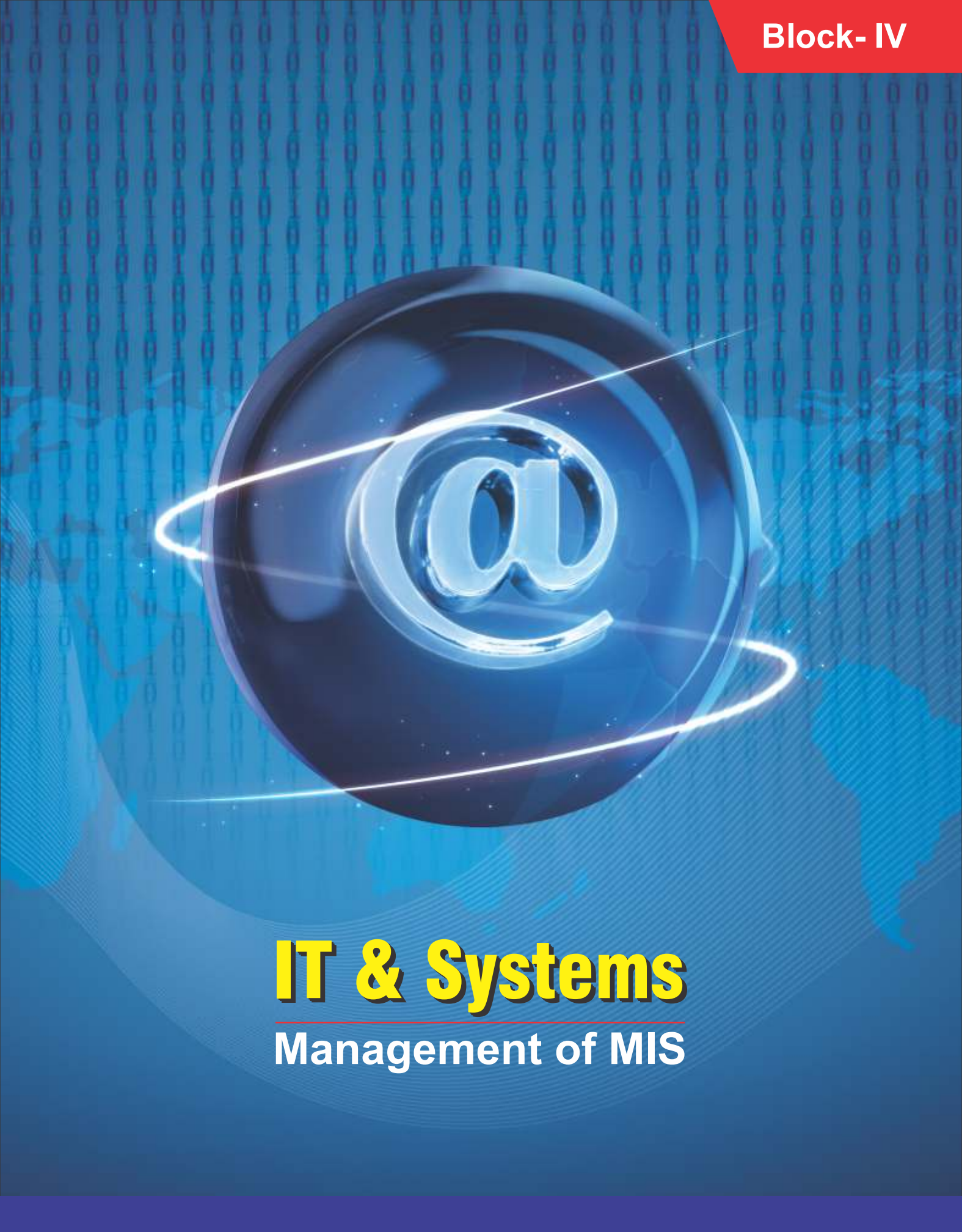
Block- IV



IT & Systems

Management of MIS

Block

IV

MANAGEMENT OF MIS

Editorial Team

Prof. K. Seethapathi
IFHE (Deemed-to-be-University), Hyderabad

Dr. D. Saravanan
IFHE (Deemed-to-be-University), Hyderabad

Dr. Y. V. Subrahmanyam
IFHE (Deemed-to-be-University), Hyderabad

Dr. Santosh Kumar Yadav
IFHE (Deemed-to-be-University), Hyderabad

Dr. Dennis Joseph
IFHE (Deemed-to-be-University), Hyderabad

Prof. Samyadip Chakraborty
IFHE (Deemed-to-be-University), Hyderabad

Content Development Team

Dr. Y. V. Subrahmanyam
IFHE (Deemed-to-be-University), Hyderabad

Dr. C. Lakshmi Devasena
IFHE (Deemed-to-be-University), Hyderabad

Dr. Sashikala. P
IFHE (Deemed-to-be-University), Hyderabad

Dr. Sumant Kumar Tewari
IFHE (Deemed-to-be-University), Hyderabad

Dr. Sumangla Rathore
IFHE (Deemed-to-be-University), Hyderabad

Dr. Jitendra Shreemali
IFHE (Deemed-to-be-University), Hyderabad

Prof. N. Siva Prasad
IFHE (Deemed-to-be-University), Hyderabad

Dr. Vaibhav Mishra
IFHE (Deemed-to-be-University), Hyderabad

Dr. Jaipal Dhobale
IFHE (Deemed-to-be-University), Hyderabad

Dr. Nasina Jigeesh
IFHE (Deemed-to-be-University), Hyderabad

Prof. G.S.B.S. Chowdari
IFHE (Deemed-to-be-University), Hyderabad

Proofreading, Language Editing and Layout Team

Ms. Jayashree Murthy
IFHE (Deemed-to-be-University), Hyderabad

Mr. Chandra Sekhar
IFHE (Deemed-to-be-University), Hyderabad

Mr. Prasad Sistla
IFHE (Deemed-to-be-University), Hyderabad

Ref. No. ITM SLM 102021B4

For any clarification regarding this book, the students may please write to The ICFAI Foundation for Higher Education (IFHE), Hyderabad specifying the unit and page number.

While every possible care has been taken in type-setting and printing this book, The ICFAI Foundation for Higher Education (IFHE), Hyderabad welcomes suggestions from students for improvement in future editions.

Our E-mail id: cwfeedback@icfaiuniversity.in

Centre for Distance and Online Education (CDOE)
The ICFAI Foundation for Higher Education
(Deemed-to-be-University Under Section 3 of UGC Act, 1956)
Donthanapally, Shankarapalli Road, Hyderabad- 501203.

BLOCK IV: MANAGEMENT OF MIS

The fourth block to the course on IT & Systems discusses in detail about the management information system, which has been briefly introduced in Unit 6 of Block II. Block IV contains five units. The first two units discuss the planning, design, implementation, evaluation, and maintenance aspects of an MIS. The third and fourth units examine the various ways in which information can be managed within an organization and across geographical boundaries. The last unit highlights the use of MIS in specialized areas.

The first unit, *MIS – Planning and Design*, introduces you to the planning and design aspects of an MIS. For effective MIS implementation, it is important that the planning and design phases of an MIS should be properly carried out. The role of MIS dashboard and Use Cases in planning and design is discussed in the unit.

The second unit, *MIS – Implementation, Evaluation, and Maintenance*, deals with the implementation, evaluation, and maintenance aspects of an MIS. Organizations face a lot of challenges when it comes to implementing the MIS. Once an MIS is properly implemented, it needs to be evaluated on a periodical basis to check for its effectiveness. It should also be controlled and maintained from time-to-time keeping in view the environmental changes.

The third unit, *Information Resources Management and IT Governance*, examines the various ways in which information resources in an organization can be managed. Information is a very important resource for any organization and therefore, needs to be properly managed. The unit also discusses how the governance of information technology helps in directing and managing an organization. Information security in e-Business is also discussed in the unit.

The fourth unit, *Global IT Management*, discusses the crucial role played by information technology in enhancing an organization's global business operations. Organizations are going global due to various reasons. Proper management of information technology would help them sustain their businesses and fight the competition in the highly challenging global business environment.

The fifth unit, *MIS in Specialized Areas*, examines the use of information technology in specialized areas such as government organizations, non-profit organizations, online marketplaces, manufacturing sector and services sector. MIS application areas such as materials management, personnel management and production management are discussed. The unit also discusses how information technology can be used for managing the performance of an organization and for managing projects.

Unit: 11

MIS – Planning and Design

Structure

11.1 Introduction

In the previous unit, we dealt with the telecommunication systems in business, scope of telecommunication networks, components, equipment for WAN and network convergence.

In unit 6 of the course (Block II), we have seen that information systems play a very important role in simplifying the way business operations are carried out, in improving the business performance, and in achieving strategic advantage.

However, there are many organizations which under-utilize the potential of their information technology (IT) systems. One of the main reasons of this under-utilization is the lack of managerial involvement in strategic planning for the development and design of IT systems. In this unit, we introduce you to the planning and design of a management information system (MIS) in the organization. Conceptual design gives a direction to the MIS project and requires the involvement of not only technicians but also the managers.

In this unit, we would highlight our discussion on the managerial perspective of planning and design. We shall then move on to discuss the systems approach to problem solving with regard to MIS implementation. Finally, we will end this unit with a discussion on the make-or-buy decisions with regard to MIS.

11.2 Objectives

By the end of this unit, you should be able to:

- Evaluate the strategic planning function of Management Information System (MIS).
- Explain the design aspect of MIS implementation.
- Explain the systems approach to problem solving.
- Analyse the choices between make or buy option for MIS.

11.3 MIS Planning

MIS planning involves understanding the mission, objectives, and strategies of an organization. This is required since the MIS has to be based on the objectives and strategies of the organization. Moreover, deviations from the organizational objectives can lead to failure of the MIS which can come at a significant cost for the organization. Since MIS plays an important role in the decisions taken by the line managers, planning for MIS has to consider informational requirements of these managers in taking appropriate decisions. A well planned MIS takes into account an organization's current as well as future informational needs. MIS should be viewed as a strategic tool capable of maximizing organizational effectiveness.

11.3.1 Strategic Planning for MIS

Strategic planning for MIS involves transforming the organizational objectives and strategies into relevant and consistent MIS objectives and strategies. Organizational objectives and strategies can be collectively termed as organizational strategy set and MIS strategies as MIS strategy set. The organizational strategy set and the MIS strategy set are discussed below:

11.3.1.1 Organizational Strategy Set

Organizational strategy set includes organizational mission (i.e. basic purpose of the organization as a business entity), objectives (i.e. goals like higher profits, etc), broad strategies (for achieving the objectives), and other strategic attributes (like flexibility of the management, organization's willingness to accept change, etc).

11.3.1.2 MIS Strategy Set

The MIS strategy set includes system objectives, system constraints, and system design strategies. System objectives define the rationale behind implementing MIS in the organization. In order to make the MIS implementation effective, the constraints associated with MIS should be identified. These constraints may be internal or external. External constraints (like government and industry) emphasize the need to integrate MIS with the various organizational functions. Internal constraints, which are within the organization, try to limit or hinder the MIS implementation. MIS design strategies are used in the designing process of MIS. MIS strategic planning involves transforming the organizational strategy set into an MIS strategy set and the process used in this transformation is called as MIS strategic planning process.

11.3.2 MIS Strategic Planning Process

The three stages in the MIS strategic planning process are:

11.3.2.1 Understanding the Organizational Strategy Set

The first stage of this process is to identify and understand the organizational strategy set. The mission statement and objectives of many organizations are available explicitly in written form (e.g. in an organization's long term plans and latest annual reports). However, documents like annual reports may lack information on the future strategic approach of the organization and managerial action as they are prepared for public relations purposes. To this end, interactions with the stakeholders and functional heads can help in acquiring important information on the possible strategies they should adopt for attaining the organizational goals. In order to do this, the MIS group has to explain each stakeholder group (like the employees, customers, suppliers, etc.), understand their present and future goals, and finally, identify and understand the organization's goals for each of the stakeholders.

11.3.2.2 Validation of Organizational Strategy Set

After collecting information on the organization's mission, objectives, and stakeholders, this information has to be presented to the top management for validation and feedback so as to confirm the organizational stand on the objectives and strategies. From this step, the MIS group can also infer about the organization's MIS requirements. The top management is asked to rate the level of importance to be given to each piece of information presented. This validation provides insights about the top management's stand on the organizational strategy set and its willingness to accept change.

11.3.2.3 Transforming Organizational Strategy Set into MIS Strategy Set

This step involves developing MIS objectives, constraints, and strategies on the basis of organizational strategy set. For instance, if maintaining high level of customer good will is an organizational objective, then a possible MIS objective based on this can be 'to facilitate quick information leading to quicker response to customer inquiries.'

11.3.3 Planning Process for MIS Implementation

MIS planning has to consider ways to improve organizational effectiveness since organizational effectiveness is regarded as the most important objective in managerial decision making. There are three major components of MIS planning which should be considered by every organization while implementing MIS. These are organizing, designing, and evaluating.

11.3.3.1 Organizing

Organizing is the process of forming a formal group of people for performing the MIS planning process. These groups are called by different names in different organizations. Organizing process involves planning the structure of these information systems groups. Organizing is regarded as an important part in the MIS planning since it assists communication and coordination between information systems group and other departments in the organization. This group is usually headed by an information systems manager and he/she is responsible for all the major decisions in planning. Such decisions can be most effective if they are based on accurate information from all those departments which come under the MIS. Thus, the information systems manager has to communicate with other departments for understanding their current and future informational requirements.

11.3.3.2 Designing

The process of creating the physical structure of MIS is known as system designing or designing. This process attempts to organize the necessary systems and subsystems, equipment required (including computer hardware), software requirements, etc. Multiple designs are developed and the one which best matches with the organizational requirements is selected. Designing should take into consideration the current as well as future informational requirements and all the possible constraints that can hinder or disrupt the information flow across the departments. Moreover, the probable ways of minimizing such constraints should be built into the design.

Activity: Anbelle Manufacturing Limited, an automobile equipments manufacturer, wants to implement MIS for improving its operational efficiency. How should the company go about with the MIS planning process? What are the three components of MIS that the company should consider while implementing MIS across the entire organization?

Answer:

_____
_____
_____
_____

11.3.3.3 Evaluating

Evaluation, as a process, helps to evaluate MIS planning with respect to the current data available and choose the design that best matches the organizational requirement. Certain evaluation techniques are used for analyzing and evaluating the different system designs developed in the designing stage. The common evaluation techniques are simulation, weighting methods, quantification of various factors, mathematical formulations, benchmarking, etc. Most evaluation techniques do not take into account the long range planning of MIS. Therefore, the process of MIS planning will prove to be redundant in the long term as it does not take into account the long-term goals of the organization.

Check Your Progress-1

1. Which of the following components of planning process in MIS implementation facilitates communication and coordination between information systems group and other departments in the organization?
   a. Organizing
   b. Designing
   c. Evaluating
   d. All of the above
2. Strategic planning of MIS involves transforming the organizational strategy set into an MIS strategy set. What are the components of the MIS strategy set?

3. Which among the following statements is **false** regarding the process of evaluation in the MIS planning process?
   a. Evaluation helps in choosing the best design that matches with the organizational requirements
   b. The process of evaluation is very useful in long range planning of MIS
   c. Evaluation helps in evaluating the MIS planning with respect to the current data available
   d. The process of evaluation helps in determining the effectiveness of the MIS
4. The basic purpose of the organization as a business entity is defined by the _____ of the organization.
5. In MIS implementation process; simulation, mathematical formulations, benchmarking, etc. are
   a. Planning techniques
   b. Designing techniques
   c. Evaluation techniques
   d. Validation techniques
6. Organizing, an important component of MIS planning process, refers to
7. Planning for MIS involves understanding the _____ of the organization.
   a. Mission
   b. Strategies
   c. Objectives
   d. All of the above
8. The MIS strategic planning process consists of three stages:
   i. Validating the organizational strategy set
   ii. Transforming the organizational strategy set into MIS strategy set
   iii. Understanding the organizational strategy set
   iv. What is the correct sequence of the stages in the process?
9. Which stage in the strategic planning process involves developing MIS objectives, constraints, and strategies based on the organizational strategy set?

10. Designing is the process of creating the physical structure of the MIS. Which among the following statements is **false** regarding the designing component of the MIS planning process?
    a. Designing has to take into account only the current informational requirements
    b. The process puts together the required systems, subsystems, equipment, software, etc
    c. The process considers all the constraints that hinder the information flow across the departments
    d. None of the above

11.4 MIS Dashboard

MIS dashboard provides key performance information of different departments in the organization such as finance, HR, operations, IT and marketing. It provides the planned and achieved figures of each department so that top management can take corrective action in respective department based on deviations from planned figures. MIS dashboard provides a quick snapshot of the performance of various units in the organization. Instead of looking at bits and pieces of information scattered in the organization, top management can look at the dashboard for current status of the organization.

The advantages with MIS dashboard include: it measures performance, drills down functionality, gives a graphical representation of performance, issues performance reports, highlights the negative trends (if any), saves time in report generation and is useful in making informed decisions. It can be used for MIS planning purposes. The MIS in the organization makes use of the data warehouses and business intelligence in the organization. It also uses the information coming from enterprise systems such as ERP, SCM and CRM systems. It can generate detailed reports and trend reports as well. It enables us to quickly identify the relationships or correlations among the data items. MIS dashboard is a useful tool for C-Level executives such as CEO and COO.

Data Visualization has significant role in Data Analysis, and it helps all types of users build reports and dashboards for the decision makers to analyze data from multiple sources at a single view in visual way. Microsoft has built a tool named Power BI for Business Intelligence. Exhibit 11.1 discusses power BI dashboard.

Exhibit 11.1: Top 10 Best Power BI Dashboard Examples in 2021

Power BI Dashboard has simple UI permitting end-users to build their own reports and dashboards. Being part of the Microsoft Power Platform, can easily integrate with other Microsoft technologies. Power BI Dashboard Examples have analytical abilities and can connect to most of the common databases outside the Microsoft ecosystem. These are useful for queries related to various types of data like Sales, Marketing, and Finance.

The Top 10 Power BI Dashboards include:

Customer Segmentation Dashboard (Used in B-2-B. Helps visualize revenue, profitability, displays the top and the bottom performers and sales share from each product segment.)

Sales Scorecard Dashboard (Comparative performance in Sales, performance of different product segments, channels bringing the revenue, and permits viewing of KPI's for revenue and profit.)

Sales Analysis Dashboard (More information about products and the regions, revenue from different customer segments, the profitability in each region, and the value of discounts offered)

Product Sales Dashboard (Useful for E-Commerce companies, Focuses on Sales Channels, shows how each sales channel is doing compared to the previous year)

Email Engagement Analytics Dashboard (Display the proportion of emails; delivered, clicked, and opened. Collects data from campaign management tools like Hubspot, and provides changes of these indicators)

Marketing Campaign Insights Dashboard (Presents effectiveness of various Marketing Campaigns and the performance of product segments and channels)

Ad Display Campaign Dashboard (Helps Digital Marketers advertising products through website ads, displays the success of the advertising campaigns through Clicks, Click-Through Rate Percentage, etc.)

Finance Dashboard (Present the Financial Indicators like Revenue, Profit, and Earnings before tax, Inventories, Securities, and Accounts Payables of the organization)

Financial Analytics Dashboard (Depicts revenue and profitability from different geographies, customer segments, and product segments, permitting to go deep to analyze the Financial Performance Indicators.)

Quarterly Financial Performance Dashboard (Helps executives compare profit metrics across quarters, by digging deep into the numbers based on products and customers.)

Source: https://hevodata.com/learn/top-10-best-power-bi-dashboard-examples-in-2021/

11.5 MIS Design

The design part of MIS implementation influences its operational performance. In simple terms, designing an MIS is the process of identifying and allocating optimum information infrastructure and resources to all those personnel who need a variety of information for making effective decisions in the long run. MIS design specifies which resources are to be allocated to which department and/or personnel. The flow of information between departments and personnel is decided in the design stage. This flow of information includes the type of information and the ways in which it has to be presented to different users.

Schonberger proposed a continuum of design approaches ranging from negligible user involvement to complement user involvement. Negligible user involvement is a situation when there is no involvement from the users, while complement user involvement is a situation when there is some involvement from the users. The design approaches have been classified on the basis of the type of leadership in the design stage. In the initial stages of MIS implementation, the design part is dominated by the system analysts and programmers and more importance is given to the technical details of the system rather than the user requirements. Due to the technical complexity and narrow scope for user driven functionality, many organizations find it difficult to use the MIS.

Managements gradually began to understand the importance of managerial/user involvement in the design stage. As a result, many organizations have commissioned special teams with a mix of managerial cadre and technical cadre for designing their MIS. Managerial cadre ranging from lower levels of management to top level management mainly represent the users of the MIS and the technical cadre acts as advisors and information solicitors. The effectiveness of MIS performance improves with the increase in the user involvement in the design stage.

11.5.1 Approaches to Design of MIS

John Buckley identified four approaches to MIS design, namely, shotgun approach, traditional approach, rational approach, and empirical approach, which are listed by the order of least desired to the most desired approaches. These approaches broadly specify how information should flow to different layers of management and to different managers in each layer.

11.5.1.1 Shotgun Approach

Under this approach, if an executive raises some query, the system will provide all the relevant information relating to the query without sorting or filtering the unnecessary information. It is left to the executive to manually filter and sort the information as per 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 (which may consume huge memory space). Another major problem is duplication of information since the system returns identical information for different queries.

11.5.1.2 Traditional or Integrative Approach

Traditional or integrative approach uses integration of information systems across the functional departments of the organization. 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.

The biggest disadvantage of this approach is that query specific information is rarely provided in this approach. Traditional approach is known to provide time tested information which may not be very useful in the current scenario as it used to be in the past. 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, leading to friction in the organizational layers and functioning which in turn results in fall in revenues. Moreover, implementing MIS using this approach in big government organizations will lead to increase in costs.

11.5.1.3 Rational Approach

Rational approach is an improvement over the shotgun and traditional approaches. It incorporates decision making process in the MIS design in an abstract form. Rational approach emphasizes on rationality and model building on the MIS design. The models are developed by experts who understand managerial decision making and incorporate their recommendations in their models. The information dissemination depends on the managerial hierarchy. This is done to help the respective managers with the required information to arrive at their decisions. Model building is based on some assumptions and such assumptions may prompt the experts to include some variables and exclude some others. But, there is always a problem in distinguishing critical variables from that of non-critical ones.

11.5.1.4 Empirical Approach

In this approach, the scientific observations of decision makers at work are considered while designing an MIS. This approach lays stress on decision makers' behavior rather than on the rationality. Due importance is given to the environment in which the decisions are made and also to the decision process and the outcome of decisions. This approach focuses on how a manager behaves while making a decision. It includes the channels of information used by the manager, the type of environment he/she is working in, the organizational setup, etc. These factors are considered to influence the decision making process and ultimately the decision outcome.

This approach is used selectively since it is difficult to study all the managers working in an organization. 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 rather than enhancing the efficiency of all the decision makers. Hence, this approach considers a fixed MIS and a variable MIS. The fixed MIS is for the routine decision making and other purposes like financial reporting, whereas the variable MIS is used for effective decision making. Empirical approach focuses only on the variable MIS. By observing the various decision makers at work, it tries to reduce the limitations involved in their work. Hence, it takes into consideration all the informal ways used by decision makers for gathering information apart from the formal ways.

11.5.2 Design Process

The MIS group responsible for the implementation of the design process has to consider the approaches mentioned and then select the best possible approach in system design. After the selection has been made, they can proceed with the process of MIS design. William King and David Cleland have proposed an MIS design process called as information analysis model. This model has a series of eight steps which are:

11.5.2.1 Identification of User Set and Interfacing Organizations

The users of MIS include all managers and other personnel who use MIS in their day-to-day work for taking work related decisions. The users are identified on the basis of MIS objectives, organization charts, job descriptions, etc. and it is initially done by the system analysts. For strategic purposes, data that has to be processed by the MIS should reflect the internal processes and operations as well as the external environmental forces like the competitors, government, and other stakeholders.

11.5.2.2 Identification of Decision Areas

The system analyst then identifies the major decision areas that the user set makes in day-to-day operations by discussing it with the managers of all departments who are involved in decision making. A set of all possible decision areas in an organization is termed as decision inventory.

11.5.2.3 Definition of Decision Areas

After the identification of the user set and decision areas, the decision areas have to be defined as the type of decisions and their importance in the operations. For doing this, the decision areas are broken down into decision elements based on the homogeneity of decisions, need for common information input, and whether the decisions are taken by an individual or a group.

11.5.2.4 Development of a descriptive model of the system

The user set and the decision areas are then used for generating a descriptive model of the organization as well as the environmental systems. A descriptive model of the system provides authorities, responsibilities, and the roles of the user set in a two dimensional format. It describes the roles played by each user in the organization to accomplish the tasks at their respective levels of operations. Such descriptive models help the analysts as useful roadmaps for further information analysis. Apart from describing the roles of the users, it also provides insights into the interactions between the departments (organization units) and also between the departments and external agencies like suppliers, distributors, and other business partners. The type of information required by the users and the direction of information flow can also be analyzed through this model.

11.5.2.5 Development of a Normative Model of the System

Though a descriptive model provides lot of information about the roles played by the users, it provides only the current operational information and does not provide informational insights of future operations of the organization. Hence, for getting a view of the future operations and the probable decisions that can be taken, a normative model is developed. Analysts use the normative model for making changes in the existing decision-making process to make it optimal in the future operations of the organization. This requires restructuring the organizational hierarchy in terms of authority and responsibility.

11.5.2.6 Development of a Consensus Model of the System

A model which is developed based on the descriptive and normative models through a consensus approach is called as consensus model. Such a model provides framework for analyzing formal and informal information requirements at different levels in the organization. This model can be used to identify the users' specific involvement in the decision elements in each decision area.

11.5.2.7 Decision Model Identification and Specification

The framework based on the consensus model makes it possible for the analyst to identify specific decision models and criteria for performing the activities in a particular decision element. The decision models can be either mathematical models, or descriptive models, or even mental models (a model which is not put on paper).

11.5.2.8 Specification of Information Requirements

The final step involves the determination of information requirements from the consensus model and specific decision models. These models are used for understanding the specific information requirements. The consensus model helps in establishing linkages between the elements of this information.

For instance, in order to carry out the purchasing activity in an organization, some of the information required may include available quantity of material in inventory, possible date by which the material is required, purchasing policy, availability of the material with the suppliers, can suppliers supply the material by the required date, etc.

Activity: RKS Beverages Limited wants to implement MIS. Regarding the MIS design aspect, the company wants to implement an MIS system which will provide it with all the available information about a particular query. What is the design approach that the company wants to follow in this case? What are the problems that the company could face if it chooses this approach? Suggest some other MIS design approaches that the company should consider.

Answer:

_____
_____
_____
_____
_____

Check Your Progress -2

11. Explain the descriptive model of the MIS.
12. John Buckley identified four approaches to MIS design. They include the shotgun approach, traditional approach, rational approach, and empirical approach. Model building is emphasized in which of the following approaches to MIS design.
    a. Traditional approach
    b. Shotgun approach
    c. Empirical approach
    d. Rational approach
13. In the four approaches to MIS design, the approach in which scientific observations of decision makers at work are considered at the design stage is _____.
14. A descriptive model **does not** provide a description of
    a. Current operational information
    b. Future operational information
    c. The roles played by each user in the organization to accomplish the tasks at their respective levels of operations
    d. Interactions between the departments as well as between the departments and external agencies
15. Explain the consensus model in the MIS design process.

