<u>Statistical and Financial Accounting Software</u>

<u>Topic 2: IS and their role within the Organizational Structure.</u>

1. Introduction

An information system is a set of interrelated components that collect, manipulate, process and transform data into information and provide feedback to meet a specified objective. A computer based information system is an information system that uses computer technology to perform input, processing and output activities. Due to the massive computerization of manual information systems, computer based information systems are simply referred to as information systems. They are the subject of discussion in this chapter.
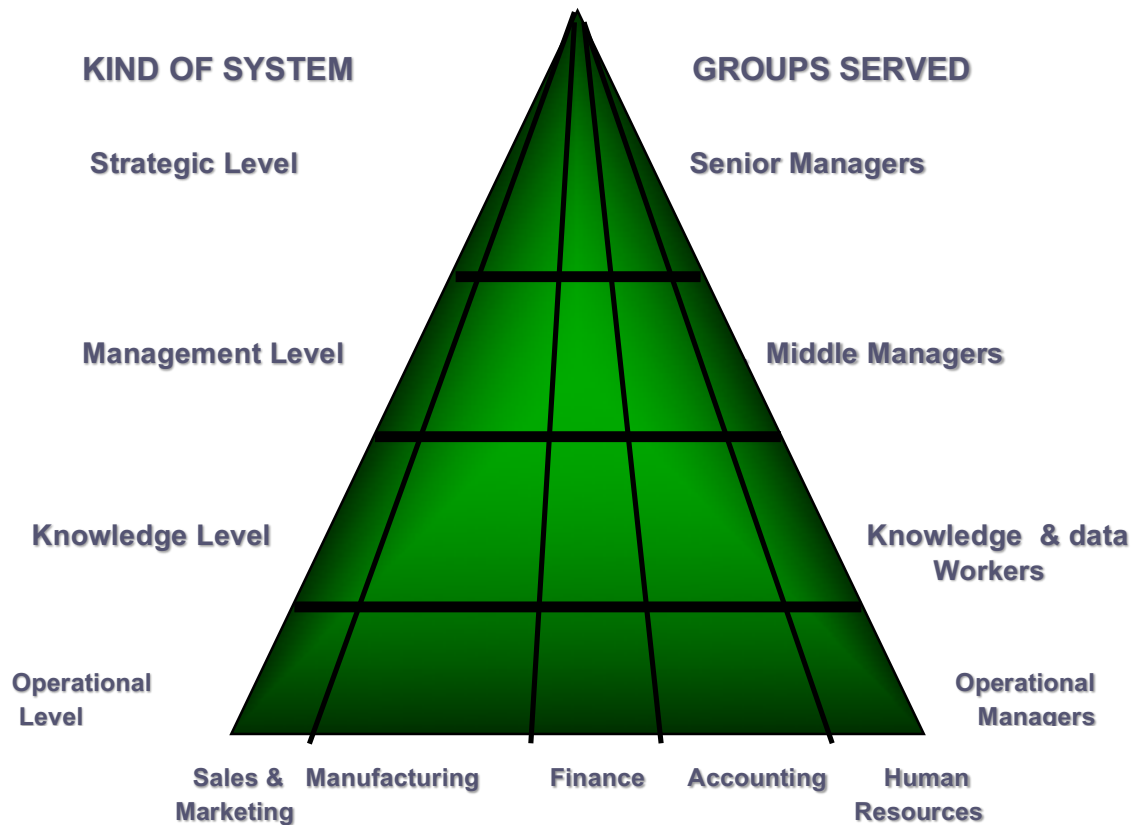
Common examples of information systems include: Automated Teller Machines (ATMs), Point of Sale (POS) terminals used by supermarket checkout clerks, airline reservation systems or flight schedule systems used by airlines, student registration systems used by colleges etc.

2. Management structure and use of information

Information systems support different types of decisions at different levels of the organizational hierarchy. While operational managers mostly make structured decisions, senior managers deal with unstructured decisions and middle managers are often faced with semi-structured decisions.

For each functional area in the organization, four levels of organizational hierarchy can be identified: the operational level, knowledge level, management level and strategic level. Different types of information systems serve each of these levels.

