Department of Master of Business Administration

Course File

MANAGEMENT INFORMATION SYSTEMS

(Course Code: A93002)

II M.B.A I Semester

2023-24

MD.Abdul Gafar
Assist. Professor

Ananthagiri, Kodad, Telangana 508 206, India.

Department of Master of Business Administration

Management Information Systems
Check List

Department of Master of Business Administration

(An Autonomous Institution)

A93002: MANAGEMENT INFORMATION SYSTEMS

Unit – I: Introduction: Information Systems in Business, Types of Information Systems, Managerial Challenges of IT, Components of Information System Resources and Activities.System for Collaboration and Social Business, Ethical and Social Issues in Information System, Information System for Strategic Advantages.

Unit – II: Business Applications of Information Systems: e-Business Systems, Functional Business Systems, Customer Relationship Management, BPR, ERP Systems, Supply Chain, e-Commerce, DSS, Business Analytics, Business Intelligence and Knowledge Management System.

Unit – III: Management of Information Systems: Information System Planning, System Acquisition, Systems Implementation, System Development Models: Water Fall Model, System Development Lifecycle, V-Model, Computer Assisted and Software Engineering Tools, Prototype Iterative Model, Evaluation & Maintenance.

Unit – IV: Management of Information Systems: System Development and Organizational Change, Business Process Redesign, Systems Analysis, System Design, System Development Process, Methodology for Modeling and Designing System, Alternative Methods for Building Information System, New Approaches for System Building in the Digital Firm Era, Agile System.

Unit – V: Introduction to Cyber Crime: Cyber Space; Cyber Law; e-Business; e-Consumers; Spam, Phishing. Cyber Crime and Information Security: Threats and Vulnerabilities.Inter-networks Security Defenses, Other Security Measures, System Control and Audit, Block chain.

Suggested Readings:

- James A.O' Brien, George M. Marcus, Management Information Systems, Ramesh Behl, McGraw Hill, 11e, 2019.
- Jaytilak Biswas, Management Information System, Sage Publications, 1e,2020.
- Laudon & Laudon, Management Information Systems: Managing the Digital Firm, Pearson, 15e, 2017.
- Sahil Raj, Management Information Systems, Pearson, 2e, 2018.
- D P Goyal, Management Information Systems–Managerial Perspective, MacMillan, 3e , 2010.
- Jawadekar, Management Information Systems Text and Cases, Tata Mc Graw Hill, 2012.
- Kelkar, Management Information Systems, Prentice Hall India, 2012.

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Timetable

II M.B.A. I Semester – MIS

Day/Hour	9.30-10.20	10.20-11.10	11.20-12.10	12.10-01.00	01.40-02.25	2.25-3.10	3.15-4.00
Monday		MIS					
Tuesday						MIS	
Wednesday	MIS					MIS	
Thursday	MIS						
Friday							
Saturday							

Department of Master of Business Administration

Vision of the Institute

To be a premier Institute in the country and region for the study of Engineering, Technology and Management by maintaining high academic standards which promotes the analytical thinking and independent judgment among the prime stakeholders, enabling them to function responsibly in the globalized society.

Mission of the Institute

To be a world-class Institute, achieving excellence in teaching, research and consultancy in cutting-edge Technologies and be in the service of society in promoting continued education in Engineering, Technology and Management.

Quality Policy

To ensure high standards in imparting professional education by providing world-class infrastructure, top-quality-faculty and decent work culture to sculpt the students into Socially Responsible Professionals through creative team-work, innovation and research.

Vision of the Department:

To achieve academic excellence and managerial relevance through interaction with the corporate world.

Mission of the Department

To provide students with excellent professional skills by cooperating closely with corporate partners and by exposing them to a dynamic and intercultural business environment.

Quality Policy:

To pursue global standards of excellence in all our endeavors namely teaching, research, consultancy and continuing education to remain accountable in our core and support functions through processes of self-evaluation and continuous improvement.

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Program Educational Objectives (M.BA)

Post Graduates will be able to

PEO1: To teach the fundamental key elements of a business organization and providing theoretical knowledge and practical approach to various functional areas of management.

PEO2: To develop analytical skills to identify the link between the management practices in the functional areas of an organization and research culture in business environment.

PEO3: To provide insights on latest technology, business communication, management concepts to build team work and leadership skills within them and aimed at self- actualization and realization of ethical practices.

Program Outcomes (M.B.A)

At the end of the Program, a post graduate will have the ability to

Po 1: To Gain The Knowledge On Various Concepts Of Business Management And Approaches.

Po 2: To understand and analyze the interconnections between the development of key functional areas of business organization and the management thought process.

Po 3: To recognize and adapt to the opportunities available and face the challenges in the national and global business.

Po 4: To possess analytical skills to carry out research in the field of management.

Po 5: To acquire team management skills to become a competent leader, who possesses complex and integrated real world skills.

Po 6: To be ethically conscious and socially responsible managers, capable of contributing to the development of the nation and quality of life.

Po 7: To develop a systematic understanding of changes in business environment.

Po 8: To understand professional integrity.

Po 9: An ability to use information and knowledge effectively.

Po 10: To analyze a problem and use the appropriate managerial skills for obtaining its solution.

Po 11: To understand a various legal acts in business.

Po 12: To build a successful career and immediate placement

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COURSE OBJECTIVES

On completion of this Subject/Course the student shall be able to:

S.No.	Objectives
1	To help understand the importance of information systems in organization for decision making.
2	To elucidate the business applications of information systems.
3	To provide understanding of the system development life cycle.
4	To impart knowledge of new approaches for system building in the digital firm era.
5	To highlight the challenges of cybercrime.

COURSE OUTCOMES

The expected outcomes of the Course/Subject are:

S.No.	Outcomes
1.	Understand the importance of MIS for strategic advantages.
2.	Learn various business applications of information systems like e-business, BPR, DSS.
3.	Learn examine the information system planning.
4.	Understand alternative methods for building information system.
5.	Learn cyber security with inter networks security defenses.

Signature of faculty

Note: Please refer to Bloom's Taxonomy, to know the illustrative verbs that can be used to state the outcomes.

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GUIDELINES TO STUDY THE COURSE / SUBJECT

Course Design and Delivery System (CDD):

- The Course syllabus is written into number of learning objectives and outcomes.
- Every student will be given an assessment plan, criteria for assessment, scheme of evaluation and grading method.
- The Learning Process will be carried out through assessments of Knowledge, Skills and Attitude by various methods and the students will be given guidance to refer to the text books, reference books, journals, etc.

The faculty be able to –

- Understand the principles of Learning
- Understand the psychology of students
- Develop instructional objectives for a given topic
- Prepare course, unit and lesson plans
- Understand different methods of teaching and learning
- Use appropriate teaching and learning aids
- Plan and deliver lectures effectively
- Provide feedback to students using various methods of Assessments and tools of Evaluation
- Act as a guide, advisor, counselor, facilitator, motivator and not just as a teacher alone

Signature of HOD

Date:

Signature of faculty

Date:

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COURSE SCHEDULE

The Schedule for the whole Course / Subject is: Management Information Systems

S. No.	Description	Duration (Date)		Total No. of Periods
		From	To	
1.	Unit – I: Introduction: Information Systems in Business, Types of Information Systems, Managerial Challenges of IT, Components of Information System Resources and Activities. System for Collaboration and Social Business, Ethical and Social Issues in Information System, Information System for Strategic Advantages.	04-09-2023	20-09-2023	12
2.	Unit – II: Business Applications of Information Systems: e-Business Systems, Functional Business Systems, Customer Relationship Management, BPR, ERP Systems, Supply Chain, e-Commerce, DSS, Business Analytics, Business Intelligence and Knowledge Management System	21-09-2023	30-10-2023	20
3.	Unit – III: Management of Information Systems: Information System Planning, System Acquisition, Systems Implementation, System Development Models: Water Fall Model, System Development Lifecycle, V-Model, Computer Assisted and Software Engineering Tools, Prototype Iterative Model, Evaluation & Maintenance.	31-10-2023	13-11-2023	10
4.	Unit – IV: Management of Information Systems: System Development and Organizational Change, Business Process Redesign, Systems Analysis, System Design, System Development Process, Methodology for Modeling and Designing System, Alternative Methods for Building Information System, New Approaches for System Building in the Digital Firm Era, Agile System.	14-11-2023	29-11-2023	12
5.	Unit – V: Introduction to Cyber Crime: Cyber Space; Cyber Law; e-Business; e-Consumers; Spam, Phishing. Cyber Crime and Information Security: Threats and Vulnerabilities. Inter-networks Security Defenses, Other Security Measures, System Control and Audit, Blockchain.	30-11-2023	02-01-2024	17

Total No. of Instructional periods available for the course: 73Hours

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SCHEDULE OF INSTRUCTIONS - COURSE PLAN

	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Textbook, Journal)
1	1	4-Sep-23	1	Unit – I: Information Systems in Business	1 1	D P Goyal , Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	2	5-Sep-23	1	Types of Information Systems	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	3	6-Sep-23	1	Structure of MIS ,Importance of MIS	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	4	6-Sep-23	1	Characteristics of MIS, Nature and scope of MIS, Functions of MIS	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	5	11-Sep-23	1	Classifications of MIS, Components of Expert System	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	6	12-Sep-23	1	Managerial Challenges of IT	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010

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	7	13-Sep-23	1	Components of Information System Resources and Activities	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	8	13-Sep-23	1	System for Collaboration and Social Business	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	9	14-Sep-23	1	Ethical and Social Issues in Information System	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	10	19-Sep-23	1	Ethical analysis, Ethical Principles	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	11	20-Sep-23	1	Information System for Strategic Advantages.	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	12	20-Sep-23	1	Strategic information system(SIS), Strategic information system for competitive advantages	1 1	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
2	1	21-Sep-23	1	UNIT-II: E-Business Systems, Functional Business Systems	2 2	D P Goyal, Management Information Systems– Managerial Perspective,

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						MacMillan, 3e , 2010
	2	25-Sep-23	1	Accounting information system, Financial information system,	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	3	26-Sep-23	1	Human resources information system	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	4	27-Sep-23	1	Customer Relationship Management	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	5	27-Sep-23	1	Business Process Reengineering	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	6	3-Oct-23	1	Enterprise resource planning(ERP)	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	7	4-Oct-23	1	Life cycle ERP	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	8	4-Oct-23	1	Modules of ERP, Issues related to ERP Maintenance and support	2 2	D P Goyal, Management Information Systems– Managerial

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						Perspective, MacMillan, 3e , 2010
	9	5-Oct-23	1	Challenges for the implementation of ERP system, Benefits of ERP Implementation	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	10	9-Oct-23	1	Evolution of Supply Chain Management	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	11	10-Oct-23	1	objectives of Supply Chain Management	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	12	11-Oct-23	1	functions of Supply Chain Management	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	13	11-Oct-23	1	E-Commerce, Categories of E-Commerce, Classifications of E-Commerce	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	14	12-Oct-23	1	Applications of E-commerce, Various method of online payments	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	15	16-Oct-23	1	Decision Support System(DSS)	2 2	D P Goyal, Management Information Systems–

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						Managerial Perspective, MacMillan, 3e , 2010
	16	17-Oct-23	1	Business Analytics	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	17	18-Oct-23	1	Business Intelligence,Appilcations of Business Intelligence	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	18	18-Oct-23	1	Data Warehouse, Data Mining	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	19	19-Oct-23	1	Knowledge Management System	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	20	30-Oct-23	1	Big Data Technologies	2 2	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
3	1	31-Oct-23	1	UNIT-III: Information System Planning, NOLAN Stage Model	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	2	1-Nov-23	1	Four Stage Model of IS Planning, Information Resource	3 3	D P Goyal, Management

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				Management		Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	3	1-Nov-23	1	System Acquisition	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	4	2-Nov-23	1	Systems Implementation	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	5	6-Nov-23	1	System Development Models: Water Fall Model	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	6	7-Nov-23		System Development Lifecycle	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	7	8-Nov-23	1	V-Model, Prototype Model	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	8	8-Nov-23	1	Iterative Model ,Computer Assisted and Software Engineering Tools	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010

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	9	9-Nov-23	1	Evaluation & Maintenance of Information system	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	10	13-Nov-23	1	Cost Benefit Analysis , Maintenance of Information System	3 3	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
4	1	14-Nov-23	1	UNIT-IV: System Development and Organizational Change, Business Process Redesign	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	2	15-Nov-23	1	Systems Analysis	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	3	15-Nov-23		Requirement determination	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	4	16-Nov-23	1	System Design	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	5	20-Nov-23	1	Phases of System Design	4 4	D P Goyal, Management Information Systems– Managerial Perspective,