16. Which among the following sets of employees in an organization represent the users of MIS?
    a. Advisors/consultants
    b. Technical cadre
    c. Managerial cadre
    d. Operational cadre

17. Explain the shotgun approach to MIS design.

18. In the MIS design process, employees belonging to the technical cadre _____.
    a. Represent the users of MIS
    b. Form the part of top level management
    c. Act as advisors and information solicitors
    d. None of the above

19. Which among the following is **not** an advantage of the traditional approach to MIS design?
    a. The traditional approach to MIS design provides reports to the decision makers with which they are familiar with
    b. Integration of information into a centralized database results in shifting of power from the individual departments to the headquarters
    c. Traditional approach uses integration of information systems across the functional departments in the organization
    d. Integration of information into a centralized database helps in minimizing costs by eliminating duplicate data

20. Given below are some statements regarding the normative model in the MIS design process. Indicate true/false.
    a. The normative model is developed to get a view of the future operations and probable decisions that can be taken.
       True/False
    b. The normative model is used by analysts to amend the existing decision-making process to make it optimal in the future operations of the organization.
       True/False
    c. The normative model limits itself to the current operational information and does not provide informational insights into the future operations of the organization.
       True/False

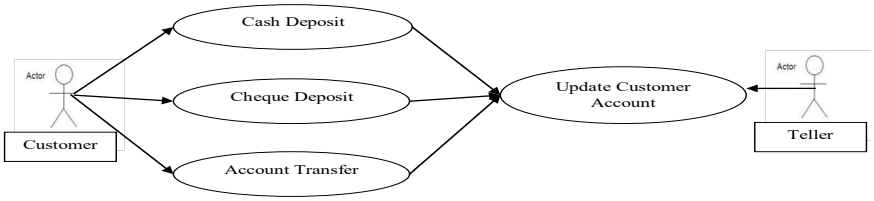
21. Development of the descriptive model, normative model, and consensus model of the system are part of the
    a. Systems development lifecycle
    b. Information analysis model
    c. Approaches to MIS design
    d. MIS strategic planning process
22. Explain the empirical approach to MIS design.
23. Which among the following statements is **true**?
    a. In the initial stages of MIS implementation, user requirements are given more importance than the technical details of the system
    b. The effectiveness of the performance of MIS improves with the increase in user involvement in the design stage
    c. The employees belonging to the managerial cadre act as advisors and information solicitors
    d. All of the above

11.6 Use Cases

Use case represents a flow or scenario in a software system. Use case diagrams are used in use case view of an object oriented software system. Use case is represented as an ellipse in use case diagram. For example, cash deposit, cheque deposit and account transfer are use cases in a banking application. Use cases are used in object oriented design stage of a software project. The actor interacts with the use case. For example, customer and teller of a bank are actors interacting with the use case. An actor can be a human being or any other software system. Use cases are also used by business analysts in modeling business requirements.

There are relationships possible between two different use cases. They are <<include>>, <<extend>>, <<generalization>> and <<association>>. One use case includes functionality of other use case. One use case extends the functionality of other use case. One use case can bring generalization from two different use cases. One use case can be in association with other use case. The readers can refer to UML User Guide, Second Edition (Booch, Rumbaugh and Jacobson, Addison-Wesley, 2005) for further reading on use cases. Use cases are part of Unified Modeling Language (UML) notation.

Figure 11.1: Use Cases in Account Deposit Scenario of a Banking System



11.7 Systems Approach to Problem Solving

In order to develop a standard and structured framework for problem solving, the system analysts and programmers introduced the systems approach to problem solving. Managers can use the systems irrespective of the type of problem. It provides a universal methodology with an inherent logic to solve any kind of problem through a series of steps. Some of the steps in the systems approach include defining the problem, identifying alternative solutions, evaluating alternative solutions, selecting the best alternative, implementing the solution, and follow-up.

Another popular model proposed by Herbert Simon involves four steps, namely, intelligence, design, choice, and review. Intelligence includes the first step of the above approach viz. problem identification and definition. Design consists of developing and evaluating the alternative solutions. Choice is the process of selecting the best alternative and implementing it while, review is the follow-up process after implementing the solution.

Each of the steps involved in the systems approach to problem solving are:

11.7.1 Define the Problem

The first step in this approach is to identify the problem which can be done by identifying its symptoms. A symptom is an indicator of a problem and may not be the cause of the problem. After identifying the problem, it has to be defined in clearer terms so that no ambiguity exists in communicating the problem across the hierarchy.

11.7.2 Identify Alternative Solutions

A problem can be solved in several ways. In this step, multiple alternatives for the problem are identified and developed. The solutions that have worked in the past are a good source to search for new alternatives. Moreover, advice from colleagues (internal) and consultants (external) can provide fresh insights into the problem. Organizations also use expert systems for generating alternatives. Expert systems use the knowledge of

various experts and develop solutions to problems in the same way as an expert will do.

11.7.3 Evaluate Alternative Solutions

Once the alternative solutions are developed, they are evaluated to see how well an alternative is fitting as the right solution to the problem. Every alternative is evaluated through different analyses like cost-benefit analysis, etc. Different criteria for each alternative are evaluated to understand their influence in the solution to the problem.

11.7.4 Select the Best Alternative

The next step involves selecting the best alternative as the solution to the problem. Different factors in each alternative are compared with other alternatives for the purpose of eliminating the less feasible alternatives. After several comparisons, the best alternative is selected. If it so happens that none of the alternatives developed serve as the solution to the problem, than fresh alternatives have to be developed. It may also happen that 'no action' can be the best solution to the problem.

11.7.5 Implement the Solution

The selected solution has to be implemented for solving the problem. Sometimes, the solution has to be freshly designed in order to be implemented. For instance, if installation of new and custom made equipment is considered as the chosen solution, then the equipment has to be designed accordingly and then installed. In case of information systems too, changes in MIS have to be designed and redesigned to suit the organizational requirements.

11.7.6 Follow-up

Follow-up is the final step in this approach. It involves monitoring and evaluating the results produced by the solution since the best solution may also fail to produce the desired results when practiced in the real world. Follow-up assures that the post-implementation performance of the system is satisfactory.

11.7.7 Systems Development Life Cycle

The use of systems approach to problem solving in developing management information systems is called as information systems development or application development. It follows a process of steps, also called as systems development life cycle (SDLC).

In the first step, the organization has to identify if there is a need to install an information system in the organization. After identifying the need, a feasibility study has to be conducted for analyzing the associated costs and benefits. This analysis leads to the development of a broad outline plan for the project. As part of the planning process, all the users of the information systems and their information requirements have to be identified. Once the system planning is completed, it has to be designed on the basis of the information requirements of the users. System design includes information flow between departments, identification of hardware, networking, etc. System design is followed by implementation, which includes acquiring the necessary hardware and software, installing the system, testing it, and training the people to operate the new system. Finally, the post implementation review has to be done for monitoring and evaluating the performance of the system. In case any discrepancies and/or deviations are found, the systems approach can be used for resolving them.

11.8 Make or Buy Decisions

Every organization has to decide whether to develop a part or a component in-house or to buy it from external sources. This is termed as make-or-buy decisions. Organizations make the evaluation by taking into consideration factors like production cost (in-house), purchasing cost (external sources), quality, available capacity, reliability, etc. These decisions cannot be made only by considering the economic factors since such decisions often involve acquiring or losing the core competencies. All such decisions taken by the organization will affect the production techniques adopted by the organization, the working capital, the cost of debt, and the competitive position.

An organization that wants to install a MIS also faces a similar situation of making or buying the MIS. Organizations therefore have three alternatives or options to consider, namely, building an MIS in-house, external procurement, and outsourcing.

11.8.1 Building an MIS In-house

Developing an information system involves a sequence of steps called as the information systems development cycle or the SDLC. The various methods involved in information system development are prototyping, Computer-Aided Systems Engineering (CASE), and end user development. The organization has to decide whether to build an MIS in-house with the help of IS staff or whether to consider other alternatives.

Most often, organizations do not consider building an MIS in-house, as a feasible solution because of the following reasons:

- Organizations may have inadequate IS staff who may be deployed to take care of the system administration or the maintenance activities, or they may not have the capacity to build an MIS in-house without the assistance of external experts. Again, hiring of external experts may be a costly proposition for the organization.
- The available IS staff may not possess the skills required for building a specific kind of system.
- Since the available IS staff is overburdened with work, they may not devote too much time on new system development. Hence, they should prioritize the various duties by addressing those systems which affect the entire organization first, and then catering to those at the departmental or individual levels.
- Factors like employee turnover, changes in technology, budget constraints, etc., affect the performance of the IS staff, thus resulting in failure of the system.

Thus, an organization will consider other alternatives of procuring information systems from external sources or going in for outsourcing.

11.8.2 IS Procurement

IS procurement, also called external procurement of IS, and refers to acquiring an information system from external sources or suppliers. An organization should first carry out an upfront analysis of the specific needs which should take into consideration the basic purpose/s for which the system is required, the budget considerations, the number of employees using the system, etc. This analysis will help the organization to narrow down the various options and save time. After making the analysis, the organization should seek information about the various systems from the potential suppliers.

After evaluating the information, the organization would have a list of the vendors who can set up their systems in the organization for testing. Based on the reaction of the IS staff and the performance of the system in the actual working environment, the organization can make the final decision of whether to procure or not to procure a system from a particular vendor.

For making an external procurement, organizations usually opt for the process of competitive bidding since it will enable the organization to get the best system at the lowest possible rate. In this method, the suppliers have a chance to display the systems that meet the needs of the organization.

The steps involved in the process of competitive bidding include identifying, selecting, and planning the system, analyzing the system, inviting proposals, evaluating the proposals, and finally, selecting the vendor. The initial steps are similar to those that are required for developing a system in-house. The next three steps involved in the process differentiate an external procurement from developing a system in-house.

11.8.2.1 Inviting Proposals

In this stage, the organization communicates its requirements to the vendors and invites them to supply information on the ways in which they will be able to meet those requirements. A Request for Proposal or RFP is the document used for requesting the vendors to participate in the bidding process for hardware, software, and/or services. A RFP is issued for assessing the competitive bids from the vendors.

There are two variants in RFP, namely, Request for Quotation (RFQ) and Request for Information (RFI). A RFQ is used when the product or service specifications are already known and there is no need to discuss such details with the vendors. At times, RFQ is send to the vendors before sending the RFP to get information about the range of prices. Such information can be used to write a full-fledged RFP.

A RFI is used for finding out the potential products or services available in the market which are capable of meeting the needs of the organization. This document does not invite a seller to participate in the bid and is not mandatory on the part of the buyers or the sellers. A RFI may not necessarily lead to a RFQ or a RFP. These documents are mostly used in situations where the organization has to make major purchases and when numerous options are available to meet the requirements.

A RFP contains information on the existing systems and their applications, system features and performance requisites, required service, reliability, and backup, criteria used for evaluating the proposals, and time and cost constraints.

The RFP is then sent to the potential vendors along with an invitation to present their bids for the project before a fixed data and time. The returned proposal would contain information about the vendor company, its corporate history, financial position, technical expertise, product/service information, etc. The product/service information contains details about the product or the service for which the proposal has been invited for. It also includes the price and the references of the customers who had earlier used the product/service from the vendors. The organization will then evaluate the various vendors.

Activity: Consider the following three situations:

i. Prakash Private Limited wants to purchase some computers for its finance and accounting department. It is already aware of the product specifications of the various manufacturers of computers, but wants the price quotation for the computers from various vendors. What type of Request for Proposal should be prepared by the company and why?

Contd. .....

ii. Siddharth Tractors Limited manufactures tractors. The company wants to buy the tractor equipment from external vendors. For this purpose, the company first wants to gather information about the various equipments supplied by the vendors. What type of Request for Proposal should the company prepare and why?

iii. SpectraSys Technologies Limited, a Kolkata-based company, is planning to set up two call centers in Hyderabad. The company wanted to purchase computer systems and furniture for these call centers. It put out an advertisement in the newspaper requesting interested vendors to send their product details and quotations. What type of request is the company making to the vendors? Do you think this will help the company to get good quality products and/or services at reasonable prices? Explain.

Answer:

_____
_____
_____
_____

11.8.2.2 Evaluating the Proposals

Evaluation of the proposals includes live demonstrations of the system, evaluating its performance, and verifying whether the system meets the criteria set by the organization. Live demonstrations help the organization to get an experience of the capabilities of the system and can take place at the buyer's facility or at the vendor's facility, depending upon transportability. In a live demonstration, the vendor first gives an oral presentation about the system, its price, and performance features, followed by the actual demonstration of the system. These demonstrations will help the organization to test the performance of the system. However, they do not give an affirmation for purchasing the system without further evaluation.

Benchmarking the system may be a good option for better evaluation of the system. Through systems benchmarking, sample benchmark programs can be developed based on the workload on computer. These programs can then be tested using the system.

Some of the common benchmarks set for the systems include the response time taken by the system for a specified number of users, the time taken by the system to sort the records, the time taken by the system to retrieve a set of records, the time taken by the system to produce a given report, and the time taken by the system to understand a set of data. At times, the vendor company itself may supply the benchmarks.

At certain times, live demonstrations and system benchmarks may not provide the entire information that is required to make a purchase. In these situations, the requirements which were listed by the organization in the second phase (systems analysis) can be used as the criteria to judge a proposal. The criteria may change based on the hardware and software requirements.

11.8.2.3 Selecting the Vendor

Though a number of systems that would meet the requirements of the organization may be short listed, only a few may actually fit into the criteria set by the organization better than the others. In such situations, the organization should rank or prioritize the proposals. A scoring system can be devised for this purpose. The scoring system includes the criteria and the results obtained from benchmarking for each of the systems. Maximum points for each of the criterion are allotted and points are given to each individual system based on the criteria listed. The vendor whose system gives the highest score is selected.

A shortcoming of this method is that the systems which are not selected because of the low score may actually be good systems. The rationale behind such low score may be improper communication from the vendors about their commitment towards the organization, considering the criteria to be less important than others. In order to avoid these problems, the buyer organization should appropriately inform the vendors about the process of evaluation and the importance that is attached to each selection criterion. Companies can also adopt less formalized methods like using a checklist, or more subjective methods for selecting a vendor.

11.8.3 IS Outsourcing

In IS outsourcing, the organization gives away or outsources the responsibility of developing an information system to an outside company. In this arrangement, the outside company develops the information systems and keeps them within its facility, runs the applications of the organization on their computers, or develops information systems to run on existing computers within the organization.

With IS outsourcing, organizations can concentrate more on the key focus areas that are critical for achieving a competitive advantage over others in the market. An organization may opt for outsourcing for some or all of the reasons, namely, concerns over the cost and quality aspects, problems faced due to internal IS staff performance, pressures faced by the suppliers, concentration on core competencies, opting for downsizing and reengineering the processes, financial factors, problems due to cultural changes, and conflicts between the internal IS staff and the end users.

11.8.3.1 Types of Outsourcing Relationships

Rather than entering into a legal contract with their outsourcing vendors that binds both the parties for a fixed period of time, organizations prefer to enter into a relationship in which both the parties have a direct as well as an equal stake in the success of the other party. On the other hand, there are other types of outsourcing relationships which stress upon the fact that not all outsourcing relationships need to be structured in the same way. In reality, the three different types of outsourcing relationships that can be identified between the buyer and the outsourcing vendor are:

- Basic outsourcing relationship, in which the organization buys the products or services of the outsourcing vendor considering the price and convenience factors. It is also called as a cash and carry relationship.
- Preferred outsourcing relationship, in which the buyer and the vendor lay down preferences and prices which would benefit each other.
- Strategic outsourcing relationship, in which both the buyer and the seller share the risks and rewards equally.

11.8.3.2 Successful IS Outsourcing Relationship

Any outsourcing relationship will be successful if the relationship entered into is the outcome of a strategic decision, if the relationship suits and benefits both the parties, and if the relationship is properly managed. A contract is signed between the buyer organization and the outsourcing vendor to signify legal binding. However, the relationship between the parties begins much before signing the contract. Candidness is a prerequisite and a crucial factor which affects the outsourcing relationship.

Activity: With the number of customers increasing every day, IFD Insurance Limited (IIL) decided to install a customer database management system that would help the company in managing the database of its customers efficiently. IIL has given the contract for developing the software and maintaining it to iLearning Software Limited. What kind of make-or-buy decision has the company made? What are the possible reasons that may have led IIL to take such a decision?

Answer:

_____
_____
_____
_____

An IS outsourcing relationship will be successful if it is well managed. The internal IS staff plays an active and strong role in maintaining relationship with the outsourcing vendor. The internal IS staff should properly manage the legal and professional relationship with the vendor. Organizations can also employ full time managers from among the organization's IS staff to manage relationships. These managers will act as coordinators in the IS outsourcing project.

Check Your Progress-3

24. In the various types of information systems outsourcing relationships, a cash and carry relationship is also referred to as _____.

25. A Request for Proposal (RFP) is a document used for requesting the vendors to participate in the bidding process for hardware, software, and/or services. An RFP is issued during which of the following stages in the bidding process?
    a. Analyzing the system
    b. Inviting proposals
    c. Evaluating the proposals
    d. Selecting the vendor.

26. What are the various factors evaluated for making a make-or-buy decision?

27. Explain the concept of outsourcing. What are the various types of outsourcing?

28. What is strategic outsourcing relationship?

29. Given below are some statements regarding Request for Proposal (RFP), Request for Quotation (RFQ), and Request for Information (RFI). Indicate true/false.

a. The RFI is not used for inviting a seller to participate in the bid and is not obligatory on the part of the buyers or the sellers
   True/False

b. An RFP is sent to the vendors prior to the RFQ to get information about the range of prices
   True/False

c. The RFQ is used for finding out the potential products or services available in the market that can fulfill the needs of the organization
   True/False

d. An RFI is used in situations where the specifications of the product or the service are already known
True/False

e. An RFQ is used in situations where there is no need for discussing the product or service specifications with the vendors
True/False

f. An RFP is used in situations where the specifications of the product or the service are to be sought and where there is need for discussing details with the vendors
True/False

g. The RFI is mostly used in situations where the organization has to make major purchases and when numerous options are available to meet the requirements
True/False

11.9 Summary

- The MIS has to be based on the objectives and strategies of the organization. Therefore, MIS planning involves understanding the mission, objectives, and strategies of an organization.
- Strategic planning for MIS involves transforming the organizational objectives and strategies into relevant and consistent MIS objectives and strategies.
- MIS strategic planning process includes the three stages of: understanding the organizational strategy set, validation of organizational strategy set, and transforming the organizational strategy set into MIS strategy set.
- Organizing, designing, and evaluating are the three major components of MIS planning which should be considered by every organization while implementing MIS.
- The four approaches to MIS design, namely, the shotgun approach, traditional approach, rational approach, and empirical approach, broadly specify how information should flow to different layers of management and to different managers in each layer.
- The various stages involved in the process of MIS design are: identification of the user set and interfacing organizations, identification of decision areas, definition of decision areas, development of a descriptive model of the system, development of a

normative model of the system, development of a consensus model of the system, decision model identification and specification, and specification of information requirements.

- To develop a standard and structured framework for problem solving, the system analysts and programmers introduced the systems approach to problem solving. The steps in the systems approach to problem solving include: defining the problem, identifying alternative solutions, evaluating alternative solutions, selecting the best alternative, implementing the solution, and follow-up.
- Every organization has to decide whether to develop a part or a component in-house or to buy it from external sources. This is termed as make-or-buy decisions. Organizations have three alternatives or options to consider, namely, building an MIS in-house, external procurement, and outsourcing.

11.10 Glossary

- **Basic Outsourcing Relationship:** In this, the organization buys the products or services of the outsourcing vendor considering the price and convenience factors. It is also called as a cash and carry relationship.
- **Preferred outsourcing relationship:** In this relationship, the buyer and the vendor lay down preferences and prices which would benefit each other.
- **Request for Information (RFI):** A document used for finding out the potential products or services available in the market that can meet the needs of the organization.
- **Request for Proposal (RFP):** A document used for requesting the vendors to participate in the bidding process for hardware, software, and/or services. A RFP is issued to assess the competitive bids from the vendors.
- **Request for Quotation (RFQ):** A document used in situations where the specifications of the product or the service are already known and where there is no need for discussing such details with the vendors.
- **Strategic outsourcing relationship:** In this relationship, both the buyer and the seller share the risks and rewards equally.
- **Systems approach to problem solving:** A systematic procedure applied to develop management information systems. It is also called as information systems development or application development.

11.11 Self-Assessment Test

1. Strategic planning of MIS involves transforming the organizational objectives and strategies into relevant and consistent MIS objectives and strategies. In this context, discuss the three stages in the MIS planning process. What are the three components of MIS planning that every organization should consider while implementing MIS?
2. John Buckley has identified four approaches to MIS design which broadly specify how information should flow to different layers of management and to different managers in each layer. Explain these four approaches.
3. The systems approach to problem solving provides a universal methodology with an inherent logic to solve any kind of problem through a series of steps. What are these steps? Also give a brief explanation for each step.
4. An organization that wants to install an MIS has to decide whether to develop a part or a component in-house or to buy it from external sources. There are alternatives that the organization has to consider for taking such decision. Explain them.

11.12 Suggested Readings/Reference Material

1. Introduction to Information Technology, V. Rajaraman, PHI learning, 2018
2. Information Technology for Management, 2ed: Advancing Sustainable, Profitable Business Growth, Turban, Volonino, Wood, O.P. Wali, Wiley India Pvt Limited, January 2021
3. Introduction to Information Systems - 6th edition, R. Kelly Rainer; John Wiley & Sons, Inc.2016
4. Information Technology: An Introduction for Today's Digital World, Richard Fox, Chapman and Hall/CRC; 2nd edition (August 21, 2020)
5. Information Technology for Management, Efraim Turban, Carol Pollard, Gregory Wood, Wiley, 2018

Additional References:

1. Critchley, L., Where Nanotechnology, the IoT, and Industry 4.0 Meet., https://www.mouser.com/blog/where-nanotechnology-the-iot-and-industry-40-meet, 2019
2. Pan India implementation of HMIS over Indian Railways, Ministry of Railways., http://railministry.com/pan-india-implementation-of-hmis-over-indian-railways/ 2020
3. Vossler, C. How Long Does It Take To Order A New BMW?

https://www.bmwblog.com/2020/09/28/how-long-does-it-take-to-order-a-new-bmw/2020

4. Jay, A., 10 New ERP Trends & Forecasts for 2020/2021 – A Look Into what's next. https://financesonline.com/erp-trends/2019
5. Gingiss, D., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue (forbes.com), 2019

11.13 Answers to Check Your Progress Questions

Following are the answers to the Check Your Progress questions given in the Unit.

1. Organizing

Organizing is the process of forming a formal group of people to carry out the MIS planning process. This group plans the structure of the information systems groups. This is an important part in the MIS planning as it facilitates communication and coordination between information systems group and other departments in the organization.

2. The MIS strategy set includes system objectives, system constraints, and system design strategies.

3. (b) The process of evaluation is very useful in long range planning of MIS

Evaluation is the process of determining the effectiveness of MIS. It helps in choosing the best design that matches the organizational requirements. Most of the evaluation techniques do not take into account the long range planning of MIS. Therefore, the process may prove to be redundant in long range MIS planning.

4. Mission

MIS planning involves understanding the mission, objectives, strategies, etc. of the organization. An organization's mission spells out the basic purpose of the organization as a business entity. It provides a framework for further development of organizational objectives.

5. (c) Evaluation techniques

Evaluation is the process of determining the effectiveness of MIS implementation. It helps in choosing the design that best matches the organizational requirements. It, as a process, helps in evaluating MIS

planning with respect to the current data available. Simulation, weighting methods, quantification of various factors, benchmarking, mathematical formulations, etc are some of the common evaluation techniques.

6. **The process of forming a formal group of people to carry out the MIS planning process**

   Organizing is the process of forming a formal group of people to carry out the MIS planning process. Such groups are called by different names in different organizations like planning committees, task forces, information systems group, etc. Organizing is considered an important part in MIS planning as it facilitates communication and coordination between information systems group and other departments in the organization.

7. **(d) All of the above**

   While planning for MIS, one has to consider the informational requirements of the line managers. It involves understanding the organization's mission, objectives, and strategies. MIS has to be based on the objectives and strategies of the organization.

8. **iii-i-ii**

   The MIS strategic planning process comprises the following stages: understanding the organizational strategy set, further understanding and validating the organizational strategy set, and finally transforming the organizational strategy set, into MIS strategy set.

9. **Transforming the organizational strategy set into an MIS strategy set stage**

   The transformation of organizational strategy set into an MIS strategy set is the last and most important step in the strategic planning process. This step involves developing MIS objectives, constraints, and strategies based on the organizational strategy set.

10. **(a) Designing has to take into account only the current informational requirements**

    Designing is the process of creating the physical structure of the MIS. This process puts together the necessary systems and subsystems, equipment requirements, software requirements, etc. The process of designing has to take into account the current as well as the future informational requirements.

11. A descriptive model of the MIS provides details regarding the authorities, responsibilities, and the roles of the user set in a two dimensional format. Insights on interactions between the departments (organization units) as well as between the departments and external agencies like suppliers, distributors and others are provided. The type of information required by the users and the direction of information flow can also be analyzed through this model.

12. (d) Rational approach

Rational approach is an improvement to the shotgun and traditional approaches. It incorporates decision- making process in the MIS design, though in an abstract form. This approach to MIS design emphasizes rationality and model building.

13. Empirical approach

In the empirical approach to MIS design, scientific observations of decision makers are considered at the design stage. This approach emphasizes on the behavior of decision makers rather than on rationality. It focuses how a manager behaves while making a decision. The environment in which the decisions are made are also given due importance and the decision process is given the equal importance as that to the outcome of the decisions.

14. (b) Future operational information

Though a descriptive model provides lots of information about the roles played by the users, yet it limits itself to the present/current operational information and does not provide any insights on future operations of the organization. Hence, a normative model is developed to get a view of the future operations and probable decisions that could be taken.

15. Consensus model is based on the descriptive and normative models. It provides the framework for analyzing formal and informal information requirements at different levels. This model can be used for identifying the specific involvement of the users in each of the decision elements in each decision area.

16. (c) Managerial cadre

Employees belonging to the managerial cadre ranging from the lower to the top level management represent the users of MIS.

17. In the shotgun approach, the system ignores the process which filters the information or validates the query. Therefore, the user has to manually filter and sort the information based on the requirement. This approach increases the cost of gathering and storing information. The information also consumes a lot of memory space. The system also returns identical information for different queries thus leading to duplication of information.

18. **(c) Act as advisors and information solicitors**

    Employees belonging to the managerial cadre range from lower to top management and represent the main users of MIS. The employees who belong to the technical cadre act as advisors and information solicitors.

19. **(b) Integration of information into a centralized database results in shifting of power from the individual departments to the headquarters**

    The traditional approach to MIS design provides the same kind of information to decision makers that has been proved successful time and again. This approach uses integration of information systems across the functional departments of the organization. Integration of information in a centralized database helps in reducing costs by eliminating duplicate data. However, it results in shifting of power from the individual departments to the headquarters. This creates friction in the organizational layers and functioning, thus leading to fall in revenues.

20. **Statements (a) and (b) are true while statement (c) is false.**

    A normative model is developed to get a view of the future operations and probable decisions that can be taken. Analysts use the normative model to amend the existing decision-making process to make it optimal in the future operations of the organization. This requires restructuring the organizational hierarchy in terms of authority and responsibility. A descriptive model limits itself to the current operational information and does not provide informational insights into future operations of the organization.

21. **(b) Information analysis model**

    After deciding on the approaches to MIS design, the next stage is the actual process of designing the MIS. The information analysis model, proposed by William King and David Cleland is an MIS design process which consists of three stages: the descriptive model, the normative model, and the consensus model.

22. In the empirical approach to MIS design, scientific observations of decision makers at work are considered while designing an MIS. It focuses on how a manager behaves while making a decision. In this approach, importance is given to the environment in which decisions are made, the decision process, and the outcome of decisions.

23. (b) The effectiveness of the performance of MIS grows with the increase in user involvement in the design stage

In the initial stages of MIS implementation, technical details of the system were given more importance than the user requirements. The employees belonging to the managerial cadre ranged from lower to top management and constituted the main users of the MIS. On the other hand, employees belonging to the technical cadre acted as advisors and information solicitors.

24. Basic outsourcing relationship

In a typical IS outsourcing process, the organization gives away or outsources the responsibility of developing an information system to another company. There are three types of IS outsourcing relationships: basic outsourcing relationship; preferred outsourcing relationship, and strategic outsourcing relationship. In basic outsourcing relationship, the organization buys the products or services of the IS outsourcing vendor, considering the price and convenience factors. This relationship is also called cash and carry relationship.

