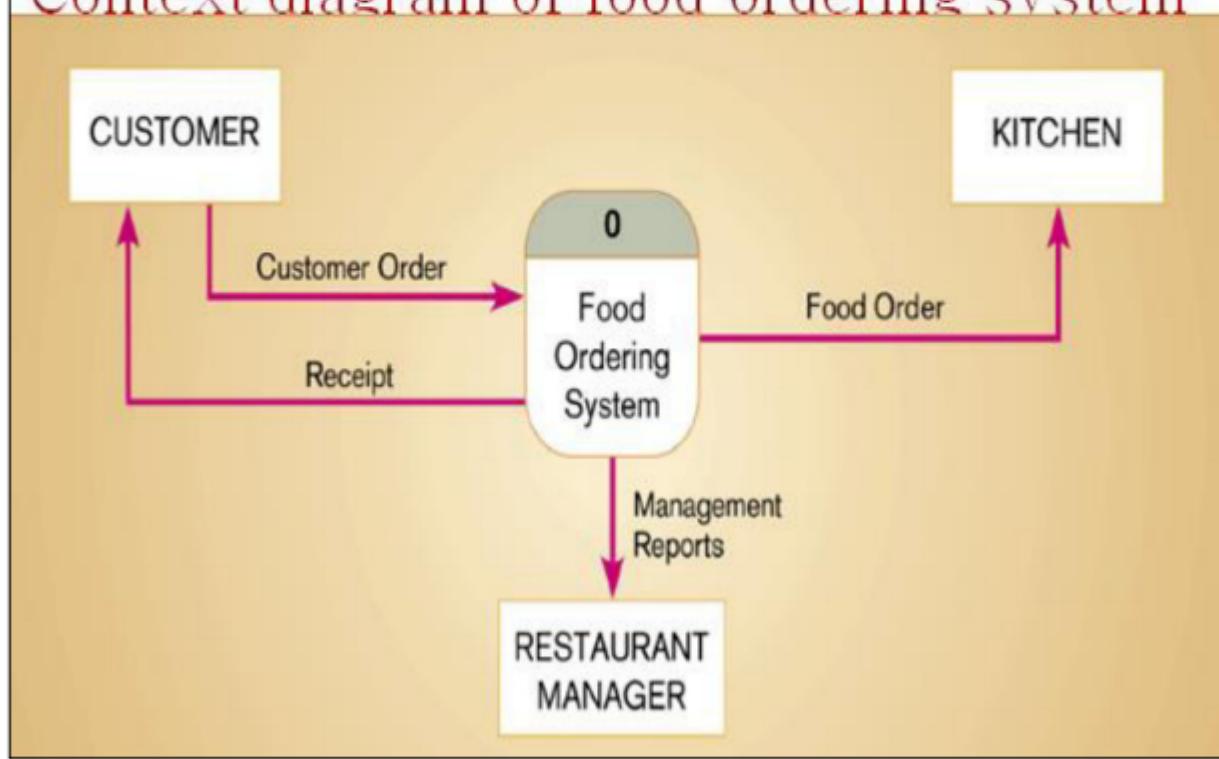
Figure: Context -Level DFD for Airline Reservation System





DFD for Food Ordering System

Context diagram of food ordering system



The process of Logical Process Modeling

When to draw Process Models?

- Strategic systems planning
- Business process redesign
- During Systems analysis
- During Fact finding & Information Gathering
- Using CASE

How to draw construct Process models?

For application development projects, an event-driven data flow diagramming strategies:

- Draw a context diagram:

To show system interfaces, business and external organization

- Draw a functional decomposition diagram:

To show the key subsystem or functions

- Create an event list:

To identify external or temporal events

- Update decomposition diagram:

- For each event, Draw an Event diagram

- Combine event diagrams into one or more system diagrams

- Complete the specification

Synchronizing of System Models

- Data synchronization refers to the idea of keeping multiple copies of a dataset.
- Process synchronization refers to the idea that multiple processes are to join up or handshake at a certain point
- Data to process CRUD matrix tool provides a simple quality check that is simpler to read data or process model.
- The errors and omissions are recorded on the matrix and in the corresponding data and process models to ensure proper synchronization.
- Process to location association matrix is a table used to document processes and the location at which they must be performed.

