HNDIT2032: System Analysis and Design

Introduction

Course Details

- Course Code : HNDIT2032
- Course Title : System Analysis and Design
- Diploma Program : HNDIT
- Semester : 2
- Course Status :Compulsory, GPA
- Number of Credits : 03

Timetable allocation (per week)

- Lectures : 02 hours
- Tutorials /Practicals : 02 hours

Learning Outcomes

After successful completion of this course the student should be able to:

- **LO1:** Collect data to analyze and specify the requirements of a system.
- **LO2:** Design system components and environments.
- **LO3:** Create general and detailed models that assist programmers in implementing a system.
- **LO4:** Describe how system analysts interact with users, management, and other information systems professionals
- **LO5:** Evaluate systems development alternatives

Data Vs Information

- **Data**:
  - Row facts
  - Unprocessed facts
- **Information**:
  - Processed data
  - Organized data in a meaningful way
- **Data cannot be used for decision making where as information can be used for decision making.**

Information system

A system which collects, processes, stores, analyses and disseminates Information for a Specific Purpose.

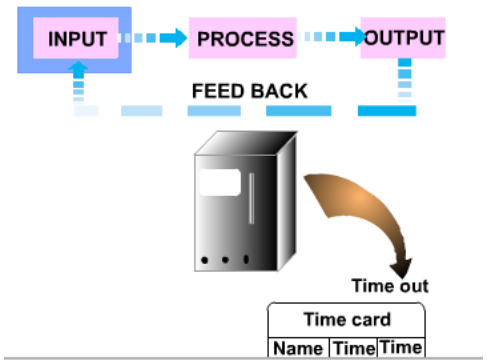
- Non Computer-Based Information Systems
- Computer-Based Information System (CBIS)

Main components of an Information System (General)

Information systems consist of four **main** components.

They are,

- Input (collects data)
- Processing (process data)
- Output (disseminates data)
- Feedback



Computer-Based Information System

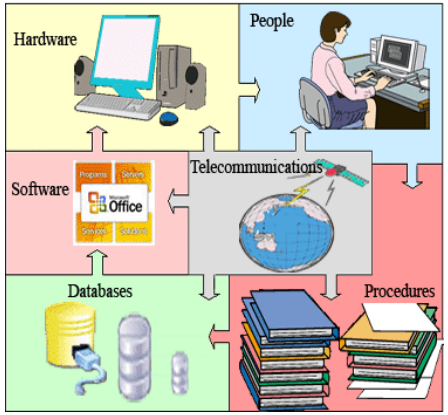
Any organized **system** for the collection, organization, storage and communication of **information by the support of computer and telecommunication technologies**

OR

It is an arrangement of **Computer Technology** (Hardware & Software) and **Telecommunication Technology** (Data, image, voice) to support and improve day to day operations, problem solving and decision making needs of management and users.

Computer Based Information Systems (CBIS)

- The **resources/ components** of a CBIS include,
  1. Hardware
  2. Software
  3. Databases
  4. People
  5. Procedures
  6. Telecommunications (Networks)



Examples for CBIS??

- Airline Reservations
- Inventory handling
- Point of sales (POS)
- School Management systems
- Library Management systems
- Bank transaction handling system

What is the purpose of an Information System (computer based)

- To turn raw data into useful information that can be used for decision making in an organization.
- Support and improve day today operations.

System development environment

- **Stakeholders:**
  Any person who has an interest in an information system (existing or proposed) and its outputs.

  Any person who can affect and can be affected by the system.

- Mainly, there are **five types** of stakeholders.
  1. Systems User
  2. Systems Owner
  3. Systems Builder
  4. Systems Designer
  5. Systems Analyst

Systems User

- A "**customer**" who will use an information system by,
  - capturing
  - validating
  - entering
  - responding to
  - storing
  - exchanging

  data and information on a regular basis.

- A common synonym is **client**.
- Systems users define the business requirements and performance expectations for the system to be built.

Systems Owner

- Systems owner is an information system's **sponsor** and advocate and he owns the final system.
- They pay for the system to be built and maintained .
- They set the vision and the priorities for the system and determine the policies for its use.
- Responsible for funding the project of
  - ✓ Developing
  - ✓ Operating
  - ✓ Maintaining the information system.

Systems Analyst

- Plays a key role in information systems development projects
- Works closely with all project team members
- System analysts are people who understand both business and computing.
- They bridge the business and the technology.

Role of system analyst

1. Identify the problem
2. Analyze and understand the problem
3. Identify the solution requirements
4. Identify alternative solutions
5. Design and implement the best solution
6. Evaluate the result

Systems Designer

- System designers are technical specialists
- Translate systems users business requirements and constrains into technical solutions
- They design the system including
  - Databases
  - Inputs
  - Outputs
  - Screens
  - Network
  - Software to meet the users requirements

System builder

- System builders are technical specialists involved with
  - Constructing
  - Testing
  - Delivering the system into operation

- They construct the information system components based on the design specifications from the system designers.

Legacy systems

- An existing computer system or application program developed times ago.
- Continues to be used because the user does not want to replace or redesign it.

Legacy systems

- Often run on obsolete hardware
- Spare parts for such computers become increasingly difficult to obtain
- Hard to maintain, improve and expand because there is a general lack of understanding of the system
- The designer of the system may have left the organization, leaving no one left to explain how it works
- Integration with newer systems may also be difficult (compatibility issues)

Why are legacy systems sometimes forced to change?

- To reflect new or changing business requirement.

- Ex:
  - Y2K (Year 2000 bug or Millennium Bug)
  - Euro conversion

Take Home Activity 01

- Compare and contrast between **System Analyst** and **Business Analyst**.

Thank You !

HNDIT2032: System Analysis and Design

Applications of Information Systems

Data Processing

- Row data is fed into computer and then analyzed and changes into useful information.

- Ex:
  - Sorting
  - Searching
  - Filtering
  - Converting data into another form

Types of Information Systems

Information systems can be classified in many ways,

1. **Classification by mode of processing:**
   i. Batch processing systems
   ii. Online system
      a. On-line batch systems
      b. On-line Real-time systems

2. **Classification by System Objectives:**
   i. Transaction Processing System (TPS)
   ii. Management Information System (MIS)
   iii. Decision Support System (DSS)
   iv. Executive Information System (EIS)
   v. Expert Systems (ES)
   vi. Communications and Collaboration Systems
   vii. Office Automation System
   viii. Geographic Information System (GIS)

1. Classification by mode of processing:

i. Batch processing systems
ii. Online system
   a) On-line batch systems
   b) On-line Real-time systems

i. Batch processing systems:

- ***The transactions are collected as they occur, but processed periodically, say, once in hours or once a day or week.***

- Once a batch job begins, it continues until it is done or until an error occurs. (scheduled processing jobs run in off-hours)

- There is no interaction with the user while the program is being executed.

- An efficient way of processing high volumes of data and similar jobs or tasks

- Batch processing allows capital investments in computing hardware to be fully utilized and for limited processing power to be reserved for high-priority tasks during business hours.

Batch processing systems:

Examples:

- **Transactions-**
  - After-hours batch processing was once extremely common in the banking industry.
- **Payroll**
- **Reporting-**
  - A manufacturer produces a daily operational report for a production line that is run in a batch window and delivered to managers in the early morning.
- **Billing:**
  - A telecom company runs a monthly batch job to process call data records that include the details of millions of phone calls to calculate charges.
- **Research:**
- **Databases**
- **Images –**
  - resize, convert, watermark, or otherwise edit image files.
- **Conversions-**
  - from one format to another

Advantages

- It can shift the time of job processing to when the computing resources are less busy.
- It avoids idling the computing resources with minute-by-minute manual intervention and supervision.
- By keeping high overall rate of utilization, it amortizes the computer, especially an expensive one.
- It allows the system to use different priorities for interactive and non-interactive work.
- Jobs can be processed without human present.