25. (b) Inviting proposals

In the inviting proposals stage, the organization conveys its requirements to the vendors and invites them to supply information about the ways in which they will be able to meet those requirements. A Request for Proposal or RFP is used during this stage. An RFP is a document requesting vendors to participate in the bidding process for hardware, software, and/or services. It helps assess the competitive bids from the vendors.

26. Every organization needs to make a decision whether to develop a part or a component in-house or buy it from external sources. This is called as make-or-buy decisions. Organizations make this evaluation by considering factors like cost of production (in-house), purchasing cost (external sources), quality, available capacity, reliability, etc.

However, the number of supervisors is not evaluated for making a make-or-buy decision.

27. In outsourcing, the organization gives away or outsources the responsibility of developing an information system to another company. There are three types of outsourcing relationships – basic outsourcing relationship, preferred outsourcing relationship, and strategic outsourcing relationship.

28. In strategic outsourcing relationship, both the buyer and the seller share the risks and rewards equally. However, very few organizations go for this kind of relationship.

29. Statements (a), (b), (d), and (g) are true while statements (c), (e), and (f) are false.

An RFQ is used in situations where the specifications of the product or the service are already known and there is no need for discussion on these issues. An RFQ is sent to the vendors prior to the RFP in order to get information about the range of prices. Such information can be used to write a full-fledged RFP. An RFI is used for locating products or services in the market that can meet the needs of the organization. This document does not invite a seller to participate in the bid and is not obligatory on the part of the buyers or the sellers. The RFI is mostly used in situations where the organization has to make major purchases and when numerous options are available to meet the requirements.

Unit 12:

MIS – Implementation, Evaluation, and Maintenance

Structure

12.1 Introduction

In the previous unit, we have discussed the planning and design aspects of an MIS. We have also discussed how the systems approach to problem solving can be used for developing an MIS. In this unit, we introduce you to MIS implementation.

The implementation of MIS takes place in three phases, namely, initial installation, testing the entire system, and evaluation and maintenance. For implementing MIS, an organization must develop a plan for implementation, allocate responsibility for implementation, develop the procedures for implementation, train operating personnel, develop forms for data collection and dissemination, develop the files, test the system, document the system, evaluate the system, control and maintain the system, and perform a cost benefit analysis of the system. Some of these activities need to be carried out simultaneously for reducing the implementation and development time.

An effective MIS framework and competent managers can help prevent major errors. Talented and experienced managers, well-defined plans, and capable implementers can minimize the problems faced during the development of MIS.

In this unit, we shall discuss the implementation, evaluation, control, and maintenance of an MIS in the organization. Each of the activities (listed above) to be carried out for implementing an MIS has subtasks, and these are explained in detail in the unit. The unit also examines the various challenges faced while developing an MIS.

12.2 Objectives

By the end of this unit, you should be able to:

- Recognize the significance of organizational change in MIS implementation.
- Discuss the planning process in MIS implementation.
- Explain the methodology in MIS implementation.
- Determine the process to be followed to evaluate the effectiveness of MIS implementation.
- Identify the challenges faced in MIS implementation.
- Evaluate the importance of MIS control and maintenance.

12.3 Organizational Change and MIS Implementation

Across the world, MIS has been implemented in organizations for over 40 years. However, the success rate of MIS implementation is very low mainly because of the organization's resistance to change.

Lynne Markus has identified three possible theories about resistance to change. The first theory describes the behavior of employees in the organization, which leads to resistance to the implementation of new processes. The second theory traces the technical dysfunctionality in the system which can lead to resistance in using the system. A third theory proposes that people resist systems due to interactions between the characteristics associated with the people and with the system.

The lack of commitment of the top management to MIS implementation can also lead to resistance to changing over to the new system. If the employees are encouraged to actively participate in the project, the problem of resistance to change can be reduced to a great extent. Moreover, the success of the MIS can be ensured if the users are given proper training on how to handle and operate the new technology. The change approach can help the organization adapt smoothly to the changes brought in by MIS implementation.

12.3.1 Change Approach to MIS Implementation

In an organization, MIS can be implemented in two different ways. The first gives more importance to the systems analysts than the users of the MIS. The systems analysts make all the major decisions in the implementation process and the users just respond to specific inquiries made by them. This method of implementation is commonly found in many organizations. In the other method, MIS users actively participate in the implementation process along with systems analysts, and as a problem solving team, they are together responsible for the development of an effective and efficient MIS. In this method, both sides participate through mutual learning and criticism. Though this method of implementation is found occasionally, this method has a higher post implementation success than the first method.

The change approach to MIS implementation is seen in the second method of implementation. This approach makes the active participation of MIS users and the top management compulsory during the implementation process. It emphasizes on the creation of an environment where organizational change is accepted through the active involvement and education of organizational members and by giving the implementation responsibility to them. The meaning of the terms involvement and education of MIS users in the implementation process are:

12.3.1.1 Involvement

Involvement refers to the active participation of organizational members in the MIS implementation for achieving success. These organizational members include all the members of the organization (like top management, all the concerned functional managers, operating managers, operating staff, systems analysts, programmers, etc.) who are directly or indirectly affected by the MIS implementation. For the sake of simplicity, they are classified into distinct groups as top management, functional heads, operating team, and systems team.

Though active participation has been made mandatory, the level of such participation from each group of members varies. According to Robert Zmud and James Cox, there are four levels of involvement that can be applied to each of the implementation stages. These levels include consultation, influence, commitment, and responsibility. According to them, the level of involvement of every group varied with each stage of the implementation process.

Consultation: Consultation refers to responding to the inquiries and providing advice and suggestions in the areas in which the members are experts.

Influence: Influence enables members to choose from among the various design alternatives varying from technical-oriented to user-oriented that will best suit for achieving the organizational goals.

Commitment: All the organizational members have to commit themselves to accepting the MIS as a tool to achieve higher levels of performance (by enhancing the operating efficiency). The top management in particular has to show full commitment to the implementation since an MIS implementation that does not have the top management's support has a higher chance of failure than the one which has the support of the top management. Apart from the top management, the commitment from functional heads and operating managers plays a crucial role in the success of implementation.

Responsibility: Responsibility is the acceptance of obligations of the implementation process and performing them successfully.

12.3.1.2 Education and Training

In order to eliminate resistance altogether, the employees should be educated on the importance of the MIS to the organization and how it will bring benefits to the employees as well as to the organization.

If the employees are comfortable using the MIS on a regular basis, they have to be trained adequately and this can be achieved by training the employees during and after the implementation process. Training is imparted in both general and specific areas. The general areas of training include introduction to computers and information systems concepts; how the MIS provides connectivity to all the departments in the organization and how information flows to and from each department; and development of the interpersonal skills of organizational members. The specific areas include information management in each functional area, technical details on operating the MIS in each functional area, etc.

Check Your Progress-1

1. Which entities participate actively in the MIS implementation process?
2. What are the various steps to be undertaken by organizations to implement MIS?

3. Which of the following statements is **true** regarding the change approach to MIS implementation?

a. The change approach can be seen in the second method of implementing MIS which emphasizes on the combined efforts of both systems analysts and the MIS users

b. The approach mandates the active participation of the MIS users during the implementation process

c. It emphasizes on creating an environment where organizational change is accepted through active involvement of organizational members

d. All of the above

4. The major reason for low success rate of MIS implementation is the organization's resistance to change. Lynne Markus has identified three theories about resistance to change. What are these?

5. Robert Zmud and James Cox identified four levels of involvement that can be applied to each of the implementation stages. They include

   i. Consultation

   ii. Influence

   iii. Commitment

   iv. Responsibility

Match the main activity specified below with the respective level of involvement.

p. Members choose among various design alternatives

q. Responding to the inquiries and providing advice and suggestions in the areas in which the members are experts

r. The acceptance of obligations of the implementation process and performing them successfully

s. Organizational members have to accept the MIS as a tool to achieve higher levels of performance

6. Training to organizational members is given in general as well as in specific areas. Which among the following does **not** include training given in general areas?

a. Introduction to information system concepts

b. Development of interpersonal skills

c. Technical details about operating MIS in functional areas

d. Training regarding connectivity and flow of information to and from each department

12.4 Planning the MIS Implementation

The MIS implementation begins with planning. It includes broad strategic planning where only the higher levels of management are involved in it. Implementation planning is about how the MIS design can be transformed into a physical reality. It involves procurement of the necessary equipment (including hardware and software), installation of networks, documenting the system, running the system live, generating information files, training the employees, etc. Systems analysts and managers together develop the detailed plans but the managers have the final say in them. Broadly, an implementation plan has to identify and establish relationships among tasks, establish a schedule for the completion of all tasks, prepare a cost estimate for the tasks, and establish a reporting and control system.

Activity: In the annual general meeting of RST Foods Limited, the board members of the company decided to implement an MIS. However, when a formal letter regarding the implementation was sent to the company's employees, the IT manager, Prakash Sinha (Prakash) found that the employees were somewhat reluctant to accept the changes involved in MIS implementation. Suggest measures that Prakash can take to ensure the smooth implementation of MIS across the organization.

Answer:

_____

_____

_____

12.4.1 Identify and Establish Relationships Among Tasks

The first step in implementation planning involves identifying all the tasks that are to be executed as part of the implementation process, followed by establishing relationships between them. The simplest relationship is to arrange the tasks in a logical sequence. However, this does not imply that a task can begin only after the completion of the preceding task. Two or more tasks can begin simultaneously or overlap during the process or end simultaneously.

12.4.2 Establish a Schedule

The next step is to develop a schedule (a tentative one) on the basis of the flow of tasks in the logical sequence. The management takes the help of systems analysts for developing the schedule. As the MIS implementation is considered as a project by itself, project management concepts can be applied here. The critical path for the project has to be calculated and the most likely time of finishing the project has to be deduced once the starting

time is known. This scheduling helps the management to plan for allocation of resources at various stages of the implementation process.

12.4.3 Prepare a Cost Estimate for the Tasks

As part of the implementation process, the cost of executing each task has to be estimated and budgeted for. Accordingly, the managers can allocate capital resources to different tasks. Budgeting also helps in controlling the cost escalations or cost overruns.

12.4.4 Establish a Reporting and Controlling System

A controlling system is used to minimize the deviations from the planned path of action. There should be a good reporting system for identifying deviations. Managers can obtain information on the progress of implementation through daily, weekly, and monthly reports. An analysis of such reports will give the status of the project and the further steps that have to be taken.

Check Your Progress-3

7. MIS implementation planning is about how the MIS design can be transformed into physical reality. An implementation plan comprises certain steps which are listed below. Arrange these steps in a logical order from the first to the last.
   i. Establish a schedule for the completion of all tasks
   ii. Identify and establish relationships among tasks
   iii. Prepare a cost estimate for the tasks
   iv. Establish a reporting & control system.
8. The critical path calculation in projects is mainly about how to
   a. Identify and establish relationships among tasks
   b. Establish a schedule for all the tasks to be completed
   c. Prepare a cost estimate for the tasks
   d. Establish a reporting and control system
9. An MIS implementation plan involves the following stages:
   i. Establish a schedule for all the tasks to be completed
   ii. Identify and establish relationships among tasks
   iii. Establish a reporting and control system
   iv. Prepare a cost estimate for the tasks

What is the **correct** sequence of the above given steps?

12.5 The MIS Implementation Process

The MIS implementation process involves installing the MIS physically in the organization and training the users to adapt to the system. The implementation process includes planning, organizing, developing procedures, training the users, developing forms for data collection, developing files for storage of data, testing the system, cutover, and documenting the system. Since the planning part has been already discussed, we will discuss the next steps.

12.5.1 Organizing for Implementation

This step involves supervising the major responsibilities in implementation. In large organizations, the MIS manager has this responsibility but in small organizations, the functional heads may take it up. Line managers must be entrusted with the responsibility for implementation and their roles should be clearly defined and explained to them. A brief explanation about the duties of line managers should be given to the middle level managers by the top management so that they can assist the line managers. Systems specialists will have to assist the managers in implementing the MIS. The management should strive to inculcate a sense of responsibility in all the staff members, including those involved in operating the system.

Employees will resist change only when the need for change has not been properly communicated to them by the management. The management generally employs specialists for implementing the MIS and hence employees feel isolated from the process and resist the MIS implementation. However, it will be a difficult task for the organizations to reap the full benefits of MIS without cooperation from the employees.

12.5.2 Developing Procedures for Implementation

Proper procedures should be established for the implementation of MIS. These procedures guide the project leader through the process of system installation and implementation. Procedures should be established for evaluating and selecting hardware, purchasing or developing software, and for implementing MIS in parts.

Testing is a core component of implementation. The only testing that is generally done is simulation of the system during the detailed design stage. The line staff should be involved in handling actual files, and hardware and software.

For developing an effective test plan, the questions that should be answered include which segments of the system will be tested, when will such tests be performed, who will perform the tests, how will the test be run, and who will evaluate test results and approve system segment or recommend modifications. The steps of system development are:

- A test description should briefly and clearly identify the objectives of the system and its ultimate goal.
- The test specification derived from the test description contains details pertaining to the conditions under which the tests are to be performed, the duration of the test, the methodologies and procedures to be followed in testing, the data that is relevant for testing, the frequency of data collection, and the method of analysis to be used on the data.
- A detailed report regarding the testing procedure should also be prepared which should include details on organizing the personnel for conducting the tests, the data sheets and test forms required, conditions for starting the test, the equipment, software and hardware that are to be used, and step-wise listing of procedures for performing the tests.
- An acceptance test program should be prepared for the operating personnel.

12.5.3 Training the Users

A central aspect of MIS implementation is the training of the personnel who will be using the system. Efforts should be made to convince the employees that the MIS will increase productivity, lead to better time management, and improve the quality of work. Training programs should be arranged for employees who will use the MIS on a daily basis. It is advisable to employ a training specialist to conduct these programs. In small organizations, MIS managers can themselves develop the training programs.

12.5.4 Hardware and Software Acquisition

cquisition of hardware and software has to be made for the physical installation of networks. Hardware includes computers and other peripherals, while software includes the operating system, applications, A and programming languages. Apart from acquiring standard software, at times, it becomes necessary to develop custom

software to suit the requirements of an organization. Programming languages are used for developing such custom-based software. Development of such software can be done either internally or outsourced to a third party. Another major managerial decision involved in this stage is whether to buy the hardware or lease it from the vendors. Capital expenditure analysis, prestige, usage, anticipated replacement schedule, and vendor's options are some of the factors that are taken into consideration to decide whether to buy the hardware or lease it.

12.5.5 Develop Forms for Data Collection

For storing the huge volume of data generated or collected by organizations from both internal and external sources in standardized formats, daily activities should be recorded in specifically designed forms. Some forms need to be used even in those organizations where sophisticated technology is used for recording of data. These may be formats in which data is stored. Forms are used not only for input/output of data but also for transfer of data between processes. For instance, the resumé, i.e., the input, is screened by the computer on the basis of the criteria specified by the system. Only those resumés that meet these criteria are selected and sent to the HR department.

12.5.6 Developing Files for Storage of Data

File specification is prepared in the detailed design phase. In the implementation phase, the data is collected and recorded for initial testing and operations. The conditions required for this include checklist of data, specification of storage format, and provision for remarks. There should also be a manual specifying the methodology for updating the data individually and for updating the files. A procedure should be devised for obtaining data if it is collected from external sources. If the data is collected internally, the source of generation or the source of compilation is generally assigned the responsibility for file items. The information collected is generally stored in the database. In the detailed design phase, the storage and retrieval mechanism is specified, and in the implementation phase, the data is analyzed by the programmers. The programmers decide on the file size, filename, frequency of access, frequency of updates, and also translation of specific files.

12.5.7 Test the System

All systems should be tested before implementation. Component tests, subsystem tests, and total system acceptance test must be carried out. In a component test, the items and aspects of system which are examined include equipment (old or new), new forms, new software programs, new data collection methods, new work procedure, and new reporting formats.

Each component should be tested independently so as to facilitate the detection and correction of errors. Component testing includes tests for accuracy, range, and frequency of input, usual operating conditions, human factor, and reliability. Component testing helps familiarize employees with the system and also to make changes to the system without much rework at the completion stage.

When the number of components being installed increases, the subsystem can be tested. System testing, which is very different from component testing, includes verification of multiple inputs, complex logic systems, interaction of humans with widely varied equipment, system interfacing, and timing of different parts.

Cutover

Cutover is the point at which the new system replaces the old system. This involves activities like the physical transfer of files, furniture, and other office equipment, and also the movement of people. Problems may crop up even after component and subsystem testing due to improper training of personnel and employees' incompatibility with the new environment. The people who designed the new system should be present to sort out any problems that may arise. System designers play an important role in ensuring a smooth transition. The designers can find out whether the employees are secretly using the old methods because of their resistance to change. In case any such activity is detected, they should report it to the management so that corrective action can be taken. The change-over process may take several months.

12.5.8 Documenting the System

Documentation is the process of maintaining written reports describing the scope, purpose, information flow, and operating procedures of the system. It is required when there is need for troubleshooting, replacement of the subsystem, training operating personnel, and upgrading the system.

Maintaining documents helps organizations to train new personnel easily, help the designers who are not familiar with the system to understand the system, serves as a common reference for managers, designers, and programmers, and helps in developing new plans, schedules, and processes.

12.5.9.1 Documenting a Manual MIS

The written reports of a manual MIS system provide the summary of scope, interfaces with other systems, types of output and users, assumptions and constraints of the design, and name of the project head; both old and new organization charts and a comparison of the number and kind of people before and after the installation of the new system; flow charts and layout charts; desk equipment; forms; output reports and formats; manual data processing procedures; and methods of controlling and revising the system.

12.5.9.2 Documenting a Computer-based MIS

There are very few differences between documentation for the manual and the computer-based systems. In a computer-based system, the master file is given importance due to its criticality in storage, processing, and retrieval of data.

MIS Reports are required by the management to assess the performance of the organization and allow for faster decision-making. It is crucial that businesses opt for an automated management information system is set up for better decision-making. Tally generates varieties of automated reports. Exhibit 12.1 presents those as available in 2021.

Exhibit 12.1: MIS Report: Definition, Types and Example (Tally solutions-2021)

The major components of a typical management information system are;

- People – people using the information system
- Data – the data recorded by information system
- Business Procedures – procedures related to record, store and analyze data
- Hardware –servers, workstations, networking equipment, printers, etc.
- Software –programs used to handle the data, like Tally, database software, etc.
- Types of MIS reports in Tally. ERP 9
- Accounting reports: To obtain information on the financial position, operational performance and economic activities of the business.
- Financial reports: To determine the financial condition of an organisation as required by shareholders, creditors and government units.
- Inventory reports: To manage the Inventory effectively since the actual status of stock items is obtained.
- Management control reports: To utilize budgets, cost centre reports, scenario reports etc. for controlling activities.

Source: https://tallysolutions.com/accounting/mis-report/ April 2021

Activity: Louis Berry Limited, a manufacturer of branded apparels, wants to implement an MIS in the organization. The basic purpose of implementing the MIS is to enhance the company's operational efficiency. What are the various steps that the company should take to ensure successful implementation of the MIS?

Answer:

_____
_____
_____
_____
_____
_____

Check Your Progress-3

10. Documentation is the process of maintaining written reports, describing the scope, purpose, information flow, and operating procedures of the system. When is it required?
11. What does information systems implementation consist of?
12. Proper procedures should be established for the implementation of MIS. For which of the following tasks should procedures be established?
    a. Evaluation and selection of hardware
    b. Purchase or development of software
    c. Implementation of MIS in parts
    d. All of the above
13. One of the steps in MIS implementation process is developing forms. What are they used for?
14. Which of the following statements is **false** regarding documenting the system in the MIS implementation process?
    a. Documentation is required when there is a need for replacement and upgradation of the system
    b. New personnel can be trained easily with the help of documents
    c. Documents are not of any use for developing new plans, schedules, and processes
    d. Designers, who are not familiar with the system, can refer to the documents to understand the system

15. Explain the detailed design phase in the MIS implementation process.
16. Consider the following two statements regarding documentation in a computer based MIS:
    i. The master file is given importance owing to its criticality in storage, processing, and retrieval of data
    ii. It is easy to complete parallel testing before target day cutover.

Which of the following options is **true** regarding the given statements?

a. Only statement (i) is true
b. Only statement (ii) is true
c. Both statements (i) and (ii) are true
d. Both statements (i) and (ii) are false

17. In the MIS implementation phase, the collection and recording of data for initial testing and operations takes place. What are the prerequisites of this stage?
18. Testing is one of the key processes in MIS implementation. What tests should be carried out before installing the system?
19. Verification of multiple inputs, complex logic systems, interaction of humans with widely varied equipment, etc., are all carried out as part of _____.
20. Which of the following tests constitute component testing of the system?
    i. Tests for accuracy and frequency of input
    ii. System interfacing
    iii. Test for usual operating conditions and reliability
    iv. Test for interaction of humans with widely varied equipment

a. Only i and iv
b. Only i and iii
c. Only ii and iv
d. Only i and ii

21. Each component should be tested before testing the entire system. Explain the importance of component testing of the system.
22. Which of the following statements **best** describes the characteristics of test description?

a. A test description should briefly and clearly identify the objective of the system and its ultimate goal
b. A test description is derived from the test specification

c. A test description contains details about the conditions under which the tests must be performed

d. A test description contains details about the frequency with which data should be collected and the method of analysis to be used on the data

12.6 Evaluation of MIS Implementation

After completing the implementation of MIS, it has to be evaluated in order to ascertain that the intended objectives of MIS implementation are met. One of the main objectives of the MIS is enhancing the ways operations are carried out in the organization. Post-implementation evaluation can be used to confirm the extent to which the MIS is being used in the organization to enhance effectiveness and efficiency. Evaluation of the implementation also brings to light the efficiency with which the allocated resources are utilized in the process.

The objectives that can be considered to measure efficiency in the MIS implementation can be technical quality, scheduled completion, user participation, available man-hours, MIS personnel training, etc. The possible performance measures for these objectives can be compliance to systems development standards (for program design, database design, testing, etc.), compliance to the schedule and variances if any, amount of user involvement and type of user involvement, and expenditures incurred in MIS training.

Evaluating the effectiveness of MIS usage can be done only after the implementation and when the users begin to use the system. Though test runs are performed during the implementation, these cannot ascertain the effectiveness of performance fully. Hence, this evaluation is done as a post implementation evaluation. The effectiveness of the MIS can be seen through achieving various objectives like improvement in quality of information, improvement in quality of decision making, improvement in organizational performance, and customer satisfaction.

12.6.1 Problems in MIS Evaluation

Evaluating the effectiveness of the MIS is a difficult task. Some of the problems in the evaluation process are:

1. The initial specification of objectives and performance measures is ill-defined in most MIS implementations. Ill-defined objectives result in ill-defined performance measures. Several times, the performance measures concerning user and organization performance have not been quantified correctly as the users' personal objectives are not usually taken into consideration. This leads to a mismatch between the measured and the real performance.

   Suggestion: The objectives and performance measures of the information system have to be defined on the basis of the operative objectives which are directly linked to the operations in the organization.

2. Managements generally use those objectives and performance measures that can be easily quantified for doing further analysis. However, such performance measures are capable of measuring the efficiency of the system and not its effectiveness. It is difficult to measure the effectiveness of the information system since it is not easy to define performance measures for such objectives.

   Suggestion: The range of the performance has to be enlarged to include operation level processes. The effectiveness of the information system can be then determined by the quality of output from the operation level processes.

3. Often, the objectives and performance measures defined initially do not remain the same after implementation since users and implementation teams learn a lot during the implementation. Changes in user needs also bring in changes in the objectives of the information system.

   Suggestion: Recognize the dynamic nature of MIS implementation and update the objectives and performance measures accordingly.

4. There may be non-existence of a mutual consensus on the objectives of the information systems among different organizational members. This may lead to different opinions on evaluating the system, resulting in differences in the performance measures.

   Suggestion: The different viewpoints of the organizational members should be taken into consideration in developing the objectives and performance measures of the information system at the initial stage as well as during the evaluation of the effectiveness of the system.

12.7 Challenges in MIS Implementation

The changes in procedures due to the implementation of MIS will affect the ways in which plans are made, programs are developed, and performance is evaluated within the organization. New patterns of communication will emerge, and new information will be available for decision making and administrative responsibilities. Organizational changes may be required for improving the MIS, which may be even more unsettling than the procedural changes required for implementing the system. The introduction of the MIS may bring about substantial changes in the established way of doing business, which can generate significant resistance from those within the organization.

The installation of a new system is a political process. It involves pressure, persuasion, and compromise. The driving force behind a new system must come from the top management. If problems arise during the design and implementation of these procedures, it is the duty of the top management to listen to the conflicting viewpoints and then take decisions to resolve such problems and remove any impediments. Operating managers are more likely to support the system if they are convinced that it will help them function better and carry out their responsibilities. The new system should provide operating managers with better information about the activities and performance of those staff members for whom they are responsible. With this information, the operating managers can have a better basis for directing and controlling the efforts of subordinates.

It may not be feasible to install an MIS across the whole organization all at once. Organizations may concentrate initially on those departments in which the results of improvement will be most visible. Success in one department can lower resistance and increase acceptance throughout the organization.

Moreover, it is difficult to accurately estimate the time period which would be required for successfully designing and implementing an MIS in organizations. On the other hand, if the management were to allow enough time for fine-tuning the efforts, the system may never be implemented.

Organizations should exercise a good deal of skepticism when presented with the initial concept of an improved management system. The rule of delay cautions officials to give the system adequate time to develop and to be prepared to face periodic setbacks in its implementation. The management must be prepared to invest personnel, time, and money to overcome breakdowns in the system as and when they occur. Most of the costs will be incurred before the benefits are achieved. The anticipated benefits from the new MIS should significantly outweigh the estimated costs of mounting the system.

The implementation of a new MIS does not absolve managers of their responsibilities. They still have to analyze, interpret data, and use their judgment in decision making. They must make allowances for inadequate or unavailable data. Although the MIS can provide certain parameters for decision making, it cannot take decisions. Ultimately, it is the manager's

responsibility to use his/her discretion while taking decisions.

12.8 MIS Control and Maintenance

Line managers are responsible for maintaining and controlling the information system. Control of the information system implies ensuring that the system is performing in the manner it is supposed to. Changes are made to the system for improving the performance of the system and these changes may not be indicated in the implementation document. Periodic tests should be conducted by managers for control purposes.

Maintenance, on the other hand, refers to the ongoing activity to ensure MIS effectiveness within the cost constraints, and is directed toward minimizing the errors that have occurred due to design and environmental changes, and enhancing the scope and services of the system. Maintenance may be classified into emergency maintenance, routine maintenance, request for special reports, and system requirements. In an organization, the activities which require maintenance include policy statements, procedures, forms, operating system, hardware or hardware configuration, software modifications or additions, system controls, security requirements, environment inputs, etc.

Activity: At its annual board meeting, Pratik Foods Private Limited decided to implement an MIS in the company. A majority of the Board of Directors of the company suggested implementing the MIS throughout the organization at one shot. However, Rahul Verma (Rahul), the Chief Information Officer of the company, pointed out that MIS should initially be implemented for those departments in which the results of improvement would be most visible. After some initial success, it could be implemented throughout the entire organization. Why do you think Rahul gave such a suggestion to the Board? What are the challenges that the company is likely to face if the Board of Directors decides to implement MIS across the organization at one go?

Answer:

Changes in the environment need to be closely monitored for avoiding undesirable effects on the MIS. Some of the environmental factors that affect the MIS are changes in governmental policies and regulations, changes in economic conditions, changes in industry and competitive conditions, and introduction of new technologies.

12.8.1 Changes in Governmental Policies and Regulations

Large companies engage specialists and lawyers for appraising the

management about the various changes that are taking place in the environment and how the organization can adapt to these changes. The organization may have to make changes in reporting and compliance requirements.

12.8.2 Changes in Economic Conditions

Economic conditions affect the financial information systems. Corporate policies are generally influenced by the information system. The information system should be designed in such a manner that it is able to internalize economic changes. Since it may not always be possible to predict economic changes, a periodic evaluation of the system is required.

12.8.3 Changes in Industry and Competitive Conditions

Timing is an important factor in the industry. It determines the success or failure of a product in the market. Changes in the business environment, too, affect the competitive strategy, pricing policy, hiring, and capital budgeting. New technology is likely to affect an organization's basic objectives. There are new standards for measurement such as package size, or metric system. All these changes require changes in the MIS.