						MacMillan, 3e , 2010
	6	21-Nov-23	1	System Development Process	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	7	22-Nov-23	1	Methodology for Modeling and Designing System, Structured Methodologies, Data Flow Diagram,	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	8	22-Nov-23	1	Data Dictionary, Structured chats, Decision trees	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	9	23-Nov-23	1	Decision tables, Object Oriented Methodology	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	10	28-Nov-23	1	Alternative Methods for Building Information System	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	11	29-Nov-23	1	New Approaches for System Building in the Digital Firm Era	4 4	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	12	29-Nov-23	1	Agile System	4 4	D P Goyal, Management Information Systems– Managerial

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						Perspective, MacMillan, 3e , 2010
5	1	30-Nov-23	1	Unit – V: Introduction to Cyber Crime: Cyber Space, Cyber Law	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	2	4-Dec-23	1	E-Business	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	3	5-Dec-23	1	E-Consumers	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	4	6-Dec-23	1	Spam, Phishing, Cyber Criminals	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	5	6-Dec-23	1	Cyber Crime and Information Security	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	6	7-Dec-23	1	Global perspective on cyber crime,	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	7	11-Dec-23		Indian perspective on cyber crime	5 5	D P Goyal, Management Information Systems–

						Managerial Perspective, MacMillan, 3e , 2010
	8	12-Dec-23	1	Indian Act 2000 with respect to cyber crime	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	9	13-Dec-23	1	Cyber Crime Measures taken by the Indian Government	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	10	14-Dec-23	1	Threats and Vulnerabilities	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	11	18-Dec-23	1	Inter-networks Security Defenses, Other Security Measures	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	12	19-Dec-23	1	Hacking	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	13	20-Dec-23	1	System Control and Audit	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	14	21-Dec-23	1	Process of Information system	5 5	D P Goyal, Management

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				audit		Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	15	27-Dec-23	1	Block Chain	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	16	28-Dec-23	1	Different types of block chain	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010
	17	2-Jan-24	1	Different types of Data Measures to protect the organization's data in the modern era	5 5	D P Goyal, Management Information Systems– Managerial Perspective, MacMillan, 3e , 2010

Signature of HOD

Date:

Signature of faculty

Date:

Note:

1. Ensure that all topics specified in the course are mentioned.
2. Additional topics covered, if any, may also be specified in bold.
3. Mention the corresponding course objective and outcome numbers against each topic.

Department of Master of Business Administration

LESSON PLAN (U-I)

Lesson No: Unit1/ 1-12 Duration of Lesson: 12hrs

Lesson Title: Introduction

Instructional / Lesson Objectives:

1. To make students to understand Unit – I: Information Systems in Business
2. To make students to Types of Information Systems
3. To make students to Structure of MIS ,Importance of MIS
4. To make students to Characteristics of MIS, Nature and scope of MIS, Functions of MIS
5. To make students to Classifications of MIS, Components of Expert System
6. To make students to Managerial Challenges of IT
7. To make students to Components of Information System Resources and Activities
8. To make students to System for Collaboration and Social Business
9. To make students to Ethical and Social Issues in Information System
10. To make students to Ethical analysis, Ethical Principles
11. To make students to Information System for Strategic Advantages.
12. To make students to Strategic information system(SIS), Strategic information system for competitive advantages

Teaching AIDS : PPTs, Digital Board

Time Management of Class :

5 min for taking attendance 40 min for the lecture delivery 5 min for doubts session

Assignment / Questions:

Refer assignment – I & tutorial-I sheets

Signature of faculty

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LESSON PLAN (U-II)

Lesson No: Unit II/1-20 Duration of Lesson: 20 hrs.

Lesson Title: Business Applications of Information Systems

Instructional / Lesson Objectives:

1. To familiarize students on UNIT-II: E-Business Systems, Functional Business Systems
2. To familiarize students on Accounting information system, Financial information system
3. To familiarize students on Human resources information system
4. To familiarize students on Customer Relationship Management
5. To familiarize students on Business Process Reengineering
6. To familiarize students on Enterprise resource planning(ERP)
7. To familiarize students on Life cycle ERP
8. To familiarize students on Modules of ERP, Issues related to ERP Maintenance and support
9. To familiarize students on Challenges for the implementation of ERP system, Benefits of ERP Implementation
10. To familiarize students on Evolution of Supply Chain Management,
11. To familiarize students on objectives of Supply Chain Management
12. To familiarize students on functions of Supply Chain Management
13. To familiarize students on E-Commerce, Categories of E-Commerce, Classifications of E-Commerce
14. To familiarize students on Applications of E-commerce, Various method of online payments
15. To familiarize students on Decision Support System(DSS)
16. To familiarize students on Business Analytics
17. To familiarize students on Business Intelligence, Applications of Business Intelligence
18. To familiarize students on Data Warehouse, Data Mining
19. To familiarize students on Knowledge Management System
20. To familiarize students on Big Data Technologies

Teaching AIDS : PPTs, Digital Board
Time Management of Class :

5 minsfor taking attendance 40 min for lecture delivery 5 min for doubts session

Department of Master of Business Administration

Assignment / Questions:

Refer assignment – I & tutorial-I sheets

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LESSON PLAN (U-III)

Lesson No:Unit-3/ 1-17 Duration of Lesson: 17hrs

Lesson Title: Management of Information Systems

Instructional / Lesson Objectives:

1. To make students understand UNIT-III: Information System Planning, NOLAN Stage Model
2. To make students understand Four Stage Model of IS Planning, Information Resource Management
3. To make students understand System Acquisition
4. To make students understand Systems Implementation
5. To make students understand System Development Models: Water Fall Model
6. To make students understand System Development Lifecycle
7. To make students understand V-Model, Prototype Model
8. To make students understand Iterative Model ,Computer Assisted and Software Engineering Tools
9. To make students understand Evaluation & Maintenance of Information system
10. To make students understand Cost Benefit Analysis , Maintenance of Information System

Teaching AIDS :PPTs, Digital Board

Time Management of Class :

5 min for taking attendance 40 min for the lecture delivery 5 min for doubts session

Assignment / Questions:

Refer assignment – I&II& tutorial-I sheets

Signature of faculty

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LESSON PLAN (U-IV)

Lesson No: Unit-4/1-12 Duration of Lesson: 12hrs

Lesson Title: Management of Information Systems

Instructional / Lesson Objectives:

1. To familiarize students on UNIT-IV: System Development and Organizational Change, Business Process Redesign
2. To familiarize students on Systems Analysis
3. To familiarize students on Requirement determination
4. To familiarize students on System Design
5. To familiarize students on Phases of System Design
6. To familiarize students on System Development Process
7. To familiarize students on Methodology for Modeling and Designing System, Structured Methodologies, Data Flow Diagram,
8. To familiarize students on Data Dictionary, Structured chats, Decision trees
9. To familiarize students on Decision tables, Object Oriented Methodology
10. To familiarize students on Alternative Methods for Building Information System
11. To familiarize students on New Approaches for System Building in the Digital Firm Era
12. To familiarize students on Agile System

Teaching AIDS :PPTs, Digital Board
Time Management of Class :

5 min for taking attendance 40 min for the lecture delivery 5 min for doubts session

Assignment / Questions:
Refer assignment – II& tutorial-I sheets

AG

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LESSON PLAN (U-V)

Lesson No: Unit-5/ 1-17 Duration of Lesson: 17hrs
Lesson Title: Introduction to Cyber Crime
Instructional / Lesson Objectives:

1. To make students understand on Unit – V: Introduction to Cyber Crime: Cyber Space, Cyber Law
2. To make students understand on E-Business
3. To make students understand on E-Consumers
4. To make students understand on Spam, Phishing, Cyber Criminals
5. To make students understand on Cyber Crime and Information Security
6. To make students understand on Global perspective on cyber crime
7. To make students understand on Indian perspective on cyber crime
8. To make students understand on Indian Act 2000 with respect to cyber crime
9. To make students understand on Cyber Crime Measures taken by the Indian Government
10. To make students understand on Threats and Vulnerabilities
11. To make students understand on Inter-networks Security Defenses, Other Security Measures
12. To make students understand on Hacking
13. To make students understand on System Control and Audit
14. To make students understand on Process of Information system audit
15. To make students understand on Block Chain
16. To make students understand on Different types of block chain
17. To make students understand on Different types of Data Measures to protect the organization's d era

Teaching AIDS :PPTs, Digital Board
Time Management of Class :

5 min for taking attendance 40 min for the lecture delivery 5 min for doubts session

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Assignment / Questions:
Refer assignment – I & tutorial-I sheets

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ASSIGNMENT – 1

This Assignment corresponds to Unit No. 1

Question No.	Question	Objective No.	Outcome No.
1	Explain briefly about Managerial Challenges of IT?	1	1
2	Explain briefly about Strategic information system for competitive advantages?	1	1

Signature of HOD

Date:

Signature of faculty

Date:

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ASSIGNMENT – 2

This Assignment corresponds to Unit No. 2

Question No.	Question	Objective No.	Outcome No.
1	Discuss the Evolution of ERP.	2	2
2	What is Business Analytics? Explain Different types of Business Analytics	2	2

Signature of HOD

Date:

Signature of faculty

Date:

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ASSIGNMENT – 3

This Assignment corresponds to Unit No. 3

Question No.	Question	Objective No.	Outcome No.
1	Write note on Nolan's six stage model	3	3
2	Describe in details various approaches for evaluating an MIS	3	3

Signature of HOD

Date:

Signature of faculty

Date:

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ASSIGNMENT – 4

This Assignment corresponds to Unit No. 4

Question No.	Question	Objective No.	Outcome No.
1	Brief on Business process redesign.	4	4
2	What are potential IT threats faced in business organization?	4	4

Signature of HOD

Date:

Signature of faculty

Date:

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ASSIGNMENT – 5

This Assignment corresponds to Unit No. 5

Question No.	Question	Objective No.	Outcome No.
1	Explain about cyber law in india.	5	5
2	Explain briefly about various inter network security defenses.	5	5

Signature of HOD

Date:

Signature of faculty

Date:

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TUTORIAL – 1

This tutorial corresponds to Unit No. 1 (Objective Nos.: 1, Outcome Nos.: 1)

Q.NO QUESTIONS

1. Information in its ____ form is called data.( )

a)processed b)unprocessed

c) both d) none

2 A management information system sometimes is called a __( )

a) management reporting system

b)management relative system

c) management collecting system

d)management iterative system

3. MIS is _____ in nature.( )

a) interdisciplinary b) no disciplinary

c) disciplinary d) simple

4. People working in groups can generate _____ than if they were working alone.( )

a) less innovative ideas b) more innovative ideas

c) more ideas d) less ideas

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TUTORIAL – 2

This tutorial corresponds to Unit No. 2 (Objective Nos.: 2, Outcome Nos.: 2)

1. The electronic sale of _____ via appropriate platforms, such as online stores.( )

a) services b) products

c) both d) none

2. The information system processes a mixture of _____ data( )

a) quantitative b) qualitative

c) quantitative and qualitative d) none

3. The conversion of data to the ERP systems from legacy systems is a _____.( )

a) complex process b) simple process

c) easy process d) small process

4. Extranet access of _____ by Customers and suppliers.( )

a) sales databases b) inventory databases

c) database d) service databases

Signature of HOD

Date:

Signature of faculty

Date:

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TUTORIAL SHEET – 3

This tutorial corresponds to Unit No. 3 (Objective Nos.: 3, Outcome Nos.: 3)

1. Strategic Planning Matching the overall _____ plan with the IS Plan.( )
a) system b) design

c) information d)organizational

2. A review is performed where the _____ as well as the requirements are analyzed.( )
a) classifications b) rectifications

c) specifications d) simple

3. Identify the simplest model of SDLC?( )

(a) Agile (b) RAD (c) Waterfall (d) Spiral

4. Identify the type of Integration testing which uses stubs.( )

(a) Bottom-up testing (b) top-down testing

(c) system testing (d) Both a and b

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TUTORIAL – 4

This tutorial corresponds to Unit No. 4 (Objective Nos.: 4, Outcome Nos.: 4)

