MANAGEMENT INFORMATION SYSTEMS

Chapter One

Conceptual Foundation of Management Information Systems

Unit Introduction

To make good decisions in all spheres of life, it is now essential to have access to updated information. Information is required everywhere: industry, trade, military, finance, schooling, economics, and government. Information is live because it must be continually upgraded and regenerative. The exponential increase of information necessitates collecting, storing, and retrieving data in numerous disciplines. For instance, when establishing a new business, knowledge of the selection of technology, talent, funds, and materials is crucial for its development and efficient operation. In choosing the cost of a product in a marketplace, the producer must know competitors' pricing policies, particularly concerning competitive items, sales strategies, etc. The MIS is an interconnected man-machine system that facilitates management's controlling and planning tasks (Davis, 2000).
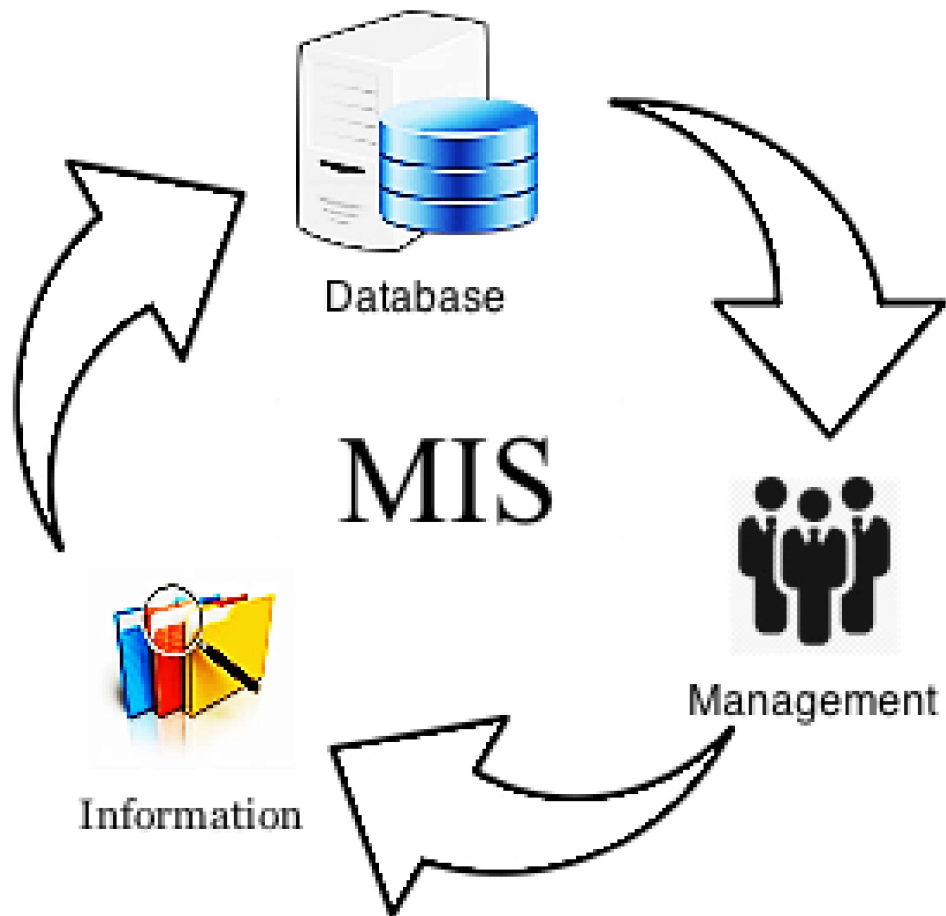
Figure 1.1. Illustration of Management Information System (MIS) (Source: Manoj Kumar et al., Creative Commons License)

A management information system (MIS) is a system that collects, processes, and presents data to leadership to enhance decision-making. Although MIS was first designed for large businesses, it applies to all enterprises. MIS in small firms is less complex than MIS in big enterprises, but it contains similar decision-making capacity (Watson, 2014). Every business needs timely and precise information. MIS gives the information required; it creates data, analyzes it, and delivers it to leadership in a suitable form so that they may make informed business choices.

