

## UNIT-I

### 1.Information and System Concepts

Management Information System is an accumulation of 3 different terms as explained below.

**Management:** We can define management in many ways like, “Manage Man Tactfully” or Management is an art of getting things done by others. However, for the purpose of Management Information System, management comprises the process and activity that a manager does in the operation of their organization, i.e., to plan, organize, direct and control operations.

**Information:** Information simply means processed data or in the layman language, data which can be converted into meaningful and useful form for a specific user.

Information is a set of classified and interpreted data used in decision making. It has also been defined as 'some tangible or intangible entity which serves to reduce uncertainty about future state or events' (Lucas, 1978). A management information system (MIS) is 'an integrated user-machine system for providing information to support operations, management and decision making functions in an organization. The system utilizes computers, manual procedures, models for analysis, planning, control and decision making, and a database' (Davis and Olson, 1984). MIS facilitates managerial functioning. Management information is an important input at every level in the organization for decision making, planning, organizing, implementing, and monitoring and controlling. MIS is valuable because of its content, form and timing of presentation. In the context of different levels of decision making, information can be described as:

- source,
- data,
- inferences and predictions drawn from data,
- value and choices (evaluation of inferences with regard to the objectives and then choosing a course of action), and
- action which involves course of action.

The MIS concept comprises three interrelated and interdependent key elements: management, system and information (Murdick and Ross, 1975).

**System:** The system can be explained in a following ways:

System can be defined as a set of elements joined together for a common objective.

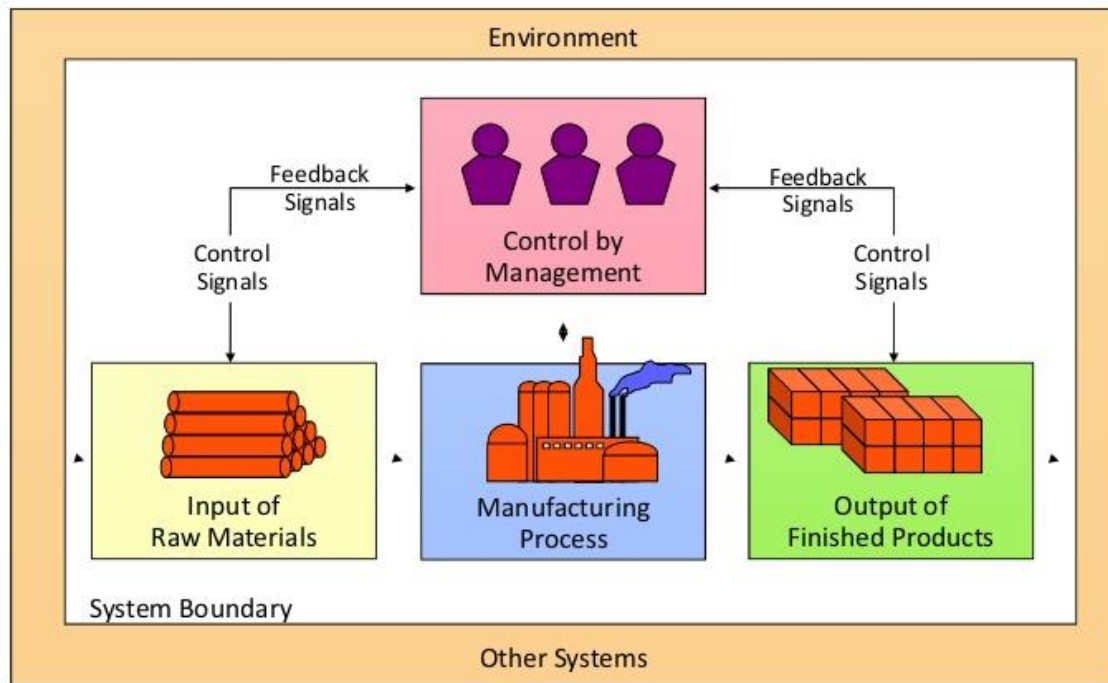
1. A group of interrelated or interacting elements forming a unified whole
2. e.g., business organization as systems.
3. A group of interrelated components working together towards a common
4. goal by accepting input and producing output in an organized
5. transformation process.

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## System Concept

The **system concept** of **MIS** is, therefore one of optimizing the output of the organization by connecting the operating subsystems through the medium of information exchange. ... It is also known as the **Information System**, the **Information and Decision System**, the computer based **Decision System**.

## System concept



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The MIS is an arrangement of data processing and information systems in an orderly manner to support the management in achieving the business objectives. The MIS boundaries cross the limits of the organization and draw the data from the source external to the organization. MIS follows a generalized model of a system as stipulated into the theory and performs on the principle of feedback and control. It works on the principle of control by exception.

MIS is designed to provide the information which is exceptional in nature from the point of view of business. The exceptions could be abnormal events, surprising developments, shocking news, or something that was not consistent with the exceptions. The MIS must catch all such points and reports then to the concerned management. It must, therefore, recognize all such possible points and provide a measure for comparison with the actual performance. Unless such a feature is included, the MIS will be supplying merely data and not information.

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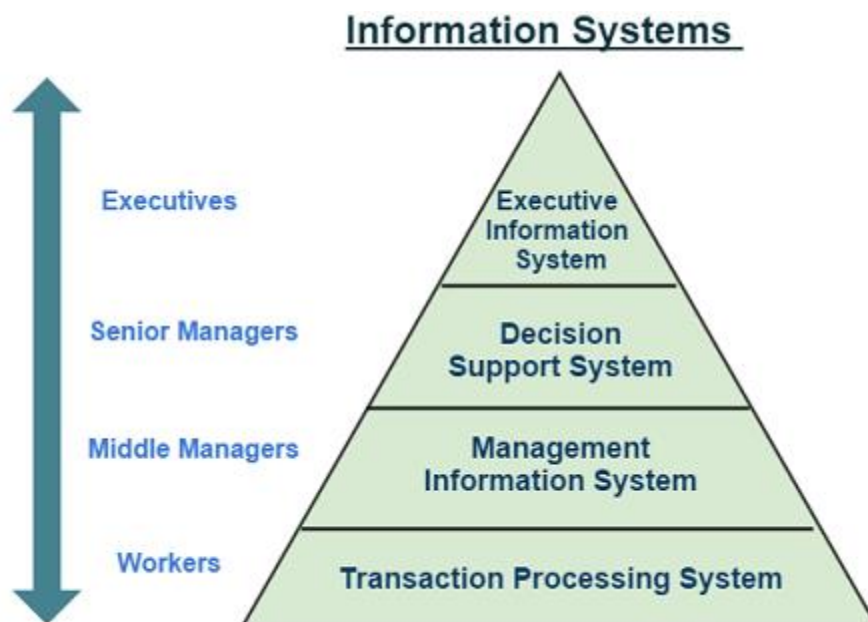
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The MIS, initially, concentrates on the quality of input satisfying the parameters, viz., impartiality, validity, reliability, consistency and age. A large amount of system effort is spent in this area to ensure the quality of the input.

The MIS provides a system for data processing and data analysis. It uses a number of applications and business models, operational research models and applications and business models, operational research models and application packages to produce the information. The MIS has a provision to display the information and also print it in a report format. It also provides a facility to store the intermediate results, which are used in a number of other systems. The MIS is a combination of the deterministic and the closed systems, and the probabilistic and the open systems.

## 2. Types of Information Systems on Organizations

Types of Information Systems



There are various **types of information systems**, few of them are listed below:

1. Transaction processing system
2. Management information system
3. Decision support system
4. Executive information system

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## 1. Transaction Processing Systems (TPS)

A **Transaction Processing Systems (TPS)** is used primarily for record keeping which is required in any organization to conduct the business. Examples of TPS are sales order entry, payroll, and shipping records etc. TPS is used for periodic report generation in a scheduled manner. TPS is also used for producing reports on demand as well as exception reports.

Every firm needs to process transactions in order to perform their daily business operations. A transaction refers to any event or activity that affects the organization. Depending on the organization's business, transactions may differ from one organization to another. In a manufacturing unit, for example, transactions include order entry, receipt of goods, shipping, etc., while in a bank, transactions include deposits and withdrawals, cashing of cheques etc.

However, some transactions, including placing orders, billing customers, hiring employees, employee record keeping, etc., are common to all organizations. To support the processing of business transactions, the transaction processing systems (TPS) are used in the organizations.

### Office Automation Systems

An office automation system (OAS) is a collection of communication technology, computers and persons to perform official tasks. It executes office transactions and supports official activities at every organizational level. These activities can be divided into clerical and managerial activities. Clerical activities performed with the help of office automation system include preparing written communication, typesetting, printing, mailing, scheduling meetings, calendar keeping, etc. Under managerial activities, office automation system helps in conferencing, creating reports and messages, and controlling performance of organization. Many applications like word processing, electronic filing and e-mail are integrated in office automation system.

**Word Processing:** Word processing is used for the preparation of documents like letters, reports, memos, or any type of printable material by electronic means. The text is entered by keyboard and displayed on the computer's display unit. This text can be edited, stored, and reproduced with the help of commands present in the word processor. Word processors have facilities for spell checking, grammar checking, counting (character, lines, pages, etc.), automatic page numbering, index creation, header and footer, etc.

**Email:** E-mail or electronic mail facilitates the transfer of messages or documents with the help of computer and communication lines. This helps in speedy delivery of mails and also reduces time and cost of sending a paper mail. E-mail supports not only the transfer of text messages but it also has options for sending images, audio, video, and many other types of data.

**Voice Mail :** Voice mail, an important call service, allows recording and storing of telephone messages into the computer's memory. The intended person can retrieve these messages any time.

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## Knowledge Work Systems

A knowledge work system (KWS) is a specialized system built to promote the creation of knowledge and to make sure that knowledge and technical skills are properly integrated into business. It helps the knowledge workers in creating and propagating new information and knowledge by providing them the graphics, analytical, communications, and document management tools.

The knowledge workers also need to search for knowledge outside the organization. Thus, knowledge work system must give easy access to external databases. In addition, knowledge work systems should have user-friendly interface to help users to get the required information quickly and easily.

Some examples of knowledge work systems are computer-aided design (CAD) systems, virtual reality systems, and financial workstations.

**Computer-aided design (CAD) systems:** These systems are used for automating the creation and revision of designs using computers and graphics software. The CAD software has the capability to provide design specifications for tooling and manufacturing process. This saves much time and money while making a manufacturing process.

**Virtual Reality System:** These systems have more capabilities than CAD systems for visualization, rendering and simulation. They make use of interactive graphics software to build computer-generated simulations which almost look like real. They can be used in educational, scientific and business work.

**Financial Workstations:** They are used to combine a wide range of data from internal as well as external sources. This data includes contact management data, market data and research reports. Financial workstations help in analyzing trading situations and large amount of financial data within no time. It is also used for portfolio management.

## 2. Management Information Systems (MIS)

**Management Information System (MIS)** provides the management routine summary of basic operations of the organization. The essential services are recorded by the TPS of the organization and MIS consolidates the data on sales, production etc. MIS provides routine information to managers and decision makers. The primary objective behind installing an MIS in the organization is to increase operational efficiency. MIS may support marketing, production, finance, etc.

Management information systems are especially developed to support planning, controlling, and decision-making functions of middle managers. A management information system (MIS) extracts transaction data from underlying TPSs, compiles them, and produces information products in the form of reports, displays or responses.

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These information products provide information that conforms to decision-making needs of managers and supervisors. Management information systems use simple routines like summaries and comparisons which enable managers to take decisions for which the procedure of reaching at a solution has been specified in advance.

Generally, the format of reports produced by MIS is pre-specified. A typical MIS report is a summary report, such as a report on the quarterly sales made by each sales representative of the organization. Another type of management information system report is an; for example, 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. However, if managers want to view the daily or hourly data, MIS enables them to do so. In addition, they provide managers online access to the current performance as well as past records of the organization.