1. The primary tool used in structured design is a:( )

(a) structure chart (b) data-flow diagram

(c) program flowchart (d) module

2. A Ring, refers to a record chain, the last of which refers to the first record, in the chain, is called a/an ( )

(a) addressing (b) location (c) pointer (d) loop

3. A problem's---- will answer the question, "What information will the computer need to know in order to either print or display the output times?" ( )

(a) Input (b) Output (c) Processing (d) Purpose

4.Which of the following model in system modeling depicts the static nature of the system?( )

(a) Structural Model (b) External Model (c) behavioral Model (d) Data Model

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Signature of faculty

Date:

Date:

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TUTORIAL SHEET – 5

This tutorial corresponds to Unit No. 5 (Objective Nos.: 5, Outcome Nos.: 5)

1. In which of the following, a person is constantly followed/chased by another person or group of several peoples?()

(a) Phishing (b) Bulling (c) Stalking (d) Identity theft

2. Which of the following is considered as the unsolicited commercial email?()

(a) Virus (b) Malware (c) Spam (d) All of the above

3. Which of the following usually observe each activity on the internet of the victim, gather all information in the background, and send it to someone else?()

(a) Malware (b) Spyware (c) Adware (d) All of the above

4. ----is a type of software designed to help the user's computer detect viruses and avoid them.()

(a) Malware (b) Adware (c) Antivirus (d) Both B and C

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Date:

Signature of faculty

Date:

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EVALUATION STRATEGY

Target (s)

a. Percentage of Pass : 95%

Assessment Method (s) (Maximum Marks for evaluation are defined in the Academic Regulations)

a. Daily Attendance
b. Assignments
c. Online Quiz (or) Seminars
d. Continuous Internal Assessment
e. Semester / End Examination

List out any new topic(s) or any innovation you would like to introduce in teaching the subjects in this semester

Case Study of any one existing Topic

Signature of HOD

Date:

Signature of faculty

Date:

Department of Master of Business Administration

COURSE COMPLETION STATUS

Actual Date of Completion & Remarks if any

Units	Remarks	Objective No. Achieved	Outcome No. Achieved
Unit 1	completed on 20.09.2023	1	1
Unit 2	completed on 30-10-2023	2	2
Unit 3	completed on 13-11-2023	3	3
Unit 4	completed on 29-12-2023	4	4
Unit 5	completed on 02.01.2024	5	5

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Date:

Signature of faculty

Date:

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Mappings

1. **Course Objectives-Course Outcomes Relationship Matrix**
(Indicate the relationships by mark "X")

Course-Outcomes / Course-Objectives	1	2	3	4	5
1	H				
2		H			
3			H		
4				H	
5					H

2. **Course Outcomes-Program Outcomes (POs) & PSOs Relationship Matrix**
(Indicate the relationships by mark "X")

CO'S/PO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			H		L		M					
CO2		H			L		L			H		H
CO3	M		M	L		L						
CO4		M	M		L				L			
CO5	H	L		H							M	

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Rubric for Evaluation

Performance Criteria	Unsatisfactory	Developing	Satisfactory	Exemplary
	1	2	3	4
Research & Gather Information	Does not collect any information that relates to the topic	Collects very little information some relates to the topic	Collects some basic Information most relates to the topic	Collects a great deal of Information all relates to the topic
Fulfill team role's duty	Does not perform any duties of assigned team role.	Performs very little duties.	Performs nearly all duties.	Performs all duties of assigned team role.
Share Equally	Always relies on others to do the work.	Rarely does the assigned work - often needs reminding.	Usually does the assigned work - rarely needs reminding.	Always does the assigned work without having to be reminded
Listen to other team mates	Is always talking—never allows anyone else to speak.	Usually doing most of the talking-- rarely allows others to speak	Listens, but sometimes talks too much.	Listens and speaks a fair amount.

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MID-I Question Paper

ANURAG Engineering College

(An Autonomous Institution)

Ananthagiri (V&M), Kodad, Suryapet (DT)

II MBA I Semester I Mid Examinations, NOV - 2023

Branch: MBA **Max. Marks: 30**

Date: 06-11-2023 AN **Subject: MIS** **Time: 120 Minutes**

Instructions for preparing Question Paper:

1. **For Each Subject you have to prepare 3 SET'S of Question paper**
2. Text Font Style : Times New Roman
3. Text Font Size : 12
4. Questions Should Not be Repeated in any 3 Sets
5. Question Paper Saving File Name format: **Example** (II-I-I-MID-Branch Name-Subject Name-SET-A)
6. If any Additional Property Like Graphs/Sign Table/Log Tables etc. The Faculty should inform Clearly in Question paper itself

PART-A

Answer All Questions Each Question Carry Equal Marks **10 X 1 = 10 Marks**
(Fill in the Blanks / Multiple Choice / Match the following)

Q.NO	QUESTIONS	Revised Bloom's Level	Outcomes	
			CO	PO
1	MIS is an information system that generates ____ information.( ) a) Accurate b)Timely c)Organized d) All	L1	CO1	PO3, PO5, PO7
2	A decision support system uses data from _____ sources.( ) a) internal and/or external b)internal c) external d) None	L1	CO1	PO3, PO5, PO7
3	Management is the _____ done through and with the people in formally organized groups.( ) a)art of getting no things b)getting people c) art of getting things d)art of things	L1	CO1	PO3, PO5, PO7
4	Strategic information systems may even change the ____ of an organization.( ) a) process b)business c) informationd) data	L1	CO1	PO3, PO5, PO7
5	Product design is also called _____.( ) a) Design engineering b) Architecture c) product testing d)product engineering	L1	CO2	PO2, PO5, PO7, PO10 ,PO12

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6	Customer relationship management as a _____ process has tended to be more common.( ) a) cooperative b)collaborative c) cooperative and collaborative d) None	L1	CO2	PO2, PO5, PO7, PO10 ,PO12
7	Enterprise Resource Planning has evolved in _____.( ) a) 1990 b)1970 c) 1960 d)1992	L1	CO2	PO2, PO5, PO7, PO10 ,PO12
8	A data warehouse is a _____ of information.( ) a) data collection b) sequence collection c) logical collection d) Technical collection	L1	CO2	PO2, PO5, PO7, PO10 ,PO12
9	A policy is a general guideline that directs and constrains ____ within an organization.( ) a) decision-making b) marketing c) sales d) products	L1	CO3	PO1, PO3, PO4, PO6
10	Allocating resources for is _____and operation.( ) a) deployment b)development c) different d) none	L1	CO3	PO1, PO3, PO4, PO6

PART-B

Answer any four questions. Each Question Carry Equal Marks **4 X 5 = 20 Marks**

Q.NO	QUESTIONS	Revised Bloom's Level	Outcomes	
			CO	PO
11	Define MIS and Discuss about Managerial challenges of IT.	L1	CO1	PO3, PO5, PO7
12	Discuss the ethical and social issues in Information System.	L2	CO1	PO3, PO5, PO7
13	Define Business intelligence. Explain the importance of Business intelligence.	L1	CO2	PO2, PO5, PO7, PO10 ,PO12
14	What is Knowledge Management System? Explain briefly.	L2	CO2	PO2, PO5,

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				PO7, PO10 ,PO12
15	Describe the activities associated with IS planning.	L2	CO3	PO1, PO3, PO4, PO6
16	What do you understand by system implementation? What are the steps involved.	L2	CO3	PO1, PO3, PO4, PO6

Revised Bloom's Levels' to consider for QP setting:

L1: Remembering

L2: Understanding

L3: Applying

L4: Analyzing

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Mid Marks Statement- MANAGEMENT INFORMATION SYSTEMS (A93002)

S.No.	H.T.No.	Mid - I Marks (30)	Mid - II Marks (30)	Avg of Mid-I & Mid-II (A)	Assignment - I (5)	Assignment - II (5)	Avg of Assg.-I & Assg.-II (B)	PPT (5) (C)	Total (A+B+C)
1	22C11E0002	16	26	21	5	5	5	5	31
2	22C11E0003	28	19	24	5	5	5	5	34
3	22C11E0004	23	21	22	5	5	5	5	32
4	22C11E0005	27	29	28	5	5	5	5	38
5	22C11E0006	27	28	28	5	5	5	5	38
6	22C11E0007	18	21	20	5	5	5	5	30
7	22C11E0008	20	22	21	5	5	5	5	31
8	22C11E0009	17	24	21	5	5	5	5	31
9	22C11E0010	28	23	26	5	5	5	5	36
10	22C11E0011	17	22	20	5	5	5	5	30
11	22C11E0012	18	20	19	5	5	5	5	29
12	22C11E0013	17	16	17	5	5	5	5	27
13	22C11E0014	17	21	19	5	5	5	5	29
14	22C11E0016	15	24	20	5	5	5	4	29
15	22C11E0017	21	24	23	5	5	5	4	32
16	22C11E0020	21	21	21	5	5	5	5	31
17	22C11E0021	17	19	18	5	5	5	5	28
18	22C11E0022	21	20	21	5	4	5	5	31

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Sample Answer Scripts & Assignments

ANURAG ENGINEERING COLLEGE
(An Autonomous Institution)
(Approved by AICTE, New Delhi, Affiliated to JNTUH, Hyderabad)
Ananthagiri (V & M), Kodad, Suryapet (Dist), Telangana.

Program		
B.Tech.	M.Tech.	M.B.A. ✓

YEAR	SEMESTER	MID EXAMINATION
II	I	I

HALL TICKET NO.: 2 2 C 1 1 E 0 0 0 5

Regulation : R22 | Branch or Specialization:

Course: Management information System

Signature of Student: V. Anjani

Signature of invigilator with date: 6/11/23

Signature of the Evaluator:

Q.No.	1	2	3	4	5	6	7	8	9	10	11
Marks Awarded											

Maximum Marks: 30 | Marks Obtained: 28

(Start Writing From Here)

PART-A

1. [D] — 1
2. [A] — 1
3. [c] — 1
4. [B] — 1
5. [d] — 1
6. [D] ✗ 0
7. [A] — 1
8. [c] — 1
9. [a] — 1
10. [B] — 1

9

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PART - B

11 MIS :=

MIS Stands for Management information System is the processes of a process of peoples, Machines, data Collection and data methode of an information is known as Management information System.

The management information System is gather information from the internal / External resources of an organisation is called Management information System.

Managerial challenges of IT :=

The Managerial challenges of IT are basically five types they are

1. Information System invertment challenge
2. Business strategic challenge
3. Globalization challenge
4. Information technology infrastructure challenge
5. Ethical and Security.

* Information System investment challenge :=

In the information System investment challenge in the System which the information is gather from the organisations whether that the internal / external of an resources in the organisation through that the challenges of the organisation which can be invested through the Systems are usually by an management in the investment challenge.

* Business Stratigic challenge :=

The business stratigic challenges which are used in the business through the choosing an stratigic levels of an organisation which it should be usually matching they stratigic levels with the other business of an organisation. in the business stratigic challenges are used in Business.

* Globalization challenge :=

In the Globalization challenge whether the information is pass through the overall of an globalization which it is used in the organisation levels with their of an issues to they organization which is known as the globalization challenge.

* Information technology as a infrastructure challenge :=

In the information System the technology as the infrastructure challenge which it is used by the technology by getting an new technology into the organisation through they infrastructure challenge by using of an technology is known as the infrastructure challenge.

* Ethical and Security challenge :=

The Ethical and Security challenge of the organisation through their performance of they information Systems which are basically used by they organisation which that can choosing the Security by the organisation is known as the ethical and Security challenges.