The word 'MIS' refers to a computer-based program built to provide decision-makers with information about their areas of interest. It is a system meant to deliver chosen decision-oriented data needed for an organization to plan, manage, as well as assess an organization's actions. It offers details concerning the organization's history, present, expected future, and pertinent events occurring within and beyond the organization (Alavi & Leidner, 2001).
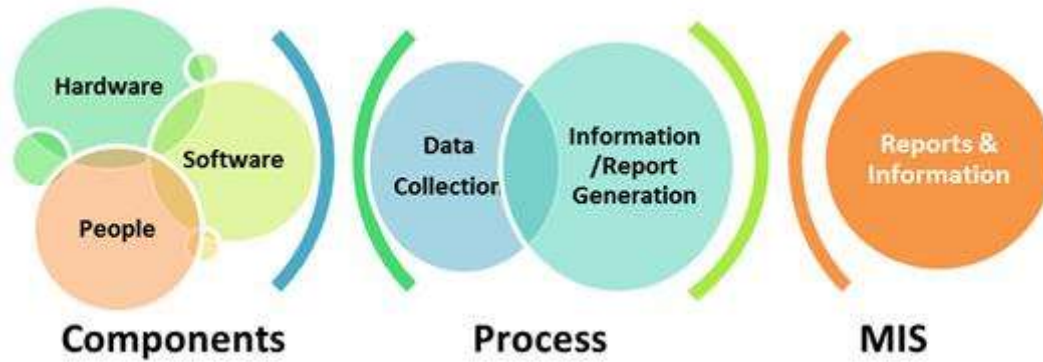
Figure 1.2. Schematic of various components and processes leading to MIS (Source: Star Web Maker, Creative Commons License)

As seen in the preceding diagram, MIS is a three-step procedure consisting of data production, data analysis, and information conveyance. A compelling mix of staff, material, and computer chips are essential for the efficient operation of MIS. These must be correctly organized for management to access the required data and make effective business choices (Kocsis, 2019).

Learning Objectives

By the end of this chapter, readers will be able to learn the following:

1. Fundamentals of Management Information Systems

2. Characteristics of Management Information Systems

3. Types of Management Information Systems

4. Importance of Management Information Systems

5. Structure of Management Information Systems

6. Development of Management Information Systems

Key Terms

1. Management

2. Information

3. Operational Control

4. Process Control

5. Management Information Systems

6. Transaction Processing System

7. Management Reporting System

8. Decision Support System

9. Office Information System

10. Business Expert System

1.1. Characteristics of Management Information Systems

Every element of a company relies heavily on MIS. These features are universal.

The following are the specific MIS characteristics:

1. The System Approach

2. Management centered

3. Need-Based

4. Exceptional Case

5. Future-centered

6. Integrated

7. Long-Term Strategy
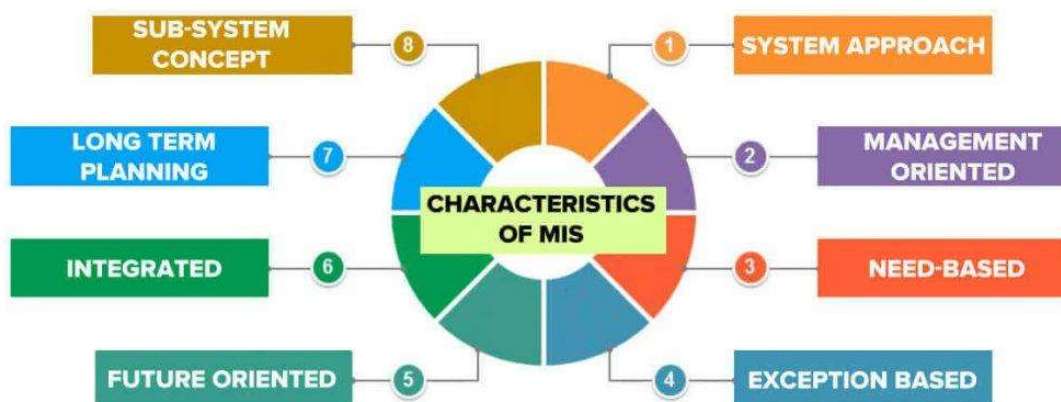
8. The Subsystem Idea

9. Centralized Database

Figure 1.3. Illustration of the MIS characteristics (Source: Geek Tonight, Creative Commons License)

1.1.1. System Approach

The management system adheres to a System's perspective. The system perspective implies a comprehensive method for evaluating the system and its functioning in light of the goal for which it was created (Baskerville, 1993).

1.1.2. Management Oriented

When creating the MIS, the top-down strategy must be used. According to the top-down method, an information system begins with determining organizational requirements and general corporate goals.

The company's overall strategy should be used to design the MIS development strategy. The management-oriented nature of MIS means that management constantly drives systems engineering activities (Silver, 1990).

1.1.3. Need-Based

MIS development and creation must be centered on the data requirements of managers at differing stages, such as the planning process, performance management, and direct management. In other terms, MIS should address the distinct demands of managers at various levels of an organizational strategy.

1.1.4. Exception Based

MIS must be built on the exception-based monitoring concept, which implies that an abnormal scenario, i.e., the highest; lowest; or forecast values fluctuate outside limit values, should be avoided. In these cases, there should be enough special reports to the decision-maker (Peppard & Ward, 2004).

1.1.5. Future-Oriented

In addition to exception-based monitoring, MIS must consider the future. In other words, MIS should not only give past or historical data but also offer data derived from forecasts that could be used to trigger activities.