### 3. Decision Support System (DSS)

**Decision Support System (DSS)** serves the management of an organization. A decision support system has sophisticated data analysis tools, which support and assist all aspects of problem-specific decision-making. DSS may use data from external sources such as current stock prices to enhance decision-making. DSS is used when the problem is complex and the information needed to make the best decision is difficult to obtain and use. DSS is developed with the help of decision-makers in an organization. DSS helps in the appropriate decision-making process and does not make any decision.

A decision support system (DSS) is an interactive computer-based information system that, like MIS, also serves at the management level of an organization. However, in contrast to MIS, it processes information to support the decision making process of managers. It provides middle managers with the information that enables them to make intelligent decisions. A decision support system in a bank, for example, enable a manager to analyze the changing trends in deposits and loans in order to ascertain the yearly targets.

Decision support systems are designed for every manager to execute a specific managerial task or problem. Generally, they help managers to make semi-structured decisions, the solution to which can be arrived at logically. However, sometimes, they can also help in taking complex decisions. To support such decisions, they use information generated by OASs and TPSs.

Decision support systems have more analytical power as compared to other information systems. They employ a wide variety of decision models to analyze data or summarize vast amount of data into a form (usually form of tables or charts) that make the comparison and analysis of data easier for managers. They provide interactive environment so that the users could work with them directly, add or change data as per their requirements, and ask new questions.

## 4. Executive Information System (EIS)

An **Executive Information System (EIS)** is also called the Executive Support System. Senior managers of an organization use the EIS. Therefore, it must be easy to use so that executives can use it without any assistance. EIS can do trend analysis, exception reporting and have drill-down capabilities. The results are usually presented in a graphical form tailored to the executive's information needs. EIS has on-line analysis tools and they access a broad range of internal and external data.

An executive support system (ESS) – an extension of MIS – is a computer based information system that helps in decision making at the top-level of an organization. The decisions taken with the help of executive support system are non-routine decisions that effect the entire organization and, thus, require judgement and sight.

As compared to DSSs, ESSs offer more general computing capabilities, better telecommunications and efficient display options. They use the advanced graphics software to display the critical information in the form of charts or graphs that help senior executives to solve a wide range of problems. To make effective decisions, they use summarized internal data from MIS and DSS as well as data from external sources about events like new tax laws, new competitors, etc. They filter, compress, and track data of high importance and make it available to the strategic-level managers.

Executive support systems help to monitor performance, track activities of competitors, identify opportunities, and forecast trends. They also assist senior managers in answering the following question:

- What business should we do?
- How are our competitors doing the business?
- Which units can be sold and which new units are to be bought?

## 3. Decision Making Process

Decision-making is an essential component of organizational life. Decision makers receive and analysis information using many different media, including traditional print, group and interpersonal information exchanges and computer-based tools. Decision support systems (DSS) is a generic concept that describes information systems that provide analytical modelling and information to support semi-structured and unstructured organizational decision making. Common characteristics of DSS include:

- Problem structure, used in semi-structured and unstructured decision context
- Intended to support and augment decision makers not replace them
- Supports most phases of decision-making process
- Uses underlying data and model
- Interactive: DSS is designed to be an interactive decision aid

A decision support system (DSS) is an integrated set of computer tools allowing a decision maker to interact directly with computer to retrieve information useful in making semi structured and unstructured decisions (Power, 2002,. Ezine, 2010. James, 1998). The Decision support system are able to help groups to make the decision .It should not be responsible for individual decision making .The Decision support system is easy to use .A user should not be required to be computer operator to generate reports .It should be convenient for the user to use DSS (Singh & Sharma, 2012).

### INTRODUCTION:-

- ◉ The word decision has been derived from the latin word 'decidere' which means cutting away or cutting off,
  - ◉ A decision involve a cut of alternative between those that are desirable and those are non desirable
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### DECISIONS MAKING

- ◉ *Decision making is the developing concepts leading to the selection of a course of action among variations. Every decision making process produces a final choice*
  - ◉ *It can be an action or an opinion. It begins when we need to do something but we do not know what*
  - ◉ *e.g. Decision to raise a Purchase Order*
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## **IN DECISIONS MAKING THREE ASPECT OF HUMAN BEHAVIOUR ARE INVOLVED**

➤ Cognition:-

Activities of mind associated with knowledge

➤ Conation:-

The action of the mind implied by such words as willing, desire etc..

➤ Affectation:-

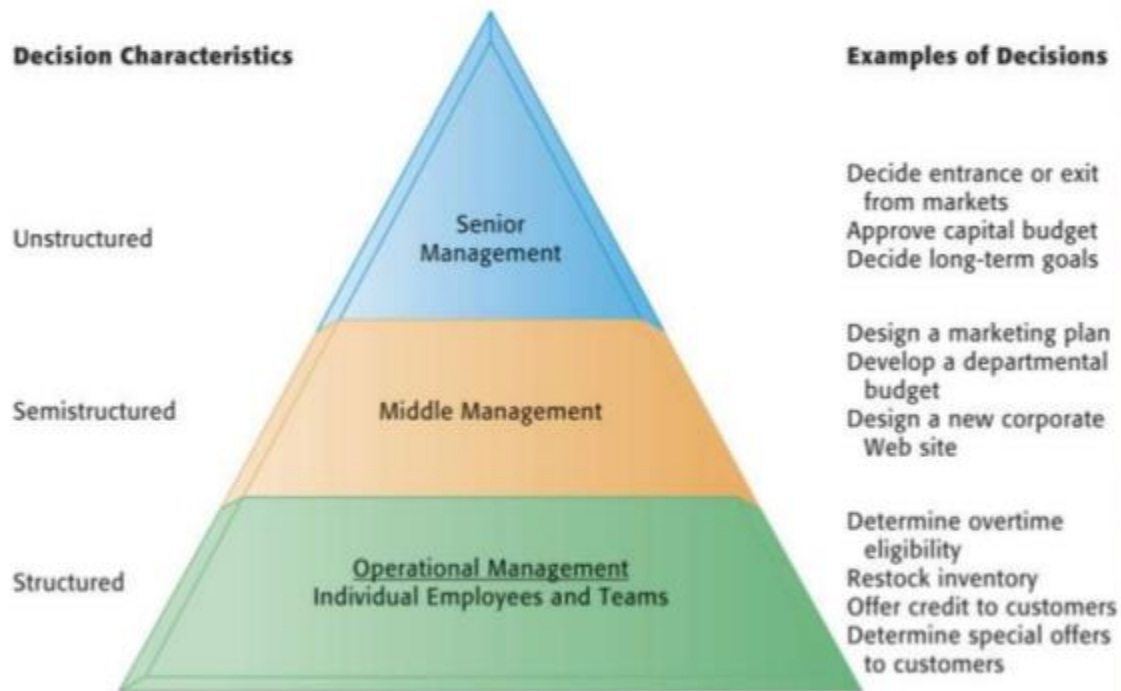
The aspect of mind associated with emotion, feeling, mood.

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## **TYPES OF DECISIONS**

- ◉ Unstructured/ Nonprogrammed
  - ◉ Structured/ Programmed
  - ◉ Semi-structured
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## INFORMATION REQUIREMENTS OF KEY DECISION-MAKING GROUPS IN A FIRM



## THE DECISION-MAKING PROCESS

### Phases of Decision Making Process

- Intelligence
- Design
- Choice
- Implementation

1. **Intelligence:** In this phase the decision maker scans the environment and identifies the problem/opportunities. The scanning of environment may be continuous or intermittent.

This phase involves Problem searching and Problem Formulation

Problem = Desired/Expected – Actual/Reality.

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When the problem is identified, there is always a risk of solving the wrong problem. To avoid such risk, it is very important that the problem is well understood and clearly stated.

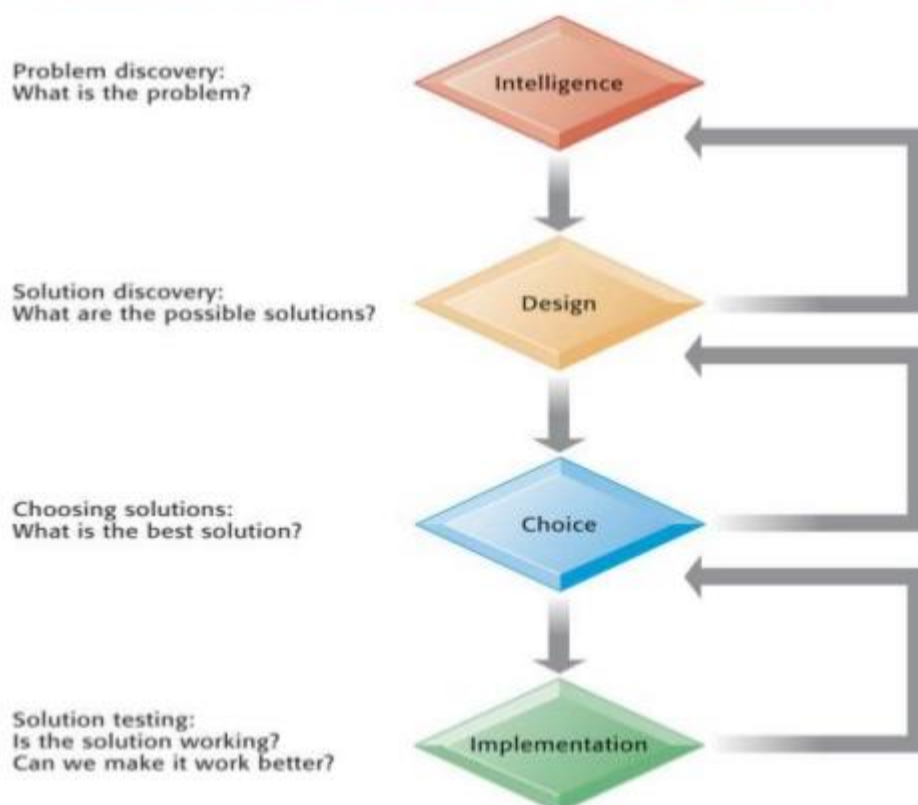
In many cases the process of clearly defining the problem is sufficient.

In problem formulation, establish the relations with some problem solved earlier will be useful.

2. **Design Phases:** In this phase the decision maker identifies alternative courses of action to solve the problem. Inventing/ Developing various alternatives is a time consuming and crucial activity as the decision maker has to explore all possible alternatives and he/she cannot take a risk of missing any alternatives, as the missed alternative might be the best one.
3. **Choice Phase:** In this phase, one of the alternatives developed in design phase is selected and is called a decision. For selecting an alternative a detailed analysis of each and every alternative is made. Having the decision, it is implemented.

**Simon's model** of decision making suggests three phases and the flow of activities is from intelligence, to design and to choice. However at any phase, the decision maker may return to a previous phase.

## STAGES IN DECISION MAKING



## **4. Individual and Organizational modes**

Individual people are motivated primarily by economic incentives, human beings are essentially passive agents, who are manipulated, motivated and controlled by the organization.

The feelings of the people are essentially irrational and must be controlled to achieve rationality and self interest.

The scientific management movement was based on the belief that by rationally explaining the one best way to do things and offering incentives to workers in the form of piece rates and bonuses, organisational output can be increased.

Organisational Model:

An organisation model, also called an organisational structure, defines an organisation through its framework, including lines of authority, communication duties and resources allocations.

A model is driven by the organization goals and services.

- An organizational model includes a number of elements.
- Organisational units identify jobs that work together to complete a specific work process.
- The model may incorporate multiple locations.
- Generally, organisational models are classified as functional, product base or matrix structure.
- Functional organisations are traditional business hierarchies.
- Functional models are most effective in a business.
- Wise business owners and leaders examine the organizational model on a regular basis to ensure that it supports their strategic goals and mission.
- Model analysis begins with an evaluation of the completion, studying key competitors to determine their organizational structure, marketing, management and production systems.

Successful business leaders examine their personal goals and style and modify them as needed to support their employees in begin productive, dedicated workers.

## **5 Managing H/W and S/W & Data resources in MIS**

The management of hardware and software assets has become much more complex since the days when the corporate user had one PC on the corporate LAN running a small number of applications. These days, users employ a range of applications on their PCs, laptops and handheld devices, each requiring support. The complexity is compounded by the increasing number of corporate users working on the road or in remote offices that are beyond the reach of traditional LAN-based management systems. With more systems and more applications in more places, budget-constrained IT departments face a considerable challenge.