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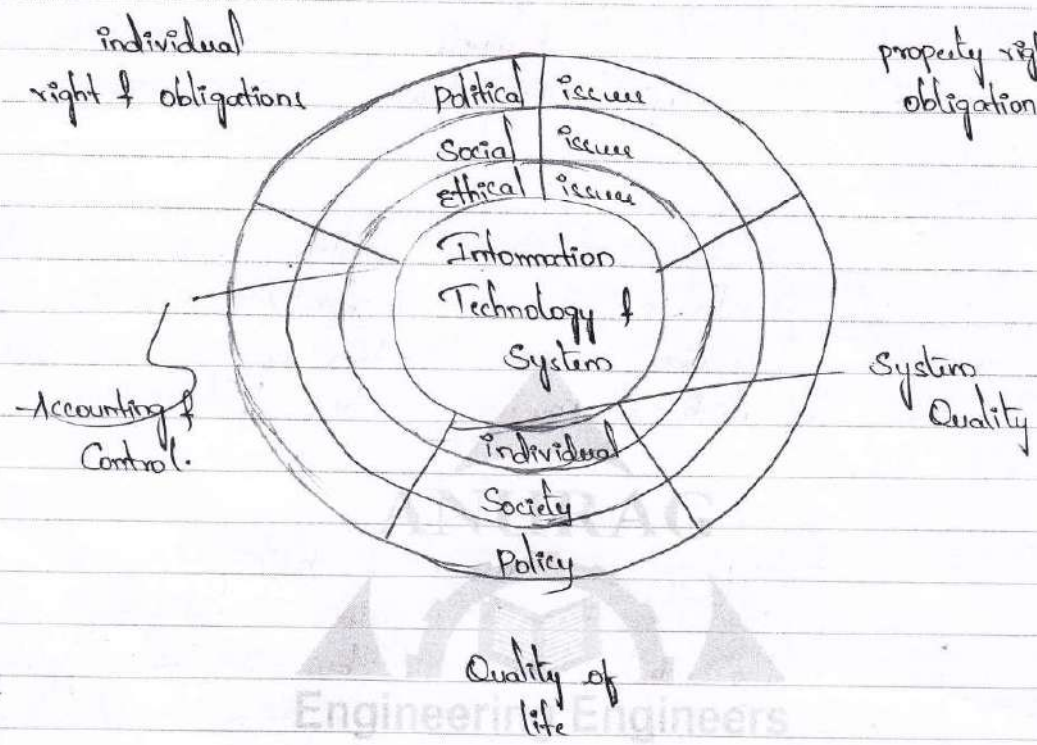
12) Ethical and Social issues in information System :-

In Ethical and Social issues in information System Such as the



→ Individual rights and obligation
→ propety rights and obligation
→ System Quality
→ Quality of life
→ Accountability & Control.

* Individual rights and obligation :-

In the individual rights and the obligations which it is used in the information which that can be used a individual rights to the organization that is ...

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* Property rights & obligations :=

The property rights and the obligations of an Management information System through that the property rights of they organisation which it is usually used by they right of an business it is used as they important to they implementing the organisation is known as property rights and obligation.

* System Quality :=

The System Quality of an organisation through they business should be run Successfully to they intelligence by through they Quality products should be maintained by the organisation.

* Quality of life :=

The Quality of life in the management information System which the process of life of an business should be used in the organisation. the Quality of life must be in the business is usually used as they different types of an organisation is known as the Quality of life.

* Accountability and Control :=

The Accountability and Control which means the process of an organisation through out that the Control as an organisation which it is used to do an accounting at the business is known as the Accountability and Control.

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13) Business intelligence :=

Business intelligence which means the process of an organization through the internal and external resources of an organization by using intelligence which that can doing an information is better than others is known as the Business intelligence.

Importance of Business intelligence :=

The importance of an Business intelligence are basically three types they are.

1. Business information Extract
2. Decision making
3. Boost - productivity.

* Business information Extract :=

The Business information Extract it is the process of an Business intelligence which it is used by the information is Extract from the organisation through they Supportive Systems of the Business it is basically used by the organization Such as the knowledge to they performance of an Information through the Business System it is used to they intelligence by an organisation which they should be used in the organisation is known as the business information Extract.

* Decision - Making :=

The decision making process in the organisation

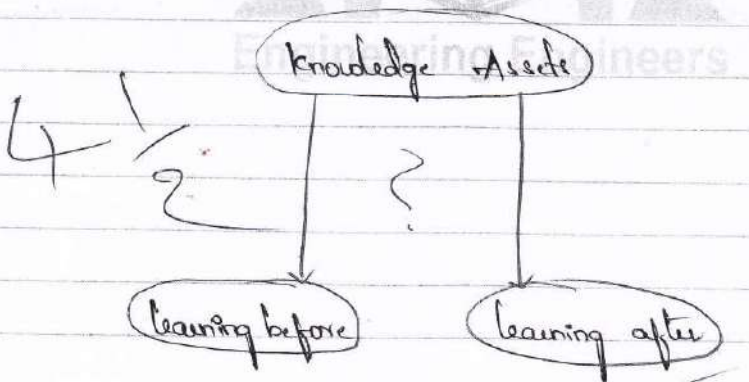
they decisions in the organisation which they are using by they management information System.

* Boost - productivity : =

The Boost productivity of an organisation through they are using by the productivity which can be used by the business intelligence process which it should be used as productivity.

14) Knowledge Management System : =

The knowledge management Systems which are using by the learning in the organisation through the process is known as the knowledge management System



Accounting & knowledge role.

Knowledge assets : =

The knowledge assets in the Management information

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System through they are used they knowledge used.

* Learning before :=

The Learning before in the organisational structure such as the knowledge of the management System through they are using by the Learning before

* Learning after :=

The Learning after in the organisation which it is through the organisation such as the solving they problems of an organisation is known as Learning after.

* Accounting knowledge role :=

The knowledge accounting role which are used as they knowledge management System such as they management System is known as accounting knowledge role.

UNIT- I

1.1 Information Systems in Business

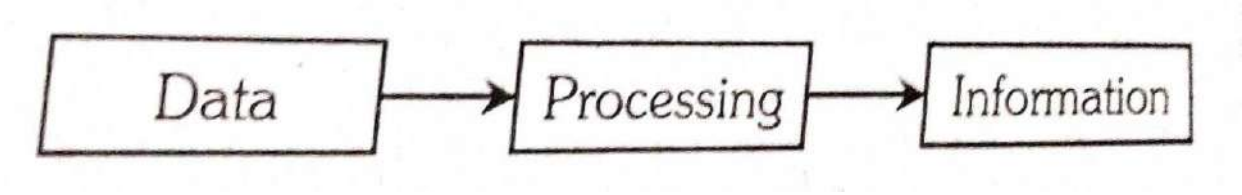
Information

Meaning

Information can be defined as an essential and crucial input employed at the time of decision making process with in the organizations.

Information is a necessary and vital input in any decision making process in an organization. Information is generated as a by-product of transaction taking place in organization.

However, it is not available in ready form; rather it has to be generated from data which acts as a raw material that needs some processing. Figure below depicts the process of generating information.



Thus, information in its unprocessed form is called data, which is generated as a by-product of transactions taking place in the organization, Information, on the other hand, is a processed data and has an element of surprise. Information reduces uncertainty and triggers action.

Characteristics

The parameters of a good quality are difficult to determine for information. Quality of information refers to its fitness for use, or its reliability.

Following are the essential characteristic features:

(i)Timeliness

Timeliness means that information must reach the recipients within the prescribed time frames. For effective decision making, Information must reach the decision-maker at the right time, i.e. recipients must get Information when they need it. Delays destroys the value of information. The characteristic of timeliness, to be effective, should also include up-to-date, i.e. current information.

(ii)Accuracy

Information should be accurate. It means that information should be free from mistakes, errors &, clear. Accuracy also means that the information is free from bias. Wrong Information given to management would result in wrong decisions. As managers decisions are based on the information supplied in MIS reports, all managers need accurate information.

(iii)Completeness

The information which is given to a manager must be complete and should meet all his needs. Incomplete information may result in wrong decisions and thus may prove costly to the organization.

(iv) Explicitness

A report is said to be of good quality if it does not require further analysis by the recipients for decision making.

(v) Impartiality

Impartial information contains no bias and has been collected without any distorted view of the situation.

Information system as a Resources

In information system includes four major resources, hardware, software, people and data Let's briefly discuss some basic concepts and examples of how these resources contributes to the information processing activities of information system.

1. Hardware - It includes all physical devices
2. Software - It includes all set of information processing instructions.
3. People - People are required for the operation of all information systems. These people resources include specialists and end users.
4. Data - Data is more than the raw material of information systems. The concepts of data resources have been broadened by managers and information system professionals.

Digital firm AND Characteristics of digital firm

A digital firm is one in which nearly all of the organization's significant business relationships with customers, suppliers, and employees are digitally enabled and mediated.

Core business processes are accomplished through digital networks spanning the entire organization or linking multiple organizations.

Characteristics

1. It employs intensive use of technologies including content management, convergence and computing over the internet to carryout business operations effectively.
2. Making the processes digital which provides increased flexibility, profitability and efficiency while avoiding people and paper based works.
3. All the transactions between customers, distributors and employees are carried out digitally in the form of digital pictures, animations, orders, receipts, bills etc., which helps in gaining strategic advantage to the firm and its stake holders.
4. Customers are allowed to browse through the web to get information regarding the product which is typically provided over a web portal. They can book order through it and track their order status.

Compare Data And Information

S.No.	Data	Information
1	Data is unorganized raw facts that need processing without which it is seemingly random and useless to humans	Information is a processed, organized data presented in a given context and is useful to humans.
2	Data is an individual unit that contains raw material which does not carry any specific meaning.	Information is a group of data that collectively carry a logical meaning.
3	Data doesn't depend on information.	Information depends on data.
4	It is measured in bits and bytes.	Information is measured in meaningful units like time, quantity, etc.
5	Data is never suited to the specific needs of a designer.	Information is specific to the expectations and requirements because all the irrelevant facts and figures are removed, during the transformation process.
6	An example of data is a student's test score	The average score of a class is the information derived from the given data.

1.2 Types of Information Systems

As more and more business functions have been automated, information systems have "become increasingly specialized. The specialized stems can operate alone or they can be combined to create a larger system that performs different functions for different people, eg: Google.

Information Systems are generally classified into the following categories:

1. Office Information Systems (OIS)

2.Transaction Processing Systems (TPS)

3. Management Information Systems (MIS)

4.Decision Support Systems (DSS)

5.Executive Information Systems (EIS)

6.Expert Systems (ES)

7. Electronic Data Processing (EDP)

1. Office Information Systems (OIS)

An office information system, or OIS pronounced oh-eye-ess), is an information system that uses hardware, software and networks to enhance work flow and facilitate communications among employees. Win an office information system, also described as office automation; employees perform tasks electronically using computers and other electronic devices, instead of manually. With an office information system, for example, a registration department might post the class schedule on the Internet and e-mail students when the schedule is updated. In a manual system, the registration department would photocopy the schedule and mail it to each student's house.

An office information system supports a range of business office activities such as creating and distributing 'graphics and/or documents, sending messages, scheduling, and accounting. All levels of users from executive management to nonmanagement employees utilize and benefit from the features of an OIS.

2. transaction processing system (TPS)

A transaction processing system (TPS) is an information system that captures and processes data generated during an organization's day-to-day transactions. A transaction is a business activity such as a deposit, payment, order or reservation

Clerical staff typically perform the activities associated with transaction processing, which include the following.

1. Recording a business activity such as a student's registration, a customer's order, an employee's timecard or a client's payment.

2. Confirming an action or triggering a response, such as printing a student's schedule, sending a thank-you note to a customer, generating an employee's paycheck or issuing a receipt to a client.

3. Maintaining data, which involves adding new data, changing existing data, or removing unwanted data.

Transaction processing systems were among the first computerized systems developed to process business data a function originally called data processing. Usually, the TPS computerized an existing manual system to allow for faster processing, reduced clerical costs and improved customer service.

3. **Management Information Systems(MIS)**

While computers were ideal for routine transaction processing, managers soon realized that the computers' capability of performing rapid calculations and data comparisons could produce meaningful information for management. Management information systems thus evolved out f transaction processing systems. A management information system, or MIS (pronounced em-eye-ess), is an information system that generates accurate, timely and organized information so managers and other users can make decisions, solve problems, supervise activities, and track progress. Because it generates reports on a regular basis, a management information system sometimes is called a management reporting system (MRS)

Management information systems often are integrated with transaction processing systems. To process a sales order, for example, the transaction processing system records the sale, updates the customer's account balance, and makes a deduction from inventory. Using this information, the related management information system can produce reports that recap daily sales activities; list customers with past due account balances; graph slow or fast selling products; and highlight inventory items that need reordering. A management information system focuses on generating information that management and other users need to perform their jobs.

4. **Decision Support Systems (DSS)**

Transaction processing and management information systems provide information on a regular basis. Frequently, however, users need information not provided in these' reports to help them make decisions. A sales manager, for example, might need to determine how

high to set yearly sales quotas based on increased sales and lowered product costs. Decision support systems help provide information to support such decisions.

(A decision support system (DSS) is an information system designed to help users reach a decision when a decision-making situation arises. A variety of DSSS exist to help with a range of decisions. A decision support system uses data from internal and/or external sources. Internal sources of data might include sales, manufacturing, inventory, or financial data from an organization's database. Data from external sources could include interest rates, population trends, and costs of new housing construction or raw material pricing. Users of a DSS, often managers, can manipulate the data used in the DSS to help with decisions.

