

INFORMATION SYSTEM CONCEPTS

Information System

An Information System is a system that comprises of

- **People**
- **Computer System**
- **Data**
- **Network**

that helps to collect, store and analyse data to produce the desired information for the functioning of the business

Need for Information

Type of User	Need
Senior Management	Aid in planning and decision making
Middle level Management	Monitoring and Controlling the business activities
Employees	To perform their day to day activities

IT is key enabler and helps the storage, processing, transmission and exploitation of information so as to meet the needs of the organisation

Information means processed data.

Key attributes of information are:-

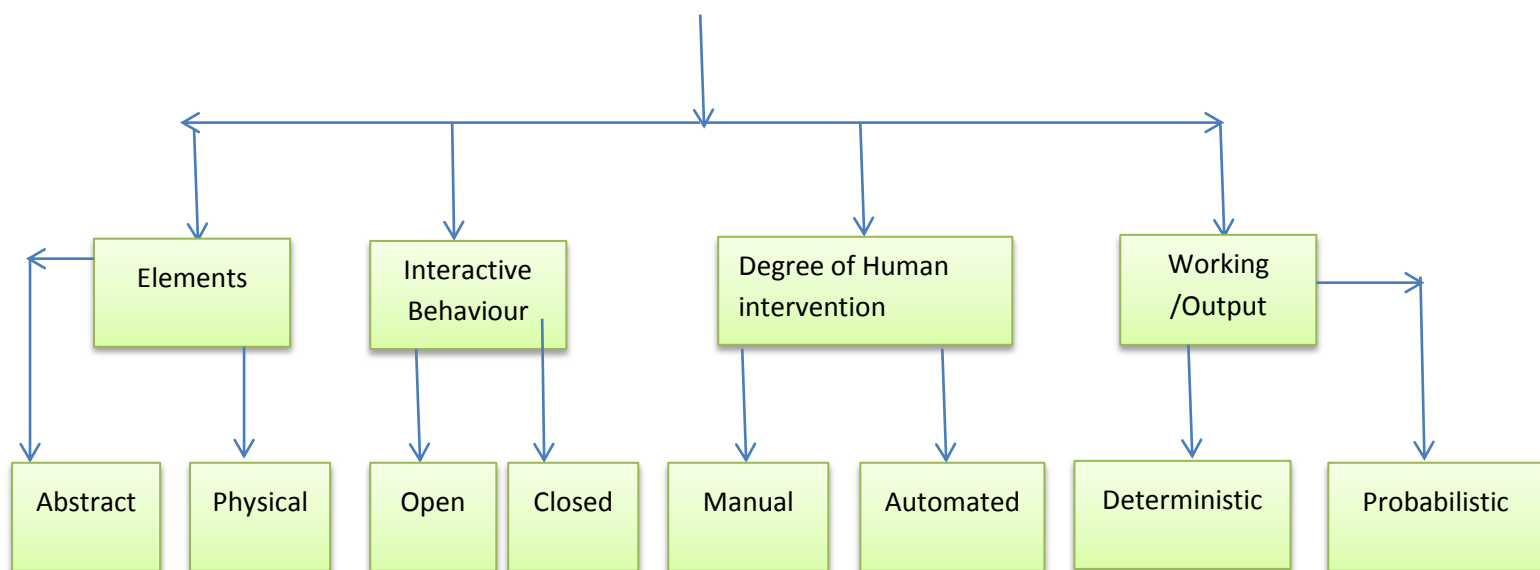
- Current/Updated
- Completeness and Adequacy
- Transparency
- Validity
- Mode and Format
- Rate
- Frequency
- Purpose
- Quality
- Reliability

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Current/Updated	Refreshed from time to time and should get updated Eg. Cricket Match Score Card
Completeness and Accuracy	Complete and adequate Eg:- Deciding Topper in a Class
Transparency	Output should be the derived from the exact input data
Value of Information	Difference between value of change in behaviour caused by information and cost of information
Mode and Format	Mode to be in easily understandable form
Rate	Useful information to be transmitted at the rate at which the user wants it to be received
Frequency	The Frequency with which the information is transmitted also affects the value
Purpose	Must have purpose at the time it is transmitted
Quality	It means correctness of information
Reliability	Measure of failure or success of using information

System

- Group of inter-connected components
 - Working towards accomplishment of a common goal
- Classification of System