Data and Process Model Synchronization CRUD Matrix

		Data-to-Process-CRUD Matrix												
		Process Customer Application	Process Customer Credit Application	Process Customer Change of Address	Process Internal Customer Credit Change	Process New Customer Order	Process Customer Order Cancellation	Process Customer Change to Outstanding Order	Process Internal Change to Customer Order	Process New Product Addition	Process Product Withdrawal from Market	Process Product Price Change	Process Change to Product Specification	Process Product Inventory Adjustment
Entity . Attribute		C	C	C	R	R	R	R	R	R	R	R	R	R
Customer	.Customer Number	C	C	C	R	R	R	R	R	R	R	R	R	R
	.Customer Name	C	C	C	R	R	R	R	R	R	R	R	R	R
	.Customer Address	C	C	C	RU	RU	RU	RU	RU	RU	RU	RU	RU	R
	.Customer Credit Rating	C	C	C	R	U	R	R	R	R	R	R	R	R
	.Customer Balance Due				U	RU	U	R	R	R	R	R	R	R
Order	.Order Number				C	D	RU	RU	RU	RU	RU	RU	RU	R
	.Order Date				C		U	U	U	U	U	U	U	R
	.Order Amount				C		U	U	U	U	U	U	U	R
Ordered Product	.Quantity Ordered				C	D	CRUD	CRUD	CRUD	CRUD	RU	RU	RU	R
	.Ordered Item Unit Price				C		CRUD	CRUD	CRUD	CRUD				R
Product	.Product Number				R	R	R	R	C	D	RU	RU	RU	R
	.Product Name				R	R	R	R	C			RU	RU	R
	.Product Description				R	R	R	R	C			RU	RU	R
	.Product Unit of Measure				R	R	R	R	C		RU	RU	RU	R
	.Product Current Unit Price				R	R	R	R	C		U	RU	RU	R
	.Product Quantity on Hand				RU	U	RU	RU						RU

C = create R = read U = update D = delete

Process-to-Location-Association Matrix

Process	Customers	Kansas City	Marketing	Advertising	Warehouse	Sales	Accounts Receivable	Boston	Sales	Warehouse	San Francisco	Sales	San Diego	Warehouse
Process Customer Application	X				X		X				X			
Process Customer Credit Application	X					X								
Process Customer Change of Address	X				X		X				X			
Process Internal Customer Credit Change						X								
Process New Customer Order	X				X		X				X			
Process Customer Order Cancellation	X				X		X				X			
Process Customer Change to Outstanding Order	X				X		X				X			
Process Internal Change to Customer Order						X		X			X			
Process New Product Addition					X									
Process Product Withdrawal from Market					X									
Process Product Price Change					X									
Process Change to Product Specification					X	X					X			
Process Product Inventory Adjustment						X					X			X

Chapter 9

Feasibility Study and System Proposal

Objectives

- Define Feasibility Analysis and its importance.
- Feasibility study checkpoints in the systems life cycle.
- Define and describe six types of feasibility and their respective criteria.
- Write suitable system proposal reports for different audiences.

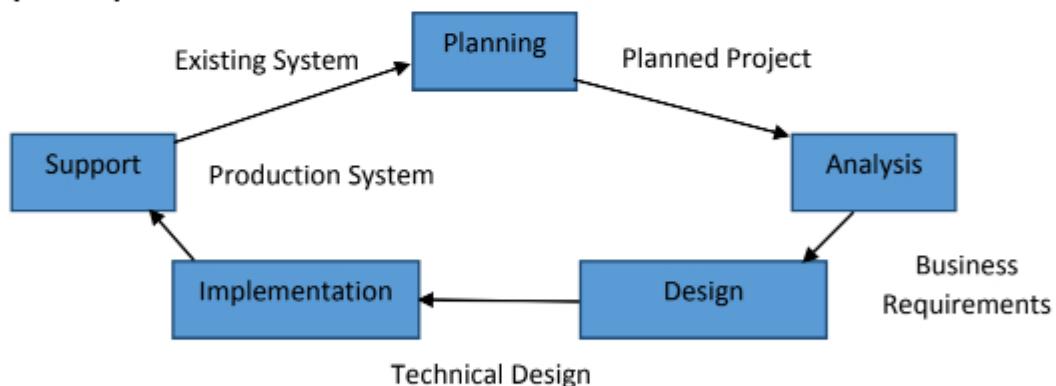
Feasibility Analysis

- Feasibility refers to determine whether the proposed information system is worth pursuing.
- Feasibility is the measure of how beneficial or practical an information system will be to an organization.
- Feasibility analysis is the process by which feasibility is measured.
- This analysis recurs throughout the life cycle.