In addition to cost and control considerations such as inventory and asset management, or logistical concerns such as technical support, hardware and software management is in many ways a security issue. As more people work from remote offices, on the road or from home,

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IT departments have come to realize that user-initiated configuration changes and out-of-date software on remote machines are the new weakest link in corporate security. The following are four considerations for the simple, secure management of hardware and software assets in the enterprise:

## **Hardware and Software**

Simply put, the first step toward the effective management of hardware and software is learning what hardware and software is deployed. As employees change departments, new people are hired and existing employees leave the company, PCs and other devices are redeployed and loaded with different software versions. As a result, it can be very difficult to track hardware or software seat licenses for the purposes of resource deployment and the management of IT spending. Discovering all hardware and registered software can help save you money, and identifying unapproved software on a device might save you from a destructive virus or hacker.

## **Software Distribution**

Your IT department faces the ongoing challenge of distributing new software, virus profile updates, operating system patches and updates of existing software. The objective here is to push out updates to PCs, laptops and other mobile devices, without requiring workers to insert CDs or download files. Deployment of software should take place without the need for user intervention and without using bandwidth users require to keep working.

## **6.It infrastructures of the organizations and digital firm in mis**

### **Digital firm**

There has been a tremendous growth in expenditure in information technology over the past two decades. Companies have invested in information systems and have come to rely on functionality, reliability and availability of these systems to fulfil business processes effectively. Within the same period of time there has also been a tendency to increase connectivity within the organisation through the use of local and wide area networks. More over the availability of cheap communication networks and the Internet has prompted connectivity among the disparate systems leading to collaboration between different departments and between the organisation and its business partners.

Use technology to increase communication and collaboration has prompted the potential for rethinking and redesigning the corporate leading to:

- New organisational structure
- Reconfiguration of working culture

Results are invariably increased flexibility of the organisation and what we call a digital firm. In essence digital firm activities span across business activities comprehensively, including electronic commerce, electronic business and the electronic relationships.

### **New organisational structure**

Traditional organisation that has been developed before the information technology era is characterised by clear division of labour leading to inflexibility in terms of responding to

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need for change and reorganisation. Organisations change continuously in the way they do things or in products and services they offer.

Conventional organisation in the information age may be less competitive than the new entrants to the market in global economy because it may be slow to respond to potentials for new markets, the need to develop new products and services, reconfigure business processes for better efficiency and more effective customer management.

Traditional organisation has a rigid hierarchical structure. Pyramid shape of the organisation demonstrates many levels of middle management. In order to compete, many of these types of company have had to downsize, reducing the number of employees and the management layers. These changes have to be accompanied by other developments such as a shift in working culture and enabling the employees to take advantage of opportunities for personal growth or to allow them to manage themselves. This though has not always been the case.

The hierarchical structure of the organisation does not disappear and it persists with the contemporary firm. In digital firm, the level of hierarchy is greatly reduced leading to flatter hierarchical organisation. In designing a digital firm we endeavour to optimise the level of hierarchy to achieve balanced distribution of power among the various layers. Delegation of decision making and distribution of power is extended to the lower layers of the organisation and lower level employees are given greater powers to manage themselves and more authority to make decisions than in the past. A shift in culture takes place where employees are no longer required to work specified hours. Employees become outcome driven and their performance is measured against requirements and achievements as oppose to presence. Employees are much more likely to work flexible hours through the use of information technology. Working from home becomes more fashionable through provision of information and opening access to internal organisational infrastructure.

There are several dimensions which are considered important in information technology infrastructure. The most important issues are :

**Flexibility:** refers to the possibility to make changes in technologies and systems. Flexibility makes it possible to adapt to changing requirements. Modularity is manifested in ability to make changes in hardware and software components so that changes to one module are possible without the need to modify other parts of the system (Byrd - Turner 2000).

**Modularity:** makes it possible to make changes to changing business needs rapidly. Integration which is about the compatibility of hardware components and applications.

**Integration:** is result of connectivity and compatibility, it refers to the ability to access information across different platforms. Infrastructure should be a reliable basis for operations, but it should also be flexible, modular and tightly integrated.

As a result, flexibility, modularity and could be considered as an organizational core competency , and cornerstones in information technology infrastructure management. From the business perspective they are critical, they allow organization to respond to new conditions rapidly.

Infrastructure is used in information systems to refer to the basic systems that are shared amongst users of information systems. Infrastructure includes a wide range of technologies,

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computers and components together with applications and systems. Organization-wide email-systems can be seen as examples of infrastructure – they are common for all departments, users and provide communication services for a range of purposes. Infrastructure is expected to provide access to data at any time, with a variety of terminal devices . It is also increasingly common that systems can be used independently of location, from a portable computer, tablet or smartphone. In this article we look at inform

Management information system (MIS) refers to a large infrastructure used by a business or corporation, whereas information technology (IT) is one component of that infrastructure that is used for collecting and transmitting data.

A management information system helps a business make decisions and coordinate and analyze information. Information Technology supports and facilitates the employment of that system.

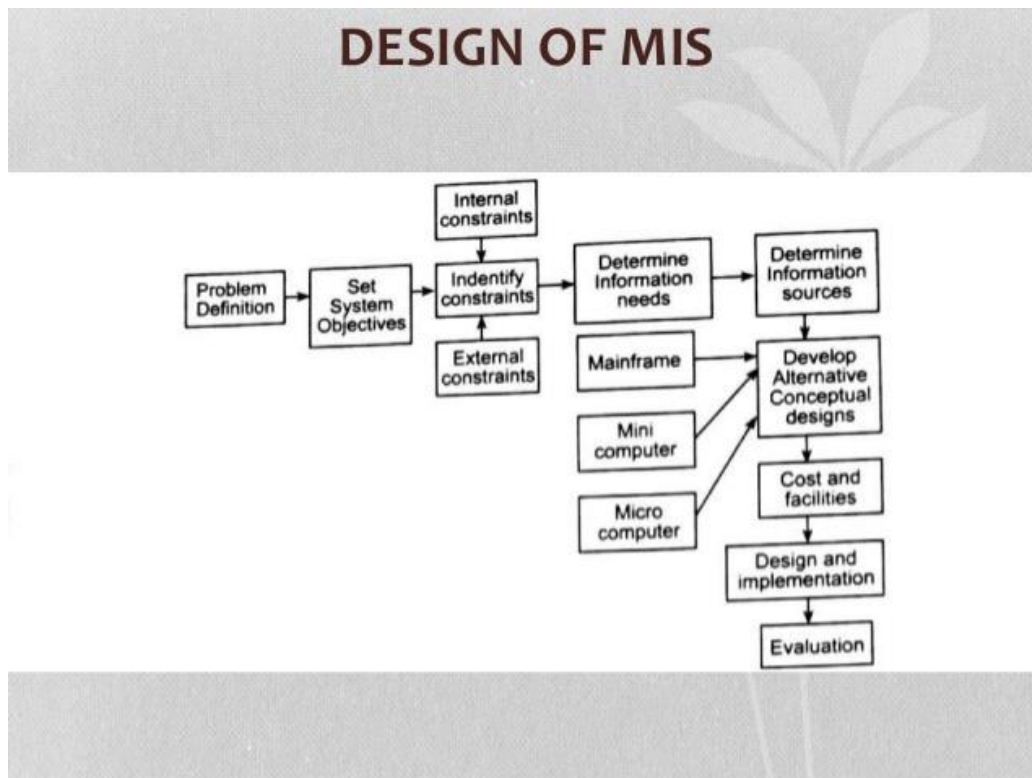
For example, IT could be a particular interface that helps users input data into a corporate MIS operation. However, that isn't to say that the scope of IT is narrow. In some ways, IT is a broader field than MIS. The particular goals of a particular IT application can fit neatly into a larger MIS framework; however, the reverse is not necessarily true.

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## UNIT-II

### 1. Importance of MIS Design

It helps in strategic planning, management control, operational control and transaction processing. It helps in the clerical transaction processing. ... It plays the **role** of information generation, communication, problem identification and helps in the process of decision-making.



#### **What is the importance of MIS?**

**MIS** plays a very **important** role in the organization; it creates an impact on the organization's functions, performance and productivity. The impact of **MIS** on the functions is in its management with a good **MIS** supports the management of marketing, finance, production and personnel becomes more efficient.

#### **What is the purpose of an MIS design for an organization?**

**MIS** is an **organized** method of providing past, present and projection information relating to internal operations and external intelligence. It supports the planning, control and operational functions of an **organization** by furnishing uniform information in proper time frame to help the process of decision-making.

## **2. Approaches for MIS-Design**

### **Approaches to Design of MIS:**

The approaches given here provide directions to the design team in developing MIS. It broadly specifies how information should flow to different layers of management and to different managers in each layer. John Buckley identified four approaches to MIS design which are listed in the order of least desired to most desired approaches. They include the shotgun approach, traditional approach, rational approach, and empirical approach.

#### **Shotgun approach**

The information requirements of different executives and employees vary with respect to the level of management and the position they hold. Under this approach, when an executive asks for some information, the system would provide all the related information relating to the query without sorting or filtering the unnecessary information. The system ignores the process of filtering the information or diagnosing the query so as to provide only relevant information. The executive then has to manually filter and sort the information according to his/her requirement. This approach can increase the cost to the organization, which includes the cost of gathering all the information as well as the cost of storing it (as it may consume a huge amount of space in memory).

#### **Traditional or integrative approach**

The essence of the traditional approach is to give the same kind of information to the decision maker that has proved successful time and again. The traditional or integrative approach uses integration of information systems across the functional departments of the organization. The integration of information into a centralized database helps in reducing costs by eliminating duplicate data. It helps in providing traditional reports to the managers which they are familiar with. This approach also suffers from certain disadvantages. The biggest disadvantage is that query specific information is seldom provided in this approach. The traditional approach is known to provide time-tested information which may not be as useful in the current scenario as it used to be in earlier cases. Hence, there exists a certain ambiguity for the managers while making decisions. Due to integration, the powers of the individual departments get shifted to the central offices or headquarters. This creates friction in the organizational layers and functioning, leading to a fall in revenues. If the MIS is implemented in big government organizations using this approach, it will result in an increase in costs.



### **Rational approach**

The rational approach is an improvement on the shotgun and traditional approaches. It incorporates the decision-making process in the MIS design, though in an abstract form. The rational approach emphasizes rationality and model building in the MIS design. The models are developed by experts who understand managerial decision-making and incorporate their recommendations in their models. Information dissemination depends on the managerial hierarchy, which indicates that different levels of management are treated discriminately by allowing varying levels of information to flow to them. This is done to provide the respective managers with the information required to help them in arriving at their decisions. Model building is based on certain assumptions and such assumptions may prompt the experts to include some variables and exclude others. But there is always a problem in distinguishing critical variables from non-critical ones.