TYPES OF INFORMATION SYSTEMS

KIND OF SYSTEM		GROUPS SERVED
Strategic Level		Senior Managers
Management Level		Middle Managers
Knowledge Level		Knowledge & data Workers
Operational Level		Operational Managers

Sales & Marketing   Manufacturing   Finance   Accounting   Human Resources

3. Components of an information system

Components of an information system include:

- People – These use the system to fulfil their informational needs. They include end users and operations personnel such as computer operators, systems analysts, programmers, information systems management and data administrators.

- Computer Hardware – Refers to physical computer equipment and devices, which provide for five major functions.
    - Input or data entry
    - Output
    - Secondary storage for data and programs
    - Central processor (computation, control)
    - Communication

- Computer Software – Refers to the instructions that direct the operation of the computer hardware. It is classified into system and application software.

- Telecommunication System/Communication network

- Databases – Contains all data utilized by application software. An individual set of stored data is referred to as a file. Physical storage media evidences the physical existence of stored data, that is: tapes, disk packs, cartridges, and diskettes.

- Procedures – Formal operating procedures are components because they exist in physical forms as manuals or instruction booklets. Three major types of procedures are required.

  o User instructions – for application users to record data, to use a terminal for data entry or retrieval, or use the result.
  o Instructions for preparation of input by data preparation personnel.
  o Operating instructions for computer operations personnel.

4. Functions of an information system

The functions of an information system can be generally classified into those functions involved in:

- Transaction processing
- Management reporting
- Decision support

4.1 Transaction processing

Major processing functions include:

i. Process transactions – Activities such as making a purchase or a sale or manufacturing a product. It may be internal to the organization or involve an external entity. Performance of a transaction requires records to:

   - Direct a transaction to take place
   - Report, confirm or explain its performance
   - Convey it to those needing a record for background information or reference.

ii. Maintain master files – Many processing activities require operation and maintenance of a master file, which stores relatively permanent or historical data about organizational entities. E.g. processing an employee paycheck needs data items such as rate of pay, deductions etc. transactions when processed update data items in the master file to reflect the most current information.

iii. Produce reports – reports are significant products of an information system. Scheduled reports are produced on a regular basis. An information system should also be able to produce special reports quickly based on 'ad hoc' or random requests.

iv. Process inquiries – Other outputs of the information system are responses to inquiries using the databases. These may be regular or ad hoc inquiries. Essentially inquiry processing should make any record or item in the database easily accessible to authorized personnel.

v. Process interactive support applications – The information system contains applications to support systems for planning, analysis and decision making. The mode of operation is interactive, with the user responding to questions, requesting for data and receiving

results immediately in order to alter inputs until a solution or satisfactory result is achieved.

1. **Management reporting**

This is the function involved in producing outputs for users. These outputs are mainly as reports to management for planning, control and monitoring purposes. Major outputs of an information system include:

   i. Transaction documents or screens
   ii. Preplanned reports
   iii. Preplanned inquiry responses
   iv. Ad hoc reports and ad hoc inquiry responses
   v. User-machine dialog results

2. **Decision support**

Types of decisions

   a) **Structured/programmable decisions**

These decisions tend to be repetitive and well defined e.g. inventory replenishment decisions. A standardized pre-planned or pre-specified approach is used to make the decision and a specific methodology is applied routinely. Also the type of information needed to make the decision is known precisely. They are programmable in the sense that unambiguous rules or procedures can be specified in advance. These may be a set of steps, flowchart, decision table or formula on how to make the decision. The decision procedure specifies information to be obtained before the decision rules are applied. They can be handled by low-level personnel and may be completely automated.

It is easy to provide information systems support for these types of decisions. Many structured decisions can be made by the system itself e.g. rejecting a customer order if the customer's credit with the company is less than the total payment for the order. Yet managers must be able to override these systems' decisions because managers have information that the system doesn't have e.g. the customer order is not rejected because alternative payment arrangements have been made with the customer.

In other cases the system may make only part of the decision required for a particular activity e.g. it may determine the quantities of each inventory item to be reordered, but the manager may select the most appropriate vendor for the item on the basis of delivery lead time, quality and price.

Examples of such decisions include: inventory reorder formulas and rules for granting credit. Information systems requirements include:

   o Clear and unambiguous procedures for data input
   o Validation procedures to ensure correct and complete input
   o Processing input using decision logic
   o Presentation of output so as to facilitate action

b) Semi-structured/semi-programmable decisions

The information requirements and the methodology to be applied are often known, but some aspects of the decision still rely on the manager: e.g. selecting the location to build a new warehouse. Here the information requirements for the decision such as land cost, shipping costs are known, but aspects such as local labour attitudes or natural hazards still have to be judged and evaluated by the manager.

c) Unstructured/non-programmable decisions

These decisions tend to be unique e.g. policy formulation for the allocation of resources. The information needed for decision-making is unpredictable and no fixed methodology exists. Multiple alternatives are involved and the decision variables as well as their relationships are too many and/or too complex to fully specify. Therefore, the manager's experience and intuition play a large part in making the decision.