Advantages

- Rather than running one program multiple times to process one transaction each time, batch processes will run the program only once for many transactions, reducing system overhead.
- Manages large repeated work easily.
- Repeated jobs are done fast
- Batch systems can work offline

Disadvantages

- Take long time to process
- Input data to feed into the system can take long time.
- Not suit for places where immediate decisions need to be taken.

II. Online system

- **The transaction information is captured by on-line data-entry devices by which user directly fed data and process in few latency.**
- User communicate directly with the computer system.
- Ensures the system always contains up-to-date information.

Ex:

- booking systems/ reservation systems
- ATM
- E- commerce sites
- POS system
- Online payment/ money transaction systems

a) On-line batch systems

- **The transaction information is captured by on-line data-entry devices and logged on the system, but it is processed periodically as in batch processing systems.**
- User communicate directly with the computer system.

EX: Point of Sale (POS) Systems,

Advantages

- Processing carried out automatically without human supervision.
- Save time and Speed up tasks processing

Disadvantages

- Need security from virus/ hacker
- Request over loading may leads to technical errors in system. (handling millions of request might slow down or stuck the system)

b) On-line Real-time systems

- **The transaction data capture by sensors rather than human in order to obtain data and process them, finally, automatically updates it's data as changes are made.**
- Uses sensors rather than human input to obtain data
- Computer response to this input data without any delays
- involves a continual input, process and output of data.
- Data must be processed in a small time period (or near real time).

EX: Radar systems, customer services and bank ATMs, warning systems on air crafts, automatic green houses, flood warning system

Advantages

- Can carry out that human are unable or difficult to involve.

Disadvantages

- Very expensive to build or buy
- System failure can cost lives

Difference between Batch Processing System and Online System :

S.No.	BATCH PROCESSING SYSTEM	ONLINE PROCESSING SYSTEM
01.	An Batch processing system handles large amounts of data which processed on a routine schedule.	An online processing system handles transactions in real time and provides the output instantly.
02.	Processing occurs when the after the economic event occurs and recorded.	When the economic event takes place then the processing occurs.
03.	In batch processing system fewer programming, hardware and training resources are required.	In Online processing system more number of dedicated hardware resources, processing elements are required.
04.	To avoid operational delays certain records are processed after the event.	Immediately all the records pertaining to event are processed.
05.	In batch processing system input data is prepared before the execution.	In online processing system data is prepared at time of execution as needed.

Difference between Batch Processing System and Online System :

S.No.	BATCH PROCESSING SYSTEM	ONLINE PROCESSING SYSTEM
06.	In batch processing system the processing sequence is predictable.	In online processing system the processing sequence is unpredictable.
07.	In this the programs and files can not be shared.	In this the program and files can be shared.
08.	In batch processing system programs are scheduled through jobs.	In online processing system programs are initiated through transactions.
09.	In batch processing system recovery and restart is easy.	In online processing system recovery and restart requires additional process.
10.	Batch processing system uses tape storage.	Online processing system uses disk storage.
11.	Examples are Inventory query, website shopping transaction, e-Banking account withdrawal etc.	Examples are month end tax calculation, data transformation, data analysis, data transformation etc.

What processing method is the best?

It depends.

selecting the best data processing system for the specific job at hand depends on the **types and sources of data** and **processing time needed to get the job done** and **create the ability to take immediate action if needed**.

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Transaction Processing System (TPS)

- **Information Systems that capture and process data about business transactions.**
- Designed to **process routine transactions efficiently and accurately.**
- Used mainly by **operational level employees**
- This data is usually obtained through the automated or semi-automated tracking of **low-level activities and basic transactions.**
- TPS are ultimately little more than simple data processing systems.

Functions of a TPS in terms of data processing requirements

Inputs	Processing	Outputs
Transactions Events	Validation Sorting Listing Merging Updating Calculation	Lists Detail reports

Some examples of TPS

- Employee record keeping system.
- Payroll systems
- Order processing systems
- Reservation systems
- Stock control systems
- Systems for payments and funds transfers
- Material movement control

The role of TPS

- Produce information for other systems
- Cross boundaries (internal and external)
- Used by operational personnel + supervisory levels
- Efficiency oriented

A business will have several TPS;

For example:

- Billing systems to send invoices to customers
- Systems to calculate the weekly and monthly payroll and tax payments
- Production and purchasing systems to calculate raw material requirements
- Stock control systems to process all movements into, within and out of the business

Management Information System (MIS)

- MIS is an information system application that provides for **management oriented reporting**.
- MISs are especially developed to support planning, controlling, and decision-making functions of middle managers.
- Helps to ensure the smooth running of the organization **to medium term**.
- It facilitate to **structured** business problems.
- extracts transaction data from underlying TPSs, compiles them, and produces information products in the form of reports, displays or responses.

Functions of a MIS

MIS are built on the data provided by the TPS

Inputs	Processing	Outputs
TPS Internal Files Structured data	Sorting Merging Summarizing	Summary reports exception report Detailed reports

Summary reports can be quarterly sales report
exception report that specifies the exception conditions the sales made by some sales representative is far below than expected.

Usually, management information systems are used to produce reports on monthly, quarterly, or yearly basis.

Some examples of MIS

- Sales management systems
- Inventory control systems
- Budgeting systems
- Management Reporting Systems (MRS)
- Personnel (HRM) systems
- Production scheduling
- Annul budgeting

The role of MIS

- Based on internal information flows
- Support relatively structured decisions
- Inflexible and have little analytical capacity
- Used by lower and middle managerial levels
- Deals with the past and present rather than the future
- Efficiency oriented

Decision Support System (DSS)

- Provides its user with **decision-oriented** information whenever decision making situation arise.
- They are interactive systems that **assist** a decision maker when faced with **unstructured or semi structured business problems.**
- Used by both middle and top management
- Such systems are usually interactive and are used to solve ill structured problems.
- Interactive computer-based modeling process

Functions of a DSS

DSS manipulate and build upon the information from a MIS and/or TPS to generate insights and new information.

Inputs	Processing	Outputs
TPS MIS Internal Files External Information?	Modelling Simulation Analysis Summarizing	Summary reports Forecasts Graphs / Plots

Some examples of DSS

- Group Decision Support Systems (GDSS)
- Computer Supported Co-operative work (CSCW)
- Logistics systems
- Financial Planning systems
- Spreadsheet Models?

The role of DSS

- Support ill- structured or semi-structured decisions
- Have analytical and/or modelling capacity
- Used by more senior managerial levels
- concerned with predicting the future
- effectiveness oriented?

Executive Information System (EIS) /Executive Support System(ESS)

- An information system designed for top-level managers.
- They integrates data from all over the organization into graphical indicators and controls
- analyze the environment in which the organization operates, to identify long-term trends, and to plan appropriate courses of action.
- Support non-routine decisions that effect the entire organization

Executive Information System (EIS)..

ESSs serve to,

1. indicate issues of importance to the organization
2. indicate new directions the company may take
3. help executives monitor the company's progress

Functions of an EIS

EIS organizes and presents data and information from both external data sources and internal MIS or TPS in order to support and extend the inherent capabilities of senior executives

Inputs	Processing	Outputs
TPS, MIS, DSS External Data Internal Files Pre-defined models	Summarizing Simulation "Drilling Down"	Summary reports Forecasts Graphs / Plots

Some examples of EIS

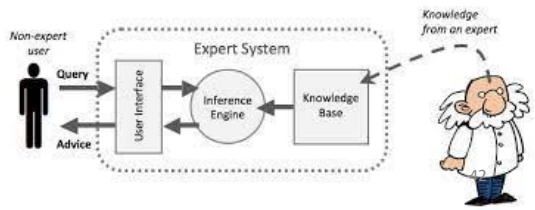
- Executive Information Systems tend to be highly individualized and are often custom made for a particular client group.
- A number of off-the-shelf EIS packages do exist and many enterprise level systems offer a customizable EIS module.