### **Empirical approach**

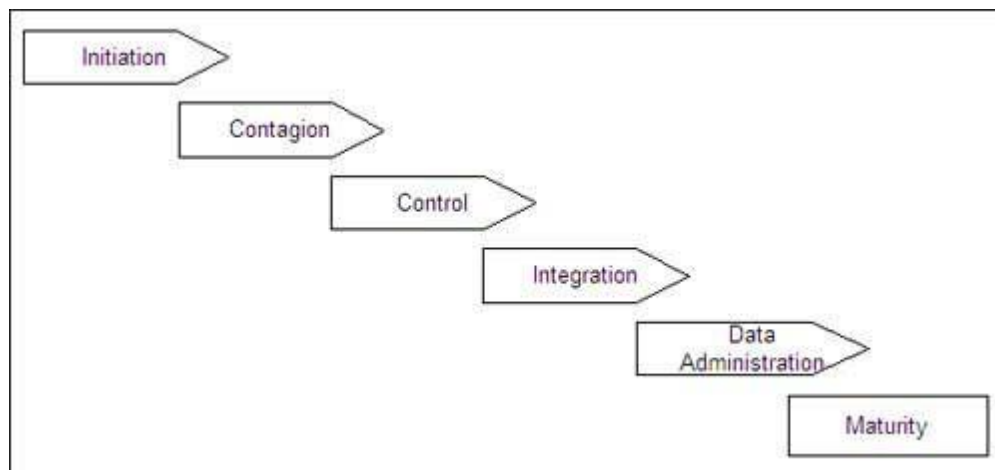
In this approach, the scientific observations of decision makers at work are taken into consideration while designing an MIS. This approach emphasizes the behavior of the decision makers rather than rationality. The environment in which the decisions are made is also given due importance and the decision-making process is given the same importance as the outcome of the decisions. This approach focuses on how a manager behaves while making a decision. It includes the channels of information the manager uses, the type of environment he/she is working in, the organizational set-up, etc. These factors are considered

to influence the decision-making process and, ultimately, the decision outcome. As it is difficult to study all the managers at work in an organization, this approach is used selectively. In other words, the empirical approach is based on the marginal utility theory. Based on this theory, the approach tries to improve the marginal effectiveness of the best decision-makers in the organization instead of enhancing the efficiency of all the decision-makers. Hence, the empirical approach considers a fixed MIS and a variable MIS.

### **3. MIS growth model**

One of the stages of **growth model**, helping in the understanding of the role of information systems, in an organization's strategy and its maturity. Earlier, in a similar **model** called the four-stage **growth model** the maturity of an organization was captured in terms of use of information systems.

Nolan (1979) indicated that there are six stages in the information system evolutionary process. It is an improvement over the four-stage model. The stages are:



**Fig: MIS growth model**

1. **Initiation**- in which the organization has an operational focus and tries to get operational efficiency and thereby limited value from the information systems.
2. **Contagion**-in which the organization moves towards online systems after having tasted success in the initiation stage. More users are added.
3. **Control**-in which the management exercises control and makes a cost-benefit type of assessment.
4. **Integration**-in which the organization moves away from an ad hoc isolated solutions based on information system to a service based information system. This is the stage when the organization transitions from a data processing outlook about information systems to more holistic information-based decision-making approach towards information systems. A more comprehensive approach towards information systems results in changes in the organization's behavior towards information systems and initiates a new appreciation for data and information.

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5. **Data administration**-in which the organization begins to appreciate the value of information and makes efforts to centralize the data management to take advantage of the benefits of information based decision-making.
6. **Maturity**-in which the organization creates synergies in its corporate objectives and information systems planning so that the two can work in a synchronized manner.

### Nolan's Stages of Growth Model

| I                                                                                                                                                                                                                                                                                  | II                                                                                                                                                                                                                                                                                                | III                                                                                                                                                                                                                                                                                                                            | IV                                                                                                                                                                                                                                                                                                               | V                                                                                                                                                                                                                    | VI                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>INITIATION</b>                                                                                                                                                                                                                                                                  | <b>CONTAGION</b>                                                                                                                                                                                                                                                                                  | <b>CONTROL</b>                                                                                                                                                                                                                                                                                                                 | <b>INTEGRATION</b>                                                                                                                                                                                                                                                                                               | <b>DATA ADMIN</b>                                                                                                                                                                                                    | <b>MATURITY</b>                                                                                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>• Users are "hands off" in approach</li> <li>• Extensive IT/IS planning</li> <li>• Cost reduction primary focus</li> <li>• Functional application is in focus</li> <li>• MIS dept/IS dept is not under strict management control</li> </ul> | <ul style="list-style-type: none"> <li>• Proliferation of applications</li> <li>• Little management control</li> <li>• Huge allocation of financial resources</li> <li>• Rapid growth of fundamental use of IT</li> <li>• IS/IT performance below importation and several crisis occur</li> </ul> | <ul style="list-style-type: none"> <li>• IT/IS is considered as an important function</li> <li>• Centralized controls are applied for IT/IS</li> <li>• No reduction in IT/IS use</li> <li>• Applications are often incompatible</li> <li>• Unhappy users</li> <li>• Use of database but with unsatisfactory outcome</li> </ul> | <ul style="list-style-type: none"> <li>• Greater use of database</li> <li>• Greater IT/IS budget</li> <li>• IT/IS dept now works on a professional utility model</li> <li>• Formal planning and control within IT/IS dept</li> <li>• Steering committees are widely used for application development.</li> </ul> | <ul style="list-style-type: none"> <li>• Data in administration</li> <li>• Applications are in sync with the organization</li> <li>• Shift from IT/IS booking after DP to holistic information management</li> </ul> | <ul style="list-style-type: none"> <li>• IT/IS dept becomes partners of users in data management</li> <li>• Applications reflect real information needs</li> <li>• Strategic planning of IT/IS becomes important</li> <li>• Managers of IT/IS dept considered at par with other dept</li> </ul> |

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## UNIT-III

### 1. Management Support System

**Management Support Systems (MSS)** are computer-based **systems** that are supposed to be used by, or at least to **support, managers**. A major problem in MSS development is requirements specification. There exist a large number of **systems** development methods (SDM) (Avison & Fitzgerald 1999; Jayaratna 1994).

A management information system is an information system used for decision-making, and for the coordination, control, analysis, and visualization of information in an organization. The study of the management information systems testing people, processes and technology in an organizational context.

Subset of management information system (MIS), it extends the information retrieval capabilities of the end-users with 'query and analysis functions' for searching a database, generating 'what if' scenarios, and other such purposes

What is the purpose of a management support system?

**Management support systems** focus on **managerial** uses of information resources. These **systems** provide information to manage for planning and decision making. The information provided by these **systems** is based on both the internal and external data using various data analysis tools.

**There are three types of management support systems, namely:**

- a) Decision Support Systems,
- b) Executive Information (support) Systems and
- c) Expert Systems.

**a) Decision Support Systems:** MIS – Decision Support System (DSS): In this tutorial, we are going to learn about the decision support system (DSS) in Management Information Systems with its characteristics, model, etc.

The **Decision Support System** is always helpful to management people to take decisions/decisions and finds the key business insights from available information systems.

This article describes the **Decision Support System (DSS) and its model**.

Decision Support System (DSS)

A **Decision Support System (DSS)** is an application for information systems that helps to make decisions. **DSS** is widely used in the planning, analysis and search for solutions for errors. A database, model base & applications are the components of the decision support system. Production, finance, and marketing are the main areas of operation of **DSS**.

# Management Information System

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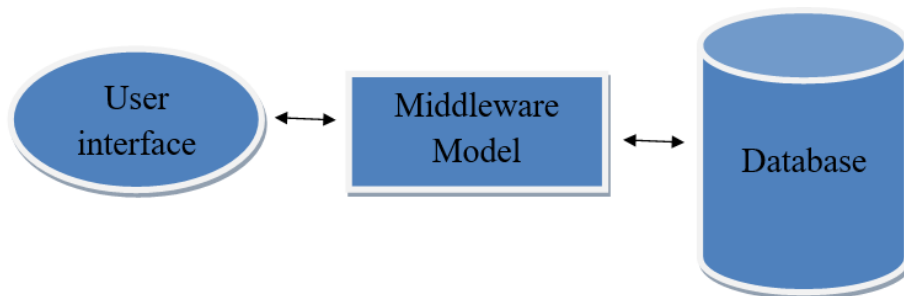
Decision Support System (DSS) characteristics

DSS always support to,

1. Various decision-making mechanisms and types.
2. Effective design and implementation support.
3. Semi-structured and unstructured decision-makers.
4. Assist at all-level to management.
5. Individual and group assistance.

## DSS model

Depending on the information processing, DSS can be distinguished from MIS. DSS collects information to support a manager's decision-making process. User's store and access data using the user interface to translate it into information, MIS processes data.

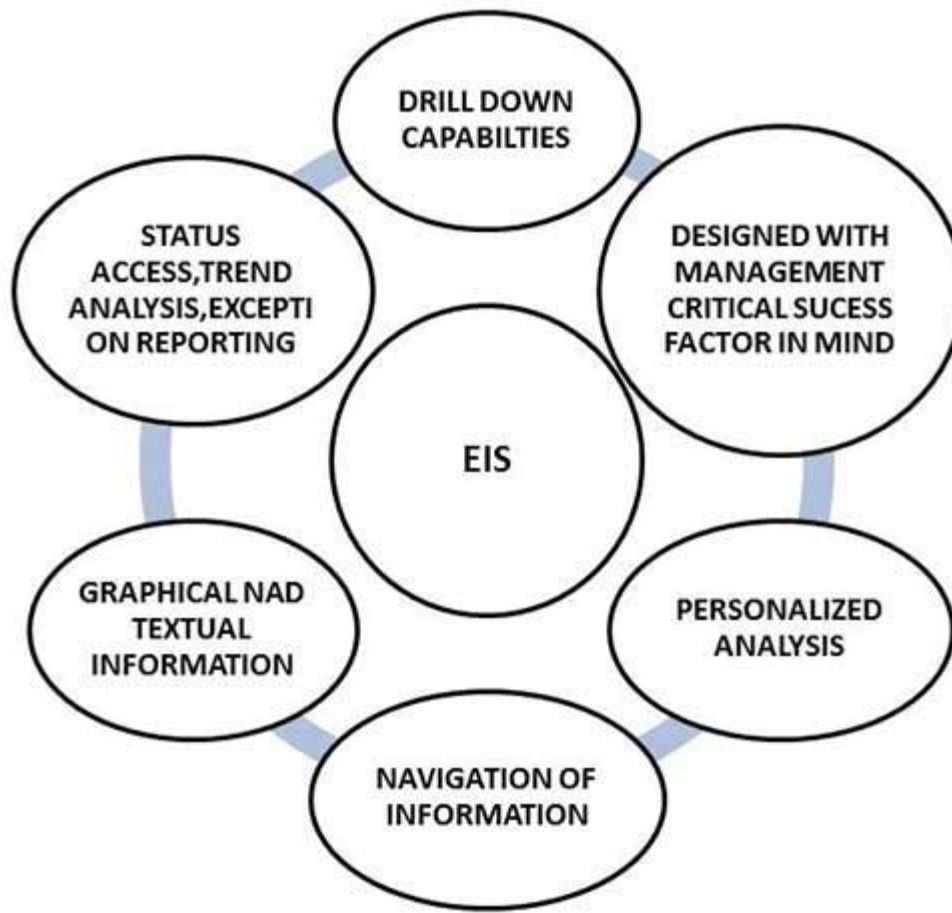


**User interface:** User interfaces are the points of access in which users interact with designs. The user interface is the process of creating interfaces with a focus on looks or style in software or computer devices. Designers aim to create user-friendly, user-friendly projects. UI design typically refers to graphical user interfaces but also involves other interfaces such as voice-controlled interfaces.

**Middleware Model:** A decision support system may compromise various models where a particular function is performed by each model. The choice of models to be included in a family of decision support systems depends on consumer specifications and DSS purposes. Remember that the DSS program provides the predefined models (or routines) that can be used to build new models to support specific decision styles.

**Database:** Database is just like a container that stores data in a systematic manner. Databases support users to store and manipulation of data whenever required.

**b) Executive information system:** An Executive information system (EIS), also known as an Executive support system (ESS), is a type of management support system that facilitates and supports senior executive information and decision-making needs. It provides easy access to internal and external information relevant to organizational goals.



Executive support systems are intended to be used by the senior managers directly to provide support to non-programmed decisions in strategic management.

These information are often external, unstructured and even uncertain. Exact scope and context of such information is often not known beforehand.