In addition there are no pre-established decision procedures either because:

- The decision is too infrequent to justify organizational preparation cost of procedure or
- The decision process is not understood well enough, or
- The decision process is too dynamic to allow a stable pre-established decision procedure.

Information systems requirements for support of such decisions are:

- Access to data and various analysis and decision procedures.
- Data retrieval must allow for ad hoc retrieval requests
- Interactive decision support systems with generalized inquiry and analysis capabilities.

Example: Selecting a CEO of a company.

1. Types of information systems: characteristics and differences

Major types of systems include:
1. Office Automation Systems(OAS)
2. Transaction Processing Systems (TPS)
3. Management Information Systems (MIS)
4. Decision Support Systems (DSS)
5. Executive Support Systems (ESS)
6. Expert Systems

5.1 Office Automation Systems

Office automation systems support general office work for handling and managing documents and facilitating communication. Text and image processing systems evolved as from word

processors to desktop publishing, enabling the creation of professional documents with graphics and special layout features. Spreadsheets, presentation packages like PowerPoint, personal database systems and note-taking systems (appointment book, notepad, card file) are part of OAS.

In addition OAS include communication systems for transmitting messages and documents (e-mail) and teleconferencing capabilities.

5.2 Transaction Processing System (TPS)

A transaction is any business related exchange, such as a sale to a client or a payment to a vendor. Transaction processing systems process and record transactions as well as update records. They automate the handling of data about business activities and transactions. They record daily routine transactions such as sales orders from customers, or bank deposits and withdrawals. Although they are the oldest type of business information system around and handle routine tasks, they are critical to business organization. For example, what would happen if a bank's system that records deposits and withdrawals and maintain accounts balances disappears?

TPS are vital for the organization, as they gather all the input necessary for other types of systems. Think of how one could generate a monthly sales report for middle management or critical marketing information to senior managers without TPS. TPS provide the basic input to the company's database. A failure in TPS often means disaster for the organization. Imagine what happens when an airline reservation system fails: all operations stops and no transaction can be carried out until the system is up and running again. Long queues form in front of ATMs and tellers when a bank's TPS crashes.

Transaction processing systems were created to maintain records and do simple calculations faster, more accurately and more cheaply than people could do the tasks.

Characteristics of TPS:
- TPS are large and complex in terms of the number of system interfaces with the various users and databases and usually developed by MIS experts.
- TPS's control collection of specific data in specific formats and in accordance with rules, policies, and goals of organisation- standard format
- They accumulate information from internal operations o the business.
- They are general in nature—applied across organisations.
- They are continuously evolving.

The goals of TPS is improve transaction handling by:
- Speeding it up
- Using fewer people
- Improving efficiency and accuracy
- Integrating with other organizational information systems
- Providing information that was not available previously

Examples—Airline reservation systems, Automated Teller Machines (ATMs,) order processing systems, registration systems, Payroll systems and point of sale systems.

5.3 Management Reporting System (MRS)

Management Reporting Systems (MRS) formerly called Management information systems (MIS) provide routine information to decision makers to make structured, recurring and routine decisions, such as restocking decisions or bonus awards. They focus on operational efficiency and provide summaries of data. A MRS takes the relatively raw data available through a TPS and converts it into meaningful aggregated form that managers need to conduct their responsibilities. They generate information for monitoring performance (e.g. productivity information) and maintaining coordination (e.g. between purchasing and accounts payable).