The role of EIS

- Are concerned with ease of use
- Are concerned with predicting the future
- Are effectiveness oriented
- Are highly flexible
- Support unstructured decisions
- Use internal and external data sources
- Used only at the most senior management levels

Expert Systems (ES)

- An expert system is a programmed decision making information system.
- It capture and reproduces the knowledge and expertise of a decision maker and
- Simulates the “thinking “ of the expert.



Some examples of Expert Systems (ES)

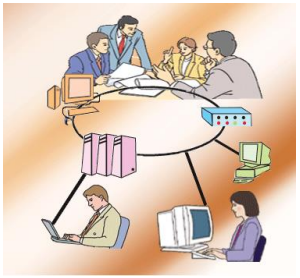
– 5-year Sales trend forecasting
– 5-year Operational Plan
– Profit Planning
– Personnel planning
– CaDet (Cancer Decision Support Tool)
– DENDRAL helps chemists identify unknown organic molecules.

Knowledge management systems (KMS)/ Knowledge Work Systems (KWS)

- **Exist to help businesses create and share information.**
- They are typically used in businesses where employees create new knowledge and expertise, which can then be shared by other people in the organization to create further commercial opportunities.
- examples include firms of lawyers, accountants and management consultants.
- KMS are built around systems which allow efficient categorization and distribution of knowledge.
- The knowledge itself might be contained in word processing documents, spreadsheets, PowerPoint presentations. internet pages etc.
- To share the knowledge, a KMS would use group collaboration systems, such as an intranet.

Communications and Collaboration Systems (CCS)

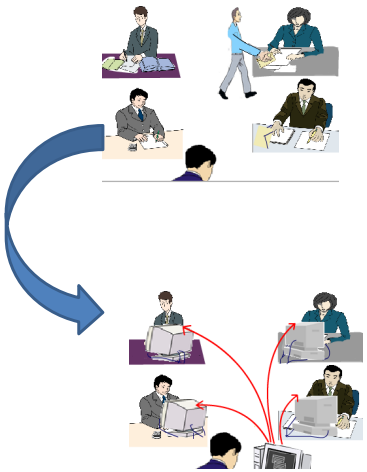
- An IS that enables **more effective communications** between,
  - Workers
  - Partners
  - Customers
  - Suppliers
- **Enhance** their ability to **collaborate**



EX: version controller, intranet, instant messages, video conferences

Office Automation System (OAS)

- Try to improve the productivity of employees who need to process data and information.
- It supports the **wide range** of business office activities.
  - Work group computing
  - Work group scheduling
  - E-mail
  - Electronic document



Ex:

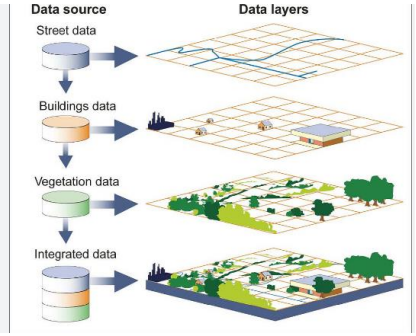
Office suite, email, eaves calculation

Advantages

- Office automation can get many tasks accomplished faster.
- It eliminates the need for a large staff.
- Less storage is required to store data.
- Multiple people can update data simultaneously in the event of changes in schedule

Geographic Information System (GIS)

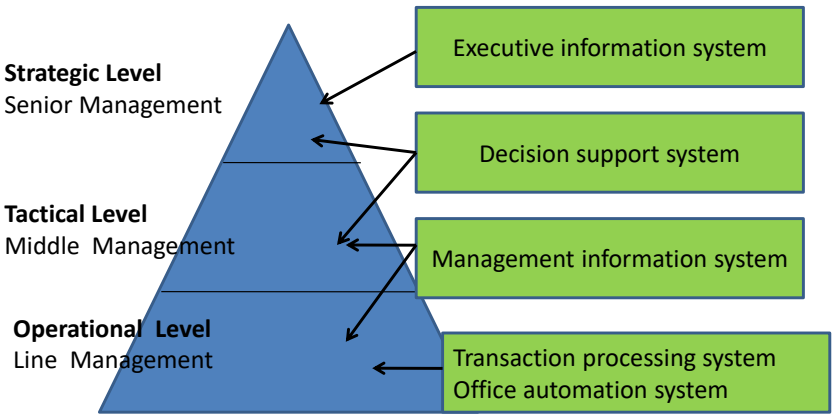
- A system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.
- Any information system that integrates, stores, edits, analyzes, shares, and displays geographic information.



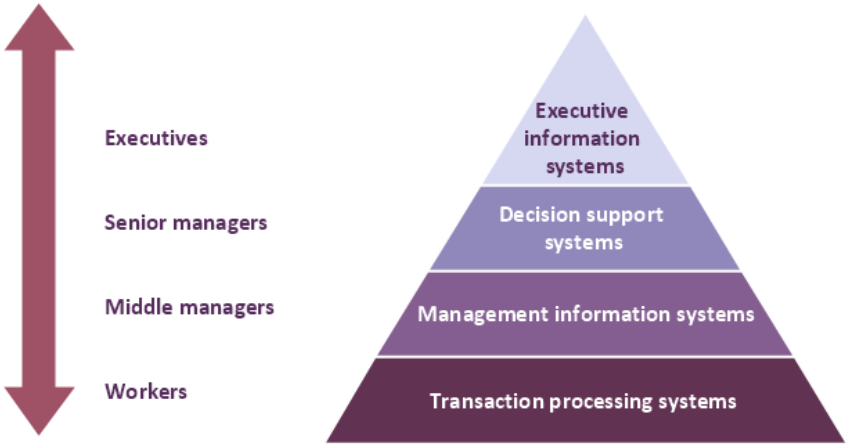
Examples of GIS applications

- Uses of GIS range from indigenous people, communities, research institutions, environmental scientists, health organisations, land use planners, businesses, and government agencies at all levels.
  - Crime mapping
  - Historical geographic information systems
  - GIS and Hydrology
  - Remote sensing applications
  - Traditional knowledge GIS
  - Public Participation GIS
  - Road networking
  - Wastewater and stormwater systems
  - Waste management

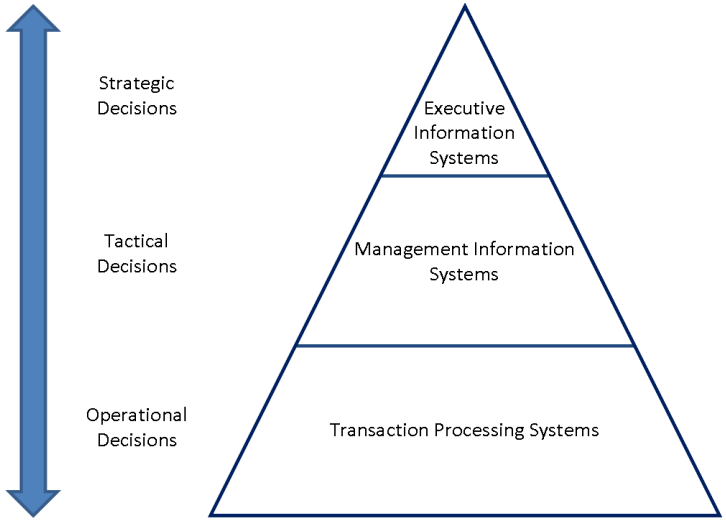
The use of information systems by management level.