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Abstract System	Orderly arrangement of ideas or constructs
Physical System	Tangible system operating to accomplish an objective
Open System	Interacts with other systems in the environment
Closed System	Does not interact with the environment and does not change with the changes in the environment
Manual System	Activities like data collection, maintenance and final reporting are done by humans
Automated System	Activities like data collection, maintenance and final reporting are done by computer system
Deterministic System	Operates in predictable manner –Eg. Software works as per instructions
Probabilistic System	A probabilistic system is one where the output from the system behaves probabilistically, i.e., the output is predictable according to probability values. The portfolio investment systems of an asset management company that invests in the stock market will have a probabilistic output

Components of Information System

- **People:-** Mean the IT professionals and the end users
- **Hardware:-** Physical components of the computer
- **Software:-** System software (OS), Application Software
- **Data:-** Raw facts
- **Network:-** Communication Media

Information system model comprises of the following steps

- **Input:-** Data collected and converted into suitable format
- **Processing:-** Data converted into information after manipulation
- **Output:-** Information is stored for future use or communicated to user

Characteristics of computer based information systems are as follows:-

- All systems work for **predetermined objects**
- System has a number of **interrelated and interdependent subsystems**
- One subsystem or component fails, the whole system does not work
- Way subsystem works with another is called interaction
- Work by the Individual subsystem is integrated to achieve the central goal of the system

Major areas of Computer based applications

- Finance and Accounting
- Marketing and Sales
- Production or Manufacturing

- Inventory/Stores Management
- Human Resource Management

Finance and Accounting: - to ensure financial viability, enforce financial discipline and monitor the budget. Also used for forecasting purposes

Marketing and Sales: -Maximise the sale and ensure customer satisfaction

Production or Manufacturing: - Optimally deploy man, material and machine to maximise production or service

Inventory or Stores Management: -Keeping the track record of material in the stores, regulate the stock levels

Human resource Management: -To ensure disruption free and timely services in business

Types of Information Systems

- **Operational level** Systems
 - *Transaction Processing System*
- **Knowledge Level** Systems
 - *Office Automation Systems*
 - Text Processing System
 - Electronic Document Management System
 - Electronic Message Communication System
 - Teleconferencing and Video Conferencing System
 - *Knowledge Management System*
- **Management Level** System
 - *Management Information System*
 - *Decision Support System*
- **Strategic Level** System
 - *Executive Information System*
- **Specialised Systems**
 - *Expert System*
 - *Cross Functional Information System -ERP*

Operational Level Systems

- They support operational managers in tracking elementary activities by ensuring business processes are followed

Transaction Processing System

- For example, in an Internet-based order processing application.
- TPS manipulates data from business transactions

- TPS involves the following activities
 - **Capturing** Data to organise in files or databases
 - **Processing** of Files/ Databases using application software
 - **Generating information** in the form of reports
 - **Processing of queries** from various quarters of the organisation
- Components of TPS
 - **Input:-** Source documents such as customer order, sales, slips, invoices, purchase orders and employee time cards
 - **Processing:-** Use of journals to provide a permanent and chronological record of inputs
 - **Storage:-** Ledgers and files provide storage of data on both manual and computerised systems
 - **Outputs:-** Document generated in the system is output.
- **Features of TPS**
 - **Large Volume of Data:-** TPS is transaction oriented and therefore consists of large volumes of data and requires greater storage capacity
 - **Automation of Basic Operations:-** TPS aims at automating the basic operations of the enterprise ‘
 - **Benefits are easily measurable:-** TPS reduces workload and improves their efficiency
 - **Source of input for other systems:-** TPS is the basic source of internal information for other information systems

Knowledge Level Systems

- These systems support the discovery, processing and storage of knowledge and data workers
- These support the business to integrate the new knowledge into business and control the flow of paperwork

Office Automation Systems

- A computer based information system that is rapidly expanding.
- Different office activities can be classified into
 - **Document Capture:-** mails, notes, hand outs and charts-need to be preserved
 - **Document Creation:-**Preparation of documents-Primarily Secretary job
 - **Receipts and Distribution:-**Distribution of Correspondences
 - **Filing, Search, Retrieval and Follow up:-** Filing and indexing of documents
 - **Calculations:-**Routine calculations like arithmetic, operations for bill passing, interest calculation
 - **Recording utilisation of Resources:-**Record keeping for resources used by the office personnel
- **Benefits of Office Automation System**
 - Improves communication within organisation and between enterprises
 - Reduce Cyclical time between preparation and receipt of messages

- Reduces the cost of office communication in terms of time spent and cost of communication