DSS uses data from

(1) Internal sources

(II)External sources

(1) **Internal sources-**sales, manufacturing, inventory, or financial for an organizations database.

(ii) **External sources-**interest rates, population trends, cost of new housing construction/ raw material pricing.

5. **Executive Information Systems (EIS)**

EIS is designed to support the information needs of executive managers. I formation in an EIS are presented in charts and tables that show trends, ratios and other managerial statistics and is stored in data warehouses.

6. **Expert Systems (ES)**

An expert system is an information system that captures and stores the knowledge of human experts and then imitates human reasoning and decision-making processes for those who have less expertise. Expert systems are composed of two main components: a knowledge base and inference rules. A knowledge base is the combined subject knowledge and experiences of the human experts. The inference rules are a set of logical judgments applied to the knowledge base each time a user describes a situation to the expert system.

Although expert systems can help decision-making at any level in an organization, non-management employees are the primary users who utilize them to help with job-related decisions. Expert systems also successfully have resolved such diverse problems as diagnosing illnesses, searching for oil and making soup.

7. Electronic Data Processing (EDP)

EDP (electronic data processing), an infrequently used term for what is today usually called "IS" (information services or systems) or "MIS" (management information services or systems), is the processing of data

Define Management, Information, System And Management Information System(MIS)

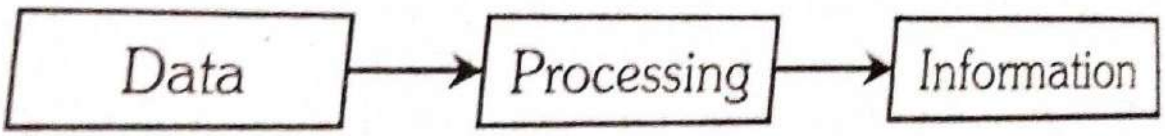
Meaning

Management information system is an acronym of three words, viz., Management, information, system in order to fully understand the term MIS, let us try to understand these three words.

(i) Management

Management is the art of getting things done through and with the people in formally organized groups.

(ii**) Information**



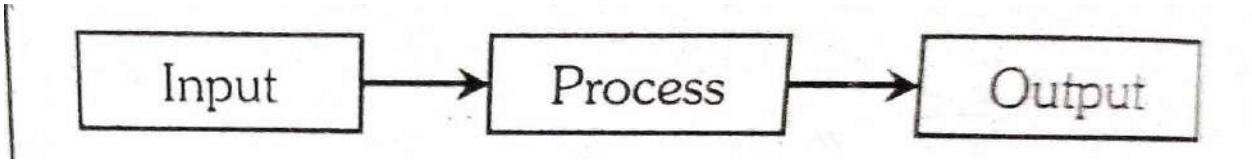
Information is data that is processed and is presented in a form which assists decision-making. It may contain an element of surprise, reduce uncertainty or provoke a manager to initiate an action.

Data usually take the form of historical records. In contrast to informal, raw data may not be able to surprise us, may not be organized and may not add anything to our knowledge.

(iii) **System**

The term system is the most loosely held term in management literature because of its use in different contexts. However, a system may be defined as a set of elements which are joined together to achieve a common objective. The elements are interrelated and interdependent.

The set of elements for a system may be understood us input, process and output. A system has one are multiple inputs; these inputs are processed through a transformation process to convert these input into outputs The three elements of a system are



Management information system Definition

Management information system is a system consisting of people, machines, procedures, databases and data models, as its elements. The system gathers data from the internal and external sources of an organization.

The structure of MIS is not easy to understand because there is no proper framework accepted globally for depicting MIS. The utilities that help a user in understanding the structure of MIS include,

1. Physical components
2. Processing applications of information systems
3. Decision support
4. Various management activity levels
5. Organizational functions.

1. Physical Components

(i) Software: It refers to the program Instructions that guide the functioning of hardware. It may be of two types,

(a) System software

(b) Application software.

(ii) Hardware: It refers to all the equipment and devices required for data processing.

Example: Monitor, keyboard, CPU. printer, drives, tapes, communication equipment.

(iii) Database: It includes data stored in the form of files by means of using application software.

(Iv) Operations: It refers to manuals and other such physical elements required to formally operate a system using standard procedures.

(v) Personnel: It includes all the people who are involved in carrying out all operations of information system.

Example: Computer programmers, system analysts, system managers, computer operations etc.

(vi) Input/ Output: It refers to various input and output operations like reports, printouts etc.

2. Processing Applications of Information Systems

(1) Processing of Transactions: Transaction refers to an activity carried out in an organization.

Example: Purchase/sale of product, Manufacturing of product. A transaction may take place internally or externally in an organization.

(ii) Maintenance of Master Files and Records: It indicates creation and maintenance of master files in an organization. A file which permanently stores past data of organizational entities is called as a master file.

(iii) Reports Production: Information systems are responsible for producing reports. There are two types of reports,

(a) Scheduled reports: Produced regularly

(b) Ad hoc reports: Produced on ad-hoc requests.

(iv) Enquiry Processing: It refers to queries which are either in pre-defined format or ad-hoc format. These queries are answered and processed using MIS by means of utilizing the database.

(v) Processing Interactive Support Applications: In this a user not only asks questions but also requests for data for an optimum solution.

3. Decision Support

There are two types of decisions,

(i) Structured decision: Well defined and programmable.

(ii) Unstructured decision: Undefined and non- programmable.

4. Management Activity Levels

(1) Strategic Planning: It involves long term considerations. The decisions are taken based upon choice of business, market strategy, product mix, etc.

(ii) Management Control: It indicates acquiring and organizing resources, work structure, personnel training.

(iii) Operational Control: It refers to short- term decisions for current operations.

Example: Inventory, pricing, production levels etc.

5. Organizational Functions

There are no standard functions which can be classified as organizational functions. However, few of the functions include,

(i) Production

(ii) Sales and marketing

(iii) Finance and accounting

(iv) Materials

(v) Personnel.

All functions require MIS to integrate and utilize data for proper management.

Importance of MIS

1. It assists managers in taking right and timely decisions quickly so as to achieve competitive advantages.

2. It lessens t burden of a manager to process huge data which usually helps him in taking correct decisions and present losses to the organization. Hence, MIS is also referred to as the "nerve Centre of an organization".

It not only helps decisions makers at different levels of decisions making by giving useful information, but also aids in accomplishing the predetermined goals and objectives of an organization.

It has now become a major functional area of an organization as it has three very important roles.

(i) It aids an organization in its business proceedings and applications.

(ii) It assists the managers in rational decision making.

(iii) It helps an organization with its strategies to give tough competition

Characteristics of MIS

1. **System Approach**

The information system follows a System's approach. The system's approach implies a holistic approach to the study of system and its performance in the light of the objective for which it has been constituted. This approach is anti- piecemeal in nature. In other words, system's approach, in the sense intended here, means taking a comprehensive view or a complete look at the interlocking sub-systems that operate within an organisation

2. **Management Oriented**

This is an important characteristic of MIS. For designing of MIS, top-down approach should be followed. Top-down approach suggests that the system development starts from the determination of management needs and overall business objectives. The MIS development plan should be dived from the cverall business plan. (Management- oriented characteristic of MIS also implies that the management actively direts the system development efforts. In MS development, a manager should spend a good amount of his/her time in system design. To ensure that the implemented system meets the specifications of the system, continued review and participation of the manager is necessary.

3. **Need Based**

MIS design and development should be as per the information needs of managers at different levels, viz., strategic planning level, management control level and operational control level. In other words, MIS should- cater to the specific needs of managers in an organization's hierarchy.

4. **Exception Based**

MIS should be developed on the exception- based reporting principle, which means an abnormal situation, i.e. the maximum, minimum or expected values vary beyond tolerance limits. In such situations, there should be exception reporting to the decision- maker at the required level.

5. **Future Oriented**

Besides exception-based reporting, MIS should also look at the future. In other words, MIS should not merely provide past or historical information; rather it should provide information on the basis of projections based on which actions may be initiated.

6. **Integrated**

Integration is a necessary characteristic of a management information system. Integration is significant because of its ability to produce more meaningful information. For example, in order to develop an effective production scheduling system, it is necessary to balance such factors as:

(i) set-up costs,

(ii) workforce,

(iii) overtime rates,

(iv) production capacity,

(v) inventory level,

(vi) capital requirements,

(vii) customer services, etc.

7. Long-Term Planning

MIS is developed over relatively long periods. Such systems do not develop overnight. A

of the company in mind. The designer must avoid the possibility of the system going obsolete before its time.

8. Sub-System Concept

The process of MIS development is quite complex and one is likely to lose insight frequently. Thus the system, though viewed as a single entity, must be broken down into digestible sub-systems which are more meaningful at the planning stage.

9. Central Database

A central database is the mortar that holds the functional systems together. Each system requires access to the master file of data, covering inventory, personnel, vendors, customers, etc. If the data is stored efficiently and with common usage in mind, one master file can provide the data needed by any of the functional systems. It seems logical to gather data once, properly validate it and place it on a central storage medium, that can be accessed by any other sub-system.

Nature and Scope of MIS

The concept of MIS is interdisciplinary in nature, i.e., it has borrowed its concepts from a large number of disciplines like Accounting, Computers, Organizations, Management, Operations Research and Behavioral Sciences, etc.

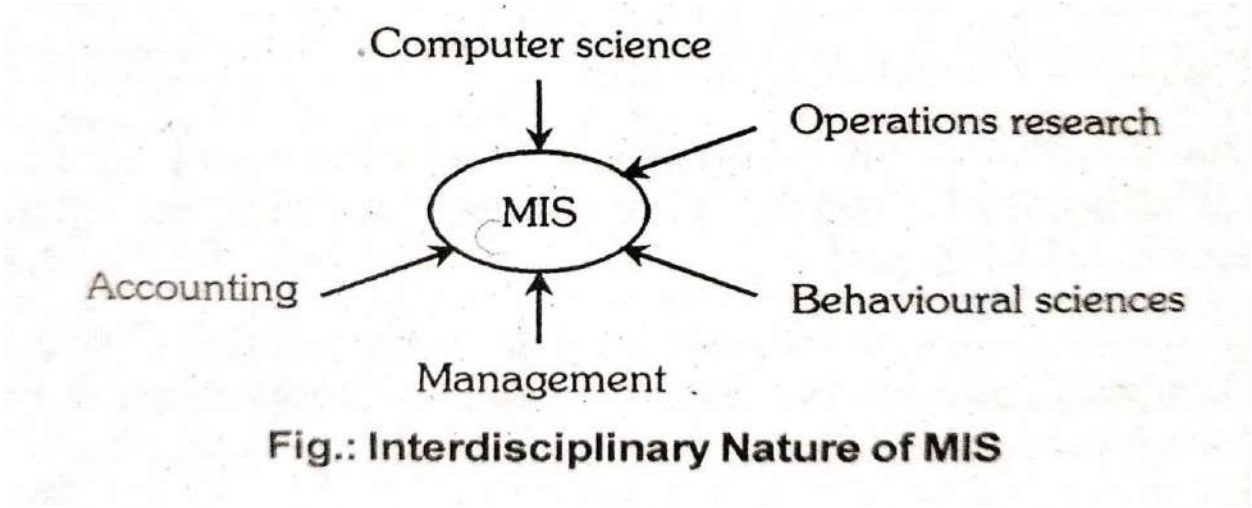


Fig.: Interdisciplinary Nature of MIS

Because (Because of its interdisciplinary nature, MIS is neither termed as a pure science nor an art; rather it is considered as a combination of both. An information system is a logical system, which is concerned with 'how' something is being accomplished and thus may be differentiated from a physical system, which is the process itself and is concerned with the content or 'what' is going on. MIS, in fact, encompasses both physical and information systems. There has been a lot of debate on the issue whether MIS is more management-oriented or computer-oriented. Though there are advocates of both the sides, MIS should be considered more of a Management subject than of computers because of the simple logic that computers are just a tool in the hands of managers. Computers are used for their characteristics like accuracy; speed and capacity to handle large amount of data.

Nowadays MIS finds application in all functional areas of every type of business organizations at all levels.