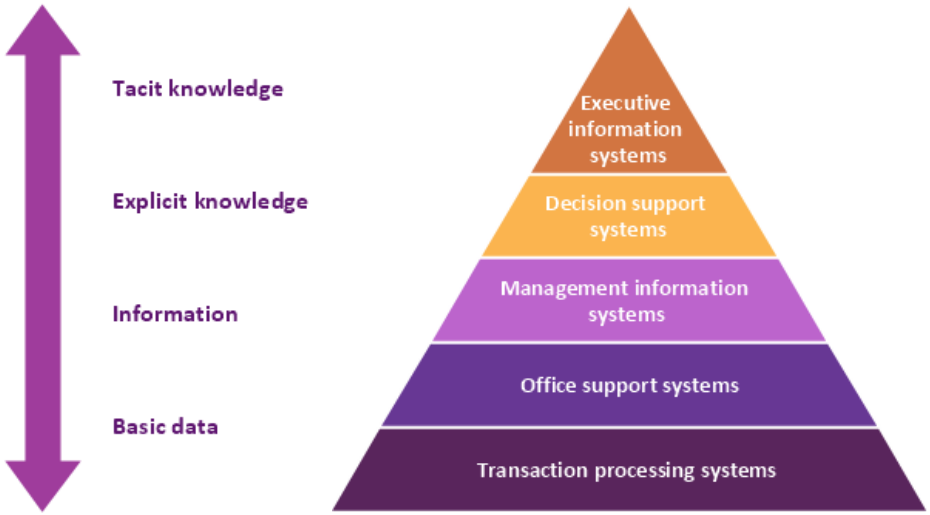
Management Levels and IS

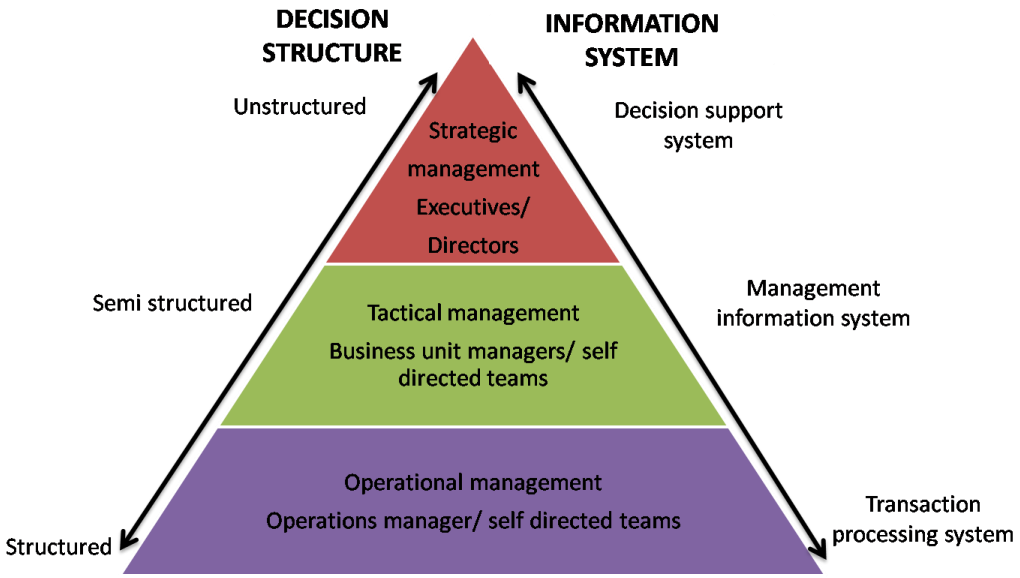


Decision types and IS



Outputs and IS





Take Home Activity 02

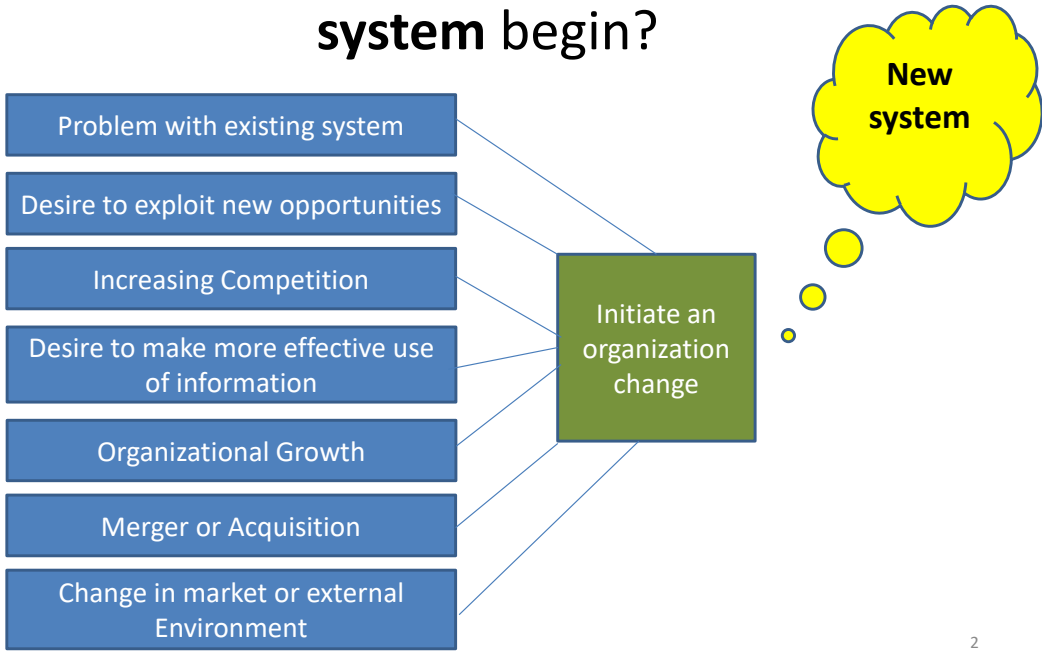
- Differentiate between TPS, MIS, DSS and ES with examples.
- Include at least 04 or more points (criteria)
- Provide your answer in tabular format.

END

HNDIT1212: System Analysis and Design

System Development Lifecycle

When does the **development of a system** begin?



Background of SDLC

- Software crisis
- Code-and-fix Approach to software development
- Code-and-fix is a disaster for some reasons
- **System Development Life Cycles**

Findings by researches

- A study conducted in 2008 found success is “improbable” in 68% of technology projects. Many of the systems that aren’t totally abandoned are delivered to the users significantly late, cost far more than expected, and have fewer features than originally planned.

IN ACTION

A significant proportion of IT projects fail to fulfill their original objectives, resulting in wasted resources and a damaged reputation for the responsible IT department. In many cases, the causes of the failure are organizational issues, not technical issues.

Qantas, the Australian national airline, has endured two high-profile IT failures in recent years. In 1995, Project eQ, a 10-year technology services contract with IBM, was cancelled after four years, at a cost of $200 million. Poor planning contributed to the failure to upgrade a complex and unwieldy IT infrastructure saddled with 700-odd applications written in older programming languages.

In 2008, Qantas canceled Jetsmart, a $40 million parts-management system implementation, due in part to a dispute with the unionized users (aircraft mechanics) of the system. The union advised its members not to assist with the implementation, claiming the software unnecessarily increased the members’ workload.