Computer Based Office Automation System

- Major Computer Based Office Automation Systems are as follows:-
 - Text Processing Systems
 - Electronic Document Management System
 - Electronic Message Communication System
 - Teleconferencing and Video Conferencing System
- **Text Processing Systems**
 - Automate the process of development of documents such as letters, memos, reports
 - They permit the use of standard stored information to produce personalised documents
- **Electronic Document Management System**
 - These Capture information contained in documents, stored for future reference and make them available to users as and when needed
 - These systems are more helpful un the remote access of documents
 - Location of the executive also becomes irrelevant for access to documents
 - E.g. Loan Application at Branch can be accessed by sanctioning officer at Head Office
- **Electronic Message Communication Systems**
 - These offer a lot of economy in terms of reduced time and also reliability of message and cost of communication
 - **Electronic Mail** –Features
 - **Portability**:-Physical location of sender and receiver is irrelevant
 - **Electronic Transmission**:- Delivery is quick
 - **Economical**:-Speed of transmission is increasing, time cost on communication media per page is falling
 - **Broadcasting and Rerouting**:-Sending a message to a large number of target recipients
 - **Integration with other information systems**:-Such an integration helps in ensuring the message is accurate
 - **Online Development and Editing**:-Can be developed and edited online before transmission and it eliminates the usage of paper
 - **Facsimile (Fax)**
 - Electronic Communication of images of documents over telephone lines
 - It uses special software and fax servers to send and receive fax messages using common communication resources
 - **Voice Mail**
 - Voicemail systems are designed to convey a caller's recorded audio message to a recipient.

- To do so they contain a user interface to select, play, and manage messages; a delivery method to either play or otherwise deliver the message; and a notification ability to inform the user of a waiting message.
- **Teleconferencing and Video Conferencing System**
 - Conducted in Business meetings
 - Involving more than 2 persons
 - Located at two or more different places
 - It helps in reducing the time cost of meeting as participants need not have to travel to attend the meeting

Knowledge Management System

- It is the process of capturing. Developing and sharing and effectively using the organisational knowledge
- It refers to any kind of IT System that stores and retrieves knowledge, improves collaboration, locates knowledge resources
- Two broad types of knowledge
 - Explicit Knowledge:- Which can be formalized easily and as a consequence is easily available throughout the organisation
 - E.g.:- Online Tutorials and Policy and Procedure Manuals
 - Tacit Knowledge:- It resides in few person/persons and hasn't been captured by the organisation or made available to others
 - E.g.:- Special Know-how, employee experiences

Management Level System

- These support the middle management in monitoring, decision making and administrative activities
- MSS Supports the managers in effective decision making by providing relevant and required information at the right time to the right people

Management Information System

- Management information system (MIS) refers to the **processing of information through computers and other intelligent devices** to manage and support managerial decisions within an organization.
- MIS supports the managers at different levels to take decisions-strategic, tactical management decisions to fulfil the organisational goals
- Characteristics of an effective MIS
 - **Management Oriented:-** Development of MIS should start from management appraisal
 - **Management Directed:-** Management should also actively direct the system development efforts

- **Common Data Flows:-** Usage of Common Input, Processing and output procedures wherever required. Data is captured by analysts one and then subsequently processing happens. This would prevent duplication
- **Common Database:-** Database integrates and consolidates all data previously stored in many separate files
- **Computerised:-** Use of computers increases the effectiveness of the system. Other attributes include accuracy and consistency in processing data and reduction in clerical staff
- **Heavy Planning element:-** It takes 1-3 years and sometimes even longer for an MIS to get established within a company. MIS designer must be present in MIS development and also consider future objectives of enterprise
- **Integrated:-** Integrate all the functional and operational information subsystems. An integrated Information System will generate more useful information to the management as it takes a comprehensive view
- **Sub-System Concept:-** Information System should be broken down into digestible sub systems, which can be implemented in a phased manner
- **Misconceptions about MIS**
 - MIS is a **Management Concept**
 - Study of **MIS** is **about use of computers**
 - **MIS** is about a **bunch of technologies**
 - **MIS** is a **Management Technique**
- **Pre-Requisites of an effective MIS**
 - **Database:-** The data in database is arranged in such a manner that the access to data is improved and redundancy is reduced
 - **Characteristics of a Database**
 - User oriented
 - Capable of being used as multiple data source to various users
 - Available to authorised users only
 - Controlled by Database Management System (DBMS)
 - **Qualified System and Management Staff:-**
 - Manned by Qualified officers –who understand views of fellow officers
 - Organisation Management base to consist of 2 categories of officers
 - System and Computer experts- capable to understand the management concepts to facilitate understanding of organisation problems
 - Management Experts: to understand the concepts and operations of a computer
 - **Support of Top Management**
 - Support of Top Management is essential due to the following