1.1.6. Integrated

Integration is a required feature of a management system. Integration is crucial since it can generate more valuable data. To build a successful manufacturing scheduling, for instance, it is essential to balance aspects such as initial investment, workforce, overtime pay, production capabilities, stock level, capital needs, and customer support (Choe, 2004).

1.1.7. Lengthy-Term Planning

MIS is created over a long period. A system like this does not emerge overnight. A significant amount of planning is required. The MIS should take into account the company's long-term goals and demands.

1.1.8. Subsystem Concept

Creating an MIS is highly complicated, and one is prone to losing track of time. As a result, the system, although considered as a whole, should be decomposed into consumable subsystems that are more relevant during the planning process (Xiao & Benbasat, 2007).

1.1.9. The Central Database

Every system needs an approach to the primary data source, which contains information on inventories, people, vendors, customers, etc. It appears rational to collect data once, thoroughly verify it, and store it on centralized storage devices that every other component may retrieve.

1.2. Types of Management Information Systems

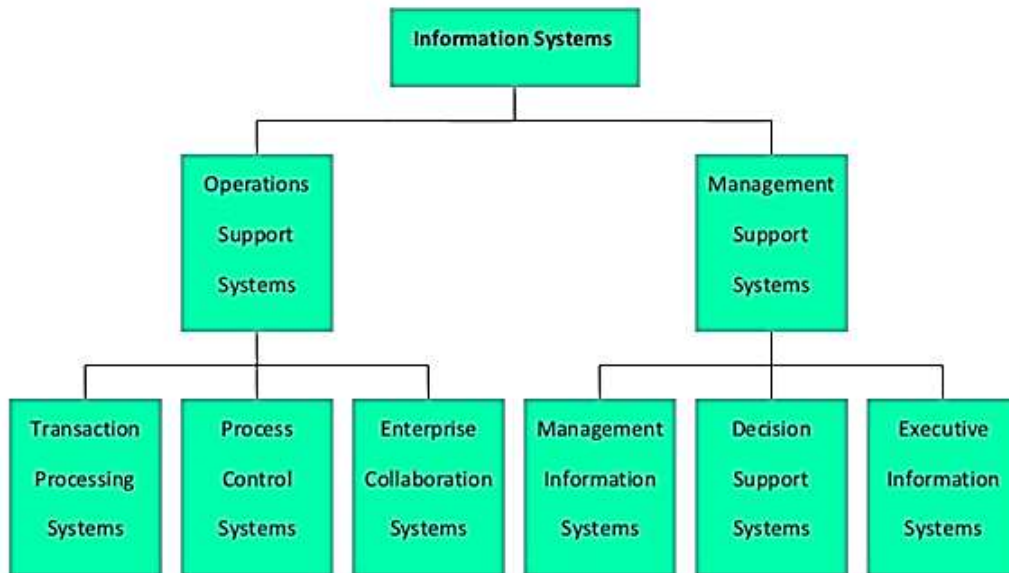The following list of 12 kinds of management information systems includes:

Figure 1.4. Types of Management Information Systems (Source: Emily Scott, Creative Commons License)

1.2.1. Process Control

That system keeps an eye on a company's physical or economic operations, such as car assembly, oil refining, or metal manufacturing. The control system method continually collects data and subsequently generates a document on the system's performance. In every industrial organization, it is among the most crucial types of information systems for management.

The analysis helps the management assess how well the procedure works and provides information on when a specific event has occurred. Additionally, it reveals how frequently the manufacturing system deviated from a cyclical production chain (Lederer & Mendelow, 1990).

This data helps assess the manufacturing systems' effectiveness and maintains control over employee and equipment safety.

1.2.2. Management Reporting System

That system is intended to generate data on the business activities and financial status of all levels of management within an organization. The management report system aids the firm manager in comparing the organizational value to the prior year and expectations.

The management may assess their effectiveness and focus on enhancing the business's success. Upper management uses this analysis to compare the organization's financial results and operational effectiveness with its established objectives (Maguire, 1991).

1.2.3. Inventory Control

It means keeping track of sales, theft, spoilage, and available inventory. The management is kept informed about each of these items through the system for inventory control.

In this approach, management can predict when specific goods are running low and when the company's storage and independent retailers need to be restocked. The transfer of merchandise from the warehouse to the retail store, as well as sales as well as exchanges, are all tracked by the inventory system. In just about any business involved with the inventory and storing of items, it is among the most crucial types of information systems for management. Because the items and services being housed are essentially currency, MIS is required (Brancheau & Wetherbe, 1990).

1.2.4. Sales and Marketing

That system assists managers in carrying out or monitoring the effectiveness of a company's sales and marketing efforts.

The marketing tasks handled by the selling and advertising system are listed below.

a) Estimated sales
b) Increasing the caliber of goods
c) The management of distribution networks
d) Putting together and monitoring the ad plans and shops
e) Using marketing, public relations, as well as sales strategies that work
f) Advertising, promotions, as well as cost

1.2.5. Human Resources

With the help of such a management information system, management can regulate how data travels across the company. The automation control data system includes electronic devices that managers use to interact with other managers of units, their staff, or even the workers to interact with one. Cell phones, landlines, video, web, net, mail, voicemail messages, teleconferencing, and document sharing are among the media technology. A system for managing human resources maintains track of personnel and their hiring. The regular monitoring of staff is also handled by it (Diamond & Khemani, 2006).