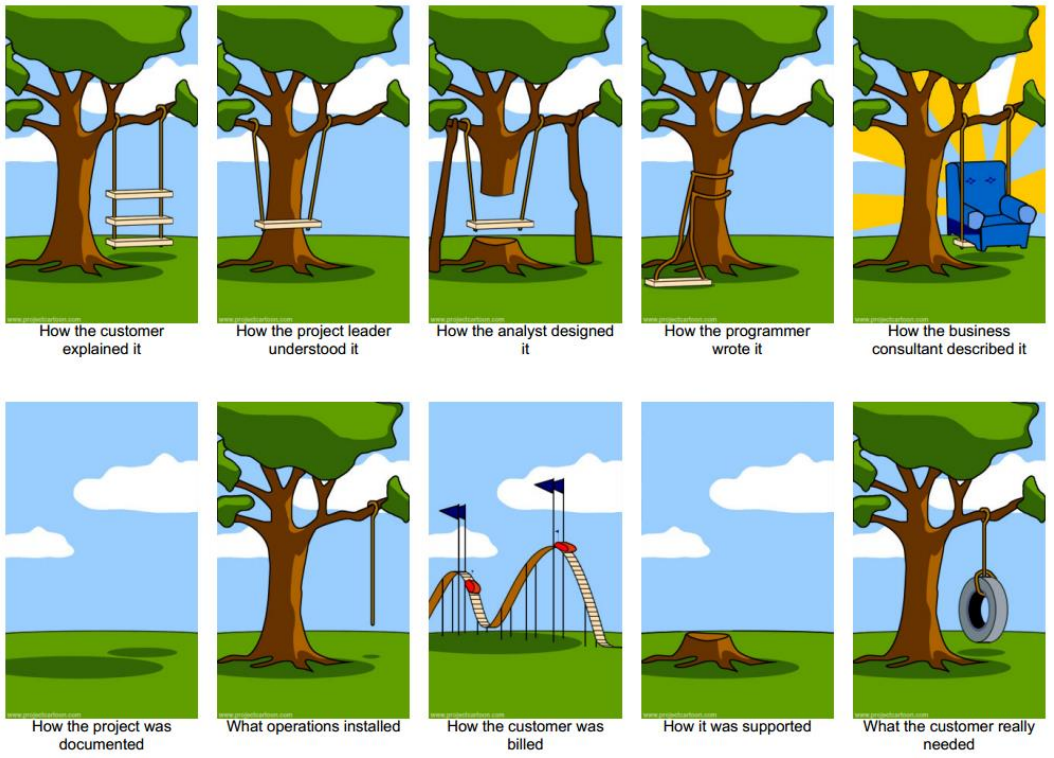
An analysis of these IT failures reveals several contributing factors. First, Qantas faced the challenges of a complicated technical infrastructure and outdated legacy applications. More significantly, however, was the failure of company leadership to understand basic IT issues. In public statements, the company CFO seemed not to care about the user perspectives on new software, preferring instead to put in what management thought was appropriate. This attitude, in part, led to union problems and claims of poorly designed, hard-to-use software and inadequate training.

Aging applications and an unwieldy technical infrastructure are challenges faced by many organizations today. But the senior-management attitude that seemingly disregards the views of software users casts serious questions about Qantas’ prospects for IT project success in the future.

Source: http:/blogs.zdnet.com/projectfailures/, February 29, 2008.

Causes of failing projects

- The top factors were reported to be;
  - Incomplete requirements (13.1%)
  - Lack of user involvement (12.4%)
  - Lack of resources (10.6%)
  - Unrealistic expectation (9.9%)
  - lack of executive support (9.3%)
  - Changing requirement specification (8.7%)
  - Lack of planning (8.1%)
  - System no longer needed (7.5%)



Systems Development Life Cycle (SDLC)

- A structured process (framework) for planning, creating, testing, and deploying an information system.

OR

- The process of determining how an information system (IS) can support business needs, designing the system, building it, and delivering it to users.

Systems Development Life Cycle (SDLC)

- A structured process (framework) for planning, creating, testing, and deploying an information system.
- It is a **logical process** by which systems analysts, s/w engineers, programmers & end users build information systems.
- It enables the production of high-quality, low-cost software, in the shortest possible production time.

Why is the SDLC important?

- It provides a standardized framework that defines activities and deliverables
- It aids in project planning, estimating, and scheduling by easing the processes
- It makes project tracking and control easier
- It increases visibility on all aspects of the life cycle to all stakeholders involved in the development process
- build high quality systems that meets customer expectations, within time and cost estimates
- It increases the speed of development
- It improves client relations
- It decreases project risks
- It decreases project management expenses and the overall cost of production

System Development Life Cycle (SDLC)

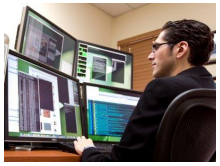
Problem Definition

Systems initialization

Systems Analysis

Systems Design

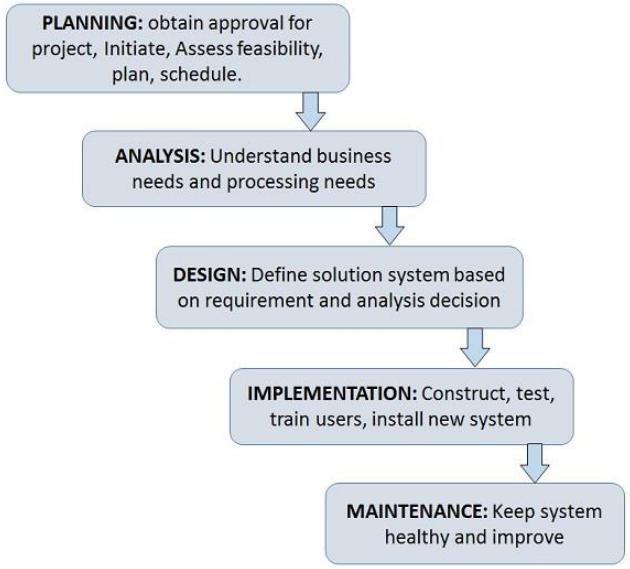
Systems Implementation



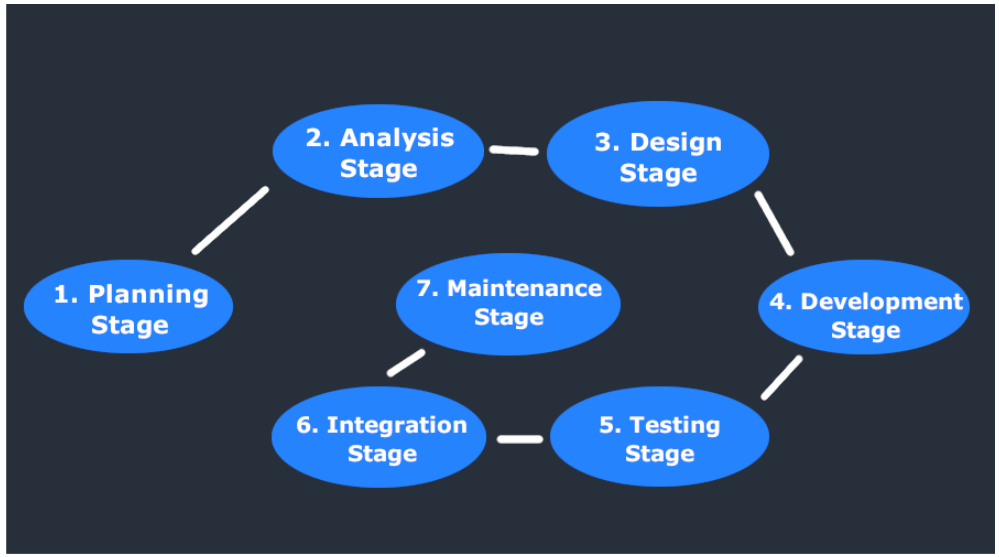
Systems Testing

Maintenance

System Development Life Cycle (SDLC)

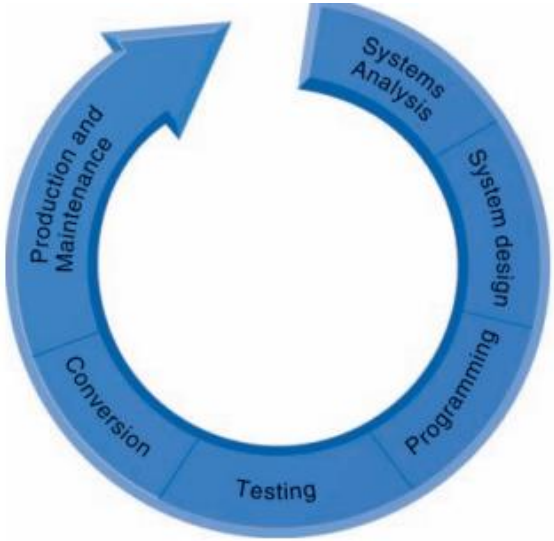


System Development Life Cycle (SDLC)



System Development Life Cycle (SDLC)

1. Systems analysis
2. Systems design
3. Programming
4. Testing
5. Conversion
6. Production and Maintenance



System Development Life Cycle (SDLC)

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Systems Development Life Cycle (SDLC)

- **Main phases of SDLC:**
  - *Problem Definition* (systems Investigation)
  - *Systems Analysis*
  - *Systems Design*
  - *Systems Implementation*
  - *Systems Testing*
  - *Systems Maintenance*

1. Problem Definition (System Initiation)

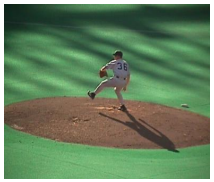
- This phase **identifies** and **defines** a need for the new system.
- Project goals, project bounds & project limits are set by the organization's management.
- They are sometimes called project's **Terms of Reference (TOR)**.