Creeping Commitment

- Creeping Commitment is an approach to feasibility that proposes that feasibility should be measured throughout the life cycle.
- It is ongoing evaluation of feasibility at various checkpoints in the life cycle.
- At any check points, the project may be canceled, revised or continued.
- This all over system called creeping commitment approach to feasibility.

Feasibility Checkpoints



Feasibility Analysis and checkpoints during System Analysis

- Scope Definition Checkpoint
- Problem Analysis Checkpoint
- Decision Analysis Checkpoint

1. Scope Definition Checkpoint

- The first feasibility analysis constructed during the scope definition phase.
- In this process measures urgency of problems and first-cut-estimate of development.

- This process focuses on the opportunities and requirements.
- 2. Problem Definition Checkpoint**
 - This checkpoint occurs after a more detailed study and scope definition of the current system.
 - When problems are understood, the analyst better estimates development cost and benefits of system.
- 3. Decision Analysis Checkpoint**
 - In this phase, alternative solutions are defined in terms of I/O methods, data storage methods, computer hardware/software requirements, processing methods.
 - After defining these each is analyzed for operational, technical, schedule and economic feasibility.

Six tests for feasibility

- **Operational Feasibility:** A measure of how well a solution meets the system requirements.
- **Cultural/Political feasibility:** A measure of how well a solution will be accepted in an organizational climate.
- **Technical Feasibility:** A measure of the practicality of a technical solution and the availability of technical resources and expertise.
- **Schedule Feasibility:** A measure of how reasonable the project timetable is.
- **Economic Feasibility:** A measure of the cost effectiveness of a project or solution.
- **Legal Feasibility:** A measure of how well a solution can be implemented within existing legal/contractual obligations.

Cost Benefit Analysis Techniques

- Economic feasibility is also known as cost benefit analysis.
- The costs fall into two categories: Cost Associated with developing the system and Cost Associated with operating system.
- System development costs are onetime costs which do not recur later.
- According standard organizations cost categories:
 - Personnel cost
 - Computer uses cost
 - Training cost
 - Supply and equipment cost
 - New devices and Software cost

The System Proposal

System Proposal is a report or presentation of a recommended solution.

- Usually formal written report or oral presentation
- Intended for system owners and users

Length of the written report

- To Executive Level managers : One or two pages
- To Middle Level Managers : Three to five pages
- To Supervisory Level Managers : Less than 10 pages

- To clerk Level Personnel : Less than 50 pages

System Proposal Formal Presentations

Formal Presentation: A special meeting used to sell new ideas and gain approval for new systems. They may also be used for any of these purposes.

- Sell new system
- Sell new ideas
- Head off criticism
- Address Concerns
- Verify conclusions
- Clarify Facts
- Report Progress

Cost Benefits Analysis Techniques

- Cost Analysis
- Benefit Analysis
- Is the proposed system cost effective

What information system benefits can be analyzed?

- Tangible benefits and intangible benefits.
- Tangible benefits are those that can be easily quantified.
 - Fewer processing errors
 - Increased throughput
 - Decreased response time
 - Elimination of job steps
 - Increased sales
 - Reduced credit losses
 - Reduced expenses

Intangible benefits are those benefits believed to be difficult or impossible to quantify.

- Intangible benefits
- Increased customer
- Goodwill
- Better service
- Better decision making

Three Popular Techniques to assess Economic Feasibility

- Payback Analysis
- Return On Investment
- Net Present Value
- **Payback analysis:** A technique for determining if and when an investment will pay for itself. Payback determines the number of years of operation that the system needs to pay back the cost of investing in it.
- Payback is determined in one of two ways:

- By increasing revenues
- By increasing savings
- **Payback period:** The period of time that will lapse before accrued benefits overtake accrued and continuing costs.
- **Time Value of Money:** Concept that recognizes that a dollar today is worth more than a dollar one year from now. Assess all the economic outlays and revenues of the information system over its economic life and to compare costs today with future costs and today's benefits with future benefits
- Use present value when the payback period is long, or when the cost of borrowing money is high.
- **Return-on-Investment (ROA) analysis:** A technique that compares the lifetime profitability of alternative solutions.