Payroll, benefits, and retirement—which are also tracked by this program and will be an element of the financial and accounting systems—are tracked. The human capital system keeps a record of many more things. Providing legal conformity alerts, required training opportunities, and HR regulations helps communicate among staff members, HR, and management. It handles everything, including maintaining track of worker keeping time, job presence, allocated and utilized leaves, and enabling staff to use sick or vacation days without involving the boss. Additionally, this information management system streamlines recruitment by gathering and analyzing applications and finding and compiling competent future candidates. (Daft et al., 1987).

1.2.6. Accounting and Finance

The accounting and financial systems keep records of a company's investments and resources. The information from such reports is gathered for the legal and financial statements needed to handle federal, employment, taxation, insurance, and pension funds. Such a system creates yearly reports for senior managers in addition to the required information for routine financial inspections.

The daily recording of routine transactions like sales revenue, bank deposits, transfers, and refunds is also made easier by the accounting and finance system. That system generates all monthly and yearly reports, including balance sheets and profits and losses statements. For top and middle management to follow and contrast the present financial position with the previous financial condition of the firm and to set future growth goals, such reports are essential for understanding the effectiveness of the company(Loch et al., 1992).

1.2.7. Decision Support System

That system is set up to assist the management in making decisions whenever necessary.

It collects information both from inner and outer data. Some instances of internal sources of data are manufacturing, sales, inventory, or financial documents. At the same time, population numbers, rate of interest, as well as the price of building new homes are cases of external resources. For example, while defining yearly sales objectives, a manager uses a decision analysis system to consider internal and external factors.

1.2.8. Expert System

The expert system is made to capture, preserve, and again utilize the information of an expert system on a particular subject to help those with less experience make choices (Dibbern et al., 2004).

> **Did you know?**
>
> An expert system's machine learning is a crucial component. Expert systems make decisions based on logical presumptions and detect your behaviors based on prior behaviors you have performed in comparable circumstances.

1.2.9. Executive Information System

An executive manager may supervise leaders with the help of the organizational information system, thanks to its well-thought-out architecture. Giving data by the type of charts and tables such a system makes it simple for managers to analyze data and make informed judgments.

1.2.10. Transaction Process System

A transaction process system's job is to gather and analyze the information generated by ordinary organizational operations. Orders, payments, deposits, and reservations are examples of functions.

1.2.11. School Information Management System

A school can efficiently manage daily operations with the help of a school information system (SIMS). Several schools are utilizing such technology to address each of the behind-the-scenes operations of a school and mold the brains of youth (Peppard & Ward, 2004).

The school data system has decreased the workload associated with maintaining and monitoring attendance of student records. The school management system now efficiently completes this task, freeing instructors' time for these other valuable endeavors.

1.2.12. Local Databases

Another type of management information system is the local database. Local databases offer comprehensive data on the populations spread throughout a nation. Such databases use information from public records, integrated community service offerings, open trading listings, and social survey responses (Brancheau & Wetherbe, 1987).

1.3. Role of MIS in Commercial Operations

A management information system (MIS) is vital to commercial operations.

What is the function of MIS: There are several MIS responsibilities, and many of the more essential roles are described here:

a) Determination
b) Coordination within the division
c) Identifying Issues
d) Comparison of Organizational Effectiveness
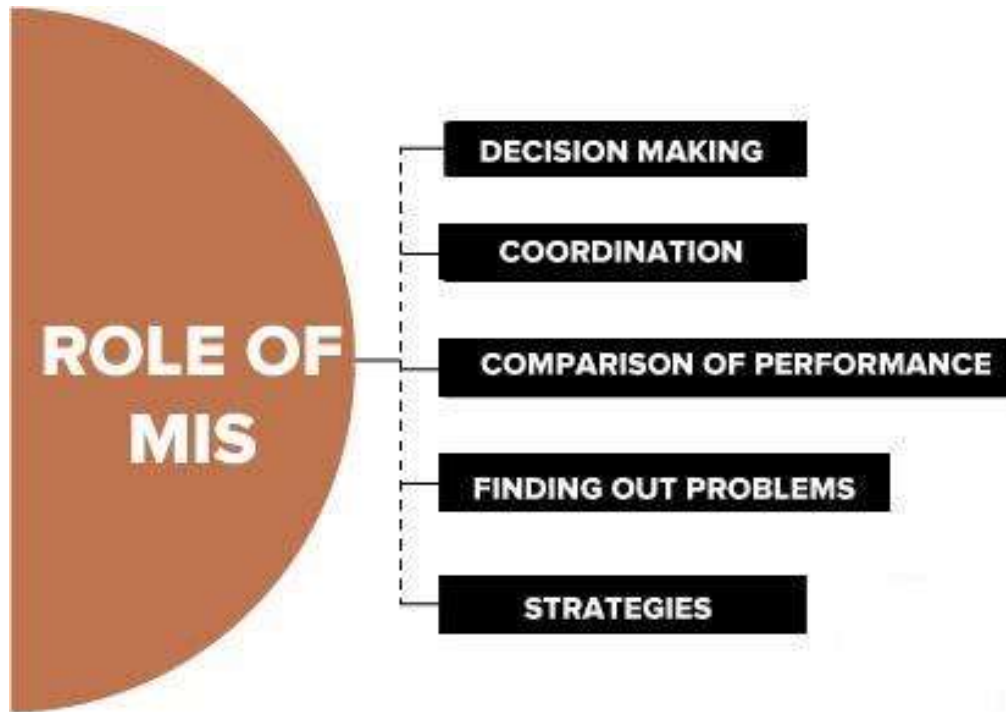e) Organizational Methodologies