Terms of Reference (TOR)

Project goals

Provides a broad statement of user requirements in users terms, or what the users expect the system to do

Project bound



Defines what part of the system can be changed by the project and what parts are to remain same.

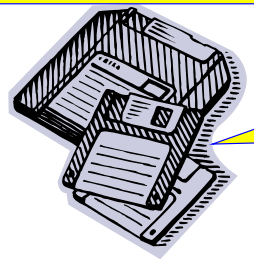
Project limits

Specify the resources to be made available for the project (resource limits).

2. Requirement Analysis

how the current system works and what it does

Producing a detailed model of what the new system will do and how it will work.



Producing a high-level description of the system

Requirement Analysis

- It specifies the system users' business **requirements**, **expectations** and **priorities** for a solution to the business problem
- This phase produces
  - a **detailed analysis model** describing how the current system works.
  - a **requirements model** describing what is needed from the new system in **user's terms**.
  - **system requirements** using **system terms**.

3. Systems Design

- Produces a design specification for the new system.
- **Things done** during the design phase:
  - Identify suitable hardware
  - Specify new programs or changes to existing programs
  - Specify new database or changes to existing database
  - produce detailed procedures that describe how users will use the system

Software Design – Why it is important?

- A good design is the key for a successful software system
- A good design allows easy maintenance of a system
- A good design allows to achieve non-functional requirements such as reliability, performance, reusability, portability.
- A good design facilitates the development and management processes of a software project.

Design activities

- Identification of the sub-systems
- Identification of the software components
- Identification of the software architecture
- Data design
- Interface design
- Algorithm design
- Data structure design
- Design specification

4. System Implementation

During the systems implementation phase,

- **individual system components** are built and tested.
- **user interfaces** are developed and tried by users.
- **a database** is built to store data.
- **data and tools** are used to build the system.

5. System Testing

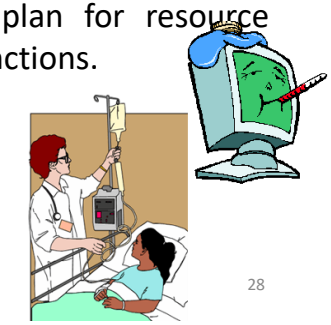
1. **Systems Testing** is recognized as an important part of *quality assurance*.
2. Individual program modules are tested by their developers.
3. ***Integration testing*** is done to test whether the modules can be combined.
4. It is important to design *test cases* that test all the conditions that can arise in the system input.
5. After testing and evaluating the results, the system is **ready to be delivered** to the user/client.

6. Maintenance

In this phase the following problems are corrected.

- **Eliminate errors** in the system during its life time.
- **Fix any** *bugs* and problems found by users
- **Tune the system** into any variation in its working environment.

Information system planners must always plan for resource availability to carry out these maintenance functions.

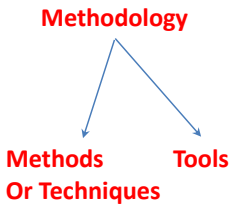


Major components of system development

1. Methodology
2. Modeling Methods or Techniques
3. Tools

Methodology

- A very **formal** and **accurate** system development process that defines a set of
  - Activities
  - Methods
  - Best practices
  - Deliverables
  - Automated tools



Methodology

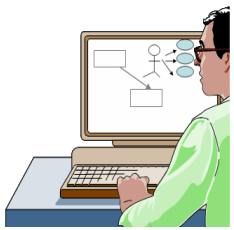
Modeling Methods Or Techniques

Eg: Class diagram,
usecase diagram

Tools
Eg: Rational rose

Modeling method

- A set of **techniques** used to implement a Methodology.
- **Data Flow Diagrams**
  - A process model
  - Depict the flow of data through a system and the work performed by the system
- **Entity Relationship Diagrams**
  - A data model
  - Depict data in terms of entities and relationships described by the data
  - Consists of several notations
- **Structure Charts etc.**



Tools

Easy Case

Rational Rose

Tools are Software systems and they **assist** analysts and designer build information systems.

General Aim :

- **Decrease the human effort** required to develop the software
- **Increase the quality** of software
- Tools will support methodologies but **will not replace** system analysts.

e.g. Easy Case, Rational Rose

Underlying Principles for System Development methodology

1. Get the system users involved
2. Use a problem-solving approach
3. Establish phases and activities.
4. Document through out Development
5. Establish standards
6. Manage the process and Projects
7. Justify systems as Capital Investments.
8. Don't be afraid to cancel or revise scope.
9. Divide and conquer
10. Design systems for growth and change.

Take home Activity 03

- Which stage of software development is most expensive?
- Where are the most errors introduced in software projects?
- What do project managers say is the worst problem (consequence) in software projects?

HNDIT2032
System Analysis and Design

ESTABLISHING INFORMATION REQUIREMENTS

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Establishing Information Requirements

- The most challenging task of the systems analyst is to define the specific information requirements that must be met by the chosen system solution.

- At the most basic level, the information requirements of a new system involve identifying
  - who needs?
  - what information?
  - where?
  - when?
  - how?

Establishing Information Requirements

- Requirements analysis carefully defines the objectives of the new or modified system and develops a detailed description of the functions that the new system must perform.

Reasons of Faulty requirements analysis

- Faulty requirements analysis is a leading cause of systems failure and high systems development costs.

  - A system designed around the wrong set of requirements will either have to be discarded because of poor performance or will need to undergo major modifications.

  - Poor knowledge of new system

Solutions

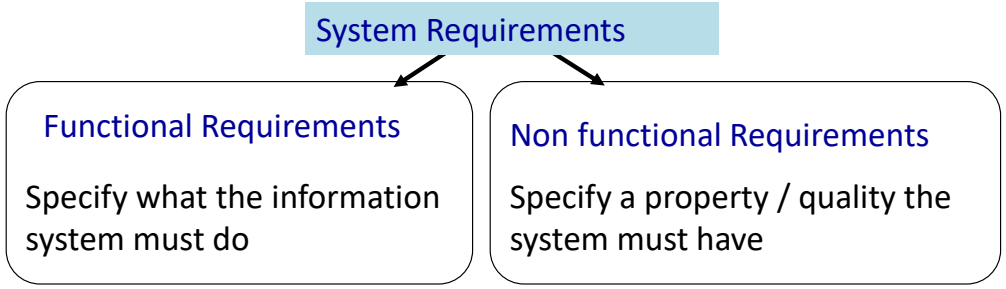
- If the problem is non information-related
  - need an adjustment in management, additional training, or refinement of existing organizational procedures.
- If the problem is information-related,
  - Systems analysis still may be required to diagnose the problem and arrive at the proper solution.

Define Requirements

- System requirements include the functions the system must perform (Functional Requirements) and such related issues as user interface formats and requirements for reliability, performance, and security (Non-Functional Requirements).

System Requirements

Specify *what the information system must do*, or *what property / quality the system must have*



Example : Library system

Functional *:- borrowing books, returning process*

Non functional *:- security level, interfaces*

Requirement categories	FURPS + categories	Example requirements
Functional	Functions	Business rules and processes
Nonfunctional	Usability	User interface, ease of use
	Reliability	Failure rate, recovery methods
	Performance	Response time, throughput
	Security	Access controls, encryption
	+ Design constraints	Hardware and support software
	Implementation	Development tools, protocols
	Interface	Data interchange formats
	Physical	Size, weight, power consumption
	Support	Installation and updates

Requirements elicitation

- Requirements elicitation is the process of identifying the sources of requirements for a new system and obtaining those requirements from those sources.