12.8.4 Use of Latest Technologies

The rapid pace at which computer technology, application programs, and management techniques have grown has helped in MIS implementation in organizations. The present generation managers use these technologies for improving productivity and efficiency.

12.8.5 Problems Involved in MIS Maintenance

The maintenance of the MIS could be a major problem if there is no proper plan involved. Some of the problems involved in maintaining a MIS include no plan drawn up for carrying out maintenance of the system, no proper allocation for the resources required for maintenance, absence of involvement and cooperation from the top management, no proper documentation, and no qualified personnel to carry out the maintenance.

The process of maintenance should be initiated by the top management. The supervisors, system analysts, computer experts, etc., are the personnel responsible for maintaining the MIS and they should work efficiently with proper coordination so as to avoid the problems involved in the maintenance. Apart from the involvement by the top management and the line managers, proper planning is required for phasing out these problems. The annual and short-range plans should be kept in place for maintaining the information system. The MIS should be documented and revised periodically.

Activity: Vishnu Beverages Limited has implemented an MIS across all its departments. However, the company did not draw up a plan for regular maintenance of the information system. The Chief Information Officer of the company, Rakesh Sharma (Rakesh), suggested to the top management to give the job of MIS control and maintenance to the line managers. However, the top management did not accept the proposal. Therefore, Rakesh decided to explain the importance of MIS maintenance to the top management. Do you accept the suggestion made by Rakesh? Give reasons to justify your answer.

Answer:

_____
_____
_____
_____

12.9 Summary

- In an organization, resistance to change during the MIS implementation can occur either because the employees are not accepting the new business processes in the fear of losing jobs, or because of technically deficient systems which are not very user friendly, or because of lack of commitment from the top management.
- In order to avoid such resistance, organizations should educate their employees about the various benefits that the MIS brings with it, both at the organizational level as well as at the individual level. Training should be imparted to the employees in terms of operating the MIS in their specific functions.
- The implementation process starts with planning for implementation where relationships among various tasks have to be identified and established, schedules for completing all the tasks should be prepared, cost estimates for various tasks have to be drawn up, and a reporting and control system has to be established. After the planning is done, the implementation process can be executed smoothly. The steps in the implementation process include organizing for implementation, developing procedures for implementation, training the users, acquiring hardware and software, developing forms for data collection, developing files for storage of data, testing the system, cutover, and documenting the system.

- After the implementation of MIS, it can be evaluated for the efficiency with which the allocated resources are utilized in the development/ implementation and the effectiveness of its usage after the implementation. There are several challenges that are faced in implementing the MIS. The commitment of the top management toward the MIS implementation is the strongest defense that can be built up against all these challenges.
- The changes in procedures due to the implementation of MIS will affect the ways in which plans are made, programs are developed, and performance is evaluated within the organization. The introduction of the MIS may bring about substantial changes in the established way of doing business, which can generate significant resistance from those within the organization.
- Line managers are responsible for maintaining and controlling the information system. Control of the information system implies ensuring that the system is performing in the manner it is supposed to.
- The MIS is affected by certain environmental factors. These include changes in governmental policies and regulations, changes in economic conditions, changes in industry and competitive conditions, and introduction of new technologies.

12.10 Glossary

- **Cutover:** A point at which the new system replaces the old system. Cutover entails activities like the physical transfer of files, furniture, and other office equipment and also the movement of people.

12.11 Self-Assessment Test

1. The success rate of MIS implementation in organizations is low. Why? In what ways can an organization overcome this problem? Explain.
2. In organizations, MIS can be implemented in two ways. Explain these approaches. In this context, briefly discuss the change approach to MIS implementation.
3. In an organization, the MIS implementation process involves installing the MIS physically in the organization and imparting training to the users to adapt to the system. What are the various steps involved in the MIS implementation process? Discuss.

4. After implementing the MIS in an organization, it has to be evaluated. Why do you think evaluation is an important step? What are the likely problems that are involved in evaluating MIS? How can an organization overcome these problems?
5. Changes in the environment have to be monitored closely for avoiding undesirable effects on the MIS. In this context, discuss some of the environmental factors that affect the MIS.

12.12 Suggested Readings / Reference Material

1. Introduction to Information Technology, V. Rajaraman, PHI learning, 2018
2. Information Technology for Management, 2ed: Advancing Sustainable, Profitable Business Growth, Turban, Volonino, Wood, O.P. Wali, Wiley India Pvt Limited, January 2021
3. Introduction to Information Systems - 6th edition, R. Kelly Rainer; John Wiley & Sons, Inc.2016
4. Information Technology: An Introduction for Today's Digital World, Richard Fox, Chapman and Hall/CRC; 2nd edition (August 21, 2020)
5. Information Technology for Management, Efraim Turban, Carol Pollard, Gregory Wood, Wiley, 2018

Additional References:

1. Critchley, L., Where Nanotechnology, the IoT, and Industry 4.0 Meet., https://www.mouser.com/blog/where-nanotechnology-the-iot-and-industry-40-meet, 2019
2. Pan India implementation of HMIS over Indian Railways, Ministry of Railways., http://railministry.com/pan-india-implementation-of-hmis-over-indian-railways/ 2020
3. Vossler, C. How Long Does It Take To Order A New BMW?https:// www.bmwblog.com/2020/09/28/how-long-does-it-take-to-order-a-new-bmw/2020
4. Jay, A., 10 New ERP Trends & Forecasts for 2020/2021 – A Look Into what's next. https://financesonline.com/erp-trends/2019
5. Gingiss, D., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue (forbes.com), 2019

12.13 Answers to Check Your Progress Questions

Following are the answers to the Check Your Progress questions given in the Unit.

1. Systems analysts and MIS users

MIS can be implemented in an organization in two different ways. In the first method, the systems analyst is given more importance than the users of the MIS. The second method involves using the combined efforts of both systems analysts and MIS users. MIS users actively participate during the implementation process along with the systems analysts and as a problem solving team they are together responsible for the development of an effective and efficient MIS.

2. MIS is implemented in three phases, namely, initial installation, test of the whole system, and evaluation and maintenance. To implement MIS, organizations must develop a plan for implementation, allocate responsibility for implementation, develop the procedures for implementation, train the operating personnel, develop forms for data collection and dissemination, develop the files, test the system, document the system, evaluate the system, control and maintain the system, and carry out a cost benefit analysis of the system.

3. (b) The approach mandates the active participation of the MIS users during the implementation process

The change approach to MIS implementation mandates the active participation of the MIS users and the top management during the implementation process. The change approach enables organizational change through active involvement and education of members (who are deemed to be affected the most) and by assigning the implementation responsibility to them.

4. Lynne Markus had identified three theories about resistance to change. The first theory states that the employees' behavior in the organization leads to resistance to the implementation of new processes. When a new technology is introduced in the organization, certain business processes are bound to be modified and/or replaced with new business processes. The second theory states that technical dysfunctionalities in the system can lead to resistance. They include technically deficient systems, low levels of user friendliness, etc. A third theory states that people resist systems due to the interactions between the characteristics of

people and the characteristics of system. For example, centralized data control in a decentralized organization can lead to a show of resistance. Top management's lack of commitment to MIS implementation can also lead to resistance to change to the new system. However, the last theory about top management's lack of commitment is not one of those proposed by Markus.

5. i-q; ii-p; iii-s; iv-r

The first step is responding to the inquiries and providing advice and suggestions in the areas in which the members are experts. Next, members choose among various design alternatives. Thereafter, organizational members have to accept the MIS as a tool to achieve higher levels of performance. Subsequently, the acceptance of all members towards the obligations of the implementation process must be ensured.

6. (c) Technical details regarding operating MIS in the functional areas

In order to make employees feel comfortable about using MIS on a regular basis, they have to be trained adequately. Training employees during and after the implementation process fulfills these educational requirements. Training is given in both general and specific areas. The general areas of training include: introduction to computers and information system concepts, how MIS provides connectivity to all the departments in the organization and how information flows to and from each department, and development of organizational members' interpersonal skills. The specific areas of training include information management in each functional area, technical details about operating the MIS in each functional area, etc.

7. ii-i-iii-iv

An MIS implementation plan has to identify & establish relationships among tasks, establish a schedule for the completion of all tasks, prepare a cost estimate for the tasks, and establish a reporting & control system.

8. (b) Establish a schedule for all the tasks to be completed

The second stage in the MIS implementation planning involves developing a schedule that ensures the smooth flow of tasks. As the process of MIS implementation is considered as project, project management concepts are applied. During this stage, the critical path of the project is calculated and the most likely time of project completion is deduced after determining the starting time. This scheduling helps the management to plan for the allocation of resources to the various stages of the implementation process.

9. (d) ii-i-iv-iii

MIS implementation always starts with planning. An implementation plan has to cover all the tasks and subtasks and assign specific responsibilities to different organizational members. The implementation plan has to identify and establish relationships among tasks, establish a schedule for all the tasks to be completed, prepare a cost estimate for the tasks, and establish a reporting & control system.

10. Troubleshooting, training of operating personnel, and upgrading the system

Documentation refers to the process of maintaining written reports describing the scope, purpose, information flow, and operating procedures of the system. It is required when there is need for troubleshooting, replacement of subsystem, training operating personnel, and upgrading the system.

11. Documentation, training, and testing

Information systems implementation consists of testing, documentation, and training. System testing involves testing hardware devices, testing and debugging computer programs and information processing procedures. Documentation is essential for implementing effective information systems. Training ensures that the end users are trained to operate new system.

12. (d) All of the above

The procedures guide the project leader through the process of system installation and implementation. Procedures should be established for all the tasks i.e. evaluation and selection of hardware, purchase or development of software, and implementation of MIS in parts.

13. Forms are used for input and output of data, and for transferring data between processes.

A vast amount of data is collected through both internal and external sources in every organization. This data must be stored in standardized formats. To do so, daily activities should be recorded in specifically designed forms. Forms are used for input/output of data and also for transferring data between processes.

14. (c) Documents are not of any use for developing new plans, schedules, and processes

Documentation is the process of maintaining written reports describing the scope, purpose, information flow and operating

procedures of the system. Documentation is required when there is need for troubleshooting, replacement of subsystem, training operating personnel, and upgrading the system. It serves as a common reference for managers, designers, and programmers. New plans, schedules, and processes can be developed easily with the help of documents.

15. In the detailed design phase, the storage and retrieval mechanism is specified. The programmers decide on the file size, file name, frequency of access, frequency of updates, and also translation of specific files. In this phase, the file specification is prepared, data storage and retrieval mechanism is specified, and simulation of the system is done.

16. (a) Only statement (i) is true

Compared to a manual system, in a computer based system, it is difficult to complete parallel testing before target day cutover. However, this is an important process in certain organizations like banks. The transactions of the bank need to be closed at the end of the day after reconciling all the accounts. If there is a delay even by a day there could be serious consequences. Similar situations also occur in case of the airlines, retailing, and project management control.

17. In the implementation phase, the collection and recording of data for initial testing and operations takes place. The prerequisites for this are checklist of data, specification of storage format, and provision for remarks, a manual specifying the methodology for updating the data individually and for updating the files. If data is collected from external sources, then a procedure should be devised for obtaining such data. If the data is collected internally, the source of generation or the source of compilation is generally assigned the responsibility for file items.

18. Before installing the system, the system should be tested. Various tests like component tests, subsystem tests, and total system acceptance test must be carried out in this regard.

19. System testing

When the number of components being installed increases, the system can be tested. System testing is very different from component testing. It includes verification of multiple inputs, complex logic systems, interaction of humans with widely varied equipment, system interfacing, and timing of different parts.

20. (b) Only i and iii

Component testing includes tests for accuracy, range, and frequency of input, usual operating conditions, human factor, and reliability. System testing includes verification of multiple inputs, complex logic systems, interaction of humans with widely varied equipment, system interfacing, and timing of different parts.

21. Component testing helps in familiarizing the employees with the system and also in making changes to the system without much rework at the completion stage. It helps in detecting and correcting the errors. Component testing includes tests for accuracy, range, and frequency of input, usual operating conditions, human factor, and reliability.

22. (a) A test description should briefly and clearly identify the objective of the system and its ultimate goal

A test description should briefly and clearly identify the objective of the system and its ultimate goal. The test specification is derived from the test description and contains details about the conditions under which the tests are to be performed, the duration of the test, the methodologies and procedures to be followed in testing, the data that is relevant for testing, the frequency with which data should be collected and the method of analysis to be used.

Unit 13

Information Resources Management and IT Governance

Structure

13.1 Introduction

In the previous unit, we have discussed the planning, designing, and implementation, evaluation, and maintenance aspects of an MIS. Apart from the above discussed aspects, it is very important to manage the information resources and technology in an organization. Information technology (IT) has largely contributed to the effective use of information and its impact can be seen throughout in an organization. In this unit, we would be discussing the various ways in which information resources can be effectively managed and how they can enhance the performance of an organization.

Managers can improve an organization's performance by bringing change to its components such as people, task, technology, culture, and structure. Therefore, Information Resource Management (IRM) has become a major responsibility of all managers, irrespective of the organizational functions they perform. Hence, data, computer hardware and software, and information systems personnel, should be viewed as valuable resources that must be managed by every business manager.

In this unit, we examine the various aspects of IT management. A major obstacle which most IT managers face from within the organization is resistance to change. The unit deals with the need for managers to plan structural and procedural changes in the organization. The unit also discusses the security and ethical challenges posed by the use of IT in business. The unit ends with a discussion on business continuity planning and IT governance.

13.2 Objectives

By the end of this unit, you should be able to:

- List the objectives of information resource management.
- Illustrate the role of IT in the implementation of information systems and organizing of information resources.
- Explain the need for information security and control.
- Discuss the concept of ethics in IT.
- Justify the importance of business continuity planning and disaster recovery planning.
- Summarize the need for IT Governance, frameworks of IT Governance, and the Sarbanes-Oxley Act.

13.3 Managing Information Resources and Technology

Organizations need information to make decisions and to do business. Organizations achieve its goals by combining people, information, and resources. Organizations deliver value to customers in an efficient and effective manner by coordinating with its suppliers, distributors, and employees. In order to achieve this, productive and updated information should flow across all departments in the organization. Thus, organizations manage information as an important resource in achieving organizational objectives.

Information as a resource is relatively a new concept and some pioneering work on this concept was done in the 1980s. Much research took place after then and the concept of information resource management evolved over time. Information Resources Management Association (IRMA) consisting of members from more than 50 countries has been established for the management of information resources.

13.3.1 Definition of Information Resource Management

IRM is the management of information resources through planning, organizing, staffing, coordinating, and controlling the information which

has significance in various business processes aimed at achieving the organizational goals.

Schneyman defined IRM as "the management (planning, organization, operations and control) of the resources (human and physical) concerned with the systems support (development, enhancement and maintenance) and the servicing (processing, transformation, distribution, storage and retrieval) of information (data, text, voice, image) for an enterprise."

McLeod and Brittain-White defined IRM as "the recognition by an organization that data and information are valuable resources and the application of the same principles of managing data and information as are used in managing physical resources such as personnel."

The concept of IRM treats information as any other organizational resource. IRM has gained importance from top management and became an integral part of organization's corporate planning strategies and is used to gain competitive advantage in the market.

13.3.2 Objectives of Information Resource Management

The objectives of IRM relate to the organizational objectives. The primary objective of IRM is to maximize the quality and value of the organizational information resources. It emphasizes the importance of information to personnel at all levels in the organization. It holds the management responsible for managing information. It enables data sharing across all departments. It ensures data integrity by ensuring accuracy and consistency of information. It provides controls for ensuring data security and preventing unauthorized access, modification, and/or destruction of information. It ensures that information is available on time and helps improve information accessibility and usability.

13.3.3 Elements of IRM

The elements of IRM (also called as principles of IRM) were developed by Nick Willard in 1993 (popularly called as Willard Model). The Willard Model has identified five elements that relate to the professionality of IRM in carrying out various activities. They are identification, ownership, cost & value, development, and exploitation.

Identification: Information resources providing quality information are discovered and are recorded in the system.

Ownership: Ownership is the act of accepting the responsibility to maintain and manage the information resource.

Cost and value: It is the process of ascertaining the cost of the information resource and its inherent value through which the organization can benefit.

Development: The value of information resource is enhanced for maximizing the benefits (to the organization) derived from the resource.

Exploitation: It is the actual process through which the information resource is put to use. Information is either used by the organization to generate further value or it is sold as a commodity to gain financial benefits.

13.3.4 IRM and Knowledge Management

Organizational knowledge is a combination of information and experience. It is considered as an asset used for formulating corporate strategies and making important decisions. It has to be updated, disseminated, and applied to various problems in the organization. Knowledge is stored in inventories called as knowledge repositories and can be continuously stored and updated. These processes are part of knowledge management. Knowledge management in an organizational context also involves sharing of information. Therefore, knowledge management can be defined as the process of creation, retention, updation, dissemination, and exploitation of knowledge.

The information collected is transformed into knowledge by analysis and human intervention. Therefore, it can be concluded that information is part of knowledge. Further, information is derived from data (facts) that can either be structured or unstructured. Structured data, which is well organized and systematic, can be found in reports, databases, data files, etc., while unstructured data, which is subjective and unorganized in nature, is found in email systems, images, drawings, video clips, web, etc. Knowledge management system links both the structured and unstructured data.

It can be concluded that knowledge management encompasses IRM in terms of scope. In every organization, IRM is treated as a platform for carrying out knowledge management efforts.

Check Your Progress-1

1. In the Willard model, _____ refers to the act of accepting the responsibility to maintain and manage the information resource.

2. The website of a company is a potential source of
   a. Structured information
   b. Well organized information
   c. Systematic information
   d. Unstructured information

3. In the Willard model, identification is an element that refers to

4. Which of the following is **not** true about information resource management (IRM)?

   a. IRM is the management of information resources through planning, organizing, staffing, coordinating and controlling the information which has significance in various business processes aimed at achieving the organizational goals
   b. The concept of IRM treats information as a valuable resource distinct from other organizational resources
   c. IRM is treated in a stewardship capacity managing the information resources as shared organizational resources
   d. It has become an integral part of every organization's corporate planning strategies and is used to gain competitive advantage in the market

5. Which of the following terms can be defined as the process of creation, retention, updation, dissemination, and exploitation of knowledge?

6. Knowledge management systems consist of _____ data.

7. Which of the following statements is/are **true** regarding the exploitation element in the Willard model of information resource management?

   a. Exploitation is the actual process through which the information resource is put to use
   b. Information is used by the organization to generate further value
   c. Information is sold as a commodity to gain financial benefits
   d. All of the above

13.4 Information Technology and Organizational Needs

Though technology plays an important role in the implementation of information systems, the information resources need to be organized and structured and should be utilized effectively. In order to implement and use IT, organizations need to understand the business and the information environment. This helps an organization understand the usage of IT. Organizations develop information systems, keeping in mind their impact on their employees, tasks, technology, culture, and structure. The challenge lies in developing information systems which result in strategic improvements in the way organizations manage these factors.

13.4.1 People

The managers and knowledge workers need for information differ to a great extent. Also, they possess diverse capabilities for effectively utilizing the information provided to them. Information systems must provide information suitable to the individual needs of the manager. This would help them in effective decision making.

13.4.2 Tasks

IT helps an organization deal with complexities by supporting radical changes like 'Business Process Reengineering'. Developments such as Electronic Data Interchange (EDI) eliminate the need to prepare, authorize, check, and send official paper documents. Communication and cooperation between organizations is also encouraged.

13.4.3 Technology

The technology of computer-based information systems evolves constantly. Due consideration must be given to the management culture and structure of the organization before introducing a new technology.

13.4.4 Culture

Every organization has a unique culture that is shared by managers and employees of an organization. Therefore, information systems design should not disturb the cultural environment in the organization.

13.4.5 Structure

An organization structures its management, employee, and job tasks into various subunits. The main aim of IT should be to enhance communication and collaboration among individuals, business units, and other organizational workgroups. A decentralized, collaborative type of organizational structure which has systems development resources distributed to business unit and workgroup levels should be supported by IT.

Activity: Carriers India Limited (CIL) is a leading courier company with branches all over India and in the Middle-East. All the operations of the company are IT-enabled. However, Celia, the Chief Information Officer of CIL, feels that the company's information resources are not being effectively utilized. She has explained this problem to the top management and stated the need for developing an information system that takes into account the impact of such a system on its employees, tasks, technology, culture, and structure. Comment on the suggestion given by Celia and give suggestions on how she can go about developing such an information system.

Contd. .....

Answer:

_____
_____
_____
_____
_____
_____

13.5 Information Security and Controls

The business processes of an organization are related to some information transaction that involves information being sent or received by the user. Organizations need to protect information as an asset. Information should be securely maintained by safeguarding the information against threats like misuse and destruction of the same.

13.5.1 ISO 17799 Standards

The British Standards Institute introduced a standard for information security management called ISO 17799 in 2001. According to this standard, the main aim of protecting information is to ensure continuity of business operations, minimize business damage, and maximize returns on investments.

Organizations need to carry out a security risk assessment for establishing information security in the organization. This helps and organization identify the threat areas where information can be manipulated or destructed by unsolicited intruders. After identifying such risks, an organization can install controls to mitigate such risks by ensuring accuracy, integrity, and safety of information resources. It also helps in minimizing errors, fraud, and destruction in the internetworked information systems. These controls also provide quality assurance for information systems. ISO 17799 provides ten such controls which are explained below:

13.5.1.1 Security Policy Control

This is one of the most important controls that address support from top management for information security and protection. The policy level initiatives taken by the top management are also implemented to ensure information security.

13.5.1.2 Organizational Security Control

This control establishes the organizational framework to formulate and execute strategies related to information security. This involves establishing a core committee to manage information security called as Management Information Security Forum, appointment of Information

System Security Officer, allocating information security responsibilities to concerned personnel, ensuring the evaluation of security considerations and obtaining approvals, etc.

13.5.1.3 Asset Classification and Control

This control classifies the assets based on the business impact, handling, labeling, and maintaining of the inventory. It protects the assets of the organization and includes a set of mechanisms and standards that describe the process of maintaining an inventory of assets. Such standards describe the processes of branding, transferring, and disposing the assets based on their classifications.

13.5.1.4 Personnel Security Control

The inherent human risks involved in human interactions with the information systems are controlled by personnel security control. This control screens the personnel for authenticating access to informational assets, informs them about maintaining information security codes of conduct, non-disclosure agreements, etc. It also specifies the terms and conditions of employment, training, and recourse.

13.5.1.5 Physical and Environmental Security

This control addresses all those risks that are inherent within the organizational premises such as locating a business, defining physical security premises, accessing control into the premises, and tracking of assets movement (transfer) within the premises and between the premises and the environment.

13.5.1.6 Communications and Operations Management Control

A secure information system is maintained by performing secure operations over different networks. This control includes various operational, capacity planning, network management, housekeeping, etc. controls and procedures that allow the organization to carry out secured operations and protect its information system.

13.5.1.7 Access Control

Access to key informational assets requires high control over the assets. This control oversees access to the assets based on business requirements and security requirements.

13.5.1.8 System Development and Maintenance Control

System development and maintenance control enables an organization to ensure that suitable information system security controls are incorporated and maintained. This control includes a set of standards and procedures that govern the development and use of security controls in an organization.

13.5.1.9 Business Continuity Management Control

This control eliminates unsolicited interruptions in normal business functioning and brings normality in the operations.

13.5.1.10 Compliance Control

Compliance control addresses an organization's ability to adhere to the regulatory, statutory, legal, and contractual obligations.

13.5.2 Cryptography

Cryptography is the art and science of encrypting and decrypting data for the purpose of secrecy or authenticity. It securely stores data and facilitates critical data transmission over an insecure network. Technically, cryptography is the process of using (or studying) electronic security systems, methods, or schemes that protect data by altering it in a way so that only the intended recipient is able to extract the original information. Encryption and Decryption mechanisms use an algorithm and a secret value that is known as a Key.

A cryptographic algorithm, cipher, is used for data encryption and decryption. A cipher is a mathematical function. The working of this algorithm takes place with a key such as a word or a phrase that encrypts plain text. The algorithm is available whereas the key is kept secret for ensuring security. Keys, also known as crypto variables, are the information or a sequence that control the enciphering and deciphering of messages. The data security is dependent on the strength of the algorithm and the secrecy of the key.

The keys, protocols, and cryptography algorithm form the cryptosystem. Cryptography is also referred to as a symmetric key encryption or secret key. Only one key is used for encrypting and decrypting data. In asymmetric cryptography, the public key is used for encrypting, while the private key is used for decrypting. The system facilitates secure transfer of data even among entities who don't have any permanent security arrangement. Pretty Good Privacy (PGP) is a good example of a **cryptosystem.**

13.5.2.1 Objectives of Cryptography

The main objectives of cryptography are authentication for verifying the identity of the person accessing the information, confidentiality for providing data privacy using encryption techniques, integrity for ensuring that the message remains unaltered, and non-repudiation for ensuring that the document came from the sender even if the recipient denies.

These objectives can be achieved using a technology called Public Key Infrastructure (PKI). PKI is an online infrastructure that uses digital

signatures, digital certificates and secure channels to secure applications, communications, and transactions. They are discussed below:

13.5.2.2 Digital Certificates

Digital certificates are similar to 'online passports' issued by certification authorities. Certification authorities are entities that validate identities and issue certificates. The entities can be organizations running their own certificate issuing server software (such as Microsoft Certificate Server) or third parties. Digital certificates act as identity verification certificates and are used as a security measure that guarantees the recipient's identity to the sender or vice-versa. Digital certificates cannot be forged or tampered. They can be used for authentication and for protecting online data from theft and tampering.

There are two types of digital certificates, namely, server certificates and personal certificates. Server certificates are used to authenticate the identity of web sites in order to ensure that there is no impersonation. Information like credit card numbers can be exchanged among web site visitors. E-Commerce sites that exchange confidential information need server certificates whereas personal certificates are used for authenticating the identity of the visitors and restrict access to specific content. These certificates can be mainly used in business to business (B2B) transactions like inventory management, updating product availability, shipping dates, etc.

Digital certificates work based on the private/public key technology. Each of these keys is a unique encryption device and can be used to find the identity of the user. These keys always work in pairs. The private key is kept secret, while the public key is distributed among the different users who want to communicate. The data encrypted by the public key can be decrypted only by the private key. The Certificate Authority (CA) distributes public keys to people and organizations and verifies their authenticity. A digital certificate along with the public key contains information about the customer like e-mail ID, full name, and so on. It is a digitally signed message that is typically used to attest the validity of a public key of an entity.

13.5.2.3 Digital Signatures

The IT Act 2000 of India defines a digital signature to mean authentication of an electronic record by a person in whose name the digital signature certificate is issued by means of an electronic method. These certificates help identify whether the public key belongs to the purported owner and if a competent authority has attested the certificate information. The digital signature helps the recipient conform to the sender that the message is intact as it was sent. Digital signature is the encrypted message that is

appended to a document that in turn confirms the identity of the sender and the integrity of the document.

13.5.2.4 Secure Channels

The Internet is an insecure channel for message transmission. The message passes through several network routers before reaching the destination. Using a dynamic routing algorithm, the path of flow of the information packets can be altered and viewed by anyone. Hence, the Internet is a not a channel for transferring confidential information.

In order to ensure data privacy, the client and the server run compatible security schemes. Network interactions typically take place between a client, such as browser software running on a personal computer, and a server, such as the software and hardware used to host a website. Here, authentication is used for identifying the clients as well as the server in a network environment.

Check Your Progress-2

8. The _____ ensures the incorporation of appropriate information system security controls, while the _____ ensures that secured operations are performed over different networks to maintain a secured information system.
9. The component of cryptography used for data encryption and decryption is
   a. Cryptographic algorithm
   b. Key
   c. Hash function
   d. Both (a) and (b)
10. The process of safeguarding information against threats like misuse and destruction is termed
11. Risks associated with the location of the business, access control into the premises, tracking assets movement within the premises and between premises and the environment are dealt by
    a. Organizational security control
    b. Asset classification and control
    c. Physical and environmental security
    d. Both (b) & (c)
12. What are the factors on which data security depends on?