This information is intelligence based –

- Market intelligence
- Investment intelligence
- Technology intelligence

### **Examples of Intelligent Information**

Following are some examples of intelligent information, which is often the source of an ESS

- External databases
- Technology reports like patent records etc.
- Technical reports from consultants
- Market reports
- Confidential information about competitors
- Speculative information like market conditions
- Government policies

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- Financial reports and information

## **Advantages of ESS**

- Easy for upper level executive to use
- Ability to analyze trends
- Augmentation of managers' leadership capabilities
- Enhance personal thinking and decision-making
- Contribution to strategic control flexibility
- Enhance organizational competitiveness in the market place
- Instruments of change
- Increased executive time horizons.
- Better reporting system
- Improved mental model of business executive
- Help improve consensus building and communication
- Improve office automation
- Reduce time for finding information
- Early identification of company performance
- Detail examination of critical success factor
- Better understanding
- Time management
- Increased communication capacity and quality

## **Disadvantage of ESS**

- Functions are limited
- Hard to quantify benefits
- Executive may encounter information overload
- System may become slow
- Difficult to keep current data
- May lead to less reliable and insecure data
- Excessive cost for small company

## **3. Concept of Data Mining**

### **a) Data Mining**

Data mining is the process of discovering actionable information from large sets of data. Data mining uses mathematical analysis to derive patterns and trends that exist in data. Typically, these patterns cannot be discovered by traditional data exploration because the relationships are too complex or because there is too much data.

# Management Information System

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These patterns and trends can be collected and defined as a *data mining model*. Mining models can be applied to specific scenarios, such as:

- **Forecasting:** Estimating sales, predicting server loads or server downtime
- **Risk and probability:** Choosing the best customers for targeted mailings, determining the probable break-even point for risk scenarios, assigning probabilities to diagnoses or other outcomes
- **Recommendations:** Determining which products are likely to be sold together, generating recommendations
- **Finding sequences:** Analyzing customer selections in a shopping cart, predicting next likely events
- **Grouping:** Separating customers or events into cluster of related items, analyzing and predicting affinities

In simple words, **data mining** is defined as a process used to extract usable **data** from a larger set of any raw **data**. It implies analysing **data** patterns in large batches of **data** using one or more software. ... **Data mining** involves effective **data** collection and warehousing as well as computer processing.

In simple words, data mining is defined as a process used to extract usable data from a larger set of any raw data. It implies analysing data patterns in large batches of data using one or more software. Data mining has applications in multiple fields, like science and research. As an application of data mining, businesses can learn more about their customers and develop more effective strategies related to various business functions and in turn leverage resources in a more optimal and insightful manner. This helps businesses be closer to their objective and make better decisions. Data mining involves effective data collection and warehousing as well as computer processing. For segmenting the data and evaluating the probability of future events, data mining uses sophisticated mathematical algorithms. Data mining is also known as Knowledge Discovery in Data (KDD).

- **Description:** Key features of data mining:
  - Automatic pattern predictions based on trend and behaviour analysis.
  - Prediction based on likely outcomes.
  - Creation of decision-oriented information.
  - Focus on large data sets and databases for analysis.
  - Clustering based on finding and visually documented groups of facts not previously known.

The Data Mining Process: Technological Infrastructure Required:

1. Database Size: For creating a more powerful system more data is required to processed and maintained.
2. Query complexity: For querying or processing more complex queries and the greater the number of queries, the more powerful system is required.

## Uses:

1. Data mining techniques are useful in many research projects, including mathematics, cybernetics, genetics and marketing.
2. With data mining, a retailer could manage and use point-of-sale records of customer purchases to send targeted promotions based on an individual's purchase history. The retailer could also develop products and promotions to appeal to specific customer segments based on mining demographic data from comment or warranty cards

## b) Concept of Data ware housing:

### What is Data Warehousing?

Data warehousing is the process of constructing and using a data warehouse. A data warehouse is constructed by integrating data from multiple heterogeneous sources that support analytical reporting, structured and/or ad hoc queries, and decision making. Data warehousing involves data cleaning, data integration, and data consolidations.

**Data Warehousing (DW)** is process for collecting and managing data from varied sources to provide meaningful business insights. A Data warehouse is typically used to connect and analyze business data from heterogeneous sources. The data warehouse is the core of the BI system which is built for data analysis and reporting.

It is a blend of technologies and components which aids the strategic use of data. It is electronic storage of a large amount of information by a business which is designed for query and analysis instead of transaction processing. It is a process of transforming data into information and making it available to users in a timely manner to make a difference.

### History of Datawarehouse

The Datawarehouse benefits users to understand and enhance their organization's performance. The need to warehouse data evolved as computer systems became more complex and needed to handle increasing amounts of Information. However, Data Warehousing is a not a new thing.

Here are some key events in evolution of Data Warehouse-

- 1960- Dartmouth and General Mills in a joint research project, develop the terms dimensions and facts.
- 1970- A Nielsen and IRI introduces dimensional data marts for retail sales.
- 1983- Tera Data Corporation introduces a database management system which is specifically designed for decision support
- Data warehousing started in the late 1980s when IBM worker Paul Murphy and Barry Devlin developed the Business Data Warehouse.

# Management Information System

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- However, the real concept was given by Inmon Bill. He was considered as a father of data warehouse. He had written about a variety of topics for building, usage, and maintenance of the warehouse & the Corporate Information Factory.

Data warehouse system is also known by the following name:

- Decision Support System (DSS)
- Executive Information System
- Management Information System
- Business Intelligence Solution
- Analytic Application
- Data Warehouse



## Using Data Warehouse Information

There are decision support technologies that help utilize the data available in a data warehouse. These technologies help executives to use the warehouse quickly and effectively. They can gather data, analyze it, and take decisions based on the information present in the warehouse. The information gathered in a warehouse can be used in any of the following domains –

- **Tuning Production Strategies** – The product strategies can be well tuned by repositioning the products and managing the product portfolios by comparing the sales quarterly or yearly.

# Management Information System

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- **Customer Analysis** – Customer analysis is done by analyzing the customer's buying preferences, buying time, budget cycles, etc.
- **Operations Analysis** – Data warehousing also helps in customer relationship management, and making environmental corrections. The information also allows us to analyze business operations.

## C) Concept of OLAP:

Stands for "Online Analytical Processing." **OLAP** allows users to analyze database information from multiple database systems at one time. ... Because of its powerful data analysis capabilities, **OLAP** processing is often used for data mining, which aims to discover new relationships between different sets of data.

In order to process database information using OLAP, an OLAP server is required to organize and compare the information. Clients can analyze different sets of data using functions built into the OLAP server. Some popular OLAP server software programs include Oracle Express Server and Hyperion Solutions Essbase. Because of its powerful data analysis capabilities, OLAP processing is often used for data mining, which aims to discover new relationships between different sets of data.

Analysts frequently need to group, aggregate and join data. These operations in relational databases are resource intensive. With OLAP data can be pre-calculated and pre-aggregated, making analysis faster.

OLAP databases are divided into one or more cubes. The cubes are designed in such a way that creating and viewing reports become easy.

Online Analytical Processing Server (OLAP) is based on the multidimensional data model. It allows managers, and analysts to get an insight of the information through fast, consistent, and interactive access to information. This chapter cover the types of OLAP, operations on OLAP, difference between OLAP, and statistical databases and OLTP.

## Types of OLAP Servers

We have four types of OLAP servers –

- Relational OLAP (ROLAP)
- Multidimensional OLAP (MOLAP)
- Hybrid OLAP (HOLAP)
- Specialized SQL Servers

## Relational OLAP

ROLAP servers are placed between relational back-end server and client front-end tools. To store and manage warehouse data, ROLAP uses relational or extended-relational DBMS.

ROLAP includes the following –

- Implementation of aggregation navigation logic.
- Optimization for each DBMS back end.

- Additional tools and services.

## Multidimensional OLAP

MOLAP uses array-based multidimensional storage engines for multidimensional views of data. With multidimensional data stores, the storage utilization may be low if the data set is sparse. Therefore, many MOLAP server use two levels of data storage representation to handle dense and sparse data sets.

## Hybrid OLAP

Hybrid OLAP is a combination of both ROLAP and MOLAP. It offers higher scalability of ROLAP and faster computation of MOLAP. HOLAP servers allows to store the large data volumes of detailed information. The aggregations are stored separately in MOLAP store.

## Specialized SQL Servers

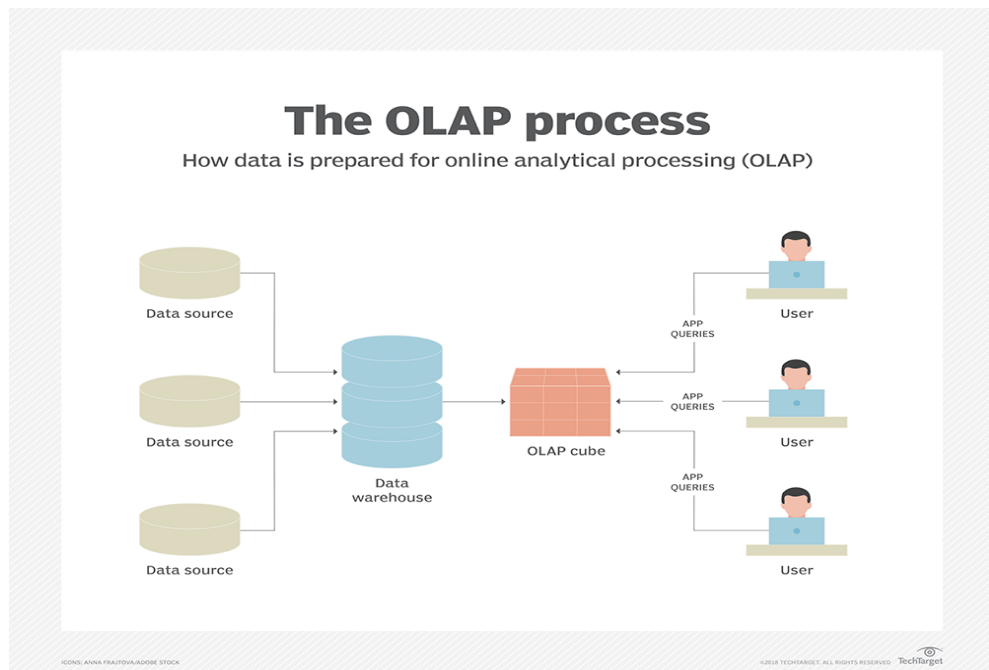
Specialized SQL servers provide advanced query language and query processing support for SQL queries over star and snowflake schemas in a read-only environment.

## OLAP Operations

Since OLAP servers are based on multidimensional view of data, we will discuss OLAP operations in multidimensional data.

Here is the list of OLAP operations –

- Roll-up
- Drill-down
- Slice and dice
- Pivot (rotate)



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## UNIT-IV

### 1. Financial Information System

A **financial information system** is an organized approach to collecting and interpreting **information**, which is usually computerized. A well-run **financial information system** is essential to a business, since managers need the resulting **information** to make decisions about how to run the organization.

A financial information system (FIS) accumulates and analyzes financial data used for optimal financial planning and forecasting decisions and outcomes. An FIS is used in conjunction with a decision support system, and it helps a firm attain its financial objectives because they use a minimal amount of resources relative to a predetermined margin of safety. An FIS can be thought of as a financial planner for electronic commerce that can also produce large amounts of market and financial data at once obtained from financial databases worldwide.

Financial data analysis may be conducted through trend evaluations, ratio analyses and financial planning modeling. Data outputs that are produced by FIS can include

- Operating and capital budgets
- Working capital reports
- Accounting reports
- Cash flow forecasts

The predictive analytics included in these applications may also narrow down exactly what could be expected from a business interaction or transaction that has yet to take place.

The management of financial information in an e-commerce business is paramount in order to gain maximum operating results in the shortest amount of time. An FIS can also yield huge amounts of data for daily business operations. Financial markets traders and salespeople have the greatest demand for FIS because they work in very fast environments and their on-demand computing systems must keep up with real-time activities in order to allow these professionals to operate in real time. Broker investigating, investment and trade data along with fiscal asset classes can be relayed through an FIS. This also works for smaller businesses that need to obtain financial data about local markets. FIS is a form of real-time operating system that works to enhance financial information exchanges.

#### **The qualitative characteristics of financial statements**

- **Understandability.** The information must be readily understandable to users of the financial statements. This means that information must be clearly presented, with additional information supplied in the supporting footnotes as needed to assist in clarification.
- **Relevance.** The information must be relevant to the needs of the users, which is the case when the information influences their economic decisions. This may involve reporting particularly relevant information, or information whose omission or misstatement could influence the economic decisions of users.