Gather Detailed Information

- Systems analysts obtain information from;
  - people who will be using the system, either by interviewing them or by watching them work.
  - reviewing planning documents and policy statements.
  - study existing systems, including their documentation.
  - They also frequently obtain additional information by looking at what other companies (particularly vendors) have done when faced with a similar business need.

Fact Finding techniques

Sampling of Existing documents

Research and site visits

Observations of the work environment

Questionnaires

Interviews

Prototyping

Joint requirements planning

Requirement Discovery Methods (Fact Finding Techniques)

- It is the formal process of using techniques to collect information about systems requirements
- Methods
  1. Interviewing users and other stakeholders
  2. Distributing and collecting questionnaires
  3. Reviewing inputs, outputs, and documentation
  4. Observing and documenting business procedures
  5. Researching vendor solutions
  6. Collecting active user comments and suggestions

1. Interview Users and Other Stakeholders

In this method, systems analysts:

- Prepare detailed questions.
- Meet with individuals or groups of users.
- Obtain and discuss answers to the questions.
- Document the answers.
- Follow up as needed in future meetings or interviews.

Question Types

Questions can be roughly divided into two types:

- Open-ended questions—
  - questions such as "How do you do this function?" that encourage discussion and explanation
- Closed-ended questions—
  - questions such as "How many forms a day do you process?" that are used to get specific facts

Interview Preparation, Conduct, and Follow-Up

- A sample checklist that summarizes the major points to be covered;
- It is useful in preparing for, conducting, and following up an interview.

Checklist for Conducting an Interview

Before

- ☐ Establish the objective for the interview.
- ☐ Determine correct user(s) to be involved.
- ☐ Determine project team members to participate.
- ☐ Build a list of questions and issues to be discussed.
- ☐ Review related documents and materials.
- ☐ Set the time and location.
- ☐ Inform all participants of objective, time, and locations.

During

- ☐ Arrive on time.
- ☐ Look for exception and error conditions.
- ☐ Probe for details.
- ☐ Take thorough notes.
- ☐ Identify and document unanswered items or open questions.

After

- ☐ Review notes for accuracy, completeness, and understanding.
- ☐ Transfer information to appropriate models and documents.
- ☐ Identify areas needing further clarification.
- ☐ Thank the participants.
- ☐ Follow up on open and unanswered questions.

Sample interview session agenda with follow-up information

Discussion and Interview Agenda

Setting

Objective of Interview
Determine processing rules for sales commission rates

Date,Time, and Location
April 21, 2012, at 9:00 a.m. in William McDougal's office

User Participants (names and titles/positions)
William McDougal, vice president of marketing and sales, and several of his staff

Project Team Participants
Mary Ellen Green and Jim Williams

Interview/Discussion

1. *Who is eligible for sales commissions?*
2. *What is the basis for commissions? What rates are paid?*
3. *How is commission for returns handled?*
4. *Are there special incentives? Contests? Programs based on time?*
5. *Is there a variable scale for commissions? Are there quotas?*
6. *What are the exceptions?*

Follow-Up

Important decisions or answers to questions
See attached write-up on commission policies

Open items not resolved with assignments for solution
See Item numbers 2 and 3 on open items list

Date and time of next meeting or follow-up session
April 28, 2012, at 9:00 a.m.

Advantages and disadvantages

- Interviewing users and other stakeholders is an effective way to understand business functions and business rules.
- It is also the most time consuming and resource-expensive option.

2. Questionnaires

- Questionnaires are special purpose documents that allow the analysts to collect information and opinions from a large audience.

Type of questionnaires

1. Free-format:
   - A question is asked, and the respondent records the answer in the space provided after the question.
     - Eg:
       What additional reports would you require from the system?

       .....

       .....
2. Fixed-format:
   - Contains questions that required specific responses from individuals.

Three type of fixed-format questions

1)Yes /No Questions

E.g:

Do you print reports from the existing system? Yes No

2) Multiple choice questions

E.g.:

How many new clients do you obtain in a year?
(Please tick one box only)

a) 1-10 ☐ b) 11-20 ☐ c) 21-30 ☐ d) 31+ ☐

3) Rating questions

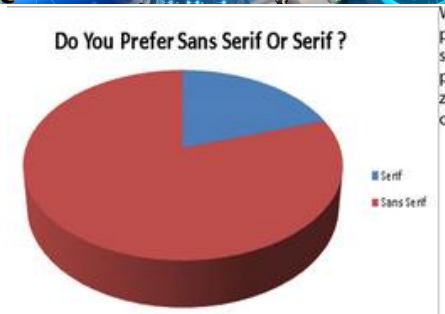
E.g:

How satisfied are you with the response time of the stock update?

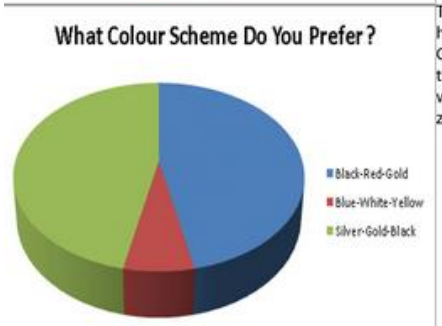
1) Very Satisfied 2) Satisfied
3) Dissatisfied 4) Very dissatisfied

Advantages and disadvantages

- **Advantages:**
  - Most questionnaires Can be answered quickly.
  - Allow individuals to maintain anonymity.
  - Relatively inexpensive way of gathering data.
  - Responses can be tabulated and analysed quickly etc.



With this questionnaire I can tell that most people prefer Sans Serif, therefore this shows modernism and this is the type of typography I am aiming to use in my magazine to emphasise the class and modernism of my magazine.



The majority of the people I have asked have said that they prefer "Black, Red & Gold" and "Silver, Gold & Black", therefore they prefer very dark and gold colour which I am planning to use in my magazine.

Responses can be tabulated and analysed quickly .

Advantages and disadvantages

- **Disadvantages:**
  - Number of responses is often low.
  - No guarantee that an individual will answer or expand on all the questions
  - Difficult to prepare

3. Reviewing inputs, outputs, and documentation

- There are two sources of information about inputs, outputs, and procedures

1. external to the organization

—industry-wide professional organizations and other companies. industry journals and magazines report the findings of “best practices” studies.

2. existing business documents and procedure descriptions within the organization

- Reviewing internal documents and procedures serves two purposes.
  - First, it is a good way to get a preliminary understanding of the processes.
  - Second, existing inputs, outputs, and documents can serve as visual aids for the interview and as the working documents for discussion.

Advantages and disadvantages

- Easy to find and access

4. Observing and documenting business procedures

- understand the fundamental business needs
- you must also be able to visualize the new system's associated business processes.
  - A quick walk through gives a general understanding of the layout of the office, the need for and use of computer equipment, and the general workflow.
  - Spending several hours observing users at their jobs helps you understand the details of using the computer system and carrying out business functions.

Advantages and disadvantages

5. Researching vendor solutions

There are three positive contributions and one danger in exploring existing solutions.

1. Researching existing solutions will frequently help users generate new ideas for how to better perform their business functions. Seeing how someone else solved a problem and applying that idea to the culture and structure of the existing organization will often provide viable alternative solutions for business needs.
2. Some of these solutions are excellent and state of the art. Without this research, the development team may create a system that is obsolete even before it is designed. Companies need solutions that not only solve basic business problems but that are up to date with competitive practices.

5. Researching vendor solutions

3. It is often cheaper and less risky to buy a solution rather than to build it. If the solution meets the needs of the company and can be purchased, then that is usually a safer, quicker, and less expensive route. The danger in exploring existing solutions is that the users and even the systems analysts may want to buy one of the alternatives immediately.