The main input to an MRS is data collected and stored by transaction processing systems. A MRS further processes transaction data to produce information useful for specific purposes. Generally, all MIS output have been pre-programmed by information systems personnel. Outputs include:

a) Ad hoc/Scheduled Reports – These were originally the only reports provided by early management information systems. Scheduled reports are produced periodically, such as hourly, daily, weekly or monthly. An example might be a weekly sales report that a store manager gets each Monday showing total weekly sales for each department compared to sales this week last year or planned sales.
b) On Demand Reports – These provide specific information upon request. For instance, if the store manager wanted to know how weekly sales were going on Friday, and not wait until the scheduled report on Monday, she could request the same report using figures for the part of the week already elapsed.
c) Exception Reports – These are produced to describe unusual circumstances. For example, the store manager might receive a report for the week if any department's sales were more than 10% below planned sales.
d) Summary reports
e) Predictive reports

Characteristics of MRS
- MIS professionals usually design MRS rather than end users- using life cycle oriented development methodologies.
- They are large and complex in terms of the number of system interfaces with the various users and databases.
- MRS are built for situations in which information requirements are reasonably well known and are expected to remain relatively stable. This limits the informational flexibility of MRS but ensures that a stable informational environment exists.
- They do not directly support the decision making process in a search for alternative solutions to problems. Information gained through MRS is used in the decision making process.
- They are oriented towards reporting on the past and the present, rather than projecting the future. Can be manipulated to do predictive reporting.
- MRS have limited analytical capabilities. They are not built around elaborate models, but rather rely on summarisation and extraction from the databases according to the given criteria.

5.4 Decision Support System (DSS)

Decision support systems provide problem-specific support for non-routine, dynamic and often complex decisions or problems. DSS users interact directly with the information systems, helping to model the problem interactively. DSS basically provide support for non-routine decisions or problems and an interactive environment in which decision makers can quickly manipulate data and models of business operations. A DSS might be used for example, to help a management team decide where to locate a new distribution facility. This is a non-routine, dynamic problem. Each time a new facility must be built, the competitive, environmental, or internal contexts are most likely different. New competitors or government regulations may need to be considered, or the facility may be needed due to a new product line or business venture.

When the structure of a problem or decision changes, or the information required to address it is different each time the decision is made, then the needed information cannot be supplied by an MIS, but must be interactively modelled using a DSS. DSS provide support for analytical work in semi-structured or unstructured situations. They enable mangers to answer 'What if' questions by providing powerful modelling tools (with simulation and optimization capabilities) and to evaluate alternatives e.g. evaluating alternative marketing plans.

DSS have less structure and predictable use. They are user-friendly and highly interactive. Although they use data from the TPS and MIS, they also allow the inclusion of new data, often from external sources such as current share prices or prices of competitors.

DSS components include:
   a) Database (usually extracted from MIS or TPS)
   b) Model Base/knowledge base
   c) User interface/Dialogue Module
   d) Decision maker

5.5 Executive information system (EIS) / Executive Support Systems (ESS)

EIS provide a generalized computing and communication environment to senior managers to support strategic decisions. They draw data from the MIS and allow communication with external sources of information. But unlike DSS, they are not designed to use analytical models for specific problem solving. EIS are designed to facilitate senior managers' access to information quickly and effectively.

ESS has menu-driven user-friendly interfaces, interactive graphics to help visualization of the situation and communication capabilities that link the senior executives to the external databases he requires.

Top executives need ESS because they are busy and want information quickly and in an easy to read form. They want to have direct access to information and want their computer set-up to directly communicate with others. They want structured forms for viewing and want summaries rather than details.

5.6 Expert System (ES)

- It is an advanced DSS that provides expert advice by asking users a sequence of questions dependent on prior answers that lead to a conclusion or recommendation. It is made of a knowledge base (database of decision rules and outcomes), inference engine (search algorithm), and a user interface.
- ES use artificial intelligence technology.
- It attempts to codify and manipulate knowledge rather than information
- ES may expand the capabilities of a DSS in support of the initial phase of the decision making process. It can assist the second (design) phase of the decision making process by suggesting alternative scenarios for "what if" evaluation.
- It assists a human in the selection of an appropriate model for the decision problem. This is an avenue for an automatic model management; the user of such a system would need less knowledge about models.
- ES can simplify model-building in particular simulation models lends itself to this approach.
- ES can provide an explanation of the result obtained with a DSS. This would be a new and important DSS capability.
- ES can act as tutors. In addition ES capabilities may be employed during DSS development; their general potential in software engineering has been recognised.

5.7 Other Information Systems

These are special purpose information systems. They are more recent types of information systems that cannot be characterized as one of the types discussed above.

(i)   Artificial Intelligence Systems

Artificial intelligence is a broad field of research that focuses on developing computer systems that simulate human behaviour, that is, systems with human characteristics. These characteristics include, vision, reasoning, learning and natural language processing.