Feasibility Study of Candidate Systems

- During the decision analysis phase of system analysis, the system identifies candidate system solutions and then analyzes those solutions for feasibility.

Candidate Systems Matrix

- A tool used to document similarities and differences between candidate systems.
- **Stakeholders:** How system will interact with people and other systems.
- **Knowledge:** How data will be implemented, how inputs will be captured, how outputs will be generated.
- **Processes:** How processes will be built and implemented.
- **Communications:** How processes and data will be distributed.

	Candidate 1Name	Candidate 2Name	Candidate 3Name
Stakeholders			
Knowledge			
Processes			
Communications			

Characteristics	Candidate 1	Candidate 2	Candidate 3
Application Software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Package Solution	Custom Solution	Same as Candidate 2
Method of Data Processing Generally some combination of: on-line, batch, deferred batch, remote batch, and real-time.	Client/Server	Same as Candidate 1	Same as Candidate 1
Output Devices and	(2) HP4MV	(2) HP4MV department	Same as

Implications A description of output devices that would be used, special output requirements, (e.g., network, preprinted forms, etc.), and output considerations (e.g., timing constraints)	department laser printers (2) HP5SI LAN laser printers	laser printers. (2) HP5SI LAN laser printers (1) PRINTRONIX bar-code printer (includes software & drivers) Web pages must be designed to VGA resolution. All internal screens will be designed for SVGA resolution.	Candidate 2
---	---	--	-------------

The System Proposal

- The system analyst should be able to write a formal business report and make a business presentation.
- Other Same as above

Feasibility Analysis Matrix (a sample) (Same as above)

	Weighting	Candidate 1	Candidate 2	Candidate 3
Description				
Cultural Feasibility				
Technical Feasibility				
Schedule Feasibility				
Economic Feasibility				
Legal Feasibility				
Ranking				

Written Report

- It is best method used by system analyst to communicate with system users.
- The written reports should be with the suitable format and necessary structure.
- Written reports can be made in two ways: Factual Format and Administrative Format.

Length of Written Report: (Same as Previous)

	Factual Format		Administrative Format
1.	Introduction	1.	Introduction
2.	Methods and Procedure	2.	Conclusions and recommendations
3.	Facts and analysis	3.	Summary and discussion of facts and details
4.	Discussion and analysis of facts and details	4.	Methods and Procedure
5.	Recommendations	5.	Final Conclusion
6.	Conclusion	6.	Appendix with facts and details

The System Proposal

- System proposal is a report or presentation of a recommended solution.

- The system analyst should be able to write a formal business report and make a business presentation.
- Usually formal written report or oral presentation
- Intended for system owners and users.
- Through the use of effectively organizing the content, writing in a professional style, and orally presenting the proposal in an informative way, the analyst can create a successful systems proposal.
- When preparing a systems proposal, systems analysts should arrange the following items in order:
 - Cover letter
 - Title page of project
 - Table of contents
 - Executive summary (including recommendation)
- In order to prepare the systems proposal analysts must use a systematic approach to identify hardware and software needs.
- Finding the actual hardware and software needs
- Identifying and forecasting costs and benefits
- Comparing costs and benefits
- Choosing the most appropriate alternative

System Proposal (Formal Presentation)

- Formal presentation: A special meeting used to sell new ideas and gain approval for new systems.
- Presentation software allows the analyst to use a microcomputer for a slide show
- Enhance the presentation by using
 - Clip art
 - Video clips
 - Sound
 - Adding or deleting presentation slides for the audience and length of time available

Guidelines for the use of presentation software

- Use software templates
- Use a combination of graphics and text to communicate
- Keep each slide clean and simple
- Use color in a meaningful way
- Use clip art to enhance the text and add humor

ORAL PRESENTATIONS

- When delivering the oral presentation, keep in mind the following facts:
- Project loudly enough so that the audience can hear you
- Look at each person in the audience as you speak
- Make visuals large enough so that the audience can see them
- Use gestures that are natural to your conversational style
- Introduce and conclude your talk confidently
- Overcome anxiety and nervousness
- Be yourself, Be prepared, Speak naturally, Breathe deeply before your presentation

Chapter 10

System Design Methods

- Describe the design phase in terms of your information building blocks.
- Identify and difference between several systems design strategies.
- Describe the design phase tasks in terms of a computer-based solution for an in-house development project.
- Describe the design phase in terms of a computer-based solution involving procurement of a commercial systems software solution.