- Implementation without top management support will suffer from priority issues and delays
 - Resources involved are higher
 - To gain the support, the officers should convince the top management of the benefits
- **Evaluation of MIS**
 - Effective MIS should be able to meet the information requirements in future also. Evaluation should consider the following points
 - Examining **whether flexibility exists** in system to cope with any expected or unexpected requirements in future
 - Ascertaining **the views of users and designers** of capability and deficiencies
 - Guiding the **appropriate authority about steps** to be taken to maintain effectiveness of MIS
- **Constraints in Operating MIS**
 - Major Constraints in Operating an information system are:-
 - **Non Availability of experts**:-diagnose the objectives of organisation and provide a desired direction
 - Experts face the problem of **selection of sub-system** of MIS to be installed and operated upon
 - **Varied objects** of business concerns, **approach adopted** by experts for implementing MIS is **non-standardised**
 - Non-availability of **co-operation from staff** –problem to be handled tactfully by organising lectures, showing films and explaining to them the utility of the system
- **Limitations of MIS**
 - **Quality of Output is governed by quality of input** and procedures
 - MIS is **not a substitute for effective management**- cannot replace managerial judgement in making decisions in different functional areas
 - MIS **may not have the requisite flexibility to quickly update** with changing needs of time
 - MIS **cannot provide tailor made information packages** suitable for purpose of every decision of executives
 - MIS **takes into account quantitative factors**, ignores non-quantitative factors like morale and attitude of employees
 - MIS **is less useful for making non-programmed decisions**. Such type of decisions are not of the routine type and thus require information
 - Effectiveness of MIS is reduced in enterprises-where **the culture of hoarding information** and not sharing with other holds
 - MIS effectiveness decreases due to frequent changes in top management, organisational structure and operational team

Decision Support System

- A **Decision Support System (DSS)** is an information system that supports business or organizational decision-making activities.
 - **DSSs serve the management, operations and planning levels of an organization** (usually mid and higher management) and help people make decisions about problems that may be rapidly changing and not easily specified in advance—i.e. unstructured and semi-structured decision problems.
 - Decision support systems can be either **fully computerized or human-powered**, or a combination of both.
 - A properly designed DSS is **an interactive software based system intended to help decision makers** to compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions
 - Example of DSS –**automatic pilots in aeroplanes and diagnosis applications used to help doctors**
 - Two types of planning languages that are commonly used in DSS are:-
 - General Purpose Planning Languages
 - Special Purpose Planning Languages
 - General Purpose planning language: This language allows users **to perform routine tasks** such as retrieval of data.E.g.COBOL, FORTRAN
 - A Special Purpose Planning language is a program language that **was designed for a specific function**. For example, LISP (List Processing) is an example of a special purpose programming language designed to create artificial intelligence.
- **Characteristics of DSS**
 - **Supports Decision making** and occurs at all levels of management
 - **Flexible and adaptable**
 - DSS **focuses on decision** rather than data and information
 - It should **be easy to use**. A user should have knowledge of computer programming to generate reports helping in decision making
 - DSS can be **used for structured problems**
 - DSS are mainly used for decision making rather than communicating decisions and training purposes
- **Components of DSS**
 - The User
 - Databases
 - Model Base

- **The User:-** The User is a manager with an unstructured or semi structured problem to solve. The two broad classes of users are Manager and Staff Specialists. They need not have computer background to operate DSS
 - Manager are users who have the basic computer knowledge and want to be user friendly
 - Staff Specialists:- are people who use the complex system in their day to day work
- **Database:-** DSS Contains routine and non-routine data from both internal and external sources. Implementation of Database happens in three levels as follows:-
 - **Physical level:** This is the lowest level of data abstraction. It describes how data is actually stored in database. You can get the complex data structure details at this level.
 - **Logical level:** This is the middle level of 3-level data abstraction architecture. It describes what data is stored in database.
 - **External Level:-**
 - External level is related to the data which is viewed by individual end users.
 - This level includes a no. of user views or external schemas.
 - This level is closest to the user.
 - External view describes the segment of the database that is required for a particular user group and hides the rest of the database from that user group.
- **Model Base:-**
 - Model Base performs the data manipulations and computations with the data provided to it by the user
- Examples of DSS in Accounting
 - **Cost Accounting System:-** e.g. Healthcare industry
 - **Capital Budgeting System:-** Analytical decisions like NPV, IRR
 - **Budget Variance Analysis System:-** Monthly Variance Systems
 - **General Decision Support System:-** Analyse different platforms
- **Difference between DSS and traditional MIS**