Functions or Activities of MIS

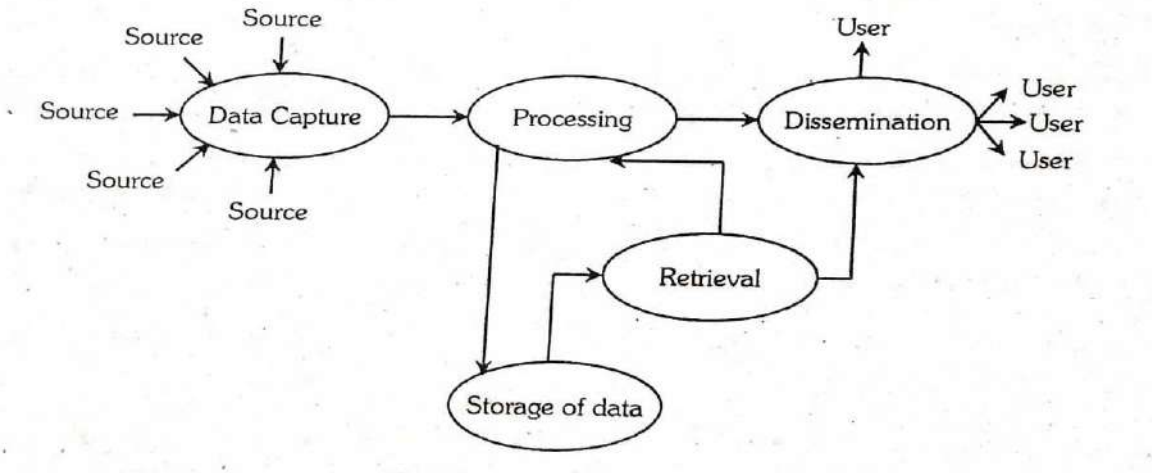


Fig.: Functions of MIS

(1)**Data Capturing**

Data Capturing "MIS captures data from various internal and external sources of an organization. Data capturing may be manual or through computer terminals. End users typically record data about transactions on some physical medium, such as a paper form, or enter it directly into a computer system.

(ii) Processing of Data

The captured data is processed to convert it into the required management information. Processing of data is done by such activities as calculating, comparing, sorting, classifying and summarizing. These activities organize, analyze and manipulate data using various statistical, mathematical, operations research and/or other business models.

(iii) Storage of Information

MIS stores processed or unprocessed data for future use. If any information is not immediately required, it is saved as an organizational record. In this activity, data and information are retained in an organized manner for later use. Stored data is commonly organized into fields, records, files and databases.

(iv) Retrieval of Information

MIS retrieves information from its stores as and when required by various users. As per the requirements of management users, the retrieved information is either disseminated as such or it is processed again to meet the exact MI demands.

(v) Dissemination of Information

Information, which is a finished product of MIS, is disseminated to the users in the organization. It could be periodic through reports, or on-line through computer terminals.

Classifications of MIS

1. **Operation Support Systems**

Operations support system is mainly required for performing low level operations. It provides support to the organization by keeping track of information regarding activities, which are performed on daily basis. This system is also capable of processing data that is obtained after performing various business operations. Operations support system closely monitors the on-going transactions with the organizations.

2. **Management Support Systems**

The information systems application that concentrate more on providing data and decision assistance for effective decision making by managers.

The major objective of MSS is to

a) Provides information and support, which is required by managers in performing decision-making process.

b) Controls and manage the business activities.

c) Generate different kinds of reports (summary reports, projected reports).

Component of Expert system

Knowledge Base

The knowledge base, is the major component of an expert system, in which knowledge is represented using set of rules. It helps the expert system to make decisions by maintaining the necessary information and set of rules.

The information needed by the expert system, should be collected from top experts in the particular field as great expertise is required. The nature of decision, varies from time to time. For different types of decisions, different rules are executed in different order. The nature and number of rules applied, varies from decision to decision.

Inference Engine

Inference engine acts like a central processing unit of expert system. It makes use of knowledge base, in order to draw conclusions for situations. It is responsible for gathering the information from the user, by asking various questions and applying it whenever necessary.

Knowledge Acquisition Subsystem

Knowledge Acquisition Subsystem, is responsible for updating knowledge base. The set of rules to be applied for a problem changes overtime, which raises the need for updation of knowledge base with new rules from time to time. The knowledge acquisition subsystem, enables the increase in expertise of the expert system by continuous refinement of the initial prototype and by adding and/or deleting the rules as necessary in the knowledge base until the expert system is perfect.

Explanation Subsystem

Explanation subsystem helps the user to understand the procedures used to solve the problems by explaining them. In order to make a decision, the user must be well-verse with those procedures and must keep track of therm.

Six Reasons why information systems are so important

1. **Operational Excellence**

In information systems, the technology is considered as an important tool for improving efficiency and high productivity. Thus, leading to high profits.

2. **New Products, Services and Business Models**

The business models emphasizes on how is the production process performed, the product deliver)' and sales to generate income or wealth. In addition to this, the information system and technology behaves as an enabling tool for creating new products, services and business models.

3. **Customer and Supplier intimacy**

This is concern with the revisiting of the customers to the shop. In essence, if the service is good invariably, the customer will return to the shop to make further purchases. Thus, raising the revenues and profits.

4. **improved Decision Making**

Decision making is the most comprehensive and embracing function of management. If the information is not accurate or precise then the managers rely on forecasts, wild guess,

thus leading to overproduction, under- production of goods and services. In addition to this, it also generates misallocation of resources and poor response time, poor outcomes, raise costs, lose customers.

5. **Competitive Advantage**

It includes the following,

Delivering better performance.

Low prices on superior products.

Giving real-time responses to customers and supplier in real-time.

6. **Survival**

The information technology is an essential part of business. This is due to the changes at the industry level such as city bank's introduction of ATMs. Also, the government do perform regulations for achieving records.

Academic Disciplines are used to Study information System

The academic disciplines used to study information systems are classified into behavioral and technical disciplines.

It is necessary to consider the issues and concerns about both of these for this study.

The disciplines associated with behaviora approach are,

(i) Psychology

(ii) Sociology

(iii) Economics.

The disciplines contribute to the study of information systems by concentrating on the following aspects of the systems,

(i) Design

(ii) Implementation

(iii) Management

(iv) Impact of business on the system.

The disciplines associated with technical approach are,

(i) Computer science

(ii), Management science

(iii) Operations science.

1.3 Managerial Challenges of IT

1. The information system investment challenge

Information systems as investments that produce value for the firm. It shows that not all companies realize good returns from information systems investment. It is obvious that one of the greatest challenges facing managers today is ensuring that their companies do indeed obtain meaningful returns on the money they spend on information systems. It's one thing to use information technology to design, produces, deliver, and maintain new products. It's another thing to make money doing it.

2. **The strategic business challenge**

Information technology investments, many organizations are not realizing significant business value from their systems, because they lack (or) fail to appreciate - the complementary assets required to make their technology assets work. The power of computer hardware and software has grown much more rapidly than the ability of organizations to apply and use this technology. To benefit fully from information technology, realize genuine productivity, and become competitive and effective, many organizations actually need to be redesigned.

They will have to make fundamental changes in employees and management behavior, develop new business models, retire obsolete work rules, and eliminate the inefficiencies of outmoded business processes and organizational structures. New technology alone will not produce meaningful business benefits.

3. **The globalization challenge**

The rapid growth in international trade and. the emergence of a global economy call for information systems that can support both producing and selling goods in many different countries. In the past, each regional office of a multinational corporation focused on solving its own unique information problems. Given language, cultural, and political differences among countries, this focus frequently resulted in chaos and the failure of central management controls. To develop integrated, multinational, information systems, businesses must develop global hardware, software, and communications standards; create cross-cultural accounting and reporting structures; and design transnational business processes.

4. **The information technology infrastructure challenge**

Many companies are saddled with expensive and unwieldy information technology platforms that cannot adapt to innovation and change. Their information systems are so complex and brittle that they act as constraints on business strategy and execution. Meeting new business and technology challenges may require redesigning the organization and building a new information technology (IT) infrastructure.

Creating the IT infrastructure for a digital firm is an especially formidable task. Most companies are crippled by fragmented and incompatible computer hardware, software, telecommunications networks, and information systems that prevent information from flowing freely between different parts of the organization. Although Internet standards are solving some of these connectivity problems, creating data and compusing platforms that span the enterprise-and, increasingly, link the enterprise to external business partners-is rarely as seamless as promised. Many organizations are still struggling to integrate their islands of information and technology.

5. **Ethics and security**

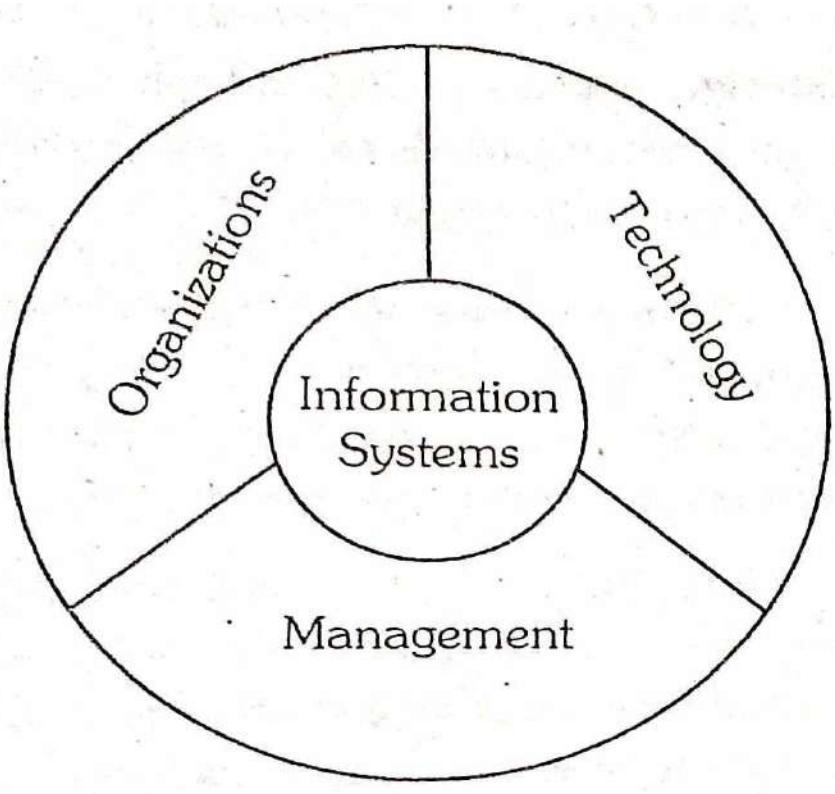
Information systems have provided enormous benefits and efficiencies, they have also created new ethical and social problems and challenge.

Ethical and social issues raised by information systems, such as threats to individual privacy and intellectual property rights, computer-related health problems, computer crimes, and elimination of jobs. A major management challenge is to make informed decisions that are sensitive to the negative consequences of information systems as well to the positive ones.

Managers face an ongoing struggle to maintain security and control. Today, the threat of unauthorized penetration or disruption of information systems has never been greater. Information systems are so essential to business, government, and daily life that organizations must take special steps to ensure their security, accuracy, and reliability. A firm invites disaster if it uses systems that can be disrupted or accessed by outsiders, that do not work as intended, or that do not deliver information in a form that people can correctly use. Information systems must be designed so that they are secure, function as intended, and so that humans can control the process.