# Management Information System

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- **Reliability.** The information must be free of material error and bias, and not misleading. Thus, the information should faithfully represent transactions and other events, reflect the underlying substance of events, and prudently represent estimates and uncertainties through proper disclosure.
- **Comparability.** The information must be comparable to the financial information presented for other accounting periods, so that users can identify trends in the performance and financial position of the reporting entity.

## Features of Financial Management

The key features of financial management system are enlisted with detail:

### 1- Management of general accounting procedures:

Financial Management System is software that manages all accounting procedures of the business such as cash flow management, general ledger, expense, payments, and purchasing. It efficiently manages all financial administrative processes.

### 2- Management of expense:

The financial management system of SolutionDots Systems manages the expense of organization into the form of documentation, it contains all information regarding the expenditure requirements, necessities, and funds etc.

### 3- Manage the budget:

It helps in the management of budget control. It keeps the record of all financial statements that help in knowing about the current budget of the organization and also helps in making decisions to control the budget efficiently.

### 4- Efficient management of time and work:

Financial management system helps in the management of time and work efficiently. It allows managing more work in less time efficiently.

### 5- Advanced reporting:

Financial management system has an ability to generate reports such as profit and loss statements, balance sheet, and other financial statements rapidly. It allows the user to customize reports according to their demand and requirement.

### 6- Ensure data security:

Financial management system developed by Solution Dots System ensures its access to the only authorized user. We understand that accounts data is important as well as confidential therefore financial management system keeps it secure from unauthorized person.

### 7- Reduced the paperwork:

Financial management system maintains and updates all records and invoices automatically, online record management reduces the paperwork. Now there is no need to update and maintain manual records.

## 8- Complete Audit:

Financial management system maintains and updates the accurate and complete audit of the organization.

## 9- Data Integrity:

Financial management system ensures data consistency and accuracy in all records updated by different departments.

## 2. Marketing Information System

A **marketing information system** (MKIS) is a **management information system** (MIS) designed to support **marketing** decision making. Jobber (2007) defines it as a "system in which **marketing** data is formally gathered, stored, analysed and distributed to **managers** in accordance with their informational needs on a regular basis."

A marketing information system is a management information system designed to support marketing decision making. Jobber defines it as a "system in which marketing data is formally gathered, stored, analysed and distributed to managers in accordance with their informational needs on a regular basis

**Definition:** The **Marketing Information System** refers to the systematic collection, analysis, interpretation, storage and dissemination of the market information, from both the internal and external sources, to the marketers on a regular, continuous basis.

The marketing information system distributes the relevant information to the marketers who can make the efficient decisions related to the marketing operations viz. Pricing, packaging, new product development, distribution, media, promotion, etc.

Every marketing operation works in unison with the conditions prevailing both inside and outside the organization, and, therefore, there are several sources ( viz. Internal, Marketing Intelligence, Marketing Research) through which the relevant information about the market can be obtained.



**Fig: Components of Marketing Information System**

# Management Information System

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1. **Internal Records:** The Company can collect information through its internal records comprising of sales data, customer database, product database, financial data, operations data, etc. The detailed explanation of the internal sources of data is given below:
  - The information can be collected from the documents such as invoices, transmit copies, billing documents prepared by the firms once they receive the order for the goods and services from the customers, dealers or the sales representatives.
  - The current sales data should be maintained on a regular basis that serves as an aide to a the Marketing Information System. The reports on current sales and the inventory levels help the management to decide on its objectives, and the marketers can make use of this information to design their future sales strategy.
  - The Companies maintain several databases such as\*Customer Database- wherein the complete information about the customer's name, address, phone number, the frequency of purchase, financial position, etc. is saved.
    - \*Product Database- wherein the complete information about the product's price, features, variants, is stored.
    - \*Salesperson database, wherein the complete information about the salesperson, his name, address, phone number, sales target, etc. is saved.
  - The companies store their data in the data warehouse from where the data can be retrieved anytime the need arises. Once the data is stored, the statistical experts mine it by applying several computer software and techniques to convert it into meaningful information that gives facts and figures.
2. **Marketing Intelligence System:** The marketing intelligence system provides the data about the happenings in the market, i.e. data related to the marketing environment which is external to the organization. It includes the information about the changing market trends, competitor's pricing strategy, change in the customer's tastes and preferences, new products launched in the market, promotion strategy of the competitor, etc.

In order to have an efficient marketing Information System, the companies should work aggressively to improve the marketing intelligence system by taking the following steps:

  - Providing the proper training and motivating the sales force to keep a check on the market trends, i.e. the change in the tastes and preferences of customers and give suggestions on the improvements, if any.
  - Motivating the channel partners viz. Dealer, distributors, retailers who are in the actual market to provide the relevant and necessary information about the customers and the competitors.
  - The companies can also improve their marketing intelligence system by getting more and more information about the competitors. This can be done either by purchasing the competitor's product, attending the trade shows, reading the competitor's published articles in magazines, journals, financial reports.
  - The companies can have an efficient marketing information system by involving the loyal customers in the customer advisory panel who can share their experiences and give advice to the new potential customers.
  - The companies can make use of the government data to improve its marketing Information system. The data can be related to the population trends, demographic characteristics, agricultural production, etc. that help an organization to plan its marketing operations accordingly.

# Management Information System

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- Also, the companies can purchase the information about the marketing environment from the research companies who carry out the researches on all the players in the market.
- The Marketing Intelligence system can be further improved by asking the customers directly about their experience with the product or service via feedback forms that can be filled online.

3. **Marketing Research:** The Marketing Research is the systematic collection, organization, analysis and interpretation of the primary or the secondary data to find out the solutions to the marketing problems. Several Companies conduct marketing research to analyze the marketing environment comprising of changes in the customer's tastes and preferences, competitor's strategies, the scope of new product launch, etc. by applying several statistical tools. In order to conduct the market research, the data is to be collected that can be either primary data (the first-hand data) or the secondary data (second-hand data, available in books, magazines, research reports, journals, etc.)

The secondary data are publicly available, but the primary data is to be collected by the researcher through certain methods such as questionnaires, personal interviews, surveys, seminars, etc.

A marketing research contributes a lot in the marketing information system as it provides the factual data that has been tested several times by the researchers.

4. **Marketing Decision Support System:** It includes several software programs that can be used by the marketers to analyze the data, collected so far, to take better marketing decisions. With the use of computers, the marketing managers can save the huge data in a tabular form and can apply statistical programs to analyze the data and make the decisions in line with the findings.

Thus, the marketers need to keep a check on the marketing environment, i.e. both the internal (within the organization) and the external (outside the organization), so that marketing policies, procedures, strategies can be designed accordingly.

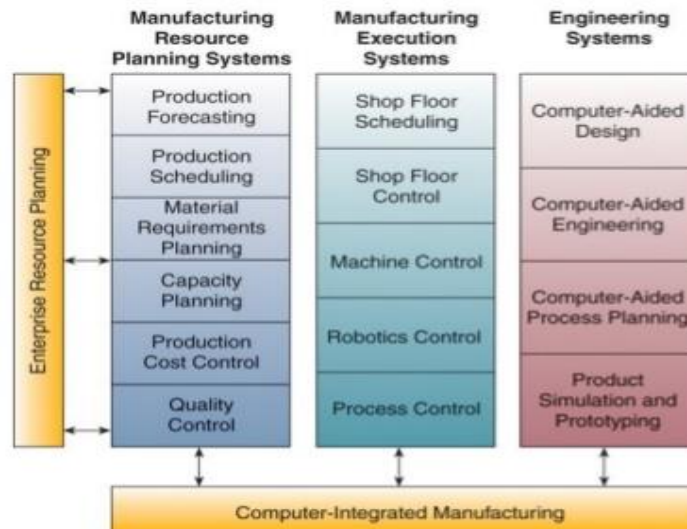
## **3. Manufacturing Information System**

**Manufacturing Information System** “A system that works in conjunction with other functional information systems to support the firms management in solving problems that relate to manufacturing firms product”.

Manufacturing Information Systems (MIS) Division works vertically with diverse stakeholder departments to deliver ISA95 compliant Manufacturing Execution System (MES) and Manufacturing Operations Management (MOM) consultation and engineering. Industry 4.0 is the appropriate integration and direction of the manufacturing process with business and operations managements systems:

- Enterprise Resource Planning (ERP)
- Inventory (IMS) and Warehouse (WMS)
- Equipment Asset (EAM) and Computerized Maintenance (CMMS)
- Process (PIMS) and Laboratory Information (LIMS)
- Quality (QMS)
- Electronic Document (EDMS)

## **Manufacturing Management Information System**



Our MIS team emphasizes MESA guidelines for development of these architectures with a focus on front-end business requirements and scope definition to ensure achievement of strategic initiatives at uncompromising quality and value. Manufacturing process data represents significant product value. Our MIS team excels in the application of Process Information Management Systems (PIMS) for enterprise data historian, batch/process reports for product release, and analytics such as Overall Equipment Effectiveness (OEE) and Total Effective Equipment Productivity (TEEP).

### **The Benefits of MIS**

The number of ways in which MIS can assist your company is virtually unlimited. These information management systems are highly adaptable to industry and user needs, so the ways in which MIS may serve your particular industry are varied.

*Benefits of MIS implementation might include:*

- Streamlined product production
- Reduced costs, waste, and re-work
- Increased efficiency in set-up times
- Assessment of correct order priority
- Assignment and reassignment of inventory as necessary
- Evaluation of optimal times to turn machines on and off
- Scheduling and rescheduling equipment

# Management Information System

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- Embedding best practices
- Improving reaction time within the supply change management process
- Making and measuring parts
- Assigning personnel
- Moving inventory from one workstation to another
- Managing suppliers
- Embedding lean and six sigma thinking into your manufacturing process
- Improving efficiency
- Increasing transparency in record-keeping processes
- Audit preparation
- Increasing total output

## **4. Financial and Human Resources information system**

A HRIS, which is also known as a human resource information system or human resource management system (HRMS), is basically an intersection of human resources and information technology through HR software. This allows HR activities and processes to occur electronically.

To put it another way, a HRIS may be viewed as a way, through software, for businesses big and small to take care of a number of activities, including those related to human resources, accounting, management, and payroll. A HRIS allows a company to plan its HR costs more effectively, as well as to manage them and control them without needing to allocate too many resources toward them.

In most situations, a HRIS will also lead to increases in efficiency when it comes to making decisions in HR. The decisions made should also increase in quality—and as a result, the productivity of both employees and managers should increase and become more effective.

The human resources department within any organization is considered to be highly critical for the entire organization. Its many functions serve as a supportive background for the company by providing everything from skilled and talented labor to management training services, employee enrichment opportunities and more. Since labor is the single largest expense for most organizations, human resources helps companies derive the greatest value from this important asset.

In order to function optimally, however, human resources departments must have the right tools and resources in place. A HRIS can be utilized within the department to help human resources employees and managers improve their productivity and the results of their efforts.

### **Benefits of an HRIS**

Using an HRIS has a number of clear benefits.

# Management Information System

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- **Record-keeping.** An HRIS is a record-keeping system that keeps track of changes to anything related to employees. The HRIS can be seen as the one source of truth when it comes to personnel data.
- **Compliance.** Some data is collected and stored for compliance reasons. This includes material for the identification for employees in case of theft, fraud, or other misbehaviors, first contact information in case of accidents, citizens identification information for the tax office, and expiration dates for mandatory certification. All this information can be stored in the HRIS.
- **Efficiency.** Having all this information in one place not only benefits accuracy but also saves time.
- **HR strategy.** The HRIS enables the tracking of data required to advance the HR and business strategy. Depending on the priorities of the organization, different data will be essential to track. This is where the HRIS comes in.
- **Self-Service HR.** A final benefit is the ability to offer self-service HR to employees and managers. This enables employees to manage their own affairs. When done right, the HRIS can offer a good employee experience. Keep in mind that not all HRIS systems offer this in a user-friendly manner!