System Design

- System design is the specification of a detailed computer-based solution.
- Also called physical design.
- System analysis emphasizes the business problem.
- Systems design emphasizes the technical or implementation concerns of the system.
- The system design process begins with a functional specification of a system and ends with detail specification.
- System designers are technically concerned to the system design and system analyst are concerned as facilitators of system design.

Characteristics of a Well-designed System

1. It is secure, accurate and reliable.
2. It is easy to understand.
3. It achieves the system goals.
4. It reflects the business procedure.

System Design Approaches:

- Model Driven Approaches
- Modern Structured design
- Information Engineering (IE)
- Prototyping
- Object-Oriented Design (OOD)
- RAD
- JAD

Model Driven Strategy

- It is a system design approach that focuses drawing system models to document technical and implementation aspects of a system.

Rapid application development (RAD)

- It is a systems design approach that utilizes structured, prototyping and JAD techniques to quickly develop systems.

Joint Application Development (JAD)

- It is a technique that complements other systems analysis and design techniques by emphasizing participative development among system owners, users, designers and builders.

System Designing From Different Perspective

- System Designing for In House Development
- System Design for Integrating Commercial software

System Design for In House Development

In House Development is known as Build Projects.

- Task 1: Design the Application Architecture
 - Define technologies to be used by (and used to build) one, more, or all information systems.
 - Revise models as physical models
- Task 2: Design the System Databases
 - Database schema
 - Optimized for implementation DBMS
- Task 3 : Design the System Interface
 - Input, output, and dialogue specifications
 - Prototypes
- Task 4 : Package Design Specifications
 - Specifications to guide programmers
 - Task 5 : Update Project Plan

Advantages

- Tailored to unique business needs
- Meets organization's requirements
- Ownership of the software code
- Complete control over future development
- Clear understanding of how the software works

System Design for Integrating Commercial Software

- This system is called buy or purchase solution.
- It is a design phase in terms of a computer- based solution involving procurement of a commercial system software solution.
- This system involves acquiring a commercial off-the -shelf (COST) software product.
- This system includes a procurement and decision analysis phases.
- Task:1 Research technical criteria and options
- Task:2 Solicit proposals or quotes from vendor
- Task:3 Validate vendor claims and performances
- Task: 4 Evaluate and rank vendor proposals

- Task: 5 Award or let contract and brief vendors.

Advantages of Buying

- Ready-made solution
- Fewer “bugs”
- Expert support and training
- Flexibility/adaptability
- Customer input

Impact of Buy Decision on Remaining Life-cycle Phases

- Must integrate or interface the new system to other existing systems.
- Decision Analysis
- Make revisions in models to reflect purchased solution.
- Implement purchased solution.
- Integration problems lead to revised business requirements statements.
- Design
- Technical specification for a subset of programs to integrate purchased and built solutions.

Research Technical Criteria and Options

- Magazines and journals.
- Internal standards may exist for hardware and software selection.
- Information services are primarily intended to constantly survey the marketplace for new products and advise prospective buyers on what specifications to consider.
- Trade newspapers and periodicals offer articles and experiences on various types of hardware and software that you may be considering.

Solicit Proposals (or Quotes) from Vendors

Request for Proposals (RFP): Used to communicate requirements and desired feature to prospective vendors. Several different vendors and/or products are candidate. They will respond with a proposal.

Request for Quotations (RFQ): Used when you have already decided on a specific product that can be acquired from multiple sources. They respond with a price quotation.