1.4 Components of Information System Resources and Activities

Dimensions of Information System or components of information system

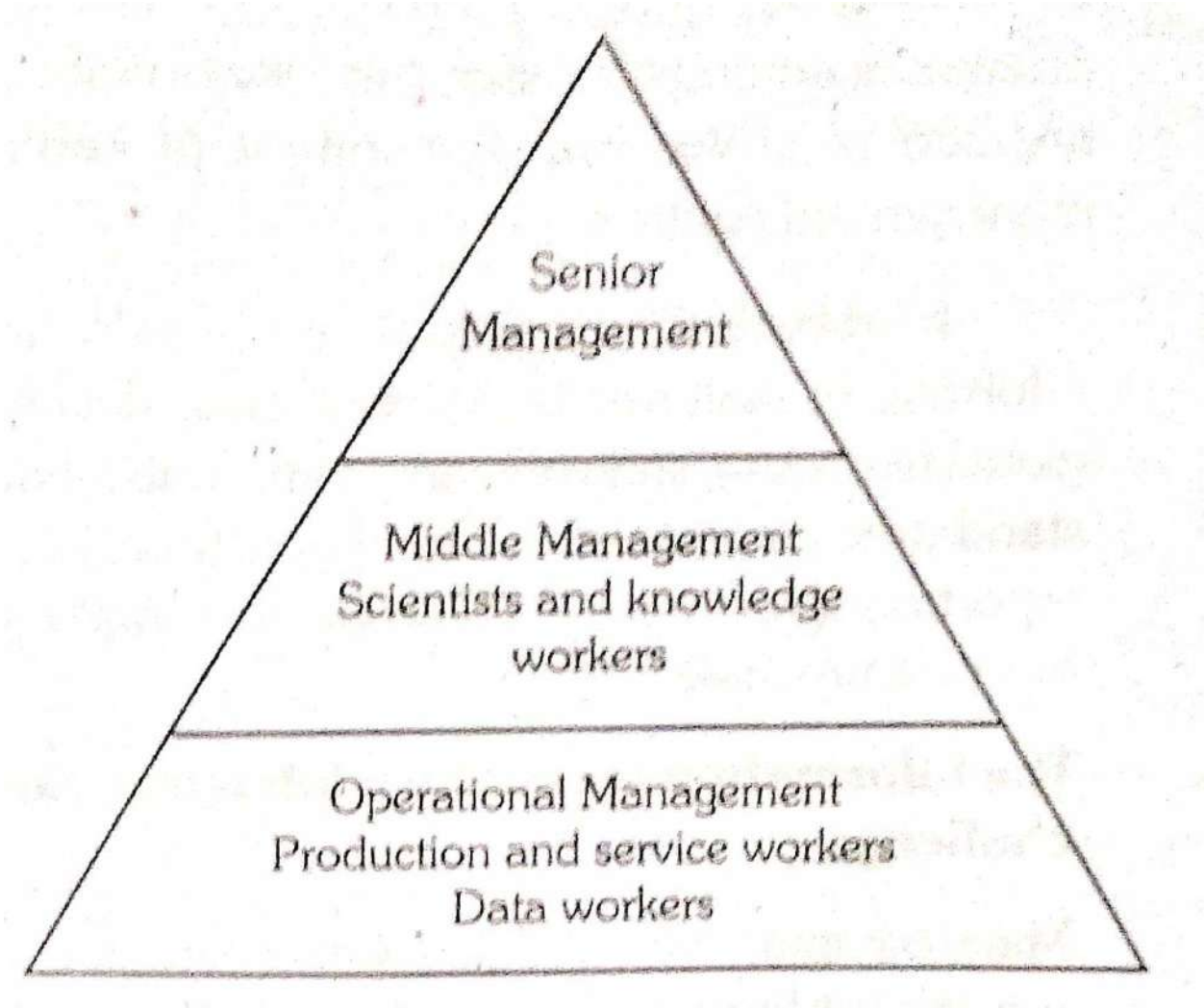


(1)Organizations

Information systems are an integral part of organizations. Indeed, for some companies, such as credit reporting firms, without an information system, there would be no business. The key elements of an organization are its people, structure, business processes, politics, and culture.

Organizations have a structure that is composed of different levels and specialties. Their structures reveal a clear-cut division of labor. Authority and responsibility in a business firm is organized as a hierarchy, or a pyramid structure of rising authority and responsibility. The upper levels of the hierarchy consist of managerial, professional, and technical employees, whereas the lower levels consist of operational personnel.

Senior management makes long-range strategic decisions about products and services as well as ensures financial performance of the firm.



Middle management carries out the programs and plans of senior management and operational management is responsible for monitoring the daily activities of the business.

Knowledge workers, such as engineers, scientists, or architects, design products or services and create new knowledge for the firm, whereas data workers, such as secretaries or clerks, assist with paperwork at all levels of the firm. Production or service workers actually produce the product and deliver the service.

(ii) Management

Management's job is to make sense out of the many situations faced by organizations, make decisions, and formulate action plans to solve organizational problems. Managers perceive business challenges in the environment; they set the organizational strategy for responding to those challenges, and they allocate the human and financial resources to coordinate the work and achieve success. Throughout, they must exercise responsible leadership. The business information systems described in this book reflect the hopes, dreams, and realities of real- world managers.

But managers must do more than manage what already exists. They must also create new products and services and even re-create the organization from time to time. A substantial part of management responsibility is creative work driven by new knowledge and information. Information technology can play a powerful role in helping managers design and deliver new products and services and redirecting and redesigning their organizations.

(iii)Technology

Information technology is one of many tools managers use to cope with change. Computer hardware is the physical equipment used for input, processing, and output activities in an information system. It consists of the following: computers of various sizes andshapes; various input, output, and storage devices; and telecommunications devices thatlink computers together.

Computer software consists of the detailed, preprogrammed instructions that control and coordinate the computer hardware components in an information system.

Data management technology consists of the software governing the organization of data on physical storage media.

Networking and telecommunications technology, consisting of both physical devices and software, links the various pieces of hardware and transfers data from one physical location to another. Computers and communications equipment can be connected in networks for sharing voice, data, images, sound, and video. A network links two or more computers to share data or resources, such as a printer.

The world's largest and most widely used network is the Internet. The Internet is a global "network of networks" that uses universal standards to connect millions of different networks with more than 350 million host computers in over 200 countries around the world.

The Internet has created a new "universal" technology platform on which to build new products, services, strategies, and business models. This same technology platform has internal uses, providing the connectivity to link different systems and networks within the firm. Internal corporate networks based on Internet technology are called intranets. Private intranets extended to authorized users outside the organization are called extranets, and firms use such networks to coordinate their activities with other firms for making purchases, collaborating on design, and other interorganizational work. For most business firms today, using Internet technology is both a business necessity and a competitive advantage.

1.5 System for Collaboration and Social Business

(1)Collaboration

Collaboration is working with others to achieve shared and explicit goals. It focuses on task or mission accomplishment and usually takes place in a business, or other organizations, and between businesses. Collaboration can be short-lived or longer term, depending on the nature of the task and the relationship among participants. It can be one-to-one or many-to-many.

(ii)Social business

Social business is part of an organization's business structure for getting things done in anew collaborative way. It uses social networking platforms to connect employees, customers, and suppliers. The goal of social business is to deepen interactions with groups inside and outside a company to expedite and enhance information-sharing, innovation, and decision-making.

Importance

Changing nature of work: More jobs are becoming "interaction" jobs. These kinds of jobs require face-to-face interaction with other employees, managers, vendors, and customers. They require systems that allow the interaction workers to communicate, collaborate and share ideas.

Growth of professional work: Professional jobs in the service sector require close coordination and collaboration.

Changing organization of the firm: Work A is no longer organized in a hierarchical fashion as much as it is now organized into groups and teams who are expected to develop their own methods for accomplishing tasks.

Changing scope of the firm: Work is more geographically separated than before.

Emphasis on innovation: Innovation stems more from groups and teams than it does from a single individual.

Changing culture of work and business: Diverse teams produce better outputs, faster, than Individuals working on their own.

Benefits of collaboration and Social Business

A Productivity: People working together accomplish tasks faster, with fewer errors, than those working alone.

Quality: People can communicate errors and correct them faster when working together versus working alone.

Innovation: People working in groups can generate more innovative ideas than if they were working alone.

Customer service: People working in teams can solve customer complaints and issues faster and more effectively versus working in isolation.

1.6 Ethical and Social Issues in Information System

Information technology has raised new possibilities for behavior for which laws and rules of acceptable con-duct have not yet been developed. Information technology is introducing changes that create new ethical issues for societies to debate and resolve. Increasing computing power, storage, and networking capabilities including the Internet-can expand the reach of individual and organizational actions and magnify their impact.

The ease and anonymity with which information can be communicated, copied, and manipulated in online environments are challenging traditional rules of right and wrong behavior. Ethical, social, and political issues are closely related.

Ethical issues confront individuals who must choose a course of action, often in a situation in which two or more ethical principles are in conflict (a dilemma).

Social issues spring from ethical issues as societies develop expectations in individuals about the correct course of action.

Political issues spring from social conflict and are mainly concerned with using laws that prescribe behavior to create situations in which individuals behave correctly.

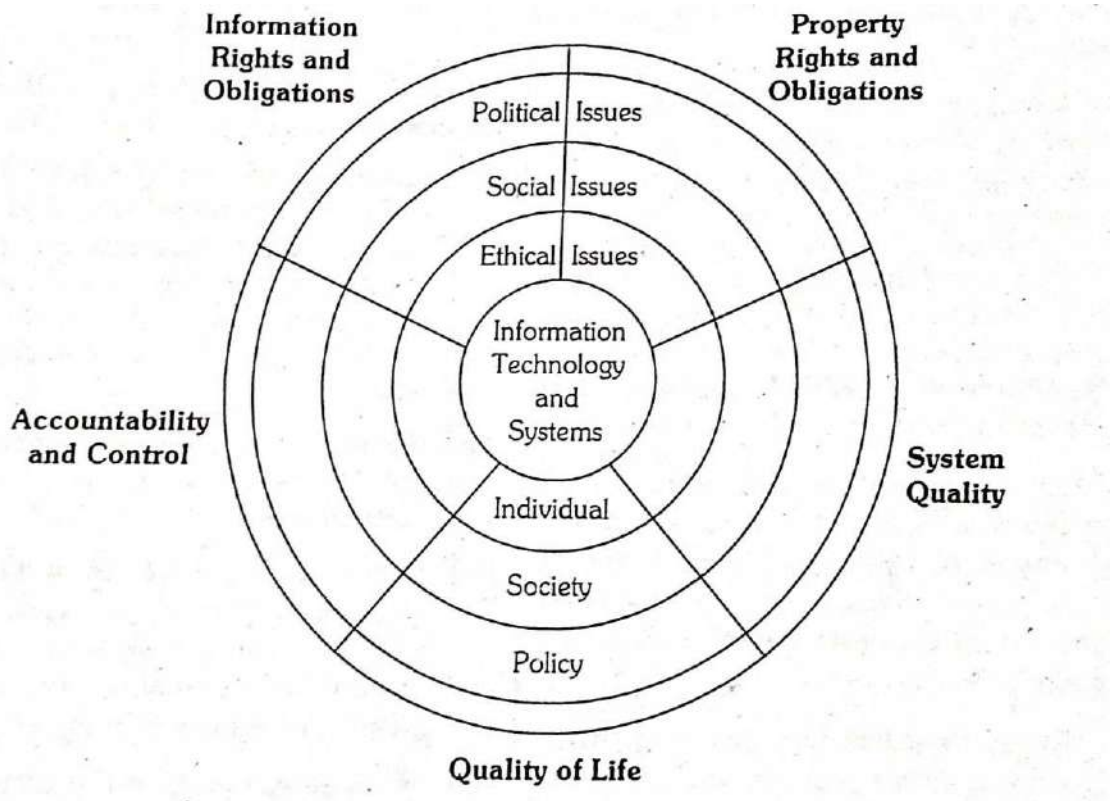


Fig.: The Relationship between Ethical, Social and Political Issue in an Information Society

Five moral Dimensions of Information society or age

• Information rights and obligations

What information rights do individuals and organizations possess with respect to themselves? What can they protect?

• Property rights and obligations

How will traditional intellectual property rights be protected in a digital society in which tracing and accounting for ownership are difficult and ignoring such property rights is so easy?

• Accountability and control

Who can and will be held accountable and liable for the harm done to individual and collective information and property rights?

• System quality

What standards of data and system quality should we demand to protect individual rights and the safety of society?

• Quality of life

What values should be preserved in an information- and knowledge-based society? Which institutions should we protect from violation?

Which cultural values and practices does the new information technology support?

Ethical Analysis

1.Identify and describe the facts

clearly Find out who did what to whom and where, when, and how. In many instances, you will be surprised at the errors in the initially reported facts, and often you will find that simply getting the facts straight helps define the solution.

2. Define the conflict or dilemma and identify the higher-order values involved

Ethical, social, and political issues always reference higher values.The parties to a dispute all claim to be pursuing higher values (e.g., freedom, privacy, protection of property, and the free enterprise system). Typically, an ethical issue involves a dilemma: two diametrically opposed courses of action that support worthwhile values.

3. Identify the stakeholders

Every ethical, social, and political issue has stakeholders: players in the game who have an interest in the outcome, who have invested in the situation, and usually who have vocal opinions. Find out the identity of these groups and what they want. This will be useful later when designing a solution.

4. Identify the options that you can reasonably take

You may find that none of the options satisfy all the interests involved but that some options do a better job than others.