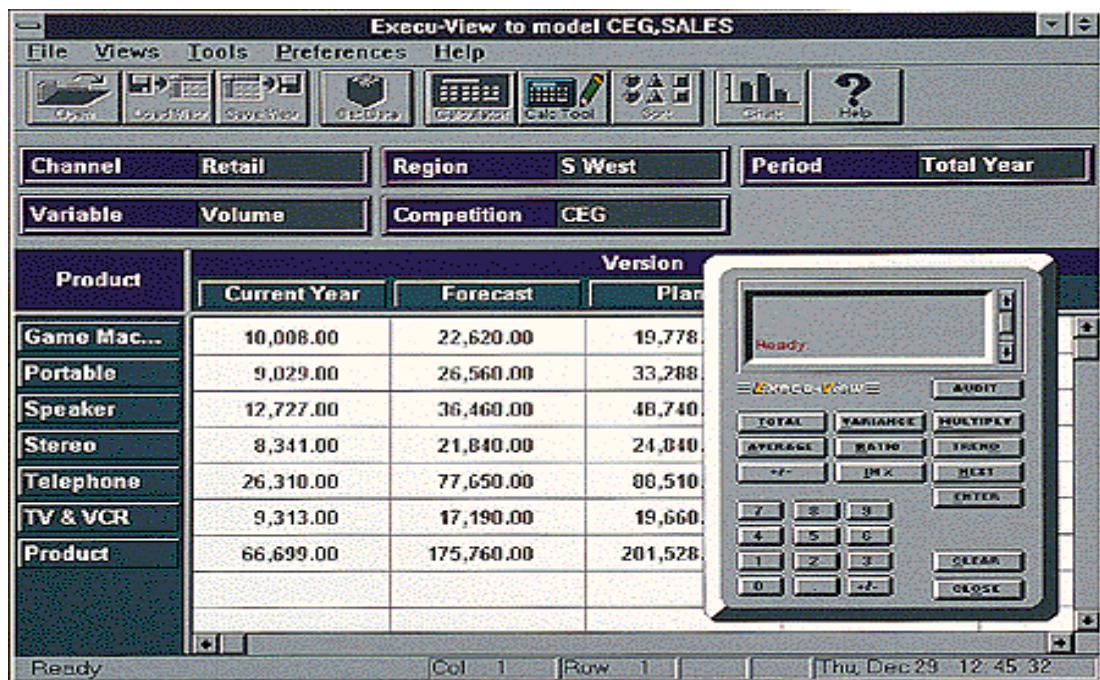
Dimensions	Decision Support System	Traditional MIS
Philosophy	Providing integrated tools, data, models, and languages to end users	Providing structured information to end users
Orientation	External orientation	Internal orientation
Flexibility	Highly flexible	Relatively inflexible
Analytical capability	More analytical capability	Little analytical capability
System analysis	Emphasis on tools to be used in decision process	Emphasis on information requirement analysis
System design	Interactive process	System development based on static information requirements

Strategic Level Systems

- These systems are for strategic managers to track and deal with strategic issues, assisting long –range planning
- These systems support the senior level management to tackle strategic issues and long term trends, both inside the organisation and outside world

Executive Information System

- An executive information system (EIS), is a type of Management information system intended to facilitate and support the information and decision making needs of the senior executives by providing easy access to both internal and external information relevant to meeting the strategic goals of the organisation
- Characteristics of ESS
 - It is a Computer Based information system **serving information needs of top executives**
 - It enables users to **extract summary data** and model complex problems without **need to know query language**
 - EIS provides **rapid access to timely information** and direct access to management reports



- EIS is capable of **accessing internal as well as external data**
- EIS **provides extensive online analysis tool** like trend analysis etc.
- EIS **can easily be given as a DSS support** for decision making