Figure 1.5. Schematic description of various functions of MIS (Source: Geek Tonight, Creative Commons License)

Management Information System (MIS) is critical in every company's decision-making procedure. In every company, decisions are made based on data that may be acquired from the MIS (Robertson & Fitzgerald, 1990).

The Management Information System satisfies the diverse requirements of a company's functional divisions.

Tip: MIS delivers important information on each element of an organization's activity. Therefore, if leadership makes a mistake, MIS data will help in locating a remedy to that issue

The MIS database stores all historic data and details. It seems the management data system is so essential for comparing the results of commercial organizations

Today's businesses operate in a highly competitive market, which necessitates implementing strategic planning. An MIS assists the company in developing the methods necessary to thrive in a competitive global environment. (Seifer & MacLaughlin, 2007)

1.4.   Importance of MIS in Organizations

MIS, as well as organizations, are interdependent. Managers construct data systems to satisfy the needs of a commercial organization. In addition, the organization must be conscious of and receptive to the effects of information management to reap the benefits of emerging technology.

The connection between information systems and organizations is complicated and impacted by several intermediary elements, such as the design, operational procedures, economics, ethos, environmental factors, as well as management choices of the business. As a manager, one must comprehend how information technology might affect social and professional life in their organization. Without knowing their corporate structure, they will be unable to properly build new technologies or comprehend current ones (Lee & Kim, 1992).
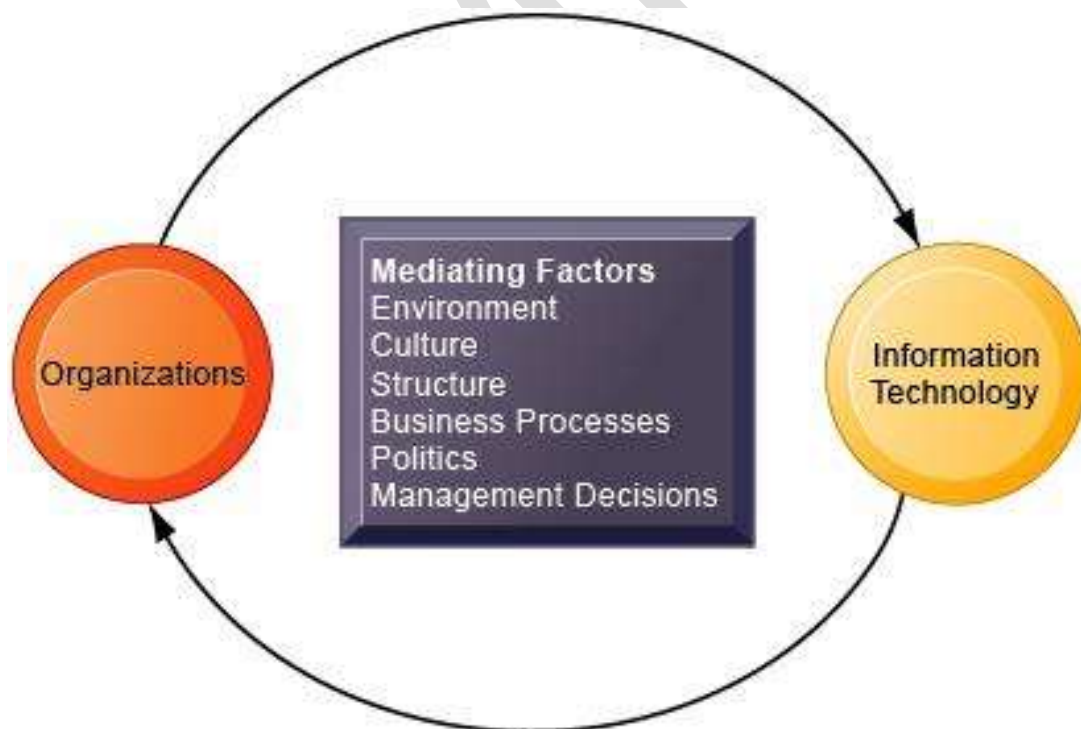