- But if a solution, such as a packaged software system, is purchased too early in the process, the company's needs may not be thoroughly investigated. Too many companies have purchased systems only to find out later that they only support half the functions that were needed. Do not rush into a purchase decision until requirements are fully defined and all viable alternatives have been thoroughly investigated

6. Collect Active User Comments and Suggestions

- Portions of the system are constructed and tested during each iteration.
- Users and other stakeholders perform the initial testing of system functions during the iteration in which those functions are implemented.
- They also test and use those same functions during later iterations.
- User feedback from initial and later testing is a valuable source of requirements information.

7. Prototyping

- Sampling a small working model and it is more related to pre-design of the information system.

Advantages and disadvantages

Advantages:

- Users and developers are able to test and understand the system in advance before final implementation.
- it is a kind of training mechanism
- Can easily and quickly gather requirement

Disadvantages:

- It use extra time and cost to develop the prototype

8. Joint requirement Planning (JRP)

- the structured group work meeting to identify, analyze problems and define the requirements of system
- JRP contains different participants with each specialized roles to perform structured meeting.
- JRP includes sponsor, facilitator, users and managers, scribes and IT staff.

Advantages and disadvantages

Advantages:

- saves time to develop systems as it is not required one-on-one interviewing of each participant within the organization

Disadvantages:

- Only the active participation of all individuals will results the solution of JRP sessions.

Prioritize Requirements

- Once the system requirements are well understood, it is important to establish which requirements are most crucial for the system.
- Users and analysts need to ask themselves which functions are truly important and which are fairly important but not absolutely required.

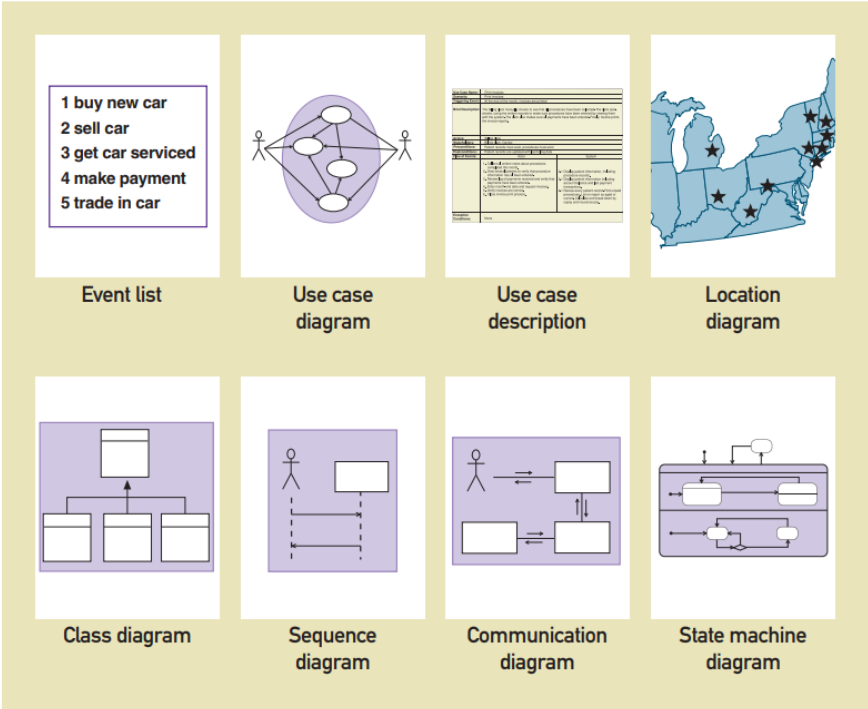
Why prioritize the functions requested by the users?

- Resources are always limited, and the analyst must always be prepared to justify the scope of the system. Therefore, it is important to know what is absolutely required.
- Unless the analyst carefully evaluates priorities.
- Requirements priorities also help to determine the number, composition, and ordering of project iterations.
- High-priority requirements are often incorporated into early project iterations so analysts and users have sufficient opportunity to refine those parts of the system. Also, a project with many high-priority requirements will typically have many iterations.

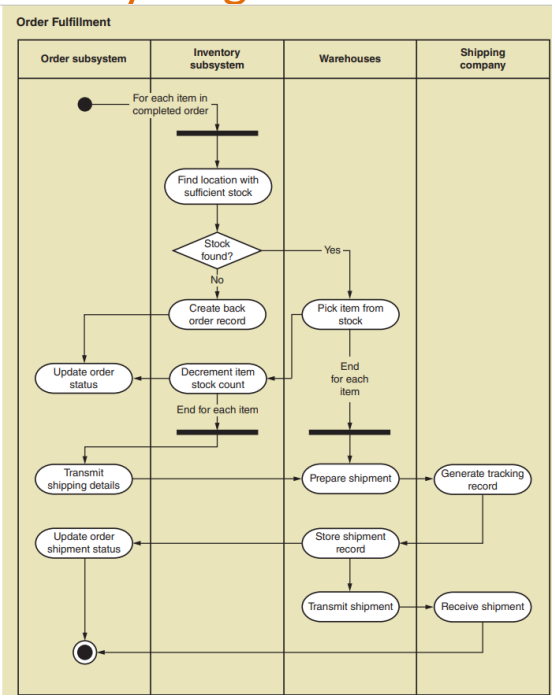
How to documented the business process

- As you gather information about business processes, you will need to document your results.
- One effective way to capture this information is with **diagrams**.
- You may want to use diagrams to describe the workflows of the new system
  - A workflow is the sequence of processing steps that completely handles one business transaction or customer request
  - Eg: Activity diagram

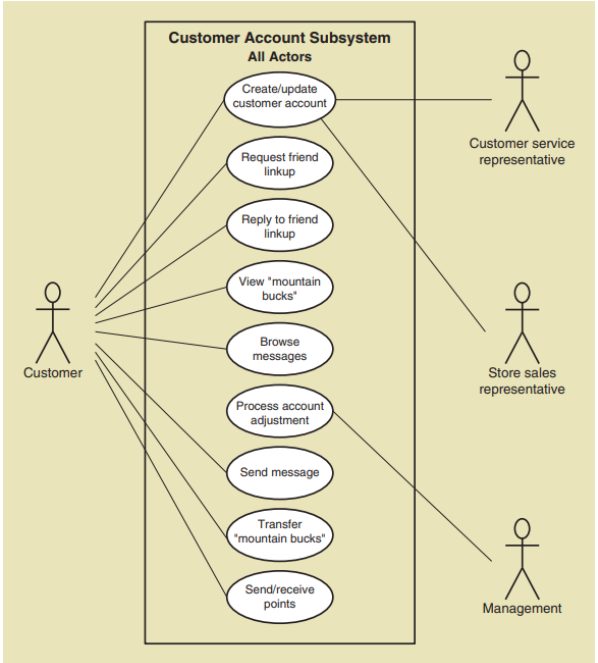
- Workflow diagrams are a key modeling technique often used as an early requirements model.
- Workflow diagrams graphically model the steps of a business process and the participants who perform them.



Simple activity diagram for online checkout



use case diagram



SRS (System Requirement Specification)

- A comprehensive description of the intended purpose and environment for software under development.
- The SRS fully describes what the software will do and how it will be expected to perform.
- This is usually signed off at the end of requirements engineering phase

What should the SRS address?

I. Functionality. What is the software supposed to do?

II. External interfaces. How does the software interact with people, the system's hardware, other hardware, and other software?

III. Performance. What is the speed, availability, response time, recovery time of various software functions, etc.?

IV. Attributes. What are the portability, correctness, maintainability, security, etc. considerations?

V. Design constraints imposed on an implementation. Are there any required standards in effect, implementation language, policies for database integrity, resource limits, operating environment(s) etc.?

What are the characteristics of a great SRS?

- An SRS should be
  - Correct
  - Unambiguous
  - Complete
  - Consistent
  - Ranked for importance and/or stability
  - Verifiable
  - Modifiable
  - Traceable

END