Examples: Expert systems, Neural Networks, Robotics.

(ii)   Knowledge Based Systems/ Knowledge Work Systems (KWS)

Knowledge Work Systems support highly skilled knowledge workers in the creation and integration of new knowledge in the company. Computer Aided Design (CAD) systems used by product designers not only allow them to easily make modifications without having to redraw the entire object (just like word processors for documents), but also enable them to test the product without having to build physical prototypes.

Architects use CAD software to create, modify, evaluate and test their designs; such systems can generate photo-realistic pictures, simulating the lighting in rooms at different times of the day, perform calculations, for instance on the amount of paint required. Surgeons use sophisticated CAD systems to design operations. Financial institutions use knowledge work systems to support trading and portfolio management with powerful high-end PCs. These allow managers to get instantaneous analysed results on huge amounts of financial data and provide access to external databases.

Workflow systems are rule-based programs - (IF 'this happens' THEN 'take this action')- that coordinate and monitor the performance of a set of interrelated tasks in a business process.

(iii)   E-Commerce/E-Business Systems

E-Commerce involves business transactions executed electronically between parties. Parties can be companies, consumers, public sector organizations or governments.

(iv)   Enterprise Resource Planning (ERP) systems

ERP systems are a set of integrated programs that handle most or all organization's key business processes at all its locations in a unified manner. Different ERP packages have different scopes. They often coordinate planning, inventory control, production and ordering. Most include finance and manufacturing functions, but many are now including customer relationship management, distribution, human resource as well as supply chain management. ERP systems are integrated around a common database. Some well known ERP vendors are ORACLE, SAP and PeopleSoft.

For instance a manufacturing company may prepare a demand forecast for an item for the next month. The ERP system would then check existing items inventory to see if there is enough on hand to meet the demand. If not, the ERP system schedules production of the shortfall, ordering additional raw material and shipping materials if necessary.

(v)   Electronic Funds Transfer (EFT)

EFT is the exchange of money via telecommunications without currency actually changing hands. EFT refers to any financial transaction that transfers a sum of money from one account to another electronically. Usually, transactions originate at a computer at one institution (location) and are transmitted to a computer at another institution (location) with the monetary amount recorded in the respective organization's accounts. Because of the potential high volume of money being exchanged, these systems may be in an extremely high-risk category. Therefore, access security and authorization of processing are important controls.

Security in an EFT environment is extremely important. Security includes methods used by the customer to gain access to the system, the communications network and the host or application-processing site. Individual customer access to the EFT system is generally controlled by a plastic card and a personal identification number (PIN). Both items are required to initiate a transaction.

Application of information systems in business

Basic business systems serve the most elementary day-to-day activities of an organization; they support the operational level of the business and also supply data for higher-level management decisions. They provide support of the functional areas of business (marketing, production/operations, accounting, finance, human resource management) through computer-based information systems. Common properties for these systems include:

♦ Often critical to survival of the organization
♦ Mostly for predefined, structured tasks
♦ Can have strategic consequences (e.g. airline reservation system)
♦ Most have high volumes of input and output
♦ Summarized information from basic systems used by higher levels of management
♦ Need to be fault-tolerant (ability to cope with failure of a system component without entire business system going down/failing).

Some of the challenges that business systems pose are:
♦ Organizational challenges
  o The need to streamline systems (manual and computer) as much as possible
  o The need to update systems without disrupting the firm
♦ People challenges
  o Ensuring consistency and completeness in procedures
  o Ensuring time is actually saved
♦ Technology challenges
  o Using client/server technology than mainframes
  o Linking different types of systems
  o Ensuring the right data is supplied to management

Application of information systems in accounting

These are systems that maintain records concerning the flow of funds in the firm and produce financial statements, such as balance sheets and income statements. They are among the earliest systems to be computerized
The system modules typically include
  • General ledger.
  • Fixed assets.
  • Sales order processing.
  • Point of sale (POS)
  • Accounts receivable.
  • Accounts payable.
  • Inventory control/inventory management.
  • Purchase order processing.
  • Just in time (JIT) systems
  • Payroll.
  • Budgeting systems
  • Cash management systems
  • Capital budgeting systems

- Investment management systems
- Financial Condition Analysis Systems
- Long-Range Forecasting Systems
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When these computerized financial accounting subsystems are integrated, each subsystem receives data as input from other subsystems and provides information as output to other subsystems.