Figure 1.6. Illustration of relation between MIS and Organization (Source: Kenneth et al. Creative Commons License)

The Bidirectional Relationship:

1. Several elements handle it, such as decisions, organizational values, bureaucracy, economics, business style, and pure science.
2. Organizations, as well as information systems, exert a reciprocal impact on one another.
3. The management information system must match the requirements of the company. To reap the advantages of new technology, the company has to be conscious of that and receptive to the effects of the data system.
4. Data systems impact organizations, as well as organizations, and inevitably influence the design of data systems.
5. Managers choose which systems will be developed, their functions, and how these will be deployed.

1.5.   Subsystems of MIS

Various subsystems can make up a system, and everyone includes components, relationships, and goals. Subsystems carry out specialized activities of the overarching goals of the complete system.
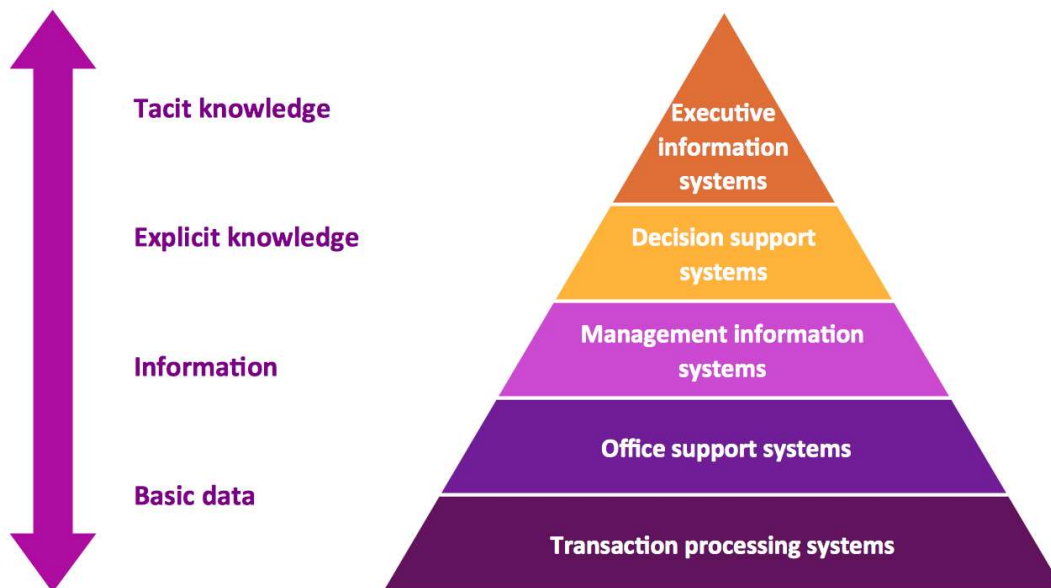
Figure 1.7 Diagram representing the subnetworks of the Information Management System
(Source: Concept Draw, Creative Commons License)

A system may consist of subsystems or essential components and operates on several levels (Zvyagina et al., 1990).

The components of the data management system include the following:

1. Processing Transactions

2. System of Management Reporting

3. System for Supporting Decisions

4. Information system for offices

5. Business Professional System

1.5.1. Transaction Processing System

It is described as an interchange between two or more organizations in a system that processes transactions. A company's primary business operations, including selling, manufacturing, stock, shipment, collecting, bill, accounts paid, account payables, payroll, ledger accounts, etc., are reflected in total processing transactions, sometimes referred to as information processing. Transaction processing is collecting data on activities that are significant events for a company (Nolan & Wetherbe, 980). The primary role of a transaction processing system is to capture, handle, verify, and record transactions that happen across different functional sections of a company for later retrieval and usage. Methods of information with several functions called "transaction processing systems" handle data from actual business activities (Cario et al., 1999).

1. A TPS keeps track of all business transactions, whether both internal or external.
2. A TPS completes simple and monotonous duties. Most lower-level management uses it while making operational choices.
3. Transactions may be performed online or in a batch system. The batch method updates data regularly, whereas the online mode records every action as it happens.
4. Data entry, data gathering, validation of data, processing, and re-validation, storing, output creation, and query assistance are the six steps of the TPS.

1.5.2. Management Reporting System

Of all the management-oriented MIS elements, management monitoring systems are among the most complex. Its primary goal is to offer printed reports and query possibilities to middle and lower leadership to support the maintenance of managerial and operational command over the organization (Polat et al., 2016).

1. Information system professionals, not interface, often create MRS.
2. Instead of forecasting the future, MRS is focused on reflecting on the present and the past.
3. MRS primarily covers internal business activities.
4. MRS typically possesses inadequate analytic skills.
5. MRS does not immediately assist in making decisions.