13. The cryptography system ensures attainment of certain objectives. Which of the following statements is/are **false** with regard to objectives satisfied by the cryptography system?

    i. Assurance from both sender and recipient that the message remains unaltered
    ii. Identification of the origin of a message and verification of its authenticity
    iii. No proof is given to substantiate that the document came from a particular sender even when the recipient tries to deny it.
    iv. Verification of the identity of the person trying to access the information and determining if the person is authorized to do it.

    a. Only i
    b. Only ii and iii
    c. Only iii
    d. Only iii and iv

14. To attain the objectives of authentication, integrity, confidentiality and non-repudiation, which technology is used?

15. The British Standards Institute came out with a standard for information security management in 2001. This standard is called

    a. ISO 17799
    b. Balanced Scorecard
    c. IT Infrastructure Library
    d. Information Resource Management

16. PKI is an online infrastructure that uses _____ to secure applications, communications, and transactions.

17. From the following statements, which of them is/are **false** with regard to digital certificates?

    a. It is used for authentication.
    b. It helps protect online data from theft and tampering.
    c. It may allow forgery or tampering.
    d. It is a type of identity verification certificates.

18. _____ is the encrypted message that is appended to a document which confirms the identity of the sender and the integrity of the document.

19. The Internet is not considered a safe channel for message transmission. Which of the following statements is/are **false** with regard to message transmission through the Internet?

    a. The message passes through a specified path.

b. Message passes through several network routers before reaching the destination.
c. The path of the flow of information packets can be altered using a dynamic routing algorithm.
d. Packets that pass through the network can be viewed by anyone.

13.6 Information Security in E-Business

Internet provides lot of information to the users. At the same time it provides threats to the information systems through malicious attacks. Malicious attacks over the Internet can corrupt, crash or down the systems and networks in the organization. E-business organizations widely use Internet for their internal and external business operations. They use Internet to interact with customer and for data transfer purposes. Hence, information security is a major concern for e-business organizations. Customers are worried about their details lying with the e-business organizations. The possible information security threats for e-business organizations using Internet include:

- Information Theft: Theft of credit card, debit card and bank account details of customers by organizational employees or outsiders.
- Natural disasters: Natural disasters such as floods and fire can wash away the organizational systems or can disrupt the ISP (Internet Service Provider) organization. The organization takes several days to restart its operations in this case.
- Unauthorized Access: Insiders or outsiders using different individual's user id and password can access the organizational databases.
- Hacking: Some technically skilled people feel thrilled about breaking into others' websites and systems. They take it as a challenge to break into the others' systems.
- Viruses: Every few minutes, a new computer virus is generated in the world. This can spread to organizational information systems.
- Hijacking: Organizational systems are used to send SPAM mails and messages to some of the well known 3rd party sites.
- Accidents: Some employees may delete important data accidentally. This is a possible human error.
- Sabotage: Because of old grudges, individuals or organizations can intentionally sabotage the organizational systems.

To deal with the above mentioned threats to information systems, the e-business firms can do the following:

- Plan for information security
- Risk assessment for information security using probability and impact matrix
- Prepare mitigation and contingency plans required to address the risks
- Prepare disaster recovery plan
- Continuously monitor the risks for information systems
- Have firewalls for the enterprise systems
- Use encryption, digital signatures and digital certificates in data transfer
- Use standardized encryption practices
- Educate and train the employees about information security
- Provide restricted access and privileges to information systems
- Have database level security for MIS

13.7 Ethical and Social Dimensions of Information Technology

Ethics in IT has gained importance in the society due to reasons such as logical malleability, the transformational factor, and invisibility factor as quoted by James H. Moor. Logical malleability is the ability of the computer to do anything for which it is programmed. A miscreant can put a computer to wrong use where IT can cause serious damage.

The transformation factor implies that IT has made things simpler and improved the quality of life. For example, with the advent of e-mail, communication got a whole new meaning in terms of speed and ease of operation. But e-mail is also used for sending unsolicited information which is considered as nonsense and irritation (spam) to the receivers.

Invisibility factor implies all those operations which are invisible to the user of the system. Between giving a command to the computer and getting the required output, a lot of operations take place inside the computer. In order to manage these operations many programs are written. This leads to invisible programming values, invisible calculations and invisible abuse. The invisible programming may or may not give desired results leading to serious problems. These programs also do some complex invisible calculations. The users may not know about these invisible calculations that help them in simplifying their tasks. Finally, invisible abuse includes all those acts that are done intentionally and that is illegal and cross ethical boundaries. Hacking in to other systems, intruding others' privacy,

manipulating organizational data for personal gains, and all such kind of acts fall under this category.

From social perspective, Richard Mason identified four major ethical areas in IT usage. They include Privacy, Accuracy, Property, and Accessibility, which are popularly called by the acronym PAPA.

13.7.1 Privacy

Privacy refers to personal privacy and its intrusion has been on the rise with the growth in IT. According to Mason, two factors that threaten the personal privacy of users of information systems are increasing ability of the information systems being used for surveillance and the increasing value of information in decision making.

Further, in the organizational context, privacy of information of employees and customers are at stake. For instance, some firms handle sensitive information of its clients with poor privacy policies. Improper privacy policies can lead to misuse and stealing of sensitive information.

13.7.2 Accuracy

Accuracy of information plays an important role in making highly effective decisions. Inaccurate information can lead to ineffective decisions and damage to the image of the decision maker as well as the organization. Inaccuracy in information can be due to human errors or computer malfunctions or poor systems designs.

13.7.3 Property

Property here refers to the intellectual property rights of the software developers used in the development of information systems. Protecting the intellectual property is difficult because it is easier to copy or reproduce. Illegal copying or reproduction of software proves to be a huge loss to the creator of the software. Software vendors use patents, copyrights, and license agreements to stop piracy and illegal copying which provide protection up to a certain degree.

13.7.4 Accessibility

Prior to the implementation of the information systems, information was accessed on paper. With the advent of IT, electronic access of information has gained importance. But ethical issues arise when the issue of affordability to access the information comes in to picture. In an organizational set up, access to certain sensitive information is restricted to lower levels employees in the organization.

Activity: Aditya Pharma Limited (APL) planned to launch a new drug in the market. However, before it could do so, a drug with the similar formula was launched by its competitor. After investigation by the APL's management, it was found that internal confidential information relating to the new drug's composition had been leaked by some employees. What type of security lapse has the company faced in this case? What measures can APL take in order to avoid such incidents in the future?

Answer:

_____
_____
_____
_____
_____

Check Your Progress-3

20. Hacking into other systems, intruding others' privacy, manipulating organizational data for personal gains, and all such other acts fall under

21. According to James H. Moor, ethics in information technology have gained importance because of
    a. Logical malleability
    b. Transformational factor
    c. Invisibility factor
    d. All of the above

22. From the social perspective, Richard Mason identified four major ethical areas in information technology usage. They include Privacy, Accuracy, Property, and Accessibility. Patent laws refer to which ethical area in IT usage?

13.8 Disaster Recovery and Business Continuity Planning

Organizations need to carry out their businesses smoothly without any disruption from events like power outages and viruses to natural calamities and terrorist attacks. An organization needs to go in for business continuity planning (BCP) and disaster recovery planning (DRP) in order to ensure continuity of business even during unforeseen circumstances.

DRP helps an organization resume its business after the occurrence of a disruptive event while BCP ensures the availablity of required IT services and minimum disruption in business operations in the event of a disaster.

Certain companies prefer BCP over DRP as BCP ensures continuity of business operations even during the event of a disaster and a few companies prefer DRP over BCP as it helps in the recovery of the information systems. Most often, the terms BCP and DRP are used together to be referred as BC/DR plans. The BC/DR plans include details for employees to be used in case of a crisis situation. The details differ from one company to another. Therefore, organizations should not overlook any of the elements and constantly communicate in order to mitigate the risks arriving out of disruptive events.

13.8.1 Disaster Recovery Planning

The management of the company needs to make certain that the DRP is in tune with the overall BCP in order to ensure consistency. The objectives of a DRP are ensuring a sense of security in the organization, assuring on the reliability of support systems, lowering the risk of delay, curtailing the risk of permanent loss of key organizational assets, reducing the time to recover the system, reducing disorder during the disaster, simulating various disaster recovery situations for providing a standard for testing the plan, and ensuring control of system and resources in case of a disruptive event.

Broadly, a DRP takes into consideration various aspects before devising a plan. It classifies critical organizational functions and lays out alternative procedures. It sets up the backup and recovery systems and regularly carries out systematic testing and training. It assigns the internal and external responsibilities of an organization to employees, clients, etc., and prepares contingency plans that lists out ways of recommencing the business. It manages the activities involving risks and evaluates the instances of failure and finally the problem is managed.

Before drawing out a DRP, the organization identifies and prioritizes their functions based on whether they are critical, vital, sensitive, and non-critical.

- *Critical functions:*Also called as mission-critical functions, these cannot be performed unless replaced by similar functions. These systems and resources should be recovered within minutes or hours of the disaster. These functions cannot be replaced by manual methods.
- *Vital functions:* These systems and resources should be recovered within 24 hours of the disaster. The cost of disruption of vital functions is lower than the cost incurred in the disruption of the critical functions. They can be manually performed but only for a short period of time.

- *Sensitive functions:* These can be performed manually for an extended period at a reasonable cost. The manual process is difficult to perform and requires additional staff to perform.
- *Non-critical functions:* These are episodic in nature and may extend for a period at little or no cost to the company. Recovery of these systems or resources can take place within several days or weeks of the disaster or till the disaster ends. Restoring of these functions also requires little time and cost.

13.8.1.1 Components of a DRP

The following are the components of a DRP:

- Emergency Plan
- Backup Plan
- Recovery Plan
- Test Plan

13.8.1.1.1 Emergency plan

After the occurrence of a disaster, an emergency plan containing an action plan should be immediately carried out. The various steps in an emergency plan depend upon the nature of the disaster. Basically, an emergency plan must constitute notifying people like top management, the police department, the fire department, and hospitals after the occurrence of the disruptive event. It takes certain actions immediately like file file removal, power shutdown, equipment shutdown, etc. It carries out the process of evacuation and finally fulfills the condition before ascertaining the safety of the site and its reusability.

13.8.1.1.2 Backup plan

A backup plan ensures that the critical IS functions of the organization are quickly restored. It should constitute information like the type of backup, the frequency with which the backup should be taken, the locations of the backup, the site for resource assembling and restarting the business operations, the priorities assigned for recovering the various systems and finally the time limit set for recovery each system. An organization needs to ensure that the backup for vital organizational resources is taken before devising a backup plan.

13.8.1.1.3 Recovery plan

A recovery plan ensures that all the IS functions of the organization are completely restored.

13.8.1.1.4 Test plan

The test paln acts as an aid in spotting the deficiencies in emergency, backup, and recovery plans. It entails testing the readiness of the organization and the employees during the disruptive event. It simulates series of disasters and lists the norms or standards against which the various plans are measured to test their sufficiency and completeness.

13.8.1.2 Testing a DRP

A DRP testing is carried out for testing the awareness and readiness of the employees for facing the disaster. It also identifies omissions made in the plans and checks to ensure that the organization is implementing good security practices.

Testing the DRP is carried out in three phases:

- *Paper test*: This is an abstract level testing that helps to determine what might happen if a disruption takes place.
- *Preparedness test*: This is carried out after the first phase of DRP testing. In this test, the actual resources are expended while carrying out simulation during a system crash. It identifies the effectiveness of the plan and helps in further enhancing the plans.
- *Post-test*: A post-test constitutes a group of activities that are to be carried out after the occurrence of the disruptive event. These activities include sending back the resources to the appropriate places, disconnecting the equipment, sending back the personnel, and deleting all company data from third-party or backup systems.

After an organization resumes its business operations, the management should lay certain procedures that enable it to evaluate the adequacy of the plan and revise it accordingly.

13.8.2 Business Continuity Planning

The September 11, 2001 attacks on the World Trade Center in the US placed the world on a high state of alert. This incident posed a threat to vital business functions of many organizations. After this incident, businesses gave equal importance to security as they gave to their business opeartions. In such cases, the IS staff faces stress as they are concerned of protecting their valuable data, assets, and the infrastructure. Concepts of DRP were already well known and is in practice in the world of business. However, it was DRP that was already known and was in practice. However, BCP gained importance during this time.

The term Business Continuity can be defined as the organization’s ability to carry out its business operations with negligible disruption or downtime

during a natural or manmade disaster. It processes and procedures ensure that continuous flow of the essential business functions before, during, and after the occurrence of the disastrous event. A BCP safeguards the systems that are vital for carrying out the business operations and tackles the associated risks. It helps in preventing disruption of mission critical services and restores various business functions.

While implementing a BCP, critical functions should be listed out and accordingly the budget should be allocated. Finally, the procedures that help in carrying out business operations are esatblished. According to Gartner Group, a BCP should constitute the details about the strategies to be adopted in case of failure of the procedures during the disasters. It should have a business resumption plan that indicates ways of carrying out the essential services at the crisis site. A business recovery plan is devised that contains ways in which the business operations can be recovered at an alternate location and a contingency plan explaining ways to deal with external events that would otherwise create a serious impact on the organization.

Business continuity is a crucial activity for any business to ensure continued service to customers and also satisfy the service level agreements, and adhering to defined quality standards and times. Disaster recovery plan is an aid helping the management to ensure continued prime business activities, even during untoward disasters. Exhibit 13.1 details the differences between BC plans and DR.

Exhibit 13.1: Business Continuity & Disaster Recovery – How they differ

Business continuity and disaster recovery planning are aimed at helping solving potential business interruptions. They minimize the impact that catastrophic events can have on a business deliverables. They are key elements of the any crisis management strategy. They can help companies to minimize the consequences of any catastrophic event.

Business continuity planning (BCP) addresses ***all*** essential functions of an organization during disruption to any function of the organization: IT systems, infrastructure, people, and premises. Disaster recovery (DR) is mainly concerned with the IT and technology infrastructures, which are mostly aimed at support to critical business functions. DR helps in restoring critical technology-based systems and services during an emergency. In a way, disaster recovery is a subset of business continuity. Creating effective plans for business continuity and disaster recovery requires analytical and problem-solving skills. During actual happening, flexibility in decision-making is needed to assess potential threats and plans to proactively mitigate them.

Contd. ....

Business continuity	Disaster recovery
Keep business activities operational during a disaster	Focuses on restoring data access and IT infrastructure after a disaster
Limit operational downtime	Limit the impact of technology failures
Day to day business activities can continue to operate during a crisis(working from different locations or using different technologies and systems, or with reduced capacity in some areas)	Focuses on restoring the normally used technologies and systems as quickly as possible.
Have disaster recovery as part of the overall plan	Exist independent of business continuity plans

Source: https://itchronicles.com/business-continuity/business-continuity-disaster-recovery-how-they-differ/William Goddard, March 11, 2021

Activity: Insys, an IT company, stores information about its clients on the company's computer systems. A major virus attack led to these systems crashing. The company lost all its data as it did not have any backup and recovery system. What can the company do to ensure business continuity during such unforeseen circumstances? Explain.

Answer:

_____
_____
_____
_____

Check Your Progress-4

23. Define critical functions in the context of Disaster Recovery Plan (DRP).

24. Before drawing up a DRP, the organization should identify and prioritize their functions based on whether they are critical, vital, sensitive, and non-critical. Given below are statements regarding these functions. Indicate true/false.

    a. Critical functions cannot be replaced by manual methods
    True/False

b. The cost of disruption of vital functions is lower than the cost incurred in the disruption of the critical functions
True/False

c. Sensitive functions can be easily carried out using manual methods and does not require additional staff
True/False

d. Restoration of non-critical functions requires little time and cost
True/False

25. According to the Gartner Group, a business continuity plan contains a disaster recovery plan, a business resumption plan, a business recovery plan, and a contingency plan. A business resumption plan contains:

a. Details about the strategies to be adopted in case of failure of the procedures during disasters.

b. Details about the various ways of carrying out essential services at the crisis site.

c. Details of ways in which the business operations can be recovered at an alternate location.

d. Details to deal with external events that will create a serious impact on the organization.

26. Given below are statements regarding business continuity and disaster recovery (BC/DR) plans. Indicate true/false.

a. Disaster recovery plan (DRP) is a plan that ensures that the required IT services are available and that there is minimum disruption in business activities in the event of a disaster. **True/False**

b. The business continuity plan (BCP) ensures that the organization resumes its business after the occurrence of a disruptive event. **True/False**

c. DRP refers only to the recovery of the business after the occurrence of an unlikely event while BCP also ensures the continuance of the business during the event. **True/False**

d. Most executives prefer to use the term DRP than BCP as the former is a broader term that includes even the latter. **True/False**

27. The components of a disaster recovery plan (DRP) include the emergency plan, backup plan, test plan and recovery plan. Notifying the top management, the police department, the fire department,

hospitals, etc., immediately after the occurrence of the disruptive event constitutes the _____ plan.

28. Simulation is a technique used to measure the sufficiency and completeness of various plans. This technique is part of which plan?

29. In DRP, which of the following tests is an abstract level test that involves the major players in the executing team attempting to determine the consequences of a disruptive event?
    a. Paper test
    b. Preparedness test
    c. Post-test
    d. None of the above

30. Which component in a Business Continuity Plan (BCP) contains details about how to deal with external events that could create a serious impact on the organization?

13.9 IT Governance

Corporate governance lays down the rules and principles that govern an organization in the achievement of its goals. It is important to clearly define and communicate the business strategies to the organization's stakeholders with the appropriate application of technology for the success of corporate governance.

13.9.1 Overview of IT Governance

IT has gained prominence and is viewed as a key driver for achieving business growth and success. In the 1990s, organizations began implementing IT solutions like CRM and ERP to remain competitive. The IT departments in organizations were under constant pressure to implement projects quickly that resulted in errors. In addition to this, the organizations incurred huge costs by implementing these projects and were unable to derive the true benefits of implementation. IT governance was the answer to all these problems.

IT governance consists of relationships and processes that direct and manage an organization, help it to achieve its business goals, and generate value for its investments in IT, while minimizing the risks. IT governance states that IT decisions should be taken by the board rather than by the chief information officer (CIO) or the business unit managers.

13.9.2 IT Governance and Sarbanes-oxley Act

In the late 1990s and early 2000s, a few corporate scams that took place increased the need for organizations to follow the corporate governance norms. The financial debacle of Enron Corporation, a Texas, US-based natural gas, energy trading, and electric utilities company due to irregular accounting procedures adopted by Enron's accounting firm Arthur Andersen LLP and accounting fraud at WorldCom Inc., a telecommunication company were the prominent ones. Other companies in the US were also found to have indulged in fraudulent accounting practices along with high-level corruption and insider trading. In response to this, the US government passed the Sarbanes-Oxley Act (SOX) in 2002. It focused on protecting investors from fraudulent accounting practices of companies. The Act also played a vital role in the development of IT governance.

The Act required all public companies to register with the established Public Company Accounting Oversight Board. It increased the corporate responsibility for any fraudulent deeds and strict punishments were given for committing frauds, destroying records and concealing them. It prohibited an auditor from being the primary auditor for more than five consecutive years. The CEO and CFO to were held responsible for certifying the financial reports. The members of the audit committee had to be either a member of the board of directors or independent. All the financial reports were to be filed with the Securities and Exchange Commission.

To comply with the rules of the SOX Act, it was important to have correct information in the hands of the related chief financial officer (CFO) of the organization. An efficient IT system was needed that could store huge amounts of data for any period of time. The systems required constant monitoring and controlling and hence efficient management of the deployed IT systems formed the core for organizations. Managing IT systems required a framework that governed the whole procedure. IT governance provided the support to organizations for managing their IT systems effectively and efficiently.

13.9.3 IT Governance Frameworks

The frameworks that help organizations to implement IT governance are IT Infrastructure Library (ITIL), Control Objectives for Information and related Technology (COBIT), and the Balanced Scorecard (BSC).

13.9.3.1 IT Infrastructure Library (ITIL)

The ITIL framework was developed by the Central Computing and Telecommunications Agency of the British government to enable British

companies to manage their IT resources efficiently. ITIL addresses skill requirements and organizational structure and provides detailed information on how to manage IT operations. The ITIL framework is published in a series of eight books called sets. These sets are further divided into disciplines. The sets include Service Delivery, Service Support, Planning to Implement Service Management, Security Management, Infrastructure Management, Business Perspective, Applications Management and Software Assets Management.

13.9.3.2 Control Objectives for Information and Related Technology (COBIT)

In 1992, the IT Governance Institute and the Information Systems Audit and Control Foundation of the US developed COBIT. It provides a set of IT control objectives that guide organizations to maximize their benefits by implementing IT and by developing IT governance in the organization. This framework became popular after the Enron incident. It describes 34 IT control processes that are covered under four domains – Planning and Organization, Acquisition and Implementation, Delivery and Support, and Monitoring.

13.9.3.3 Balanced Scorecard (BSC)

In 1992, Robert S. Kaplan and David Norton developed the concept of BSC. This management concept helps managers to monitor results in key areas. According to Kaplan and Norton, "The balanced scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. These financial measures are inadequate, however, for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation."

The main aim of BSC was to evaluate an organization using measures that improve the financial performance of an organization and enable it to achieve its goals. A balanced scorecard is a management tool that helps in performance measurement of a business from four perspectives. The financial perspective helps BSC measure business in terms of financial performance. The customer perspective measures business by conducting consumer surveys. Internal business perspective measures business in terms of business processes such as money spent on forecasting demand. Learning and growth perspective measures business in terms of the

organization's learning curve. For example, the time spent on training employees.

Using the BSC method, the IT system's performance can be analyzed from four perspectives. The financial perspective helps in measuring the financial contribution of the IT systems to the business to know the return on investments (ROI) in IT systems. The customer perspective measures the extent of customer satisfaction guaranteed by IT. The internal business perspective analyzes the extent of support for carrying out internal business processes and the learning and growth perspective of the organization focuses on measuring the expertise of IT staff and investments in current and emerging technologies.

Check Your Progress-5

31. One of the frameworks that help organizations implement IT governance is Control Objectives for Information and Related Technology (COBIT). This framework was developed by

32. Which of the following frameworks was developed by the Central Computing and Telecommunications Agency of the British government to enable British companies manage their IT resources efficiently?
    a. ISO 17799
    b. Information Resource Management
    c. Information Technology Infrastructure Library
    d. Control Objectives for Information and related Technology

33. Explain the concept of balanced scorecard.

34. Given below are statements regarding the IT Infrastructure Library (ITIL) framework. Indicate true/false.
    a. Addresses skill requirements and provides detailed information on how to manage IT operations
    b. Developed in United States
    c. It is described under four domains
    d. ITIL framework is published in a series of eight books called sets

35. Complete the sentence with suitable option/options 'IT governance consists of relationships and processes that…'
    i. Direct and manage an organization

ii. Help an organization achieve its business goals
iii. Generate value for its investments in IT
iv. Minimize risks

a. Both i and ii
b. Both ii and iii
c. ii, iii, and iv
d. i, ii, iii, and iv

36. Given below are some of the features of Sarbanes Oxley Act. Indicate true/false.

a. CFO is supreme authority in certification of financial reports.
True/False

b. An auditor can be the primary auditor for more than five consecutive years.
True/False

c. All public companies are required to be registered with the Public Company Accounting Oversight Board.
True/False

d. For any fraudulent practices, the corporate are to be held responsible.
True/False

13.10 Summary

- Information resource management (IRM) is a new concept and is used in the management of information to facilitate the smooth flow of productive and updated information across the departments in the organization.
- Organizations develop information systems, keeping in mind their impact on their employees, tasks, technology, culture, and structure.
- Security of organizational information has become a prime concern for every organization that implements information systems. Threat from internal and external manipulators of information is on the rise. Managements too are implementing more secured systems to protect their information from any threat.
- Social and ethical dimension of IT is an evolving concept and it addresses those issues which are considered unethical and/or illegal in the implementation and usage of information systems.

- BCP and DRP are processes that are essential to any organization as they ensure continuity of business even during unforeseen circumstances. These processes help an organization to prepare for any sort of disruptive events even if it is a power blackout or a natural disaster.
- The salient features of the Sarbanes-Oxley Act and its role in IT governance. Frameworks for IT governance include Control Objectives for Information and Related Technology (COBIT), IT Infrastructure Library (ITIL), and the Balanced Scorecard.

13.11 Glossary

- **Balanced Scorecard (BSC):** The main aim of the concept is to move away from the traditional process of evaluating the organization using financial data by evaluating the organization using measures that result in improvement of financial performance in future and enable it to achieve its goals.
- **Business Continuity Plan (BCP):** The ability of the organization to carry out its business operations with negligible disruption or downtime during a natural or manmade disaster.
- **Control Objectives for Information and related Technology (COBIT):** COBIT provides a set of IT control objectives that guide organizations on how to maximize the benefits from IT implementation and by developing control and appropriate IT governance in the organization.
- **Cryptography:** The art and science of encrypting and decrypting data for the purpose of secrecy or authenticity. It facilitates the secure storage and transmission of critical data in an insecure network.
- **Digital certificates:** These are similar to 'online passports' issued by certification authorities. Digital certificates play the role of identity verification certificates and are used as a security measure that guarantees the recipient's identity to the sender or vice-versa.
- **Digital signatures:** Authentication of an electronic record by a person in whose name the digital signature certificate is issued by means of an electronic method.
- **Disaster Recovery Planning (DRP):** A plan that ensures that the organization resumes its business after the occurrence of a disruptive

event. DRP refers only to the recovery of the business after the occurrence of an unlikely event.

- **Information Resource Management (IRM):** Managing information resources through planning, organizing, staffing, coordinating, and controlling the information.
- **Information Resources Management Association (IRMA):** A professional organization dedicated to promoting the practice of information resource management in organizations across the globe.
- **ISO 17799:** A standard for information security management introduced by the British Standards Institute in 2001.
- **IT governance:** It consists of relationships and processes that direct and manage an organization, help it to achieve its business goals, and generate value for its investments in IT, while minimizing the risks. IT governance calls for a clear definition and communication of corporate strategy.
- **IT Infrastructure Library (ITIL):** A framework developed by the Central Computing and Telecommunications Agency of the British government to enable British companies to manage their IT resources efficiently.
- **PAPA:** Proposed by Richard Mason, PAPA stands for Privacy, Accuracy, Property, and Accessibility. These are the four major ethical areas in IT usage.
- **Personal certificates:** These certificates are used to authenticate visitors' identity and restrict their access to specific content. These certificates are suitable for business to business (B2B) transactions like inventory management, updating product availability, shipping dates and so on.
- **Pretty Good Privacy (PGP):** It combines both conventional and public key cryptography. It can be termed as a hybrid cryptosystem.
- **Sarbanes-Oxley (SOX) Act:** Established in 2002, this act focused on protecting investors from fraudulent accounting practices of companies.
- **Server certificates:** These certificates are used to authenticate the identity of websites, to make sure that there is no impersonation. Server certificates are a necessity for e-commerce sites that facilitate

the exchange of confidential information among customers, vendors and clients.

13.12 Self-Assessment Test

1. Information Resource Management (IRM) has become a major responsibility of all managers, irrespective of the organizational functions they perform. In this context, define IRM and explain its objectives and its elements.
2. Organizations must develop information systems keeping in mind their impact on the employees, tasks, technology, culture, and structure. Explain the importance of each of these factors while developing information systems.
3. Information security is the process of safeguarding the information against threats like misuse and destruction. In this context, explain the various security controls that an organization can implement.
4. Cryptography facilitates the secure storage and transmission of critical data in an insecure network. In this context, explain the objectives of cryptography.
5. Ethics in IT has gained importance in society. Explain the ethical and social dimensions of IT.
6. Organizations need to ensure business continuity even during unforeseen circumstances. What processes help an organization to prepare for any disruptive event? Explain in detail.
7. IT governance directs and manages an organization, helps it to achieve its business goals and generate value for its investments in IT, while minimizing the risks. Give an overview of IT governance and explain its framework.