Typical Request for Proposal Outline

1. Introduction
 - A. Background
 - B. Brief Summary of needs
 - C. Explanation of RFR methods
 - D. Call for action on part of vendor
2. Standards and Instructions
 - A. Schedules of events leading to contract

B. Ground rules that will govern selection decision

- i. Who may talk with whom and when
- ii. Who pays for what
- iii. Required format for a proposal
- iv. Demonstration expectations
- v. Contractual expectations
- vi. Reference expected
- vii. Documentation expectations

Typical Request for Proposal Outline

- 3. Requirements and Features
 - A. Hardware
 - a. Mandatory requirements, features and criteria
 - b. Essential requirements, features and criteria
 - c. Desirable requirements, features, and criteria
 - B. Software
 - a. Mandatory requirements, features and criteria
 - b. Essential requirements, features and criteria
 - c. Desirable requirements, features, and criteria
 - C. Service
 - a. Mandatory requirements
 - b. Essential requirements
 - c. Desirable requirements
- D. Technical questionnaires
- E. Conclusion

Validate Vendor Claims and Performance

- Review vendor proposals and climate any that does not meet all mandatory requirements.
- Validate the vendor claims and properties against validation criteria.
 - User References
 - Technical manuals
 - Demonstrations

Evaluate and Rank Vendor Proposals

- Feasibility statement
- Scoring Statement
- Hard – dollar costs – you will have to pay to the selected vendors
- Soft – dollar costs – additional costs you will incur if you select a particular vendor (to overcome a short coming etc.)

Award Contract and Debrief vendors

- Negotiate contract with selected vendor
- Debrief vendors that submitted losing proposals.
- Not to offer a second chance.

- But to inform them of precise weaknesses in their proposals and/or products.

Chapter 11 Project Management

Objectives

- Describe what is Project Management?
- Differentiate between Project Management and Process Management.
- Describe causes of failed information systems and technology projects.
- Describe Project Management Body of Knowledge. (PMBOK)
- Describe eight activities in project management.

Project Management

- Project is a temporary sequence of unique complex and connected activities which contain a goal or purpose.
- Project is considered as a success information system acceptable to a customer within a budget.
- Project management is the process of scoping, planning, staffing, organizing, directing, and controlling the development of an acceptable system at a minimum cost with a specified time frame.
- It is cross life cycle activity.

Measures of Project Success

- The resulting information system is acceptable to the customer.
- The system is delivered “on time”.
- The system is delivered “within budget”.
- The system development process has a minimal impact on ongoing business operations.

Causes of Project Failure

- Failure to establish upper-management commitment to the project
- Lack of organizations commitment to the methodology.
- Taking shortcuts through or around the methodology.
- Poor expectations management
- Poor estimating techniques
- Over optimism
- Inadequate people management skills
- Failure to adapt business change
- Insufficient resources
- Failure to “manage to the plan”.

	Project management		Process management
1.	Project is a unique endeavor with a beginning and an end undertaken to achieve a goal.	1.	Process is a repetitive collection of interrelated tasks aimed at achieving a certain goal.
2.	Project management is the process of	2.	Process management is the ongoing

	scoping, planning, staffing, organizing, directing, and controlling the development of an acceptable system at a minimum cost within a specified time frame.		activity that documents and manages the use and improves the process or methodology for the system.
3.	The scope of the project management is a single project.	3.	The scope of process management is all projects.
4.	Project management is concerned with the administrating a single project.	4.	Process management defines the methodologies to be used on every project.
5.	Performed by project managers as project management tools.	5.	Performed by process managers as process management tools.

Project management body of Knowledge (PMBOK)

- Project management institute was created as a professional society to guide the development and certification of professional project managers.
- The institute created the project Management Body of knowledge (PMBOK) for the education and certification of professional project managers.
- PMBOK address the following facts.
- Project Managers Competencies, project management functions, project management tools and technique and project management software.

Project Management Competencies

The good project manager possess a core set of competencies.

- Business awareness
- Business partner orientation
- Commitment to quality
- Initiative
- Information gathering
- Analytical thinking
- Conceptual thinking
- Interpersonal awareness
- Organizational awareness
- Motivating others
- Communications skills
- Monitoring and controlling
- Self-confidence
- Flexibility

Project Management Functions

- Scoping: Setting the boundaries of project
- Planning: Identifying the tasks required to complete the project
- Estimating: Identifying the resources required to complete the project.
- Scheduling: Developing the plan to complete the project

- Organizing: Making sure members understand their roles and responsibilities
- Directing: Coordinating the project
- Controlling: Monitoring the project
- Closing: Assessing success and failure

Project Management Tools and Techniques

PERT CHART

- A graphical network model used to depict the interdependencies between a project's tasks.
- PERT, which stands for Project Evaluation and Review Technique, was developed at the late 1950s to plan and control large weapons development projects for the U.S. Navy.