6. MRS offers Demand or Ad-hoc Reports, Exceptional Findings, and Fixed or Recurring Findings.

1.5.3. Decision Support System

Computerized information systems which assist decision-making processes are referred to as decision support. Interactive computer-based components and techniques known as DSS are designed to support choice. A DSS could employ an optimization method or machine intelligence to convey information visually. DSS is frequently created with a quality management layer and a long-term planning managerial level in mind (Agarwal et al., 1994).

1. DSSs support decision-makers in semi-structured as well as uncontrolled issues.

2. Unlike expected information flows, individual choices are the main emphasis of DSSs.

3. DSS shows information visually and might even contain artificially intelligent or specialist systems

4. Over time, DSSs are flexible.

1.5.4. Office Information System

An information system that employs networking, hardware, and software to improve staff communication and productivity is known as an office information system. Office automation is the use of communication as well as computer technology for administrative tasks (Bižić-Omčikus et al., 2005). By offering secretarial support and enhanced communication services, office automation technologies are intended to increase the efficiency of managers at different management stages. Office automation systems are an information system's collection of hardware, software, and human resources that handle office transactions and support office operations at all management units. Such systems come with various support tools, such as word documents, electronic filing, email, messaging shifting, storage systems, information, voice interaction, etc. (Boiko et al., 1985).

1.5.5. Business Expert System

The business expert system is a knowledge-based software application that assumes the role of authority by applying its understanding of a particular, intricate application area. Among the knowledge-based information systems is this system. The expert system gives managers guidance from an expert in a specific issue area as choice assistance. Expert systems are used in various fields, including medicine, engineering, and business.

1.5.6. A Subsystem of Activity

Understanding the Information subsystems also requires understanding the subsystem from the activity standpoint. The processing activity might be carried out at four stages in every functional department.

Different tiers of human resources within the company manage such layers. For instance, the clerical operations staff often handles processing transactions, while operational control falls within the purview of lower managerial levels. The intermediate and highest layers of the management directly oversee the administrative control and planning processes. The average user experience for such activity modules is listed in the following table:

Table 1.1. Tabular data about Activity Subsystem (Source: Dinesh Verma, Creative Commons License)

Activity Subsystem	Typical Users
Transaction processing	Clerical Staff
Operational control	Junior Level Managers
Management control	Middle-level Managers
Strategic planning	Top Level Managers

1.6.   Operating Requirements of MIS

Such systems are intended to provide information to an association's vital personnel. Such systems utilize for already transaction information that has been generated by the TPS as well as creates informative reports based on this data. This type of system may include people data systems, advertising data management, sales data management, manufacturing, and operational systems, and so forth. Such systems are created using organizational behavior ideas. Most users of these types of systems are management consultants (Sørensen et al., 2010).
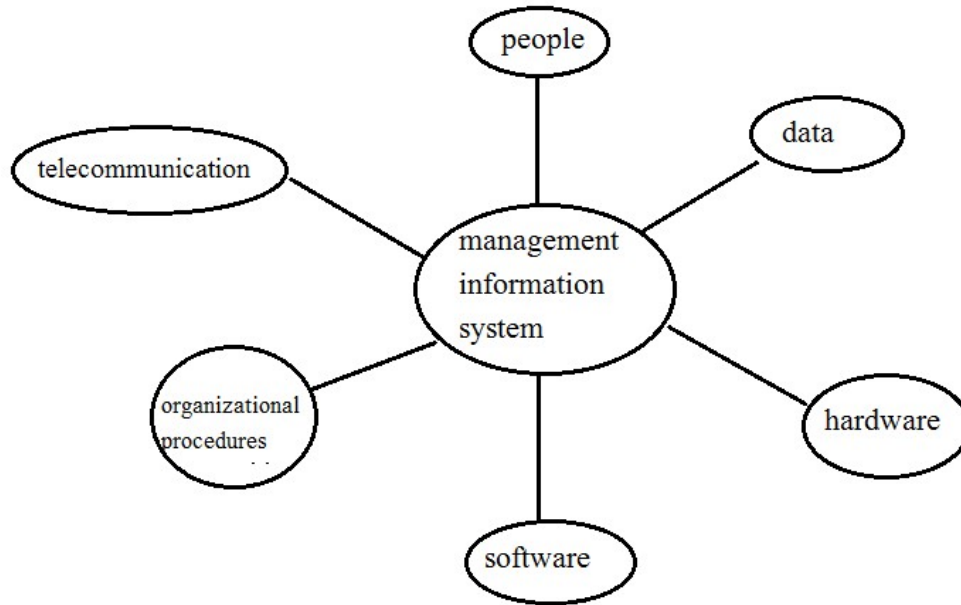
Figure 1.8. Illustration of some operating requirements of MIS (Source: Yugal Joshi, Creative Commons License)

Every information system includes the following individual parts:

1.6.1. Hardware

The system's apparatus and gadgets for input, output, data stores, computation, and connections.