13.13 Suggested Readings / Reference Material

1. Introduction to Information Technology, V. Rajaraman, PHI learning, 2018
2. Information Technology for Management, 2ed: Advancing Sustainable, Profitable Business Growth, Turban, Volonino, Wood, O.P. Wali, Wiley India Pvt Limited, January 2021
3. Introduction to Information Systems - 6th edition, R. Kelly Rainer; John Wiley & Sons, Inc.2016
4. Information Technology: An Introduction for Today's Digital World , Richard Fox, Chapman and Hall/CRC; 2nd edition (August 21, 2020)
5. Information Technology for Management, Efraim Turban, Carol Pollard, Gregory Wood, Wiley, 2018

Additional References:

1. Critchley, L., Where Nanotechnology, the IoT, and Industry 4.0 Meet., https://www.mouser.com/blog/where-nanotechnology-the-iot-and-industry-40-meet, 2019
2. Pan India implementation of HMIS over Indian Railways, Ministry of Railways., http://railministry.com/pan-india-implementation-of-hmis-over-indian-railways/ 2020
3. Vossler, C. How Long Does It Take To Order A New BMW? https://www.bmwblog.com/2020/09/28/how-long-does-it-take-to-order-a-new-bmw/2020
4. Jay, A., 10 New ERP Trends & Forecasts for 2020/2021 – A Look Into What's Next. https://financesonline.com/erp-trends/2019
5. Gingiss, D., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue (forbes.com), 2019

13.14 Answers to Check Your Progress Questions

Following are the answers to the Check Your Progress questions given in the Unit.

1. Ownership

In 1993, Nick Willard developed the Willard model which lists the elements or the principles of IRM. These relate to the professionalism of IRM in carrying out the various activities. The various elements are identification, ownership, cost and value, development, and exploitation. Ownership is an element which refers to the act of accepting the responsibility to maintain and manage the information resource.

2. (d) Unstructured information

Information is derived from data or facts. These can be structured or unstructured. Unstructured data is subjective and unorganized in nature. It is found in e-mail systems, images, drawings, video clips, web, etc. A company's website can be a potential source of unstructured information where it seeks feedback from customers and suppliers. Management can use this data, in addition to the data available in the internal database, to solve specific problems.

3. The act of discovering the information resources that are thought to provide quality information for the organization

The five elements in the Willard model are identification, ownership, cost and value, development, and exploitation. Identification is an element which refers to the act of discovering the information

resources that are thought to provide quality information for the organization.

4. **(b) The concept of IRM treats information as a valuable resource distinct from other organizational resources**

   IRM is used as a tool in the achievement of bigger organizational objectives. The concept of IRM treats information as any other organizational resource. It has attracted such importance from the top management that it has become an integral part of every organization's corporate planning strategies and is used to gain competitive advantage in the market.

5. **Knowledge management**

   Knowledge is the combination of information and experience. As an asset, it has to be updated, disseminated, and applied to various organizational problems. It has to be stored in inventories called knowledge repositories. Storage and updating of knowledge has led to knowledge management which can be defined as the process of creation, retention, updating, dissemination, and exploitation of knowledge.

6. **Both structured and unstructured**

   Information once collected should be transformed into knowledge. Information is derived from data (facts) which can either be structured or unstructured. Structured data is well organized, systematic, and can be found in reports, databases, data files, etc. Unstructured data is subjective and unorganized in nature and is found in email systems, images, drawings, video clips, web, etc. Knowledge management systems are used to link both structured and unstructured data.

7. **(d) All of the above**

   Exploitation is one of the five elements of information resource management proposed by Nick Willard. Exploitation refers to the actual process through which information resource is put to use. It either used by the organization to generate further value or sold as a commodity to gain financial benefits.

8. **System development and maintenance control; communications and operations management control**

   System development and maintenance control addresses an organization's ability to ensure that appropriate information system security controls are incorporated and maintained. Communications and operations management control ensures that secured operations

are performed over different networks to maintain a secure information system. This control oversees such operations.

9. Cryptographic algorithm and key

A cryptographic algorithm, alternatively referred to as a cipher, is used for data encryption and decryption. This algorithm works with a key, which may either be a word, a number or a phrase for encrypting plain text. Digital signatures are based on a combination of public key encryption and a one-way function that converts a message of any length into a fixed length message digest, known as hash function. The algorithm considered cryptographically suitable for a hash function should be consistent, random, unique and unidirectional.

10. Information security

Information is treated as an asset and therefore, should be effectively managed and protected. Information security is the process of safeguarding information against threats like misuse and destruction. The goal of information security is to suitably protect information to ensure business continuity, minimize business damage, and maximize returns on investments.

11. (c) Physical and environmental security

The physical and environmental security control addresses all those risks that are inherent to the organizational premises. Such risks include those associated with the location of the business, defining physical security premises, access control into the premises, tracking of assets movement (transfer) within the premises and between premises and the environment.

12. Algorithms are openly available, whereas keys are kept secret and are used for providing the required security. Keys, also known as crypto variables, are information or a sequence that controls enciphering and deciphering of messages. Therefore, data security is dependent on the strength of the algorithm and extent of secrecy maintained with regard to the key.

13. (c) Only iii

The cryptography system achieves the objective of non-repudiation. It provides proof that the document came from a particular sender even when the recipient tries to deny it. The other objectives that cryptography tries to achieve are authentication, integrity and confidentiality.

14. Public Key Infrastructure

PKI is an online infrastructure that uses digital signatures, digital certificates and secure channels to secure applications, communications and transactions. PKI technology is used for attaining the objectives of authentication, integrity, confidentiality, and non-repudiation.

15. (a) ISO 17799

Information security is the process of safeguarding information against misuse and destruction. The British Standards Institute came out with a standard for information security management called ISO 17799 in 2001. According to this standard, the goal of information security is to suitably protect information in order to ensure business continuity, minimize business damage, and maximize returns on investments.

16. Digital certificates, digital signatures, and secure channels

Public Key Infrastructure (PKI) uses digital signatures, digital certificates and secure channels to secure applications, communications and transactions.

17. (c) It may allow forgery or tampering

Digital certificates are similar to 'online passports' issued by 'certification authorities'. They play the role of identity verification certificates and are used as a security measure that guarantees the recipient's identity to the sender or vice-versa. Digital certificates cannot be forged or tampered with. They can be used for authentication and for protecting online data from theft and tampering.

18. Digital signature

A digital signature is the encrypted message that is appended to a document which confirms the identity of the sender and the integrity of the document. Through the digital signature, the recipient of a message confirms to the sender of the message that the message has been received intact and as it was sent.

19. (a) The message passes through a specified path.

In the case of voice transmission, messages pass through a specified path. Unlike voice transmission, the message passes through several network routers before reaching the destination in the case of the Internet. The path of flow of the information packets can be altered using a dynamic routing algorithm. The packets that pass through the network can be viewed by anyone. Hence, the Internet is certainly not suitable for transferring confidential or classified information.

20. Invisible abuse

Invisibility factor refers to all those operations which are invisible to the user of the system. A lot of operations take place inside the computer. These lead to invisible programming values, invisible calculations and invisible abuse. Invisible abuse includes all those acts that are done intentionally, that are illegal, and cross ethical boundaries. Hacking into other systems, intruding others' privacy, manipulating organizational data for personal gains, and all such actions fall under this category.

21. (d) All of the above

According to James H. Moor, ethics in information technology have gained importance because of logical malleability, the transformational factor, and the invisibility factor. Logical malleability is the ability of the computer to do anything for which it is has been programmed. The transformation factor implies that information technology has transformed the ways things are done. Invisibility factor refers to all those operations which are invisible to the user of the system.

22. Property

Property refers to the intellectual property rights of software developers. It includes the copyright protection and patent laws of different countries. Software vendors use patents, copyrights, license agreements to stop piracy and illegal copying which provide protection up to a certain extent.

23. Critical functions are those that cannot be performed unless they are replaced by similar ones. Also termed as mission-critical functions, these systems and resources should be recovered within minutes or hours of the disaster. These functions cannot be replaced by manual methods.

24. Except statement (c), all the other statements are true.

Sensitive functions are those that can be performed manually for an extended period at a reasonable cost. Carrying out sensitive funtions manually is a difficult task and requires additional staff.

25. (b) Details about the various ways of carrying out essential services at the crisis site

According to the Gartner Group, a business continuity plan contains a disaster recovery plan, a business resumption plan, a business recovery plan, and a contingency plan. A business resumption plan specifies the various ways of carrying out the essential services at the crisis site.

26. Only statement (c) is true while the other statements are false.

DRP ensures that the organization resumes its business after the occurrence of a disruptive event. BCP ensures that the required IT services are available and that there is minimum disruption in the business activities even in the event of a disaster. Most executives prefer to use the term BCP than DRP as the former is a much broader term that includes even the latter.

27. Emergency

An emergency plan contains an action plan for the steps to be carried out immediately after a disaster. The various steps in an emergency plan depend upon the nature of the disaster. Basically, it must specify the following: the list of persons (like the top management, the police department, the fire department, hospitals, etc.) to be notified immediately after the occurrence of the disruptive event; the actions that need to be taken immediately like file removal, power shutdown, equipment shutdown, etc; the process of carrying out the evacuation; the conditions that need to be fulfilled before ascertaining that the site is safe and can be reused.

28. Test plan

Test plan is the last component of a DRP. It serves as an aid to spot deficiencies in other plans namely, the emergency, backup, and the recovery plans. It entails testing the readiness of the organization and the employees during the disruptive event. This testing is done by simulating a series of disasters and listing the norms or standards against which the various plans must be measured to test their sufficiency and completeness.

29. (a) Paper test

A DRP is tested in three phases: paper test, preparedness test, and post-test. In paper test, the plan is tested when it is still on paper. This is an abstract level test which involves the major players in the executing team attempting to determine what might happen in case a particular type of disruption takes place.

30. Contingency plan

According to the Gartner Group, a contingency plan contains details about how to to deal with external events that could have a serious impact on the organization.

31. Information Systems Audit and Control Foundation

COBIT was developed by the IT Governance Institute and the Information Systems Audit and Control Foundation of the US in 1992. It provides a set of IT control objectives that guide organizations on

how to maximize the benefits from IT implementation by developing control measures and appropriate IT governance. It describes 34 IT control processes that are covered under four domains – Planning and Organization, Acquisition and Implementation, Delivery and Support, and Monitoring.

32. (c) Information Technology Infrastructure Library

The Information Technology Infrastructure Library (ITIL) framework was developed by the Central Computing and Telecommunications Agency of the British government to enable British companies manage their IT resources efficiently. ITIL addresses skill requirements and organizational structure and provides detailed information on how to manage IT operations.

33. The concept of balanced scorecard was introduced by Robert S. Kaplan and David Norton in 1992. This management concept helps managers monitor results in key areas. The main aim of balanced scorecard is to move away from the traditional process of evaluating the organization using financial data and instead evaluate using measures that result in improvement of financial performance in future and enable it to achieve its goals. A balanced scorecard is a management tool that helps in performance measurement of a business from four perspectives. These are financial perspective, customer perspective, internal business process perspective, and learning and growth perspective.

34. Statements (a) and (d) are true while statements (b) and (c) are false.

The ITIL framework was developed by the Central Computing and Telecommunications Agency of the British government to enable British companies to manage their IT resources efficiently. ITIL has been the de facto standard for IT service management since the mid-1990s. It addresses skill requirements and organizational structure and provides detailed information on how to manage IT operations. The ITIL framework is published in a series of eight books called sets. These sets are further divided into disciplines. Control Objectives for Information and related Technology (COBIT) was developed in the US in 1992. It describes 34 IT control processes that are covered under four domains – Planning and Organization, Acquisition and Implementation, Delivery and Support, and Monitoring.

35. (d) i, ii, iii, and iv

IT governance consists of relationships and processes that direct and manage an organization, help it achieve its business goals, and generate value for its investments in IT, all the while minimizing risks.

IT governance calls for clear definition and communication of corporate strategy.

36. Statements (a) and (b) are false while statements (c) and (d) are true.

The Sarbanes-Oxley Act (SOX) passed in 2002 focused on protecting investors from fraudulent accounting practices of companies. It mandated that both the CEO and CFO must certify financial reports. It prohibited an auditor from being the primary auditor for more than five consecutive years. It required all public companies to be registered with the established Public Company Accounting Oversight Board. The Board augmented the corporate responsibility for any fraudulent deeds and it awarded strict punishments for acts such as destroying records, committing frauds and concealing them.

Unit 14

Global IT Management

Structure

14.1 Introduction

In the previous unit, we have discussed the various ways in which information can be managed. We have discussed that information resource management helps in facilitating the smooth flow of information across the various departments in the organization. In this unit, we introduce you to the role played by information technology (IT) in the conduct of global business.

Globalization has transformed the way in which business is carried out. With more and more countries entering the World Trade Organization (WTO), the trade barriers among the countries have been largely reduced. This in turn has resulted in increased competition in several countries across the world and only those companies having some competitive advantage are able to grow in the market.

IT has made it possible for organizations to expand themselves into international markets, diversify their business profiles, and bring out new and innovative products and/or services. It helps organizations to meet their strategic objectives and compete with global players. However, the top managements of many organizations may not be willing to use IT due

to certain financial issues, cultural issues, etc. This can be overcome by educating and training them.

In this unit, we will discuss the role of IT as an enabler of global business and about global management information systems. The unit discusses the challenges faced by organizations in managing IT globally. The unit ends with a discussion on the different strategies and approaches that can be followed and the role that the chief information officer plays in conducting global business.

14.2 Objectives

By the end of this unit, you should be able to:

- Explain the role of Information Technology in global business operations.
- Define the scope of global MIS.
- Determine the challenges faced by organizations in global Information Technology management.
- Analyze the importance of managing Information Technology effectively in the global business environment.

14.3 Information Technology in Global Business

Many organizations are in the process of transforming into internetworked global companies. These organizations are venturing into the international markets for making use of the global manufacturing facilities for producing and/or assembling their products, raising money in the global capital markets, marketing or selling their goods and services, and entering into alliances with global partners. These would be practically possible and feasible only if the company has robust intranets, extranets, Internet, and other telecommunication networks.

The internetworked system has enabled the creation of a virtual market globally where transactions take place instantaneously and are processed economically. The organizations can enter into alliances with other global companies, suppliers, customers, consultants, government agencies, and even former competitors. Internet has also enabled companies to utilize the services of skilled human resources from across the world. These developments, both internal and global, have in turn improved the productivity and quality of products and services.

Globalization has brought in more complexities and uncertainties in the organizational and business environments. The business models have undergone transformations because of increased global competition and

rapid growth of IT. According to Alexander Osterwalder, Yves Pigneur, and Christopher L. Tucci, business model is "a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams."

Business models play a crucial role especially at the time of designing new products and also when an organization is functioning in a declining market. These models have undergone lot of transformations. The shopkeeper model is the oldest and also the most basic business model which entailed setting up a store in a place where potential customers are likely to shop, and demonstrating a product or a service. Some of the other business models include the razor and blades model, pyramid scheme model, multi-level marketing model, cutting out middleman model, online auction model, bricks-and-clicks model, loyalty models, low-cost carrier model, freemium models, etc.

Of late, business models have become more complicated and are very much dependent on the emerging technologies and the way in which they are used. With the increasing use of IT, new businesses have come up which brought the need to frame new business models. The role played by IT has also undergone significant transformation over the years along with changes in the business models.

14.3.1 Glocal Strategies

In 1972, advisor Rene Dubos used the phrase "Think Globally, Act Locally" to propose that ecological consciousness should begin at home. The phrase was later converged into a single term called 'glocal' and was used by several business organizations in the 1980s and 1990s as part of branding and advertising strategy for marketing their products and/or services.

IT plays a vital role in global business. It creates a major impact on the strategy, corporate culture, workplace, services, revenues, and savings of the organization. Organizations having a good IT infrastructure can easily and effectively coordinate and control their operations from anywhere in the world. Moreover, with proper IT management, they can achieve competitive advantage over its competitors in the global markets.

Some of the advantages achieved by organizations for using IT in carrying out global operations are: increased coordination and control of operations;

reduction in constraints of time and distance; sharing of scarce resources and expertise; coordination in the movement of goods and/or services from one place to another; sharing of human expertise and such other resources; developing services that would differentiate the company from its competitors, etc. These aspects will help the organizations to timely respond to the requirements in the local markets as well as leverage upon the size and scope of the market.

14.3.2 IT-enabled Services

The growing importance of IT in various fields of business has led to the emergence of IT-enabled services called ITES or ITeS. ITeS is a form of an outsourced service which can take the form of back-office accounting, insurance claim, credit card processing, web marketing, customer care, etc. It covers areas like manufacturing, human resources, administration, healthcare, banking, insurance, finance, telecommunications, retail, entertainment, logistics, etc.

Experts have presented several views on outsourcing and ITeS. According to one school of thought, ITeS is a unique form of outsourcing non-core services to an external company that has expertise in the process, thus reducing the operating costs of the organization and enhancing its profitability. Another school of thought defines ITeS as outsourcing those processes (for instance, rigorous quality checks) which can be enabled with IT due to insufficient in-house capability and expertise of the organization.

The ITeS industry has become a key business opportunity for the export-driven segments of IT software and services. This industry has enormous growth potential in terms of revenues and also creates huge employment opportunities. The legacy processes are increasingly being outsourced by organizations for enhancing efficiency and effectiveness of these processes. The ITeS are broadly divided into the following categories:

- The *back office support services*. These services are being outsourced for reducing the costs and enhancing the profitability of the organization.
- *Processing services that are industry-specific*. These services give more attention to improving the quality of delivery and experience.
- *Customer management services*. These services give more attention to improving the process experience in order to attract more customers.

Usually, companies belonging to the developed countries outsource such services to developing countries like China and India in order to take

advantage of the huge workforce and lower cost of labor in these low cost countries (LCCs).

Jobs were considered safe earlier, machine earning was not in place and it was difficult to teach computers how to perform them. Now computers can teach themselves how to complete some tasks. The same can be programmed into robots too. AI uses modelling and predictions that mimic human intelligence. Some jobs will emerge – such as those requiring empathy, inventiveness and ethical judgments that need to be made by humans. Exhibit 14.1 discusses future work environment after 2020

Exhibit 14.1: Humans and machines at work

Before AI, these decisions were difficult to automate. After AI the number of jobs increases but with a different distribution of tasks emerge. In 2018, the Pew Research Center found that between 65 and 90 percent of those surveyed in advanced economies believe that robots and computers will probably or definitely take over many jobs now done by humans. Most people believe that automation will exacerbate inequality between rich and poor while making jobs harder to find. Less than one third of those surveyed believe that new, better-paying jobs will emerge. A scenario involves equipping machines with conceptual frameworks of how the world works – allowing them to learn more like humans by recognizing patterns and generalizing from a few examples. In addition IoT consists of machines talking to each other and finding new ways of producing goods.

Source: https://unctad.org/system/files/official-document/tir2020_en.pdf, pages 37,38,39 TECHNOLOGY AND INNOVATION REPORT 2021

Activity: Gemini Retail Limited (GRL) has established operations across several countries in the world through its retail stores where customers can buy a broad range of products. With the rapid increase in its customer base, the company has decided to have an online presence through its newly developed website, www.geminiretail.com. Through this website, the customers can place their orders and make payments online. The delivery of the order was done by GRL at the customers' doorstep. What is the type of model used by the company known as? Suggest some other business models that GRL can adopt for expanding its customer base.

Answer:

_____
_____
_____

Check Your Progress-1

1. What are the various categories in Information Technology Enabled Services (ITES or ITeS)?

2. Consider the following statements about IT-enabled Services (ITeS).

   i. ITeS is a unique form of outsourcing of non-core services to an external company that owns and manages the process.

   ii. ITeS reduces the operating costs of the organization, thus enhancing its profitability.

   iii. ITeS can involve outsourcing processes that require continuous enhancement and rigorous quality checks and those that can be enabled with IT.

Which of the above statement(s) is/are **true** regarding ITeS?

   a. Only i
   b. Only i and ii
   c. Only i and iii
   d. i, ii, and iii

3. What are the reasons that prompt organizations belonging to developed countries to outsource their services to developing countries like China and India?

4. Mention the various factors due to which organizations enter international markets.

14.4 Global Management Information Systems

The Global Management Information System (GMIS), also referred to as global IT management or international information systems, includes international decision making bodies (i.e., countries); the multinational enterprises or the suppliers of IT (i.e., companies); the groups or teams within the company; the individuals; and the technology. The entities which are affected during the process of managing IT globally include the national governments, the national and multinational organizations, the companies that make use of the IS technology, the economic zones, the labor markets within a country, and the consumers. GMIS refers to numerous other disciplines like economics, law, political science,

international business, sociology, psychology, cross-cultural studies, computer science, and telecommunications.

A GMIS should match with the corporate strategy of the organization. The technological infrastructure of the country or countries in which the organization is planning to operate should support the business processes of the organization in order to facilitate GMIS. The organization should consider the issue of transborder flow and sharing of data. This is because some countries might be free with the movement of data while the others may impose regulations due to privacy concerns.

The most important point to be considered while developing a GMIS is to match it with the global business strategy of the organization. Moreover, since the nature of the information systems differ across countries because of cultural differences, a GMIS should also take into consideration the differences in the informational requirements of people belonging to different cultures, the impact of information on people belonging to different cultures, and the degree of customization required to suit different cultures.

The Global MIS helps in coordinating the operations of business organizations through the use of packages like enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), etc. It helps in developing products and/or services and serving customers globally. It helps in creating core competencies for the organization. Through GMIS, organizations can create flexible manufacturing operations. GMIS helps in sharing of resources between the organizations and helps in mitigating the risks associated with differences in currencies and conversions.

Check Your Progress-2

5. The most important point to be considered while developing a Global Management Information System (GMIS) is that:
   a. it should consider the cultural factors of the countries in which the organization is operating.
   b. it should ensure transborder flow and sharing of data allowed by the country or the countries.
   c. it should match with the global business strategy of the organization.
   d. it should effectively use the technological infrastructure of the countries in which the organization is planning to operate.

6. Which are the entities that get affected during the process of managing IT globally?
7. Which of the following statements is **false** regarding global management information system (MIS)?
   a. A global MIS facilitates coordination in the operations of business organizations through the use of ERP, SCM, and CRM packages.
   b. A global MIS helps in creating core competencies for the organization.
   c. A global MIS helps in developing products and/or services and serving customers globally.
   d. A global MIS intensifies the risks that are associated with currency differences and conversions.

14.5 Challenges in Global Information Technology Management

The IT managers have to confront a lot of challenges while implementing global IT management, some of which are similar to those encountered in the regional and the national levels, and some which are completely new. Some of the most general global IT management challenges faced by organizations worldwide include:

14.5.1 Cultural Differences

Organizations face certain cultural challenges while operating in the global business environment due to the differences in the religion, customs, social attitudes, language, working styles, working relationships, etc., prevailing across different countries. To overcome this problem, the IT managers should be properly trained before sending them to other countries for work and should also be well-informed about the culture of those countries.

Organizations should also ensure that the global IT solutions developed by them do not fail when they are implemented at the local level. Moreover, another major concern for the organizations is the willingness of the local employees to share their knowledge and expertise with the global IT managers. Since the local employees are not cooperative, it becomes a challenging task for the IT managers to work in such an atmosphere, since they have to gain a lot of knowledge and understanding about the operational and other aspects of the organization.

14.5.2 Geopolitical Challenges

Organizations face challenges when deploying IT solutions developed by them across the world due to the political scenario prevailing in some

countries. Organizations should therefore evaluate the opportunities and threats before expanding into another country.

14.5.3 Problem of Control

In order to manage IT globally, an organization needs to have a global chief information officer (CIO). In addition to this, the organization should also have IT departments in all the countries of operation, headed by CIOs for managing operations in those countries. The global CIO, placed at the headquarters should be a strong communicator and should be able to motivate and lead the country-specific CIOs. In addition, the performance metrics of the country-specific CIOs should be set in tandem with the global IT management or else it would lead to lack of cooperation from the country-specific CIOs.

14.5.4 Information Requirements

Since the operations of the global organization are diverse in nature, the managers need functional information pertaining to purchases, sales, accounting, etc., reflecting the organization's past performance, which in turn would help them in controlling and coordinating the operations. They should also have efficient warning and reporting systems. It is a difficult task to coordinate the activities of a global company. IT offers such tools like fax, video conferencing, electronic mail, etc., which would provide faster and easier access to information and help the global managers in managing the operations of the organization.

14.5.5 Transborder Flow of Data

Global IT managers face the challenge of sharing data across borders since some countries are concerned about the privacy and the employment related issues. Several laws and regulations have been framed by countries on transborder flow of data which help the countries to carry out such transference process.

14.5.6 Coordination

The problem of coordination emerges when the foreign development centers or the headquarters do not properly coordinate with the local development centers or vice versa. Although the local staff may not have the required skill set for designing the system, and may design a poor system, it is believed that the local center is well aware of the economic and political environment and is therefore in a better position to design the system as compared to the foreign counterpart. To achieve proper coordination and favorable results, it is vital for the local center to constantly communicate and coordinate with the headquarters.

14.5.7 Varied Set of Skills

Manpower skills differ across countries and hence would have an impact on managing IT globally. These variations should therefore be properly interpreted and taken into consideration while designing global IT solutions.

14.5.8 Standardized System

While operating at the global level, organizations need a standardized system for accessing data from anywhere in the world. However, it is not possible to develop such a system due to the economic and the cultural diversity of different countries and also because it requires standardization of the core systems, which takes a long period. Therefore, organizations should develop a global system that is customized to suit the needs of a specific country.

14.5.9 Telecommunication Networks

Another major challenge for a global organization is the setting up of a telecommunications network. A global company has to create a link to the various developmental centers located worldwide. This is a difficult task since the telecommunications standards and regulations vary across countries. Moreover, the services offered and the pricing policies of the telecommunication networks also differ across countries. For instance, in some countries, the telecommunication networks are strongly regulated due to privacy concerns. Hence, transferring of data from one place to another is strongly restricted.

14.5.10 Computing Standards

Earlier, computing standards were set by vendors who had a wider presence in few of the leading countries. However, with the introduction of the open source movement, emphasis is given on giving out of common specifications by all the vendors worldwide. This movement may reduce certain problems that organizations are facing in setting up integrated systems across multiple countries. Problems related to integration issues, interconnection issues, etc., will also be solved with the implementation of the movement.

14.5.11 Alignment of Strategies

The global IT managers should ensure that their corporate strategies are properly aligned with the IT strategies. The managers should also properly understand the overall global strategy of the organization and the strategies of the individual business units. Priority must be given to those initiatives which have a global reach. The IT managers should help the top

management in making them understand the relation between the organization wide strategic policies and IT infrastructure.

14.5.12 Hardware Problems

Global IT managers also face certain hardware technology problems, especially if they prefer using specific technologies for following universal standards. Managers have to face problems from prices, import and copyright restrictions, lead times, vendors, etc., while managing IT globally. The purchasing process is hindered by the import restrictions and copyright restrictions posed by some countries. Moreover, the lead times differ across countries. The vendors or the distributors with whom the managers want to deal with may not offer their services to a particular country in which the organization is operating. The vendors may also release newer models and/or versions of their products non-concurrently, resulting in coordination problems between the IT managers and the vendors.

14.5.13 Developing IT Solutions

Companies usually buy software packages and then make modifications to suit their requirements. This practice creates certain problems in the global arena. For instance, the software solutions that are developed exclusively for the American market may not be suitable for the Asian or European markets.

Also, some countries strictly restrict the export and import of computers and other related technologies. Under these situations, the company needs to make local purchases. This creates another problem since it is not always possible to locate software dealers in all the countries where the company is operating.

At the designing level, the company has to face the challenge of separating the global requirements from the local requirements. The development cycle of the application is usually longer if the software developers and the users belonging to different countries are involved. Involving various countries in the development process may also prove to be a risky proposition since the political changes in the future would put the implementation and the maintenance process in jeopardy.

14.5.14 Operational Problems

Operational or technical problems might arise if the global information system is entirely designed to operate from a centrally situated location. Generally, when an application system needs to be maintained or backup needs to be taken for the system, it consumes certain amount of time. This process will

therefore, be carried out early in the morning or late in the night when no one is using the system. On the contrary, if the system is being used globally, then this would result in idle time for the people who are making use of this system in some part of the world. In order to avoid such possibilities, such offline works (as they are called) are carried out during holidays. However, this possibility is again ambiguous as holidays also differ from country to country.