## Function of Human resource management system

HRIS encompass a few modules, which include:

1. The human resource management module- encompasses various aspects ranging from employment to retirement of employees and everything in between.
2. Payroll module – this is concerned with obtaining employee attendance records and creating paychecks while taking into account deductions and taxes. It can also extend to produce worker tax reports.
3. Benefits administration module- track employees benefit programs and their contribution towards it.
4. Training module- offers a way to manage and track worker training and advancement programs. It makes it possible for the HR to keep an eye on employee education, qualification and skills while determining the best way to train and educate them.
5. The analytics module- enables the coupling of the HRIS with other management platforms.
6. Employee self-service module-enables the employees to take over some duties traditionally reserved for the HR. Such include employees updating their benefits records and querying attendance records while supervisors can view and approve or decline over time hour requests from employees without involving the HR personnel.

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## UNIT-V

### 1. Information System Security & Control

**Information systems security**, more commonly referred to as INFOSEC, refers to the processes and methodologies involved with keeping **information** confidential, available, and assuring its integrity. It also refers to: Access controls, which prevent unauthorized personnel from entering or accessing a **system**.

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It also refers to:

- Access controls, which prevent unauthorized personnel from entering or accessing a system.
- Protecting information no matter where that information is, i.e. in transit (such as in an email) or in a storage area.
- The detection and remediation of security breaches, as well as documenting those events.

Information systems security does not just deal with computer information, but also protecting data and information in all of its forms, such as telephone conversations.

Risk assessments must be performed to determine what information poses the biggest risk. For example, one system may have the most important information on it and therefore will need more security measures to maintain security. Business continuity planning and disaster recovery planning are other facets of an information systems security professional. This professional will plan for what could happen if a major business disruption occurs, but still allow business to continue as usual.

**Information Security** is not all about securing information from unauthorized access. Information Security is basically the practice of preventing unauthorized access, use, disclosure, disruption, modification, inspection, recording or destruction of information. Information can be physical or electrical one. Information can be anything like Your details or we can say your profile on social media, your data in mobile phone, your biometrics etc. Thus Information Security spans so many research areas like Cryptography, Mobile Computing, Cyber Forensics, Online Social Media etc.

During First World War, Multi-tier Classification System was developed keeping in mind sensitivity of information. With the beginning of Second World War formal alignment of Classification System was done. Alan Turing was the one who successfully decrypted Enigma Machine which was used by Germans to encrypt warfare data.

Information Security programs are build around 3 objectives, commonly known as CIA – Confidentiality, Integrity, Availability.

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1. **Confidentiality** – means information is not disclosed to unauthorized individuals, entities and process. For example if we say I have a password for my Gmail account but someone saw while I was doing a login into Gmail account. In that case my password has been compromised and Confidentiality has been breached.
2. **Integrity** – means maintaining accuracy and completeness of data. This means data cannot be edited in an unauthorized way. For example if an employee leaves an organisation then in that case data for that employee in all departments like accounts, should be updated to reflect status to JOB LEFT so that data is complete and accurate and in addition to this only authorized person should be allowed to edit employee data.
3. **Availability** – means information must be available when needed. For example if one needs to access information of a particular employee to check whether employee has outstanding the number of leaves, in that case it requires collaboration from different organizational teams like network operations, development operations, incident response and policy/change management. Denial of service attack is one of the factor that can hamper the availability of information.

Apart from this there is one more principle that governs information security programs. This is Non repudiation.

- **Non repudiation** – means one party cannot deny receiving a message or a transaction nor can the other party deny sending a message or a transaction. For example in cryptography it is sufficient to show that message matches the digital signature signed with sender's private key and that sender could have sent a message and nobody else could have altered it in transit. Data Integrity and Authenticity are pre-requisites for Non repudiation.
- **Authenticity** – means verifying that users are who they say they are and that each input arriving at destination is from a trusted source. This principle if followed guarantees the valid and genuine message received from a trusted source through a valid transmission. For example if take above example sender sends the message along with digital signature which was generated using the hash value of message and private key. Now at the receiver side this digital signature is decrypted using the public key generating a hash value and message is again hashed to generate the hash value. If the 2 value matches then it is known as valid transmission with the authentic or we say genuine message received at the recipient side
- **Accountability** – means that it should be possible to trace actions of an entity uniquely to that entity. For example as we discussed in Integrity section Not every employee should be allowed to do changes in other employees data. For this there is a separate department in an organization that is responsible for making such changes and when they receive request for a change then that letter must be signed by higher authority for example Director of college and person that is allotted that change will be able to do change after verifying his bio metrics, thus timestamp with the user(doenig changes) details get recorded. Thus we can say if a change goes like this then it will be possible to trace the actions uniquely to an entity.

At the core of Information Security is Information Assurance, which means the act of maintaining CIA of information, ensuring that information is not compromised in any way when critical issues arise. These issues are not limited to natural disasters, computer/server malfunctions etc.

Thus, the field of information security has grown and evolved significantly in recent years. It offers many areas for specialization, including securing networks and allied infrastructure,

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securing applications and databases, security testing, information systems auditing, business continuity planning etc.

**Security controls** are safeguards or countermeasures to avoid, detect, counteract, or minimize security risks to physical property, information, computer systems, or other assets.

They can be classified by several criteria. For example, according to the time that they act, relative to a security incident:

- Before the event, **preventive controls** are intended to prevent an incident from occurring e.g. by locking out unauthorized intruders;
- During the event, **detective controls** are intended to identify and characterize an incident in progress e.g. by sounding the intruder alarm and alerting the security guards or police;
- After the event, **corrective controls** are intended to limit the extent of any damage caused by the incident e.g. by recovering the organization to normal working status as efficiently as possible.

According to their nature, for example:

- **Physical controls** e.g. fences, doors, locks and fire extinguishers;
- **Procedural controls** e.g. incident response processes, management oversight, security awareness and training;
- **Technical controls** e.g. user authentication (login) and logical access controls, antivirus software, firewalls;
- **Legal and regulatory or compliance controls** e.g. privacy laws, policies and clauses.

## 2. Vulnerability & Abuse

In computer security, a vulnerability is a weakness which can be exploited by a threat actor, such as an attacker, to perform unauthorized actions within a computer system. To exploit a vulnerability, an attacker must have at least one applicable tool or technique that can connect to a system weakness.

A vulnerability, in information technology (IT), is a flaw in code or design that creates a potential point of security compromise for an endpoint or network. Vulnerabilities create possible attack vectors, through which an intruder could run code or access a target system's memory. The means by which vulnerabilities are exploited are varied and include code injection and buffer overruns; they may be conducted through hacking scripts, applications and free hand coding. A zero-day exploit, for example, takes place as soon as a vulnerability becomes generally known.

Checking for vulnerabilities - This process should include regular network scanning, firewall logging, penetration testing or use of an automated tool like a vulnerability scanner. A vulnerability scanner is a program that performs the diagnostic phase of a vulnerability analysis, also known as vulnerability assessment. This often includes a pen test component to identify vulnerabilities in an organization's personnel, procedures or processes that might not be detectable with network or system scans.

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**Identifying vulnerabilities** - This involves analyzing network scans and pen test results, firewall logs or vulnerability scan results to find anomalies that suggest a malware attack or other malicious event has taken advantage of a security vulnerability, or could possibly do so.

**Verifying vulnerabilities** - This process includes ascertaining whether the identified vulnerabilities could actually be exploited on servers, applications, networks or other systems. This also includes classifying the severity of a vulnerability and the level of risk it presents to the organization.

**Mitigating vulnerabilities** - This is the process of figuring out how to prevent vulnerabilities from being exploited before a patch is available, or in the event that there is no patch. It can involve taking the affected part of the system off-line (if it's non-critical), or various other work-around.

## **Vulnerability management frameworks**

The Common Vulnerability Scoring System (CVSS) is a framework for rating the severity of security vulnerabilities in software. Operated by the Forum of Incident Response and Security Teams (FIRST), the CVSS uses an algorithm to determine three severity rating scores: Base, Temporal and Environmental. The scores are numeric; they range from 0.0 through 10.0 with 10.0 being the most severe.

The National Vulnerability Database (NVD) is a government repository of standards-based vulnerability information. NVD is a product of the National Institute of Standards and Technology (NIST) Computer Security Division and is used by the U.S. Government for security management and compliance as well as automatic vulnerability management. The NVD is sponsored by the Department of Homeland Security (DHS), NCCIC and US-CERT.

## **3. Anti Virus Packages**

**Antivirus software**, or **anti-virus software** (abbreviated to **AV software**), also known as **anti-malware**, is a computer program used to prevent, detect, and remove malware.

Antivirus software is a type of program designed and developed to protect computers from malware like viruses, computer worms, spyware, botnets, rootkits, keyloggers and such. Antivirus programs function to scan, detect and remove viruses from your computer. There are many versions and types of anti-virus programs that are on the market. However, the prime objective of any antivirus program is to protect computers and remove viruses once detected.

Most antivirus programs incorporate both automated and manual filtering abilities. The instant scanning option may check files - downloaded from the Internet, discs that are embedded into the PC, and files that are made by software installers. The programmed

scanning process may likewise check the entire hard drive on a day-to-day basis. The manual scanning system enables you to check single documents or even to scan the complete network at whatever point you feel it is necessary.

Since new infections are always being made by PC programmers, antivirus programs must keep an updated database of the most recent malware codes. This database incorporates a list of "malware definitions" that the antivirus software implements when filtering records. Since new infections evolve every day, it is essential to keep your product's infection database up and coming. Luckily, most antivirus programs naturally refresh the infection database all the time.

While antivirus software is basically intended to ensure complete protection for PCs against virus infections, numerous antivirus programs now secure against different sorts of malware — for example, spyware, adware, and rootkits as well. Antivirus software may likewise include firewall features, which anticipate unapproved access to your PC. Utilities that incorporate both antivirus and firewall abilities are commonly called "Internet Security Suite".

While antivirus programs are accessible for Windows, Macintosh, and Unix platforms, most antivirus software is compatible with Windows operating system. This is on account of the fact that most infections are focused towards Windows PCs and subsequently virus protection is particularly imperative for Windows clients. If you are a Windows user, it is important to install a third party, feature-packed, robust antivirus program on your PC. **Comodo Antivirus** has been the best and compelling solution to outsmart even the zero-day and unknown threats with efficient features and technologies like default-deny protection, Host Intrusion Prevention, Auto sandboxing solutions and Containment technology.

Antivirus software was originally developed to detect and remove computer viruses, hence the name. However, with the proliferation of other kinds of malware, antivirus software started to provide protection from other computer threats. In particular, modern antivirus software can protect users from: malicious browser helper objects (BHOs), browser hijackers, ransomware, keyloggers, backdoors, rootkits, trojan horses, worms, malicious LSPs, dialers, fraudtools, adware and spyware. Some products also include protection from other computer threats, such as infected and

malicious URLs, spam, scam and phishing attacks, online banking attacks, social engineering techniques, advanced and botnet DDoS attacks. identity (privacy), online persistent threat (APT)

## Features of an Effective Antivirus

The following features of any antivirus are to be looked for when you decide on installing one

Proactive scanning for malwares, and deleting once detected

Default-Deny Protection – Default-Deny protection that is implemented to prevent the entry of suspicious files by default.

Auto Sandbox Technology – A virtual environment where suspicious and unknown files are secluded and run to check for any malicious activity without interfering with the normal operations.

Containment Technology – Validates and authorizes the programs that are executable and ensures that the processes are run without effecting the regular operations of the system.

Host Intrusion Protection System (HIPS) – This feature works on a protocol-based intrusion prevention system, that oversees all the application and program activities that are processed in the system. The HIPS terminates any malicious activities once found. This prevents the malware from infecting the operating system, registry keys or personal data or system memory.

## 4. System Audit

A **system audit** is a disciplined approach to evaluate and improve the effectiveness of a **system**. **Audits** are carried out in order to verify that the individual elements within the **system** are effective and suitable in achieving the stated objectives.

### Definition

System audit is defined as “A systematic and independent examination to determine whether activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.”

System audit is also defined as “A systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled.”