1.6.2. Software

The group of programs to support processing systems like application software and the modeling foundation are all examples of software.

1.6.3. Data Base

On storage devices systems like electronic tapes, hard disks, and floppy diskettes, managerial statistics by different software programs are often saved in the arrangement of databases and files (Sani et al., 2014).

1.6.4. Procedures

Documented operating processes in the shape of physical guides are an integral part of MIS. Operating Guides, User Guides, as well as Systems Manuals are the three primary classifications for these publications.

1.6.5. Operating Personnel

The operating personnel for such data systems consists of system administrators, systems engineers, administrators, programmers, data entry specialists, and computer programmers.

The following are the primary processor activities in data systems:

1.6.6. Handling of Commercial Transactions

To collect, gather, store, save, and process business-related activities so that their impact is reflected in organization statistics (Nisar et al., 2018).

1.6.7. Updating Master Files

The impact of such transactions is transferred to the current records of the organization's effectiveness while updating master files. The state of any entity should be reflected in the master data at all times, taking into account the effects of transactions.

1.6.8. Production of Information Summaries

After processing transactions and updating master files, data findings are created to aid managers' decision-making.

1.6.9. The processor of Interactive Inquiries

Online data systems generally give the ability to reply to business questions asked by executives on files – including master and transaction records (Weill et al., 2002).

1.6.10. Delivering Active Analytical Help

Not only do the key decision-makers have to engage with the file systems to retrieve information with the assistance of scientific and organizational models, but they also require processed online assistance to analyze the effect of several potential actions. A Decision Support System is a result whenever the system can pull information from relevant documents and apply it to the user-selected categories.

1.7. Structure of MIS

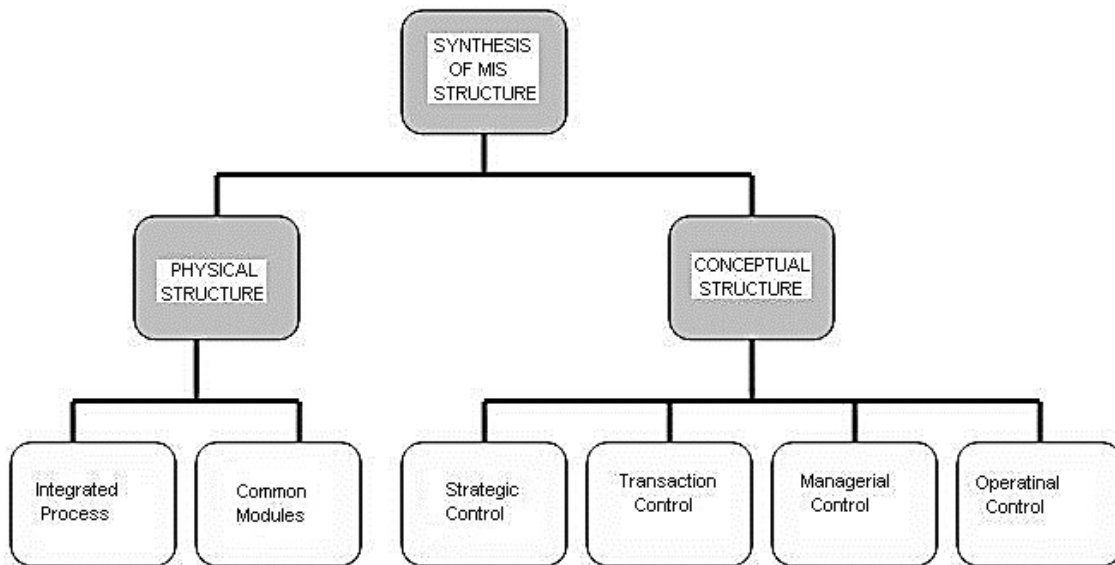The structure might be comprehended by examining both the physical and conceptual structures:

Figure 1.9. Diagram representing the MIS Structure (Source: Dinesh Verma, Creative Commons License)

1.7.1. The Conceptual Structure

The proposed framework may be characterized as an interconnected system of operation stages, all of which may be subdivided into four distinct data items:

a) The transaction processing system

b) Informational system for effective control

c) Administrative information system for management and

d) System for strategic planning information.

The organization's functional systems would utilize subsystem-specific data files and generic file systems that many subsystems may use. The database notion shared by several functional areas is referred to as a generic database and therefore is handled by a database management system (Roberts, 1985). In parallel to the software programs generated for every functional department, a micro-view of the MIS framework would also reveal the existence of the software program. In addition, the MIS utilizes a model foundation explicitly designed for MIS monitoring and decision safety nets. A variety of programs share the model foundation and shared software applications even within functional domains (Trend, 2001). Whenever software applications for upper executives, managerial level, management executive, and executive functions are combined with universal software applications, the resulting management system has a comprehensive conceptual framework (Peroulis et al., 2005).