Executive Decision Making Environment

- Type of decisions made by executives is very broad. Often these decisions are based on their vision
- 5 Characteristics of the type of information used in executive decision making are as follows:-
 - **Lack of Structure** :- Decisions by executives are relatively unstructured-not as clear cut as to how to debug a computer program or how to deal with overdue account balance
 - **High Degree of Uncertainty**:-Executives work In an environment where decisions are not scientifically predictable from actions
 - **Future Orientation**:-Strategic Management Decisions are made in order to shape the future
 - **Informal Source**:- Executives rely more on the informal sources for key information
 - **Low Level of Detail**:-Most important executive decisions are made by observing broad trends
- **Contents** of EIS
 - Whatever is of use for the executives is to be included here
 - Selection of data for EIS is difficult

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- Principles to guide design of measures and indicators to be included in an EIS is presented below:-
 - EIS Measures must be easy to understand and collect:- Data should be naturally collected wherever possible
 - EIS Measures to be based on balanced view of organisation structure:- Data in system to reflect the objectives of the organisation
 - Performance indicators must reflect everyone's contribution in fair and consistent manner
 - EIS measures must encourage management and staff to share the ownership of organisation's objectives
 - EIS information is to be made available to everyone in the organisation
 - EIS measures must evolve to meet the changing needs of the organisation

Difference between EIS and Traditional Information System

Dimensions of Difference	Executive Information System	Traditional Information System
Level of management	For top or near top executives	For lower staff
Nature of Information Access	Specific issues/problems and	Status reporting
Nature of information provided	Online tools and analysis	Offline status reporting
Information Sources	More external, less internal	Internal
Drill down facility to go through details at successive levels	Available	Not available
Information format	Text with graphics	Tabular
Nature of interface	User-friendly	Computer-operator generated

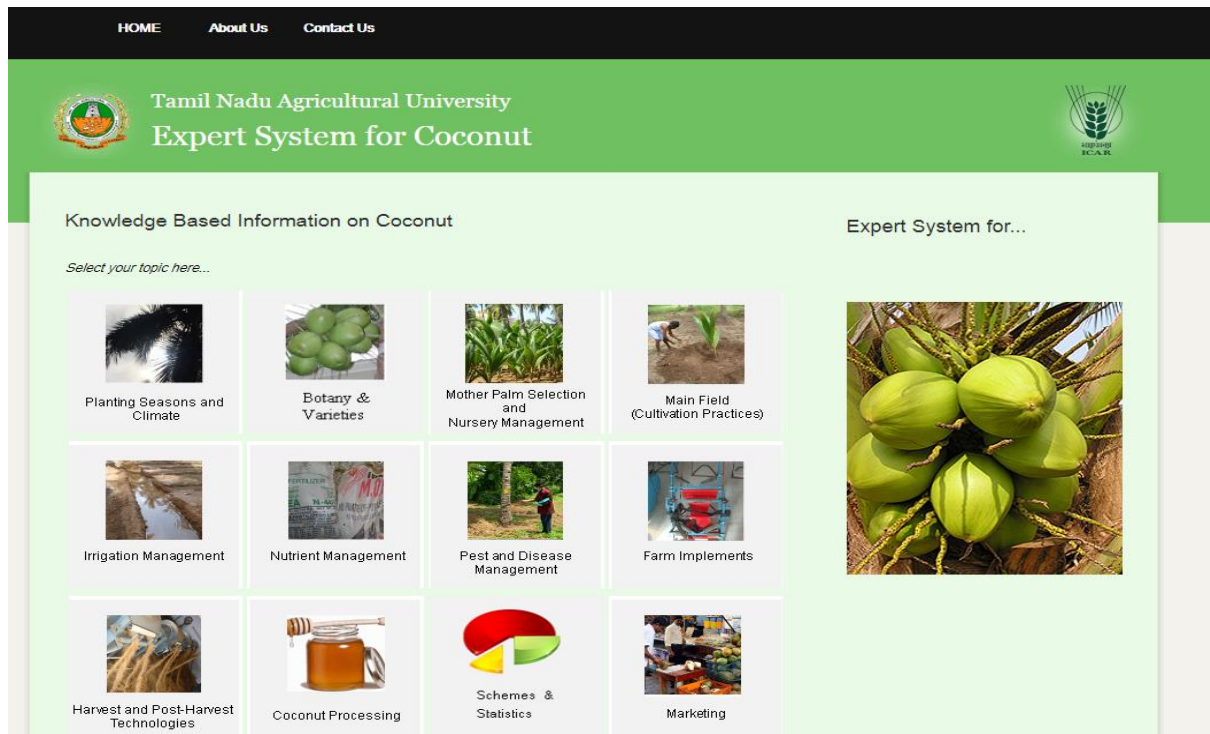
Specialised System

- There exists information systems that provide comprehensive end to end IT solutions and services to various corporations globally
- Some of these are Expert Systems, Cross Functional Information Systems and Core

Banking System, etc.