14.5.15 Vendor Problems

Global IT managers also face problems due to vendors since it is not always possible to find the hardware and/or software vendors in all the countries where the company operates. Some of the vendors or the distributors might be present in a particular country out of licensing agreements with the local companies, who might not be as reliable as their licensors. Moreover, some vendors might not provide after-sales service to the organization if it is located in some other country. On the whole, the vendors may not be as reliable in other countries as in the home country.

Activity: Prakash is the IT manager of India-based Sujoy Infotech Limited. The company also has its own divisions in China and Japan. Since Prakash has a good knowledge of and exposure in IT, the company decided to send him to the Japan division for deploying IT solutions. On his first day at office there, he observed that the local employees were reluctant to share their knowledge and expertise with him and that the working styles were also very different from those in India. As a result, working in such an environment became a challenging task for him. How can Prakash overcome this problem? What are the other problems which IT managers like Prakash are likely to face when they are relocated to other countries?

Answer:

_____
_____
_____
_____

Check Your Progress-3

8. When Google, Inc. decided to set up a Chinese version of its website, the Chinese government placed certain restrictions which required the company to censor all the content on its site. The challenge faced by the company in China can be termed as

9. Organizations face several challenges while globalizing their business operations. Differences in work ethic is a/an
   a. Economic challenge
   b. Cultural challenge
   c. Geographical challenge
   d. Geopolitical challenge
10. An American software development company realized that the Japanese users of the company's software complained on finding a dollar sign in place of the yen in a financial report which was denominated in yen. This is a challenge faced by the company due to
11. Which of the following is a major privacy and employment related concern for many countries that make it difficult for the IT managers to properly manage IT globally?
    a. Cultural differences
    b. Vendor problems
    c. Operational problems
    d. Trans-border flow of data

14.6 Managing Information Technology in the Global Business Environment

Managing IT globally is entirely different from and more challenging than managing IT at the regional and the national levels. Companies that are making a global foray will therefore be facing a completely new experience and a new learning curve. Some of the strategies and approaches for international IT management are:

14.6.1 Strategies for Managing IT Globally

Christopher A. Bartlett (Bartlett) and Sumantra Ghoshal (Ghoshal) have proposed four basic global business strategy models used by companies for managing their businesses and competing in the global arena. These models are differentiated by the forces faced by an organization and can be used for managing their IT globally. These are multinational strategy, global strategy, international strategy, and transnational strategy.

14.6.1.1 Multinational Strategy

A multinational organization is one which has subsidiaries functioning like independent entities established in all the countries where it has a presence. They have a strong local autonomy. They try to differentiate their products

and/or services from the local players by responding to the preferences and requirements of customers, the characteristics of the industry, and the nature of the local government regulations. These companies make full utilization of the available local resources to meet their requirements. However, these organizations do not try to exploit the knowledge from the existing local players.

14.6.1.2 Global Strategy

Global organizations have centralized operations which results in standardized procedures throughout the world, thus enabling them to enjoy the benefits of the economies of scale. They enjoy cost advantages because of centralized operations. However, their transportation costs are huge and they also have to deal with the exchange rate risks. These companies are highly efficient but are not flexible. They usually consider the overall global environment and carry out their operations. They consider the worldwide demand for the products and/or services. The scope of learning is also limited since the R&D facility is centralized.

14.6.1.3 International Strategy

International organizations develop innovations in the home country and deploy it to the other countries in order to strengthen their competitive positions in those countries. This process involves transferring the processes, strategies, knowledge, and expertise from the parent company to the subsidiaries. This knowledge is then diffused and adapted by the subsidiaries.

Subsidiaries of international companies are less efficient, less flexible, less independent, and have relatively less autonomy than the subsidiaries of multinational companies. The parent company also retains the control and influence upon the subsidiaries, but comparatively less than that imposed by a global company.

14.6.1.4 Transnational Strategy

A transnational company is a mix of all the above strategies of multinational, global, and international. A transnational organization tries to maintain flexibility in the local markets and at the same time attempts to absorb and diffuse the innovations developed by the parent company. In simple words, these organizations try to spread their innovation across the organization. The costs and revenues are simultaneously managed while the resources and other capabilities are partly centralized and partly

decentralized. These companies aspire for global integration of processes and operating efficiencies.

Activity: India-based ARK Software wants to expand its operations to other Asian countries. At a meeting held between the managers and the Board of Directors of the company, a decision was taken to set up subsidiaries in a few Asian countries. These subsidiaries will act as independent entities. They will be responsible for localizing the company's products to suit the tastes and preferences of the people of those countries as well as complying with the local government regulations. Comment on the strategy adopted by ARK software for expanding and managing business in the Asian countries. What are the other alternative strategies that the company could have adopted to globalize its operations?

Answer:

_____
_____
_____
_____
_____
_____

14.6.2 Approaches to Global IT Management

Blake Ives and Sirkka Jarvenpaa brought out four different approaches for managing IT in a global business environment. These approaches are based on and correspond to the global business strategies proposed by Bartlett and Ghoshal. Organizations can manage their global IT operations as independent operations, operations driven by the headquarters, operations supported by intellectual cooperation, and integrated operations.

14.6.2.1 Independent Operations

Organizations can have independent global IT operations. The main focus of organizations following this approach is to respond to the local requirements of their customers. These organizations have subsidiaries that have complete autonomy to lay out their IT strategies in the country where they operate. The subsidiary acquires the technology and other related equipment from local vendors. This approach often leads to a set-up where the IT databases, applications, and the equipment are non-integrated since they are all more dependent on the local information system departments and technology. However, this non-integration of IT operations hampers the efforts laid out by the organizations in implementing global business

strategies. The parent organization seldom interferes in the operations of the subsidiary and is most often unaware of the initiatives taken by it.

14.6.2.2 Operations Driven by the Headquarters

Organizations following this approach impose certain IT solutions developed centrally on their subsidiaries. The subsidiaries are entirely driven by the headquarters. Organizations following this strategy support global products and/or services and need highly efficient IT operations worldwide. The IT operations are centralized and this provides standardized control mechanisms that ensure efficient operations. However, this approach may receive certain resistance since the solutions are imposed or the applications might suffer due to improper applicability or maintenance.

14.6.2.3 Operations Supported by Intellectual Cooperation

In this approach, the headquarters has a major influence than control on the IT related choices made by the subsidiaries. The employees are frequently swapped between the headquarters and the subsidiaries and applications are developed jointly. A subsidiary can take the application developed by the parent organization and can customize it as per the requirements of the specific country. Another alternative could be that the subsidiary can send a team of IT managers to the headquarters to study the application for developing it on their own. This management approach enables sharing of ideas, dissemination of corporate innovation, and makes it flexible to respond to the local business units.

14.6.2.4 Integrated Operations

This approach is similar to the transnational strategy proposed by Bartlett and Ghoshal. According to Bartlett and Ghoshal, the transnational strategy takes over the multinational, international, and global strategies that are currently being followed by organizations. The transnational companies are globally very efficient and act immediately to the responses of the customers and are quick in diffusing the innovation developed by the parent organization. In transnational organizations, innovation and learning is a two-way process where both the parent organization and the subsidiaries benefit from each other.

Transnational organizations have integrated operations which help the organization to meet the requirements of its various subsidiaries that are operating in different types of environments. As proposed by David Feeney and other strategists, the organizations which are pursuing a transnational strategy need IT applications which should reach across boundaries for meeting the organization’s diverse objectives. The IT

managers ensure that the organization wide IT practices are diffused properly and are tailored based on the environments in which the subsidiaries operate.

14.6.3 Numerous Problems, but Few Solutions

Some of the challenges faced by organizations in managing IT globally could be solved by developing the following systems for operating in various countries:

- Organizations should develop global systems. The task of managing IT projects globally becomes complex when all the personnel belong to the same country and work in the same place. It is also difficult to coordinate the multinational project teams especially in the aspects of hiring the right people and hiring people with the right skill set. Lack of soft skills is also a major problem faced by organizations while developing global systems.
- Organizations should focus on creating inter-organizational relationships, though the process is very complex due to differences in the telecommunication capabilities in different countries.
- Organizations should ensure that there is uniformity in the data across the world.
- Though it involves huge initial investments, technology should always be backed up by good infrastructure.
- With globalization, the telecommunication regulations have become more liberalized. Organizations should make use of such liberal policies to their maximum advantage to expand their businesses aggressively.

Check Your Progress-4

12. Which of the following statements is **false** regarding transnational companies?
    a. Transnational companies act immediately to the responses of the customers.
    b. Transnational organizations are quick in diffusing innovation developed by the parent organization.
    c. Transnational organizations have integrated operations.
    d. In transnational organizations, innovation and learning is a one-way process where the subsidiaries benefit from the innovation developed by the parent organization.

13. An organization has its subsidiaries established in all the countries where it has a presence. These subsidiaries function like independent entities and have strong local autonomy. The organization is following a _____

14. Transnational companies have
    a. Independent operations
    b. Operations driven by the headquarters
    c. Operations supported by intellectual cooperation
    d. Integrated operations

15. Which of the following statements is **true** regarding global companies?
    a. In a global organization, the control at the center is very strong
    b. Global companies do not enjoy cost advantages
    c. Global companies are highly efficient and flexible
    d. Global companies usually concentrate upon the local environment where they operate than the global environment and accordingly carry out their operations

16. Blake Ives and Sirkka Jarvenpaa brought out four different approaches for managing IT in a global business environment. In which management approach, the headquarters and the subsidiaries have strong links with each other and also provide cooperation and assistance to each other?

17. If the business operations of an organization are driven by headquarters _____.
    a. Its IT operations are decentralized
    b. The IT solutions developed by the organizations will be properly maintained
    c. There is no standardized control mechanism to ensure efficient operations
    d. The IT solutions are developed centrally and are followed throughout the organization

18. Which of the following statements is **true** regarding international organizations?
    i. International organizations develop innovations in the home country and deploy it in other countries in order to strengthen their competitive position in other countries.

ii. The subsidiaries of international organizations are less efficient, less flexible, less independent, and have comparatively less autonomy than the subsidiaries of multinational companies.
iii. The parent company retains the control and influence upon the subsidiaries, but this is comparatively less than that imposed by a global company.

a. Only i and ii
b. Only ii and iii
c. Only i and iii
d. i, ii, and iii

19. Centralized operations in an organization will result in
    a. Reduced transportation costs
    b. Economies of scale
    c. Greater flexibility
    d. Unlimited learning capabilities

20. Kranthi India Private Limited is a textile company that has centralized its global operations in India. All the strategic and operational decisions in the company are centralized and are taken by the parent organization. Even the R&D facility of the company is centralized. What type of strategy is the company following?

14.7 Summary

- IT has enabled organizations to expand into new international markets, diversify their business profiles, and come out with new and innovative products and/or services. The Global Management Information System (GMIS) is a sub-discipline of the information systems which involves managing of information systems globally.
- While managing IT globally, managers face a lot of challenges due to the cultural differences, geopolitical differences, control problems, information requirements, transborder data flow, coordination, varied skill sets, telecommunication networks, computing standards, strategies alignment, hardware problems, developing IT solutions, operational problems, vendor problems, etc.
- The four basic global business strategy models proposed by Christopher A. Bartlett and Sumantra Ghoshal used by companies for managing their businesses and competing in the global arena are multinational strategy, global strategy, international strategy, and

transnational strategy. Based on these strategies, the four different approaches that can be applied for managing IT in the global business environment include: managing business operations as independent operations, managing from the headquarters, supporting them through intellectual cooperation, or through integration.

- IT managers face numerous problems and challenges in managing IT globally. However, there are a few solutions for these problems. The solutions include developing global systems, focusing on creating inter-organizational relationships, ensuring uniformity of data worldwide, good infrastructure, and liberalized telecommunication regulations.

14.8 Glossary

- **Business model:** It describes the value proposition, target customer segments, distribution channels, customer relationships, value configurations, core capabilities, partner network, cost structure, revenue model etc of a business and determines the way of conducting business.
- **Global Management Information System (GMIS):** Also referred to as global IT management or international information systems. A GMIS deals with managing information system globally.
- **IT enabled Services/ITeS:** According to one school of thought, ITeS is a form of outsourcing non-core services to an external company that has expertise in the process.

14.9 Self-Assessment Test

1. IT managers face several challenges while managing IT globally. In this context, discuss these challenges and suggest measures on how they can be overcome.
2. Christopher A. Bartlett and Sumantra Ghoshal have proposed four basic global business strategy models that are used by companies for managing their businesses and competing in the global arena. Explain them. Also, discuss the four different approaches proposed by Blake Ives and Sirkka Jarvenpaa which correspond to the global business strategies proposed by Bartlett and Ghoshal to manage IT in a global business environment.

14.10 Suggested Readings / Reference Material

1. Introduction to Information Technology, V. Rajaraman, PHI learning, 2018
2. Information Technology for Management, 2ed: Advancing Sustainable, Profitable Business Growth, Turban, Volonino, Wood, O.P. Wali, Wiley India Pvt Limited, January 2021
3. Introduction to Information Systems - 6th edition, R. Kelly Rainer; John Wiley & Sons, Inc.2016
4. Information Technology: An Introduction for Today's Digital World , Richard Fox, Chapman and Hall/CRC; 2nd edition (August 21, 2020)
5. Information Technology for Management, Efraim Turban, Carol Pollard, Gregory Wood, Wiley, 2018

Additional References:

1. Critchley, L., Where Nanotechnology, the IoT, and Industry 4.0 Meet., https://www.mouser.com/blog/where-nanotechnology-the-iot-and-industry-40-meet, 2019
2. Pan India implementation of HMIS over Indian Railways, Ministry of Railways., http://railministry.com/pan-india-implementation-of-hmis-over-indian-railways/ 2020
3. Vossler, C. How Long Does It Take To Order A New BMW? https://www.bmwblog.com/2020/09/28/how-long-does-it-take-to-order-a-new-bmw/2020
4. Jay, A., 10 New ERP Trends & Forecasts for 2020/2021 – A Look Into What's Next. https://financesonline.com/erp-trends/2019
5. Gingiss, D., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue (forbes.com), 2019

14.11 Answers to Check Your Progress Questions

Following are the answers to the Check Your Progress questions given in the Unit.

1. The ITeS are broadly divided into the following categories: back office support services, industry-specific processing services, and customer management services. Back office support services are being outsourced in order to reduce costs and thus enhance profitability. Industry-specific processing services focus more on enhancing the quality of delivery and experience. Customer

management services focus more on improving the process experience in order to attract customers.

2. (d) i, ii, and iii

ITeS can be defined as a unique form of outsourcing non-core services to an external company that owns and manages the process. This would reduce the operating costs of the organization thus enhancing its profitability. Another school of thought defines ITeS as outsourcing those processes which can be enabled with IT. These processes, though critical to the organization, are outsourced due to deficient in-house capability and expertise. These processes require continuous enhancement and rigorous quality checks and are therefore, outsourced to an external organization.

3. Huge workforce and lower cost of labor

Most of the companies located in the developed countries outsource their services to developing countries like China and India in order to reap the benefits of the huge workforce and lower cost of labor in those countries. These countries have become attractive destinations for outsourcing companies.

4. Manufacturing, marketing, and capital

Several organizations are in the process of transforming into internetworked global companies. Companies seek international markets duly utilizing the global manufacturing facilities and raising money in the global capital markets. They market or sell their goods and services by entering into alliances with global partners, etc.

5. (c) it should match with the global business strategy of the organization .

The most important point to be considered while developing a GMIS is to match it with the global business strategy of the organization. This process involves properly organizing the information systems function across the various countries where the organization is operating.

6. The entities that get affected during the process of managing IT globally are the national governments, the national and multinational organizations, the companies that make use of the IS technology, the economic zones, the labor markets within a country, and the consumers.

7. (d) A global MIS intensifies the risks that are associated with currency differences and conversions.

The global MIS provides support to the business strategies that are framed by the companies. It helps in coordinating the operations of business organizations through the use of software packages like enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), etc. It helps in developing products and/or services and serving

customers globally. A global MIS helps in mitigating the risks that are associated with currency differences and conversions.

8. Geopolitical challenge

Organizations face challenges when it comes to deploying IT solutions developed by them across the world. This is because of the geopolitical situations in some countries. In the given situation, Google faced restrictions from the Chinese government which required the company to censor all content on its site. The company faced a geopolitical challenge in China. Organizations, should therefore, need to evaluate the opportunities and threats before entering another country.

9. (b) Cultural challenge

While developing global business and IT strategies, it is important for managers to take note of cultural differences between different communities. Cultural challenges facing global businesses include differences in language, religion, customs, social attitudes, political philosophies, differences in work ethic and business relationships, etc.

10. Cultural differences

Organizations face certain cultural challenges while operating in the global business environment. These challenges are due to the differences in religion, customs, social attitudes, language, working styles, working relationships, currencies etc. among different countries.

11. (d) Trans-border flow of data

Global IT managers face the challenge of sharing data across borders. This is because some countries are concerned about the privacy and the employment related issues. To tackle this, several laws and regulations have been framed by countries regarding trans-border flow of data.

12. (d) In transnational organizations, innovation and learning is a one-way process where the subsidiaries benefit from the innovation developed by the parent organization.

Transnational organizations act immediately to the responses of the customers and are quick in diffusing the innovation developed by the parent organization. In transnational organizations, innovation and learning is a two-way process where both the parent organization and the subsidiaries benefit from each other.

13. Multinational strategy

A multinational organization is one which has subsidiaries established in those countries where it has a presence. These function like independent entities and have strong autonomy. The strategic and organizational capability of the company enables it to respond quickly to the changes in the local environment.

14. (d) Integrated operations

A transnational company stresses both on efficiency and flexibility. The costs and revenues are simultaneously managed by this type of companies while the resources and other capabilities are partly centralized and partly decentralized. These companies aspire for global integration of processes and operating efficiencies. Transnational organizations therefore have integrated operations. This helps the organization to meet the requirements of various subsidiaries that are operating in different types of environments.

15. (a) In a global organization, the control at the center is very strong

In a global organization, the control at the center is very strong. All strategic and operational decisions are centralized. This centralization results in cost advantages. These companies are highly efficient but not flexible. They consider the overall global environment of demand for products and services the world over and carry out their operations.

16. Operations supported by intellectual cooperation

When the global IT operations are supported by intellectual cooperation, the headquarters and the subsidiaries have strong links and provide cooperation and assistance to each other. The headquarters has a major influence on the IT related choices made by the subsidiaries. This management approach enables sharing of ideas, disseminating of corporate innovation, and makes it flexible to respond to the local business units.

17. (d) The IT solutions are developed centrally and are followed throughout the organization

If the operations of an organization are driven by headquarters, the IT solutions are developed centrally and are followed throughout the organization. The subsidiaries are entirely driven by the headquarters. Organizations following this strategy need highly efficient IT operations worldwide and support global products and/or services. The IT operations are centralized and this provides standardized control mechanisms that ensure efficient operations. This approach has certain problems as there might be resistance from some locations as the solutions are imposed, or the applications might suffer due to inapplicability or improper maintenance.

18. (d) i, ii, and iii

International organizations develop innovations in the home country and deploy it in other countries in order to strengthen their competitive position in other countries. This process involves transferring the processes, strategies, knowledge, and expertise

from the parent company to the subsidiaries. This knowledge is then diffused and adapted by the subsidiaries. Subsidiaries of international companies are less efficient, less flexible, less independent, and have comparatively less autonomy than the subsidiaries of multinational companies. The parent company also retains the control and influence upon the subsidiaries, but this is comparatively less than that imposed by a global company.

19. (b) Economies of scale

Centralized operations in an organization bring economies of scale and this serves as an effective strategy. However, it results in huge transportation costs, little flexibility, and limited learning.

20. Global strategy

In a global organization, the control at the center is very strong. This control in turn results in standardized procedures throughout the world that enables the company to reap the benefits of the economies of scale. In these organizations, all the strategic and operational decisions are centralized. Kranthi India Private Limited is following a global strategy.

Unit 15

MIS in Specialized Areas

Structure

15.1 Introduction

In the previous unit, we have discussed about management information systems, the various ways in which information can be managed, and about managing information technology globally. Information technology (IT) is not only being widely used in business organizations but also by various other types of organizations like government organizations and non-profit organizations. IT is also being used for managing performance of an organization, for managing projects, and for buying and selling products/services.

Any organization becomes successful only by managing certain resources they have in a productive way. Traditionally these resources are referred to as labor, money, materials, managers, machines and facilities. Lately, information has come to be recognized as an important resource by organizations, which enables the efficient management of other resources. Like other resources, information also has many properties like value and being available to the management in time. Since information is a valuable resource, it must be managed in a proper way using well-designed systems.

Block-4: Management of MIS

Managers have to be aware of utilizing management information systems effectively to be competitive in the business world

Despite the opportunities provided by Information and Communication Technologies (ICTs), it poses certain challenges related to storage, retrieval, and processing of data causing delay in decision making. These problems were addressed by developing advanced computer systems. For instance, marketing databases, electronic point of sale systems, and automated teller machines (ATMs) have changed the way traditional business functions, and the development of just-in-time (JIT) practices, materials requirement planning (MRP), etc., have enabled faster and economical production.

In this unit, we introduce you to the role played by management information system (MIS) on specialized areas such as government organizations and non-profit organizations. The unit also highlights on the use of MIS in managing corporate performance and in managing projects. The unit ends with a discussion on the creation of online marketplaces.

Management information systems serve management-level functions. MIS provides managers with reports of an organizations' current performance and historical records. MIS can also give online access for managers to these reports. MIS are used to deal only with internal activities of an organization, and not the external environment. Planning, controlling and decision making at the management level is assisted by the MIS. To function, MIS depends on the information which is collected from the operational level by transaction processing systems. MIS summarizes and reports the details of an organizations basic operations. Transactional data are first compressed and presented as a reports at regular intervals, which are then converted into MIS files. These reports are usually generated in a weekly, monthly or yearly time horizon, but with MIS, managers have the ability to dig deeper and drill down to watch daily or hourly data. MIS systems are concerned with answering routine questions which are formulated and specified in advance with general predefined procedures for answering them. Due to this MIS lacks flexibility and they also have very less analytical capability. Complex mathematical models and statistical techniques are not employed by MIS.

Management information systems produce regular reports on the operations of organizations to managers. This serves as a feedback system by which managers can know the performance of the different activities of the organization. This may also be utilized by top management to monitor the organization as a whole. MIS compares actual results against planned results and previous results. When an organization is planning to adopt an

MIS, they have to first determine the investments required in MIS and make sure that the organization has the required resources. The benefits which an MIS will bring to the organization must be identified. A successful implementation of an MIS requires efforts by the organization to change both people as well as technology. It is vital to document and communicate system requirements for successful implementation of MIS.

Finding the right MIS solution that fits an organization is also very important. There are different options available like buying from a vendor or building a system in house, and whether to go with an open-source system or a proprietary system. Decision-support systems (DSS) also are used at the management level of the organization. These systems help managers make decisions that are unique, rapidly changing, and not easily specified in advance. They deal with problems for which predefined procedures may not exist to arrive at the solution. DSS makes use of internal information from transaction processing systems and management information systems, and information from external environment. These systems have more analytical capabilities than other systems and are designed to be used directly by managers. Users of DSS can change assumptions, ask new questions, and include new data.

15.2 Objectives

By the end of this unit, you should be able to:

- Show the application of MIS in government organizations.
- Justify the application of information systems in non-profit organizations.
- Define the concept of corporate performance management.
- Assess the concept of project management information system.
- Find out the application of MIS in online marketplaces.

15.3 MIS in Government Organizations

With the growing importance of technology, the government organizations have started employing ICTs for carrying out their functions. Consumers realized that online transactions were easy and convenient. The consumers have become increasingly demanding as they expect the government to provide the same level of service provided by commercial organizations.

For instance, Bangalore One is a service provided by the Government of Karnataka. This portal was launched in an effort to provide facilities to the citizens of Bangalore. Various government departments offered this service. The services offered allowed customers to pay their water,

electricity, and telephone bills online. Other services include registration of commercial establishments, issuing driving licenses, etc.

Information technology has been of immense benefit during Covid to Government (applications, Vaccination, telemedicine etc), Public (ecommerce, payments etc), distributors (MIS data, Extranet etc). We will be delighted to note that Delhi government is using Health Information (Management) systems on cloud. Exhibit 15.1 details the approach of Delhi government of using HIMS.

Exhibit 15.1: Delhi to Implement Cloud-based Health Information Management System by 2022

Cloud tech

According to the Economic Times report, Delhi government's ambitious cloud-based Health Information Management System (HIMS) is going to be implemented by early next year. (2022)

E-health card

The massive project would see every Delhiite get an e-health card and have their medical history available online when they see a doctor after taking an appointment from home.

Going digital

After HIMS is implemented, Delhiites would be able to take an online appointment and consult the designated doctor within a fixed time-frame.

One for all

Plans are afoot to distribute the e-health cards through a door-to-door campaign, apart from providing them at hospitals and other dedicated centres

Medical data

The QR code-based cards would be issued on the basis of voter ID and population registry, from which demographic and basic clinical information of each patient would be obtained.

Source:
https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/delhi-to-implement-cloud-based-health-information-management-system-by-next-year/cloud-tech/slideshow/85297673.cms

15.4 MIS in Non-profit Organizations

The non-profit organizations (NPOs) play a very important role in the society. These organizations carry out programs that help in improving the lives of the deprived sections of the society. The NPOs function from the funds received by government organizations, public companies, private companies, individuals, foundations, etc. CARE, Christian Children's Fund, Greenpeace, Child Rights and You (CRY), etc., are examples of NPOs.

There is an increasing amount of competition between NPOs, even though there are plenty of funds available for developmental activities from governments, corporate houses, individuals and societies. NPOs are ranked by their ability to implement projects. Their past activities and success stories are taken into consideration when they are evaluated by funding agencies. Funding agencies carefully study the NPO performances and cost of their services. These factors force an NPO to improve its efficiency by different means. Many NPOs use MIS to achieve the desired goals. In the absence of a proper information system, data would be in a scattered state at different locations with different people. Collecting information becomes difficult when data is scattered. Employees may also leave taking with themselves vital information required for the organization, creating some vaccum. MIS can solve this problem by protecting crucial information by storing them in a central repository and making this information available to management as and when required. Data required by NPOs may be both internal or external, internal generated from implementation activities and external from government and other agencies. These external data are required for comparisons, advocacy purposes, planning and policy making. A high degree of flexibility is therefore required in any MIS that caters to the needs of NPOs. The MIS should be flexible both in terms of capturing data as well as storing data. The MIS system must be user friendly to the extent that both basic and query formats can be changed without disturbing the database in anyway. The user also must be able to create new formats and make changes to existing formats either by making changes to the original structure or by importing existing data into the new formats.

15.4.1 Information Systems Applications in NPOs

With the advent of information systems, NPOs are active as profit-oriented organizations employing complex information systems similar to the ones used in commercial establishments. The application of information systems in NPOs was expected to provide lot of advantages especially in the field of communication. Information systems can be put to use for internal as well as external purposes in these organizations.

15.4.1.1 Internal Uses

Information systems manage organizational resources, locate the donors, record and maintain financial proceedings, and monitor various activities of the organization. Such activities would enhance the efficiency and productivity of the organization.

15.4.1.2 External Uses

Information systems expose the mission, purpose, and objectives of the organization to the general public indicating the services rendered by the organization. The NPOs spread the message to the people regarding the services offered through the Internet, thus making information access convenient to the people. The information system implements transparent procedures in their operations, enabling the donors and the government agencies to monitor the spending of these organizations on a regular basis.

15.4.2 Challenges Faced by NPOs

The most basic challenge faced by NPOs is the lack of financial resources. Creating an information system requires huge investments in infrastructure and people. The information system needs to be maintained regularly which requires technically qualified people and many people may not desire to work for an NPO. Another important challenge is the indecisiveness of the organization of whether or not to set up a website and information system. This is a problem as the organization might fear that when a web site is built, the donors who are old and reserved may be isolated.

15.4.3 Information Systems at CRY

Seven friends in the year 1979 decided to transform the lives of deprived children. The group was led by Rippan Kapur with very few resources and a belief that every single person can make a difference in the life of a child. This formed the beginning of Child Relief and You (CRY). On April 01, 2006, the organization's name was changed to Child Rights and You.