An information technology audit, or information systems audit, is an examination of the management controls within an Information technology infrastructure

System audits are one of the key management tools for achieving the objectives set out in the policy of the organization. A system audit is a disciplined approach to evaluate and improve

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the effectiveness of a system. Audits are carried out in order to verify that the individual elements within the system are effective and suitable in achieving the stated objectives. The system audit also provides objective evidence concerning the need for the reduction, elimination and most importantly, prevention of non conformities. The results of these audits can be used by the management for improving the performance of the organization. System audits are carried out by the trained auditors who can be organization own staff or staff of an external auditing agency or independent professional auditors. They are carried out by looking up for objective evidence.

System audits are usually carried out for the following objectives.

- To evaluate the organization system against a system standard
- To determine the conformity or non conformity of the system elements with the specified requirements
- To determine the effectiveness of the implemented system in meeting the specified objectives
- To offer an opportunity for improvement in the system
- To meet statutory and regulatory requirements

In the latest approach to the systems audit, the auditors are expected to go beyond mere auditing for the compliance by focusing on risk, status, and importance. This means they are expected to make more judgments on what is effective, rather than merely adhering to what is formally prescribed.

## Terms used in a system audit

- **Audit** – A planned and documented audit performed in accordance with manual, procedures records and other documents like checklists etc. for the intended purpose of verifying applicable elements of a system standard and its implementation.
- **Audit Plan** – Typically an audit report based on the applicable audit requirements in system standard for the activity/area being audited and the audit report summary, with additional questions/issues that are to be verified included in or attached to these documents as needed to ensure objectivity and impartiality. May also be a marked up copy of the procedure/process documentation, identifying evidence to be collected to verify conformance.
- **Auditor** – A qualified and trained individual who is authorized to perform specific audit functions under the direction of a lead auditor.
- **Audit coordinator** – Person with responsibility/authority for scheduling audits, selecting auditors (ensuring objectivity and impartiality), and ensuring issues raised are effectively addressed.
- **Effectiveness** – The evidence, including the relationship with inputs and outputs for the process, shows the process is working, driving performance, and supporting the organization's policy, objectives, and compliance with requirements (laws, regulations, etc.).
- **Finding** – An issue needing resolution. It could be an actual problem (something requiring corrective action), a potential problem (something requiring preventive action), or any other opportunity for improvement (including those making us better and/or helping us be more fiscally responsible). These “problems” are also known as non-conformances with any element of the management system. All non-conformances must be formally resolved to assure effective correction of the observed condition and the adoption of system improvements or preventive measures to reduce

or preclude the likelihood of recurrence. Types of findings are: (i) Major – The evidence shows the problem to be systemic (very big or bad) and/or requirements from the applicable standard are not addressed or adhered to. (ii) Minor – The evidence shows a problem, in need of attention, but not one where the system is broken down (simply needs a little touch-up) and/or a requirement or two from the applicable standard are not completely addressed or adhered to. (iii) Comment, opportunity for improvement, or observation – May be a praise or may be pointing out things that could use a little work (correction, preventive action, or opportunities for improvement). When all is said and done, the decision whether something is a major or minor is in the lead auditor's hands. The tendency is to use "the benefit of doubt" (things start as a minor and escalate as supported by evidence) as the rule of thumb.

- **Internal auditor** – A qualified and trained individual of the organization who performs systems audits to report non-conformances and observations, and to evaluate the adequacy of corrective and preventive actions, reporting audit findings to the organization management.
- **Lead auditor** – A qualified and trained and certified individual, who is authorized to plan, organize, and direct system audit of an organization, to report non conformances and observations, and to evaluate the adequacy of corrective and preventive actions.
- **Noncompliance** – Evidence indicates the organization is not complying with a regulation, rule, or requirement where compliance is mandatory (i.e., law, corporate policy, etc.).
- **Nonconformance** – Evidence indicates the actions by those fulfilling a process and the information in supporting documentation do not conform to one another and/or requirements outlined in the system standard.
- **Objectivity and impartiality** – An expectation of both auditors and the process they employ. To be objective and impartial means to let the evidence speak for itself. Auditors and the audit process need to be free of bias and in pursuit of the truth with evidence to support conformance with the processes or activities being audited.

### Types of audits

There are several types of audits as described below.

- **Adequacy audit** – This is the audit exercise which determines the extent to which the documented system, represented by the manual, the associated procedures, work instructions and record forms adequately meets the requirements of the system standard and if it provides objective evidence that the system is correctly designed in this respect.
- **Compliance audit** – This is the audit which determines the extent to which the documented system is implemented and observed within the organization.
- **External audit** – This is an audit carried out by the organization with whom there is a contract to purchase goods or services or intend to do so. It can be adequacy and/or compliance audit or both. It is also known as second party audit
- **Extrinsic audit** – This is an external audit carried out by an independent accredited third party using a standard to provide assurance on the effectiveness of the systems. This audit can also be adequacy and/or compliance audit or both. It is also known as third party audit.
- **Internal audit** – This is an audit which is carried out by an organization from its own internal sources for its systems for the purpose of providing assurance to the

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management that the systems are functioning properly and are effectively achieving the planned objectives. These audits are carried out by that staff of the organization which is not directly involved in the system. Sometimes organizations take the help of external agencies for carrying out the internal audit. It is also known as first party audit.

- **Process or product audit** – It is a vertical audit which looks into complete system that goes into the production of a specific end product or service.

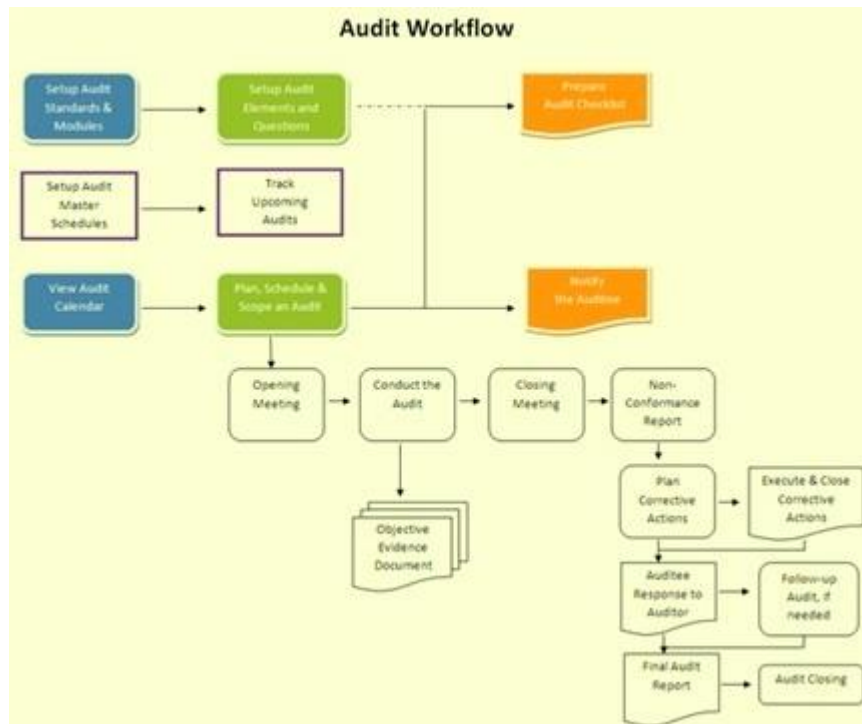


Fig: Work flow of a system audit

## 5. Managing global Information System

An **international information systems** architecture consists of the basic information systems required by organizations to coordinate worldwide trade and other activities. The basic strategy to follow when building an international system is to understand the global environment in which your firm is operating. This means understanding the overall market forces, or business drivers, that are pushing your industry toward global competition. A **business driver** is a force in the environment to which businesses must respond and that influences the direction of the business.



**Fig. International Information Systems Architecture**

## **The Global Environment: Business Drivers and Challenges**

The global business drivers can be divided into two groups: general cultural factors and specific business factors. Easily recognized general cultural factors have driven internationalization since World War II. The development of global communications has created a global village in a second sense: A global culture created by television, the Internet, and other globally shared media such as movies now permits different cultures and peoples to develop common expectations about right and wrong, desirable and undesirable, heroic and cowardly.

Responding to demand, global production and operations have emerged with precise online coordination between far-flung production facilities and central headquarters thousands of miles away. The new global markets and pressure toward global production and operation have called forth whole new capabilities for global coordination.

Finally, global markets, production, and administration create the conditions for powerful, sustained global economies for scale. Not all industries are similarly affected by these trends. Clearly, manufacturing has been much more affected than services that still tend to be domestic and highly inefficient. However, the localism of services is breaking down in telecommunications, entertainment, transportation, finance law, and general business.

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## Business Challenges

As a cultural level, **particularism**, making judgments and taking action on the basis of narrow or personal characteristics, in all its forms (religious, nationalistic, ethnic, regionalism, geopolitical position) rejects the very concept of a shared global culture and rejects the penetration of domestic markets by foreign goods and services. **Transborder data flow** is defined as the movement of information across international boundaries in any form.

**Table: Challenges and Obstacles to Global Business Systems**

|                                                                                              |
|----------------------------------------------------------------------------------------------|
| GENERAL                                                                                      |
| Cultural particularism: Regionalism, nationalism, language differences                       |
| Social expectations: Brand-name expectations, work hours                                     |
| Political laws: Transborder data and privacy laws, commercial regulations                    |
| SPECIFIC                                                                                     |
| Standards: Different Electronic Data Interchange (EDI), e-mail, telecommunications standards |
| Reliability: Phone networks not uniformly reliable                                           |
| Speed: Different data transfer speeds, many slower than United States                        |
| Personnel: Shortages of skilled consultants                                                  |

**Table: Management Challenges in Developing Global Systems**

|                                                   |
|---------------------------------------------------|
| Agreeing on common user requirements              |
| Introducing changes in business processes         |
| Coordinating applications development             |
| Coordinating software releases                    |
| Encouraging local users to support global systems |

## Global Systems Strategy

The following figure lays out the main dimensions of a solution. First, consider that not all systems should be coordinated on a transnational basis; only some core systems are truly worth sharing from a cost and feasibility point of view. **Core systems** support functions that are absolutely critical to the organization.

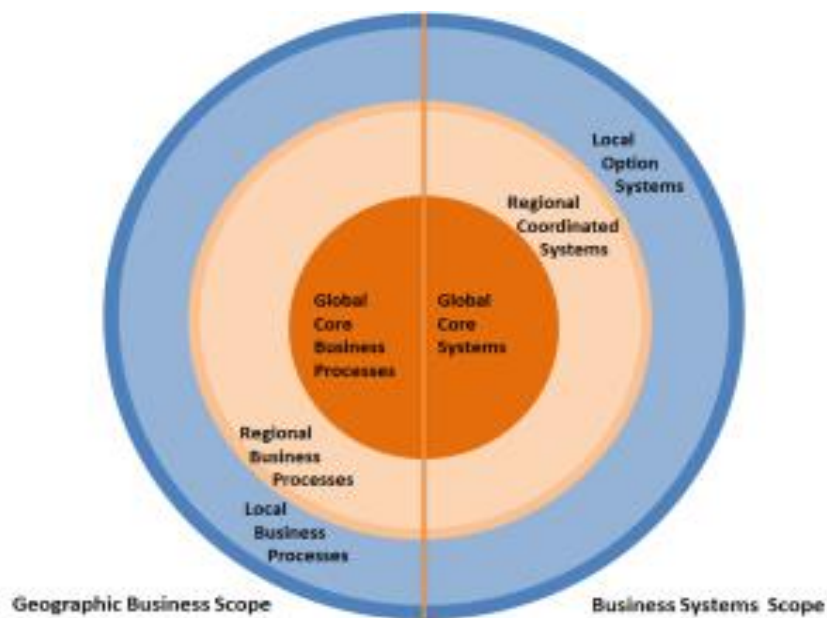


Fig. Local, Regional, and Global Systems

Table: Problems of International Networks

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Quality of service

Security

Costs and tariffs

Network management

Installation delays

Poor quality of international service

Regulatory constraints

Network capacity

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