Expert System

- In artificial intelligence, an expert system is a computer system that imitates the decision-making ability of a human expert
- E.g. Medical Industry-PXDES (X-ray Diagnosis, Lung Disease) CaDet (Cancer Detection)



Some of the **business applications of Expert System** are as follows:-

- **Accounting and Finance:-** Tax advice and investment advice
- **Marketing:-** Respond to customer enquiries
- **Manufacturing:-** Process running correctly
- **Personnel:-** Assessing applicant qualifications and assisting employees in filling forms
- **General Business:-** Assisting Project proposals, recommending acquisition strategies

Need for Expert Systems

- **Expert labour is expensive** and scarce. Companies face shortage of talent in key positions
- **People can handle only few factors at a time**
- Pace at which business is running and the human information processing capability-put a **practical limit on quality of human decision making**

Benefits of Expert System

- **Preserve Knowledge** that may be lost through retirement, resignation or death
- **Put information into an active form** so that it can be summoned almost as a real life expert
- **Assist Novices** thinking the way experts do
- **Not Subject to human feelings** like fatigue, too busy or being emotional
- **Effectively used as a strategic tool** in areas like marketing products, cutting costs and improving products

Properties that the potential applications should possess to qualify for Expert System Development are:-

- **Availability:-** One or more experts are capable of communicating
- **Complexity:-** requires logical inference processing
- **Domain:-** Domain is relatively small
- **Expertise:-** Only few possess the expert knowledge, techniques required
- **Structure :-** Solution process must be able to cope with the ill-structured, uncertain, missing and conflicting data

Cross Functional Information System

- It is an integrated information system that combines most of the information systems and designed to produce information and decision making for different levels of management and business functions. E.g. ERP

Enterprise Resource Planning

- **Enterprise resource planning (ERP)** is business process management software that allows an organization to **use a system of integrated applications to manage the business and automate many back office functions** related to technology, services and human resources.

Components of ERP model

- Software
- Process Flow
- Customer Mindset
- Change Management

Software:- Visible Component and comprises of several modules like Finance, Human Resource, Supply Chain Management

Process Flow:- Model illustrating the flow of information among different modules in ERP System

Customer Mind set: - Old ways of working, on implementation of ERP needs to be changed-which may lead to resistance from the users

Change Management:- User's attitude, resistance to change and business process changes

Benefits of ERP

- **Streamline Process and workflows** within a single integrated system
- **Reduce redundant data entry**
- **Establish uniform processes**
- **Improved workflow and efficiency**
- **Improved customer satisfaction**
- **Reduced inventory costs** –Planning, tracking and forecasting
- **Decrease in vendor pricing**-taking advantage of quantity breaks and tracking vendor performance

CORE Banking System

- Core banking is a banking service provided by a group of networked bank branches where customers may access their bank account and perform basic transactions from any of the member branch offices
- Elements of Core Banking include:-
 - Making and servicing loans
 - Calculating Interest
 - Customer Relationship Management (CRM) Activities
 - Managing Customer Accounts
 - Establishing Interest Rates

Application of Information Systems in Enterprise Processes

Information Systems perform the following three vital roles in business firms

- Support an organisation's **business processes and operations**
- Support **Business Decision-Making**
- Support **Strategic Competitive Advantage**

To operate Information Systems effectively and efficiently, a business manager should have the following knowledge about it