CRY made use of information systems for managing its activities and advertising the cause for which it was fighting for through its website. In 2004, CRY deployed an enterprise resource planning (ERP) system developed by Agni Software Private Limited to manage the operations related to its donations, financials, contacts, and volunteers. These systems are explained below in brief:

15.4.3.1 Donation Management System

Corporates as well as individual make financial or non-financial donations to CRY. The donations made by corporate houses are through the employees and employers. These donors give a fixed part of their salaries on a periodical basis or at a time. These donations are managed through the back office work outsourced by CRY. The CRY Donation Management System (CRYDMS) manages these donations records details of the donors like profiles; generation of history, trends, and retention

analysis; receipting; etc. It also manages the campaigns of the organization effectively and economically.

15.4.3.2 Financial Accounting System

CRY keeps a computerized system for their accounting and MIS requirements. The CRY Financial Accounting System (CRYFAS) helps in maintaining the books of accounts for the NPOs based on the Bombay Public Trust Act of 1950. The CRYFAS enables integration of the system with other systems in line with the CRYDMS. CRYFAS maintains cost centers and parallel cost centers. The accounts and the cost centers are maintained parallely to track or find out the deviations with the actuals. The system also helps in transferring the transactions of a branch to the head office and vice versa.

15.4.3.3 Contact Management System

The CRY Contact Management System (CRYCMS) deals with the marketing of CRY by interacting with the individual donors, corporate donors, product buyers, etc. The CRYCMS enables providing of better servicing, strategic information analysis and avoid the concentration of information with one person or entity.

15.4.3.4 Volunteer Management System

The CRY Volunteer Management System (CRYVMS) enables tracking of CRY volunteers and records the details of the volunteers manually or through the organization's website. On behalf of CRY, these volunteers can donate the time, ideas, activities, thoughts, etc. The CRYVMS is also integrated with CRYDMS to check for any common volunteers and donors. The system also helps in generating various reports.

Activity: PeaceOne, a non-profit organization (NPO) faced difficulties in managing its operations manually. It planned to use information technology to carry out its activities and to enhance its efficiency and productivity. The trustees of the NPO, however, considered the use of information system in its activities a costly proposition and thought it was not of much use for a NPO. The volunteers of the NPO tried to convince the trustees about the use of information system and the benefits derived from it. What, according to you, are the benefits of using information system in an NPO? Do you think using information system will be a financial burden for the organization?

Contd. .....

Answer:

Check Your Progress-1

1. Externally, information systems in a non-profit organization are used for
   a. Managing resources of the organization
   b. Locating donors
   c. Monitoring the activities of the organization on a regular basis
   d. Exposing the organization's mission, purpose, and objectives to the general public
2. Organizations that carry out programs that improve the lives of the deprived sections of the society are called _____.
3. In non-profit organizations, the most important application of information systems is in the field of
   a. Communication
   b. Donations management
   c. Financial management
   d. Contact management
4. What are the challenges to a non-profit organization?
5. Non-profit organizations (NPOs) play a very important role in society. Following are some statements regarding NPOs. Indicate true/false.
   a. The scope of activities provided by the NPOs is sometimes limited to certain geographical areas
      True/False
   b. The nature and scope of activities vary from organization to organization
      True/False
   c. The NPOs function only from funds received from government organizations
      True/False

d. Charities, service clubs, sports association, child care centers, etc. come under NPOs
True/False

15.5 MIS in Managing Corporate Performance

The advent of decision support systems in 1970 helped organizations in analyzing their individual departments and forecast the future. The emerging technologies helped managers to analyze and make plans based on the customers, product lines, distribution channels, etc.

The executive information systems introduced in the 1980s helped organizations to list out a summary of the day-to-day transactions in the organization. These systems provided technology to the management which could be used for investigating the strengths and weaknesses of the organization without the need of programmers.

By the year 1990, with the introduction of computer technologies, the concepts of business intelligence, ERP, and customer relationship management gained popularity. The use of advanced management techniques combined with technology helped the aspects of business planning, business reporting, and business analysis gain importance.

The introduction of management techniques like balanced scorecard helped organizations to concentrate not only on the financial results, but planning and monitoring aspects of the business like efficient internal processes, internal growth, internal learning, customer retention, etc.

Various management techniques were combined with the management processes like budgeting, forecasting, reporting, etc., to build an integrated organization. Such integration, supported by technology, helped the organizations to properly plan and measure. This in turn paved way for the development of a concept called corporate performance management.

The concept of Corporate Performance Management (CPM) was introduced by Gartner, Inc. in 2001. It is a management discipline that defines the processes, methods, metrics, and the systems that are required for managing the performance of the organization. It is also referred to as business performance management (BPM). CPM outlines the opportunities and threats of an organization while providing insights required for making proactive decisions. It enhances the performance, decision making capabilities, and execution of business strategies of an organization. The various stages involved in CPM are strategic planning,

scorecarding, budgeting, forecasting, consolidation, and business intelligence.

Technology is widely being used for conducting performance reviews. Performance management software packages are available in the market which helps organizations to manage performance throughout the organization. With the help of the software, the observations made by the managers are easily transformed into words and all this takes place in less time with greater accuracy. Performance management software ensures consistency all through the years.

Check Your Progress-3

6. _____ is a management discipline that defines the processes, methods, metrics, and systems that are required for improving the business performance of the organization.

7. The concept of Corporate Performance Management was introduced by
   a. TRW Nelson
   b. Gartner, Inc
   c. Commerce One
   d. Xavier Institute of Management

15.6 MIS Application Areas

MIS can be used in different functional, operational and technical areas of organization. Some of the application areas of MIS include:

- Personnel Management or Human Resource Management
- Financial Management
- Manufacturing
- Services Management
- Operations Management
- Production Management
- Performance Management
- Employee Training
- Knowledge Management
- Talent Management
- Business Process Management
- Product Development

- Customer Relationship Management
- Organizational Planning and Strategy
- Supply Chain Management
- Contact Center Management
- Material Management
- Vendor Management
- Contract Management
- Payment Processing
- Inventory Control
- Resource Planning and Allocation
- Project, Program and Portfolio Management
- Business Intelligence and Market Intelligence
- Social Networking and Image Building

The above mentioned areas are mostly applicable to different organizations in different domains such as telecom, retail, healthcare, construction, IT, BPO, KPO, biotechnology, manufacturing, pharmaceutical, energy, oil and gas, utilities, banking and financial services and insurance industries. Management information systems make use of organizational data and provide information to management for actionable, efficient and responsible decision making. They store, analyze, present, transform and transmit the data in the organization. They make use of RDBMS, data warehouses and data marts in the organization.

15.7 MIS Applications in Manufacturing Sector

Management information systems have many applications in manufacturing sector. Different products of Information technology are regularly used by manufacturing industries. They should also have an awareness of management information systems and apply it to solve their problems. As today's business environment is dynamic and challenging, an organization must incorporate efficient information systems like management information systems to survive. Data collection and analysis by sophisticated information systems have become very simplified due to innovations. Having the appropriate management information systems, managers are able to focus on the creative elements of management, and leave other tasks to such information systems. Managers can concentrate on developing strategy, searching for new opportunities and competitive advantages, and optimizing the use of the organization's resources.

MIS applications in manufacturing sector include the following:

- MIS is used for payroll, financial accounting, and inventory management.

- MIS is used for Materials Management
- Production Management Information Systems help in production planning, scheduling, controlling and measuring performance.
- MIS is used for resource planning, supply chain management, computer aided design and simulation
- It is used in product design, order management and procurement
- Enterprise management systems use ERP, SCM, and CRM
- MIS is used in logistics and distribution
- MIS is used for shared production, collaborative product development, distributed product development and integrated supply chain management.
- MIS is used for exchange of product data
- It is used for human resource planning, training and development.
- It is used for financial book keeping, production plant book keeping, material book keeping, and book keeping of fixed assets.
- It is used for VAT (Value Added Tax) calculations
- It is used for invoicing and bill generation in manufacturing sector
- It is used in goods receivables section.
- MIS is used for marketing, sales and investments
- MIS is used for balance sheet generation and profit and loss accounting
- It is used to collect the customer feedback as well.
- It is used for organizational communication, technical documentation and word processing purposes.

For example, Boeing, an airplane manufacturer, has integrated its IT infrastructure consisting of resource planning (Baan), product configuration (Triology), forecasting (i2) and product data management (SDRC) to provide integrated solutions to customers. With this customers are able to order spare parts and check for availability online. The improved MIS reduced commercial airplane delivery time from 36 months to somewhere between 8 to 12 months for Boeing.

15.8 MIS in Managing Projects

The planning, control, procurement, delegation, reporting, and administrative activities of a project are better managed with the increasing use of computers and various tools and techniques. MIS ensures timely access to the information for making executive decisions. MIS, when integrated with project management, brings out the following questions:

- Is project management restricted only to data processing projects?

- The project manager would act as the programmer or the user?
- What should be the extent of the authority of the project manager?
- What would be the effect of the project manager's authority on the equilibrium of the organization?

A study conducted by the TRW Nelson Division indicated that data processing in project management began with MIS personnel acting as project leaders. However, the companies felt that technical experts were best qualified to be project leaders. In general, rather than as project managers, the MIS personnel act as team members and resource personnel.

15.8.1 Project Management Information Systems (PMIS)

A Project Management Information System (PMIS) helps in planning, scheduling, and tracking the various tasks and procedures involved in a project. A PMIS is an information system that contains a set of automated tools and techniques which are used for gathering, integrating, and disseminating the results obtained from the project management processes. The steps involved in selecting a PMIS include:

- Compiling a comprehensive set of selection criteria which should have the capability to carry out functions like project planning, resource management, tracking, report generation, etc.
- Laying down a set of priorities for the items based on the extent to which they are required
- Evaluating the software using data supplied by vendors, product reviews, and software surveys
- Determining the current and the forecasted future requirements of the software by using a standard project
- Negotiating price, especially if the organization is purchasing in large volumes

A PMIS supports all the project activities and also acts as a repository for all the project information. It helps team members share the knowledge and directs and manages the execution of a project while coordinating the various activities among the project team members. A PMIS provides document management and collaboration tools that help the project team members to coordinate and work on the project. These tools are accessible within an organization and are integrated into a system. They are used in controlling the information and in developing the scope of the project.

With the help of PMIS, a project manager presents the information to its team members in the form of a report. The project manager can update project schedules, and monitor and control costs and other resources involved in the project. It alerts the team members when the documents are

modified and can be used as a reporting and tracking tool for checking the progress of the project from time to time.

A project manager faces a few problems due to the PMIS. These problems include:

- The PMIS should be verified as it may not highlight the actual problems involved.
- PMIS sometimes provides excess information leading to further confusion in decision making.
- The project manager may over depend on reports generated by the PMIS.
- PMIS may not cover all project areas causing imbalance.

The PMIS software selected should have certain characteristics or attributes such as it should be user-friendly and should have clear and logical manuals. The software should be able to recalculate the schedules and the resource records in case of an information update. Its software should display the PERT and CPM network for the project. It should contain the budget details for helping project managers in planning, monitoring, and controlling the processes. It should have the ability to transfer or receive data to and from spreadsheets, word processors, database programs, graphics programs, etc. The PMIS software should have the ability to consolidate into a single database. This would help project managers in determining the total amount/quantity of resources used and helps in finding out any resource conflicts.

15.8.2 Project Management at XIMB

Established in 1987, the Xavier Institute of Management, Bhubaneswar (XIMB) is among the leading business schools in India. XIMB is known to be one of the most technology-intensive institutes in India. IT is used as a source of strategic advantage by the institute. It was used for strengthening the infrastructure, modifying the content delivery process, developing software development capabilities, and building industry partnerships. XIMB also used IT in managing their projects.

XIMB used a tool called Project Accounting and Monitoring Information System (PAMIS). PAMIS, an accounting and project planning software, helped organizations manage their financial aspects and plan their projects. However, it can be used by NPOs to implement their projects and programs within a given time frame and within budgets.

PAMIS is a tool that helps in project planning, allocating expense, treating the project as a complete accounting unit rather than a cost center, and monitoring the financials and processes in the project right from the initial

stage to the final stage. PAMIS ensures accountability, responsibility, and transparency.

With the help of PAMIS, the donors and the funding agencies monitor and provide guidance to the NPOs for performing effectively. The PAMIS generates reports such as status report, physical progress report, budget compliance report, receipt and payment report, income and expenditure report, etc. PAMIS is also customizable, i.e., it has a high degree of flexibility that helps it in adapting to the specific requirements of the organization.

Check Your Progress -3

8. Given below are some statements regarding PMIS. Indicate true/false.
   a. PMIS reports always highlight the actual problems involved. **True/False**
   b. PMIS at times provides an overdose of reporting and data representation. **True/False**
   c. The project manager or the top management may start depending excessively on the PMIS reports. **True/False**
   d. PMIS does not equally cover all the project areas. **True/False**
9. Which of the following is an information system that contains a set of automated tools and techniques that are used for gathering, integrating, and disseminating the results obtained from the project management processes?

15.9 MIS in Online Marketplaces

An online marketplace is a medium for buying and selling of products/services through the Internet. The products are bought online when the markets are open. However, the traders also have the option to place the orders at their convenience beyond the usual trading hours. There are six types of online marketplaces. These are:

15.9.1 One-to-Many Marketplaces

One-to-many marketplaces is an online marketplace which links one seller to numerous buyers. The seller is usually the owner of the marketplace. Traders operating in these marketplaces have sufficient market influence. They force the participants of the marketplace to follow their way of conducting business.

15.9.2 Aggregator Hubs

Aggregator hubs allow sellers and buyers to trade in markets that are highly fragmented. They demonstrate the content in the catalogs of the suppliers to the prospective buyers. Some of these hubs also display certain other types of content like contracts and authorizations.

15.9.3 Broker Hubs

Broker hubs involve multiple buyers and sellers negotiating on the price of the product and/or service. These online marketplaces are best suited for commodities that are traded in bulk and are in limited supply. E-mail or automated bidding process is used for handling requests for quotes, proposals, contracts, and other such transactions that take place between the buyers and the sellers.

15.9.4 Collaboration Hubs

Collaboration hubs are online marketplaces backed by good infrastructural facilities that facilitate online trading. They have software tools and virtual environments that enable multiple buyers and sellers to share information and collaborate on a specific functionality. Collaboration hubs also provide web-based collaborative design and engineering software for industries like automotive and aerospace that have highly engineered products. For example, mySAP.com from SAP is a Collaboration Hub.

15.9.5 Translator Hubs

Translator hubs are online marketplaces that offer capabilities like buying, selling, and collaboration. They are similar to collaboration hubs. Translator hubs have significant enterprise application integration (EAI) capabilities that enable system and data integration between the different trading environments of trading partners. These hubs provide data translation services in order to facilitate communication including EDI, electronic mail, fax, eXtensible Markup Language (XML).

15.9.6 True Many-to-Many Marketplaces

True many-to-many marketplaces are virtual software environments that enable direct interaction between multiple purchasing and ordering systems. They facilitate free and unrestricted e-commerce between the buyers and the sellers. True many-to-many marketplaces are rule defined, i.e., the workflow technology is used for transferring the relevant information from the computer systems of the buyers to those of the sellers and vice versa. At the front end, workflow automates most of the decision making and collaborative planning associated with customer ordering and at the back end, it automates the logistics supply and demand. True many-

to-many marketplaces manage all the processes involved in the supply chain.

With the advent of online trading, security transactions have become transparent. For online trading to take place, the MIS of companies should be Internet-enabled. Online trading has reformed the securities industry in numerous ways. Customers have the ability to manage their own investments more effectively than before. The financial details and research-based data which were earlier accessible only to the market analysts are now available even to the individual investors.

The securities trading industry has also become quite efficient. The costs per trade have come down drastically for the investors who make use of online brokers both at firms that provide exclusive online services and firms that provide a mix of both traditional full service trading and online options. Due to this, the investors who realized that the charges of a full-service brokerage firm to be very high can now actively participate in the trading of securities.

Activity: Adrian wants to make capital market investments through a security brokerage firm. As he is investing in the stock markets for the first time, it requires a lot of understanding of the investment process involved. For this, he needs to interact with the firm on a continuous basis. As Adrian is employed full-time with a multinational, it is not possible for him to personally meet the firm's agents on a regular basis. How do you think Adrian will be able to carry out the transactions with the firm and get investment advice? Explain.
Answer:

Check Your Progress -4

10. _____ are exchanges that have significant enterprise application integration (EAI) capabilities and enable system and data integration between different environments of trading partners.

a. Broker hubs
b. Translator hubs
c. One-to-many marketplaces
d. Many-to-many marketplaces

11. Which is the exchange that is best suited for commodities that are traded in bulk and which are in limited supply?

12. What are one-to-many marketplaces?

15.10 MIS Applications in Services Sector

MIS is used very differently in service sector than manufacturing sector. This is because the manufacturing sector develops a tangible product whereas in services, products and services are not tangible. Services do not take shelf space in the store. They are provided on demand. They do not have physical unit of measurement. They cannot be demonstrated before servicing. Controlling service quality is difficult. These are some of the characteristics of services. Some of the MIS application areas in service organizations include:

- Human Resource Management: People are the assets to services companies. This was well said by the Chairman of Infosys Mr. N.R.Narayana Murthy. Service organizations use MIS in training employees, performance measurement and resource management. They use MIS for leave and payroll processing also.
- Banking and Financial Services: MIS is widely used to maintain details of individual, organizational and governmental customers. They use MIS for transactions saving and processing. MIS is widely used for report generation.
- Insurance: MIS is used for claims processing, fraud detection, payment processing, policy generation and risk assessment. It is used in very long term perspective.
- Airline Industry: MIS is used for ticket booking, finding customer food preferences, language preferences and finding travel class, etc. Passenger tickets are delivered online immediately using MIS.
- Customer Service: MIS is used for customer support, customer relationship management, customer contacting and feedback.
- Healthcare: MIS is used in hospitals, primary care centers, doctors' offices and in intensive care units. They are used to maintain patient

medical history. They store the prescriptions and exchange medical records with other healthcare service providers.

- Hospitality Industry: MIS is used for room allotment, reservations and billing purposes. They widely use it for customer relationship management and to interact with business partners.
- Payroll, Inventory Management and Accounting: Service organization use MIS for payroll processing, inventory management and financial accounting purposes.
- The best practices of service organization include listening to the customer, setting customer service standards and measuring the performance. Service organizations have to train their employees, recognize and reward the top talent.

15.11 Summary

- IT has offered several opportunities as well as has posed challenges to the commercial and the government organizations. Development of computer systems made the processes of data collection, storing, retrieving, and manipulation easier.
- Information systems help in enhancing the efficiency and goodwill of an organization. They provide a competitive advantage to the organization and aid in differentiating it from other similar organizations.
- Corporate performance management is a management discipline that defines the processes, methods, metrics, and the systems that are required for managing the performance of the organization.
- A Project Management Information System (PMIS) helps in planning, scheduling, and tracking the various tasks and procedures involved in those projects.
- Online trading has transformed the way in which business are conducted. It is a method through which purchase and sale of goods and/or services takes place through the Internet. There are six different types of online marketplaces. These are one-to-many marketplaces, aggregator hubs, broker hubs, collaboration hubs, translator hubs, and true many-to-many marketplaces.
- MIS can be used by business organizations, government organizations and non-profit organizations for performance management, project management and to help in selling products or services.

- Non-profit organizations which work for the welfare of the most deprived sections of society are also more and more using systems like MIS to streamline their operations.
- These systems helps non-profit organizations with internal activities like communication as well as external activities.
- Importance of MIS in online marketplaces is discussed.
- Importance of Management information systems in the manufacturing sector and in project management are presented.
- MIS helps organizations in planning, controlling, procurement, reporting, delegation and administrative activities of a project.
- We have covered how MIS helps online market places, and how it impacts the service sector

15.12 Glossary

- **Aggregator hub/Aggregators:** Online exchanges that allow sellers and buyers to trade in highly fragmented markets. Aggregators offer guidance to buyers in these markets by providing information at a single online contact point.
- **Broker hubs:** Online exchange that brings together multiple buyers and sellers to negotiate on the price of the product and/or service. Broker hubs are best suited for commodities that are traded in bulk and those which are in limited supply.
- **Collaboration hubs:** Online exchanges that are backed by good infrastructural facilities that facilitate online trading. These exchanges have software tools and virtual environments that enable multiple buyers and sellers to share information and collaborate on a specific functionality.
- **Corporate Performance Management (CPM):** It defines the processes, methods, metrics, and the systems that are required for managing the performance of the organization.
- **One-to-many marketplaces:** Private online exchanges which link one seller to numerous buyers.
- **Online exchanges**: These are neutral third parties that match the ask and bid rates in a regulated environment.
- **Online marketplaces:** A medium through which purchase and sale of goods and/or services takes place using the Internet as a medium.

- **Online trading:** It refers to carry out security transactions through the Internet or online media. Online trading is possible only if the MIS of companies are Internet-enabled.
- **Project Management Information System (PMIS):** An information system that contains a set of automated tools and techniques which are used for gathering, integrating, and disseminating the results obtained from the project management processes.
- **Translator hubs:** Online exchanges that offer capabilities like buying, selling, and collaboration. Translator hubs provide data translation services in order to facilitate communication including EDI, electronic mail, fax, eXtensible Markup Language.
- **True many-to-many marketplaces:** Virtual software environments that enable direct interaction between multiple purchasing and ordering systems.

15.13 Self-Assessment Test

1. Government organizations have realized the importance of technology and have started employing ICTs in carrying out their functions. In this context, describe the applications of MIS in government agencies.
2. Well-designed information systems provide a lot of advantages to Non-Profit Organizations (NPOs), especially in the field of communication. In this context, describe the applications of MIS in non-profit organizations.
3. Projects can be better managed by integrating MIS with project management. In this context, describe the role of MIS in project management.
4. Online marketplaces have transformed the way in which business transactions were traditionally conducted. In this context, define an online marketplace and describe the six types of online marketplaces.

15.14 Suggested Readings/Reference Material

1. Introduction to Information Technology, V. Rajaraman, PHI learning, 2018
2. Information Technology for Management, 2ed: Advancing Sustainable, Profitable Business Growth, Turban, Volonino, Wood, O.P. Wali, Wiley India Pvt Limited, January 2021
3. Introduction to Information Systems - 6th edition, R. Kelly Rainer; John Wiley & Sons, Inc.2016
4. Information Technology: An Introduction for Today's Digital World, Richard Fox, Chapman and Hall/CRC; 2nd edition (August 21, 2020)
5. Information Technology for Management, Efraim Turban, Carol Pollard, Gregory Wood, Wiley, 2018

Additional References:

1. Critchley, L., Where Nanotechnology, the IoT, and Industry 4.0 Meet., https://www.mouser.com/blog/where-nanotechnology-the-iot-and-industry-40-meet, 2019
2. Pan India implementation of HMIS over Indian Railways, Ministry of Railways., http://railministry.com/pan-india-implementation-of-hmis-over-indian-railways/ 2020
3. Vossler, C. How Long Does It Take To Order A New BMW? https://www.bmwblog.com/2020/09/28/how-long-does-it-take-to-order-a-new-bmw/2020
4. Jay, A., 10 New ERP Trends & Forecasts for 2020/2021 – A Look Into What's Next. https://financesonline.com/erp-trends/2019
5. Gingiss, D., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue., How Integrating Social Media Into The Rest Of The Business Will Increase Revenue (forbes.com), 2019

15.15 Answers to Check Your Progress Questions

Following are the answers to the Check Your Progress questions given in the Unit.

1. (d) Exposing the organization's mission, purpose, and objectives to the general public

In a non-profit organization, Information systems can be used internally as well as externally. Externally, information systems are used for exposing the organization's mission, purpose, and

objectives to the general public. They can be used to provide information to the public about the services rendered by the organization, spread their message to the people, educate them, and in the process, build relationships with them. The Internet provides access to the website of the organization and allows the readers to scan through the information comfortably at their own his/her pace. These systems can also be used in situations where people hesitate to speak in person about certain issues and prefer to remain anonymous.

2. Non-profit organizations

Non-profit organizations (NPOs) carry out programs that help improve the lives of the deprived sections of the society. NPOs act as watchdogs for society and execute programs developed by government organizations. These organizations function from the funds received by government organizations, public companies, private companies, individuals, foundations, etc.

3. (a) Communication

Information systems provide a lot of advantages to NPOs especially in the field of communication. These systems are used for sharing the organization's mission, purpose, and objectives with the general public. They can be used for providing information to the public about the services rendered by the organization.

4. The challenges faced by a non-profit organization are lack of financial resources, lack of technically qualified people, indecisiveness in organization, building an information system, alignment of website with the mission and communications strategy of the organization, etc.

5. All the statements are true except statement (c).

The non-profit organizations (NPOs) carry out programs that help improve the lives of deprived sections of the society. The scope of activities provided by these organizations is at times limited to certain geographical areas. The nature and the scope of activities vary from organization to organization. These organizations operate by using funds received from government organizations, public companies, private companies, individuals, foundations, etc.

6. Corporate Performance Management

Corporate Performance Management (CPM) is a management discipline that defines the processes, methods, metrics, and the systems that are required for managing the performance of an organization. It is sometimes referred to as business performance management (BPM).

7. (b) Gartner, Inc

The concept of Corporate Performance Management (CPM) was introduced by Gartner, Inc. in 2001. It is a management discipline that defines the processes, methods, metrics, and the systems that are required for managing performance of an organization. It is also referred to as business performance management (BPM).

8. All statements are true except statement (a).

PMIS reports might not always highlight the actual problems involved, which is a disadvantage. Also, they may simply understand the existing problems without providing any solutions. Excess information, over dependence on reports, and imbalanced coverage of the project areas are the other disadvantages of PMIS.

9. Project Management Information System

At the organizational level, there may be projects that involve hundreds of tasks and numerous work units. A PMIS (Project Management Information System) helps plan, schedule, and track the various tasks and procedures involved in those projects. A PMIS is an information system that contains a set of automated tools and techniques which are used for gathering, integrating, and disseminating the results obtained from the project management processes.

10. (b) Translator hubs

Translator hubs are exchanges that offer capabilities like buying, selling, and collaboration. These exchanges are similar to collaboration hubs. Translator hubs have huge EAI capabilities enabling system and data integration between different environments of different trading partners. These hubs provide data translation services to facilitate communication including EDI, electronic mail, fax, eXtensible Markup Language.

11. Broker hubs

Broker hubs bring together multiple buyers and multiple sellers on product pricing. These exchanges are best suited for commodities that are traded in bulk and which are in limited supply. It is an exchange in which commodities are trade through auctions or some kind of bidding process. Although, real time transactions are becoming more common, e-mail or automated bidding process is used for handling requests for quotes, proposals, contracts, and other such transactions that take place between buyers and sellers.

12. One-to-many marketplaces are private exchanges which link one seller to numerous buyers. The seller is usually the owner of the marketplace. He/she has sufficient market leverage to force participants in the market to follow his/her way of conducting business.

IT & Systems

Course Components

BLOCK I	**Introduction to Information Technology and Systems**
Unit 1	Computer Systems – An Overview
Unit 2	Operating Systems
Unit 3	Fundamentals of Information Systems
BLOCK II	**Applications of Information Technology in Business**
Unit 4	Personal Productivity Software
Unit 5	Enterprise Collaboration Systems
Unit 6	Management Information Systems
BLOCK III	**Software and Database Concepts, and Networks**
Unit 7	Program Design and Programming Languages
Unit 8	Database Management
Unit 9	*Computer Networks*
Unit 10	*Telecommunication Networks*
BLOCK IV	**Management of MIS**
Unit 11	MIS – Planning and Design
Unit 12	MIS – Implementation, Evaluation, and Maintenance
Unit 13	Information Resources Management and IT Governance
Unit 14	Global IT Management
Unit 15	MIS in Specialized Areas
BLOCK V	**Enterprise Functions and E-Business**
Unit 16	Basics of E-Business and Enterprise Application Integration
Unit 17	Supply Chain Management and E-Business
Unit 18	Enterprise Resource Planning
Unit 19	CRM and E-Business
BLOCK VI	**Advanced Topics in IT**
Unit 20	Cloud Computing
Unit 21	Business Intelligence and Big Data
Unit 22	Current Trends in Software Design and Architecture
Unit 23	Mobile and Social Technologies
Unit 24	IT and Business Process Management