Gantt chart

- It is a bar chart used to depict project tasks against a calendar.
- The Gantt chart, first conceived by Henry L. Gantt Chart in 1917, is the most commonly used project scheduling and process evaluation tool.

SN	Task name	May	Jun	July	Aug	Sep
1.	Problem Analysis					
2.	Requirement Analysis					
3.	Logical Design					
4.	Decision Analysis					

- Project Management Software is routinely used by Project managers to plan the project, develop schedules, develop budgets, monitor progress and costs and generate reports.

Project Management Software

- Niko's Project Manager
- Microsoft Project
- Artemis International Solutions Corporation 9000
- Computer Associates, All Fusion Process Manager Suits

Enterprise Application

ERP (Enterprise Resource Planning)

- A software application that fully integrates integrate information system basic, core business function (including transaction processing and management information for those business function).
- Purchase and installed enterprises are not sufficient to meet all of our needs for Infosys in our organization. To request for development of value-added-application to meet additional needs of business.
- E.g. SAP, SCT, MANUGISTICS, I2 Technologies, SSA

Modern Structured Design

- Structured design technique helps developers to deal with the size and complexity of a program. It is a process oriented technique that emphasizes breakdown of a single program into manageable hierarchy of modules which results a computer program that is easier to implement and maintain (change)
- It is similar to top down approach and also called structured programming.
- Here simply a program is designed as top down hierarch of modules. Module is a group of instruction which are developed under certain rules and regulations.
- It is process-oriented techniques because it emphasizes on the process building blocks in our information system.
- Module should be cohesive i.e. should perform a single function that can be used in any part of the program again.
- Modules should be loosely coupled i.e. modules should be independent so that a little changes in a module does not affect any other module. Here, flow of data in a program is given more priority. It is useful for Mainframe based application software.

Information Engineering

Information Engineering is also a model driven and data centered but process sensitive, technique for planning, analyzing and designing information system. Primary tool of ICE is a data model diagram. It involves conduction business and requirement analysis from which information system applications are carved out and prioritized. The application identified in IE are become project to other developers and analyst which will be useful to be applied in order to develop the production system.

Prototyping

- Best than paper and pencil process
- Encourage end user participation
- Iteration and change are a natural consequence of system development
- End user don't know fully about the requirement until they are provided with prototyping

Object Orient Design

- It is a newest design strategy. Modeling using UML. This technique is an extension of Object oriented analysis strategy presented. Its technologies and techniques are an attempt to eliminate the separation of concerns about data and process. It is used to refine the business requirements collected in a requirement definition phrase and define phase.

RAD

- Structured, prototyping, JAD mix First invent preliminary data and process model of business requirements. Prototypes than help the analyst and users to verify those requirements and to formally refine data and process model.
- System building blocks
- System development phases
- That tasks that implement a phase

- Failure to establish upper-management commitment to the project.
- Lack of commitment to the system development methodologies. Many system development do little more than collect dust.
- Follow shortcut through methodologies.
- Poor estimating techniques.
- Poor people management skills.
- Lack of skill to manage overall project.
- Lack of resources.
- Unable to adopt changes.
- Unable to manage the plan.
- Over optimism.

	PERT Chart		GANTT Chart
1.	Project Evaluation and Review Technique was established in 1950s to control the weapon development project on USA, NAVY.	1.	Gantt chart was developed by Henry Gantt in 1917.
2.	It is a graphical network model that depicts a project development tasks and relationship between them.	2.	It is a horizontal bar chart that depicts the project task against the calendar.
3.	It is more effective when we want to study about tasks relationship.	3.	It is more effective when we are seeking to communicate schedule.
4.	It is little bit complex and time consuming to draw.	4.	It is easier because it is a pictorial representation.
5.	Task and time schedule are represented in several boxes which are linked by arrow.	5.	Tasks are represented in Y-axis and schedule in X-axis.