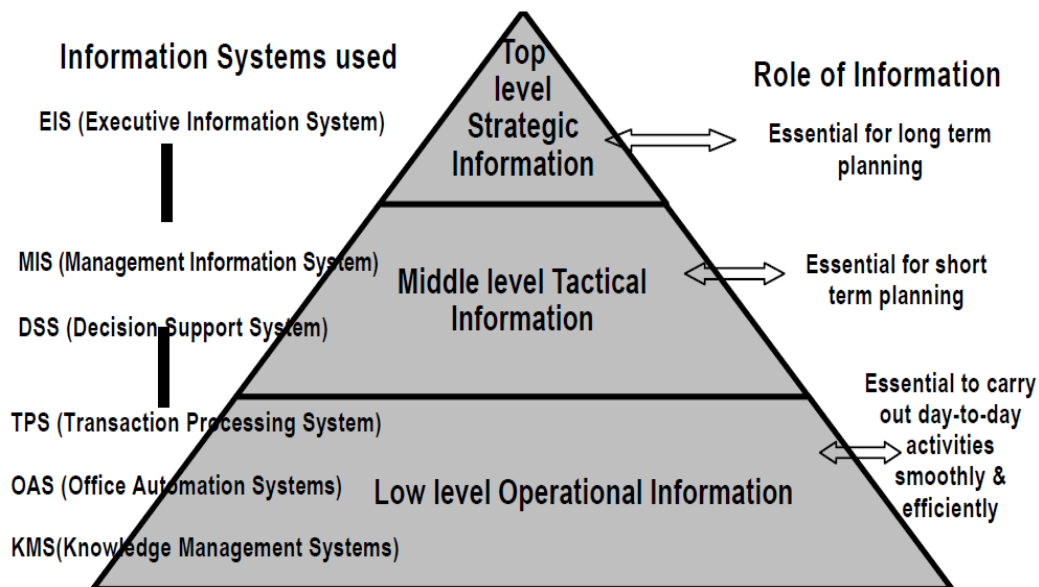
- **Foundation Concepts:-** Fundamental Business and Managerial Concepts
- **Information Technologies:-** Operation, Development and Management of Hardware, software, data management
- **Business Applications:-**Major uses of IT in business steps, i.e., processes, operations, decision making
- **Development Processes:-** How end users and IS specialists develop and execute business/IT solutions to problems
- **Management Challenges:-**How the function and IT resources are maintained and utilised to attain top performance

Implications of Information Systems in Business

- Information System helps **managers in efficient decision making** to achieve organisational goals
- Organisation will be able to **thrive and survive in highly competitive environment** on the strength of a well- designed information system
- Information Systems helps in making **the right decision at the right time**
- Generates **innovative ideas for solving** critical problems
- Knowledge gathered through information systems **may be utilised by managers in unusual situations**
- Information system is viewed as a process, it can be **integrated to formulate a strategy of action or operation**

Information as a key business asset

- Information helps the organisation **achieve its long term objectives and goals**
- **Top Management Strives** for Information that can help them in **major policy decisions**
- **Middle Management** require tactical information that helps in **implementing decisions** taken by the top management
- **Lower Management** requires operational information which is required in day to day activities



Various Types of Business Applications

Impact of IT on different sectors is as follows

- **E-Business:-**
 - Primary Components are infrastructure, electronic commerce and electronically linked devices and computer aided networks
 - Advantages of E-Business are 24 hour sale, lower cost of doing business, eliminate middlemen, unlimited market space and access with broaden customer base
 - Different type of business can be done- B2B, B2C
- **Financial Service Sector :-**
 - Using IT, the financial institutions operate nationally and have wide network of regional offices
 - Most of the services are offered on internet, can be accessed anywhere, anytime which makes it more convenient to customers-reduces cost in terms of office staff and office building
 - Advancement of IT, Customer of a bank need not visit the bank to carry out transactions, instead he can do transactions by internet banking, phone banking and deposit or withdraw money from ATM's
- **Wholesaling and retailing**
 - Stock control, management reports, customer information and accounting
 - IT can be used in wholesale for supply chain logistics management
- **Public Sector**
 - Hospitals, Police Stations, universities –track of the cases, qualifications
- **Other**
 - Includes-entertainment industry, agriculture, tour industry

Overview of Underlying IT Technologies

- **Business Website:-** Enterprise becomes reachable to a large number of customer. It can also be used in advertisement
- **Internet and Intranet:-** Electronic exchange of information within an organisation- E-Commerce provides a platform for doing a business in a better way
- **Software and Packages:-**DBMS, Data warehouses can be used for getting information that plays a major role in decision making
- **ERP Packages:-** It integrates all business processes and functions of the entire enterprise into a single software system
- **Data mining:-** Can be used in database analysis and decision support system. Other applications of data mining are as follows:-
 - **Text Mining**(deriving information from text)
 - **Web analysis**
 - Customer profiling-list out what type of customers buy what type of products

- Identifying Customer requirements:- It can identify the most demanding and appropriate products for different customers
- Provide summary information:- Multidimensional summary reports
- Finance planning and asset evaluation
- **Business Intelligence:-** refers to applications and technologies that are used to collect and provide access and analyse data and information about operations
- **Computer systems, Scanners, Laptop, Printer, Webcam, Smart Phone etc.-**
Webcam and Microphone are used for long distance meeting