5. Identify the potential consequences of your options

Some options may be ethically correct but disastrous from other points of view.

Ethical Principles

1.The Golden Rule

Do unto others as you would have them do unto you (the Golden Rule). Putting yourself in the place of others, and thinking of yourself as the object of the decision, can help you think about fairness in decision making.

2. Immanuel Kant's categorical imperative

If an action is not right for everyone to take, it is not right for anyone (Immanuel Kant's categorical imperative). Ask yourself, "If everyone did this, could the organization, or society, survive?"

3.Descrates' rule of change

If an action cannot be taken repeatedly, it is not right to take at all. This is the slippery slope rule : An action may bring about a small change now that is acceptable, but if it is repeated, it would bring unacceptable changes in the long run. In the vernacular, it might be stated as "once started down a slippery path, you may not be able to stop."

4.utilitarian principle

Take the action that achieves the higher or greater value (utilitarian principle). This rule assumes you can prioritize values in a rank order and understand the consequences of various courses of action.

5.risk aversion principle

Take the action that produces the least harm or the least potential cost (risk aversion principle).Some actions have extremely high failure costs of very low probability (e.g., building a nuclear generating facility in an urban area) or extremely high failure costs of moderate probability (speeding and automobile accidents). Avoid actions which have extremely high failure costs; focus on reducing the probability of accidents occurring.

6.No-free lunch rule

Assume that virtually all tangible and intangible objects are owned by someone else unless there is a specific declaration otherwise. (This is the ethical no-freelunch rule.)

If something someone else has created is useful to you, it has value, and you should assume the creator wants compensation for this work.

Responsibility, Accountability, Liability

Responsibility is a key element of ethical action. Responsibility means that you accept the potential costs, duties, and obligations for the decisions you make.

Accountability is a feature of systems and social institutions: It means that mechanisms are in place to determine who took responsible action, who is responsible. Systems and institutions in which it is impossible to find out who took what action are inherently incapable of ethical analysis or ethical action.

Liability extends the concept of responsibility further to the area of laws. Liability is a feature of political systems in which a body of laws is in place that permits individuals to recover the damages done to them by other actors, systems, or organizations.

1.7 Information System for Strategic Advantages

Role of Information System in Organizations

The concept of IS has passed through several stages. In 1950, information was considered a necessary evil, whereas today information is regarded as an important strategic resource. The changing concept of IS has been briefly discussed as below:

1. **Information as a Necessary Evil**

Information was regarded as a necessary evil, associated with the development, production and marketing of products or services. Information was thus merely considered as a by-product of transactions in the organizations. As a result, information systems of 1950s were primarily designed with the aim to reduce the cost of routine paper processing in accounting areas. The term Electronic Data Processing (EDP) was coined during this period.

2. **Information for General Management Support**

By mid 1960s, organizations began recognizing information as an important tool which could support general management tasks. The information systems corresponding to this period were known as management information systems (MIS) and were thought of as systems processing data into information.

3. **Information for Decision-Making**

In the early 1980s, information was regarded as providing special-purpose, tailor-made management controls over the organization. Decision Support Systems and Executive

Support Systems were important advancements, which took place during this period. The purpose of such information systems was to improve and speed-up the decision-making process of top-level managers.

4. **Information as a Strategic Resource**

In the revolutionary change pattern, the concept of information changed again by the mid-eighties and information has since then been considered as a strategic resource, capable of providing competitive advantage or a strategic weapon to fight the competition. Latest information systems which, are known as strategic systems, support this concept of information.

Five Force competitive Model

Porter has suggested five major forces that could pose a threat to a given industry. In other words, these five forces shape the strategy of competition in an industry. Though the details of the model may differ from one industry to another, its general structure remains the same and is universal. The five forces can be generalized as follows:

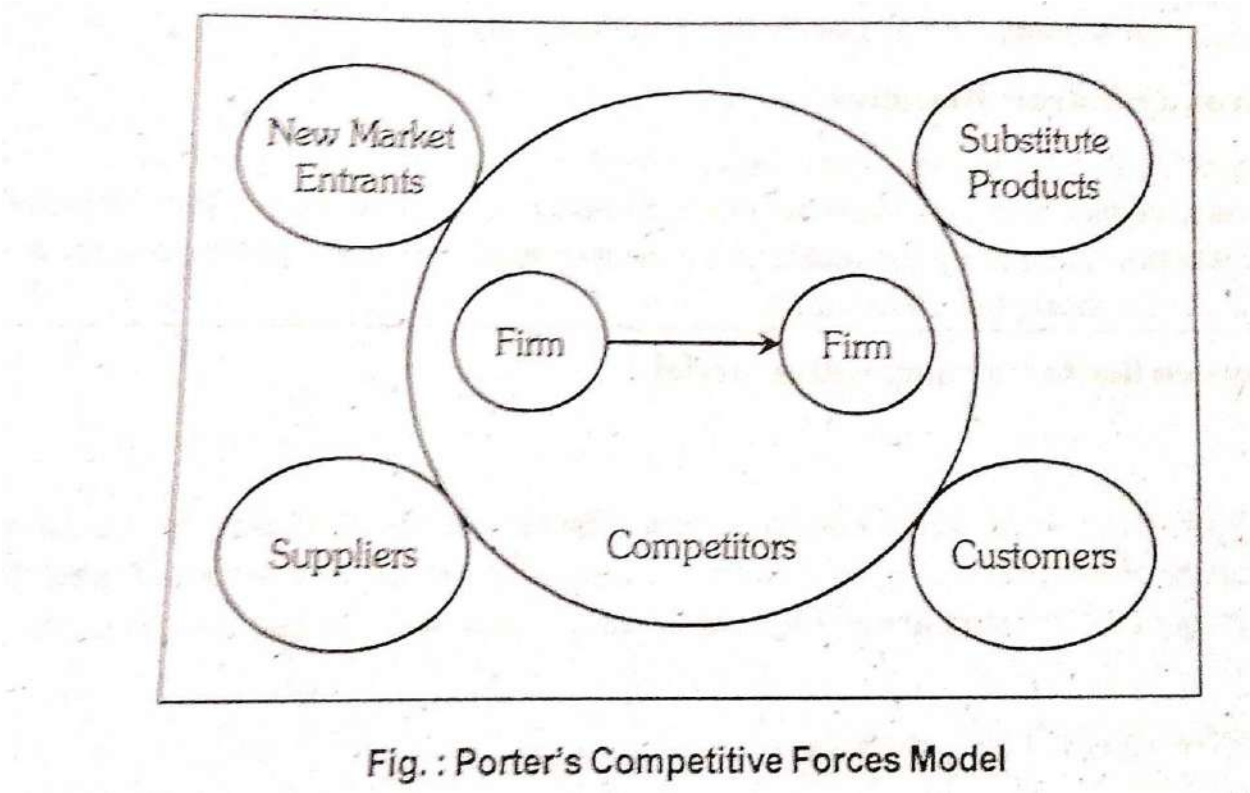


Fig. : Porter's Competitive Forces Model

1. The threat of entry of new competitors

2. The bargaining power of suppliers

3. The bargaining power of customers (buyers)

4. The threat of substitute products or services

5. The rivalry among existing competitors (firms)

The Porter's five forces model. These five forces explain the general business environment of an organization. The following sections briefly discuss how these forces shape the competitive position of an organization.

1. **The threat of entry of new competitors**

Because of free economy, new companies are always entering in the marketplace. The entry of these organizations is difficult in some of the industries, whereas it is easy in some other industries. For example, it is easy to start a new retail shop: but quite difficult to start a new university, which requires high capital cost and a professional expertise. The new companies have many advantages like they start with latest technology/infrastructure; recruit young and motivated people; and not have a legacy system to unlearn and relearn the experiences. But these advantages, many a times become disadvantages. The new technology/infrastructure needs relearn huge funding; young people are less experienced; and need good time to create a- brand.

2. The bargaining power of suppliers

The supplier's power can also influence the company in a big way, especially when the firm can not increase prices as fast as its supplier can. If the number of suppliers for a given industry is large, the organization can have a greater control over its suppliers and can negotiate in a better way in terms of price, quality and delivery schedules. For example, automotive company generally has multiple competing suppliers of key components.

3.The bargaining power of customers (buyers)

The bargaining power of customers increases if they can easily switch to a competitor's products and services. For example, the online purchases have increased the bargaining power of the customers as they can know all the available products/services offered by different suppliers and they also know the prices of these products. For.example, online booking of an air ticket offers a number of facilities to its customers and thus online customers have a great advantage over offline air ticket firms.

4. The threat of substitute products or services

There are substitutes for almost every product, which might be used in the case of high prices or non availability of the products. New researches produce substitutes for the existing products which may be more efficient, less costly or eco friendly. For example, ethanol can be used as a substitute for gasoline in cars; vegetable oil for diesel fuel in trucks,, and wind, solar, coal, and hydropower for industrial electricity generation. The availability of more substitute products in an industry would mean lowering of pricing and thus an impact on the profit margins.

5.**The rivalry among existing competitors (firms)**

In order to attract new and to retain the existing customers, the competitors are always finding new ways of doing business which are more efficient. They are also improving their products / services and try to increase the loyalty of their customers to their organisations.

Information System strategic for dealing with competitive force

To counteract various competitive forces, an organization can use information systerns to its advantage. There are three generic strategies, each of which often is enabled by using information technology and systems. These three strategies are:

(a) low-cost leadership;

(b) product differentiation; and

(c) focus on market niche.

(a) Low-Cost Leadership

To get a competitive advantage, an organization wants to achieve the lowest operational cost. Information systems can help an organization in achieving this goal.

(b) Product Differentiation

Another strategy to gain competitive advantage is product differentiation. Information systems are used to enable new products and services, or greatly change the customer convenience in the existing products and services. A new and unique search service on its website by Google is a good example of product differentiation. Apple is another example of continuous innovation which has recently introduced a portable iPod video player

Similarly, Dell Computer Corporation is following a product differentiation strategy, which sells directly to customers using assemble-to-order manufacturing. Customers can buy computers directly from Dell, customized with the exact features and components number or through Dell's website. Once Dell's production control receives an order, it directs an assembly plant to assemble the computer using components from an on-site warehouse based on the configuration specified by the customer.

(c)Focus on Market Niche

An organization can focus on a small market niche so as to serve this narrow target market better than its competitors. Information systems can support this strategy by analyzing data and providing information for sales and marketing activities with the help of information systems companies. These can analyze customer buying patterns, tastes, and preferences so and thus focus on smaller and smaller target markets for their advertising and other marketing related activities.

Strategic Information System

Strategic Information Systems (SIS) are a specialized type of information systems. These systems change the goals, operations, products, services or environmental relations of an organization to help it gain an edge over the competitors. Strategic information systems may even change the business of an organization. These changes in the business force

organizations to adopt new behavior patterns. As a result, organizations may often need to change their internal operations, require new managers, a new workforce and a much closer relationship with customers and suppliers.

The strategic information systems can be used at all levels of the organization and are more far- reaching and deep-rooted than the other types of information systems. Strategic information systems fundamentally change the way an organization runs its business.

Strategic Information System for Competitive Advantages

Today, organizations use their strategic information systems for gaining competitive advantage. An SIS can offer competitive advantage to an organization in the following ways.

(i) creating barriers to competitors' entry.

(ii) generating databases to improve marketing.

(iii) 'locking in' customers and suppliers.

(iv) lowering the costs of the products.

(v) leveraging technology in the value chain.

(i) Creating barriers to competitors' entry

In this strategy, an organization uses information systems to provide products or services that are difficult to duplicate or that are used to serve highly specialized markets. This prevents the entry of competitors as they find the cost for adopting a similar strategy very high. The organization gets a competitive advantage as with differentiated products and services, they no longer have to compete

(ii) Generating databases to improve marketing

An information system also provides companies an edge over their competition by generating databases to improve their sales and marketing strategies. Such systems treat existing information as a resource.

(iii) 'Locking in' customers and suppliers

Another way of gaining competitive advantage by using strategic information systems is by 'locking in' customers and suppliers. In this concept, information systems are used to provide such advantages to a customer or a supplier, that it becomes very difficult for them to switch-over to a competitor.

(iv) Lowering the costs of the products

Strategic information systems may also help organizations lower their internal costs, allowing them to deliver products and services at a lower price than their competitors can provide. Thus, such information systems can contribute to the survival and growth of the organization.

(v) Leveraging technology in the value chain

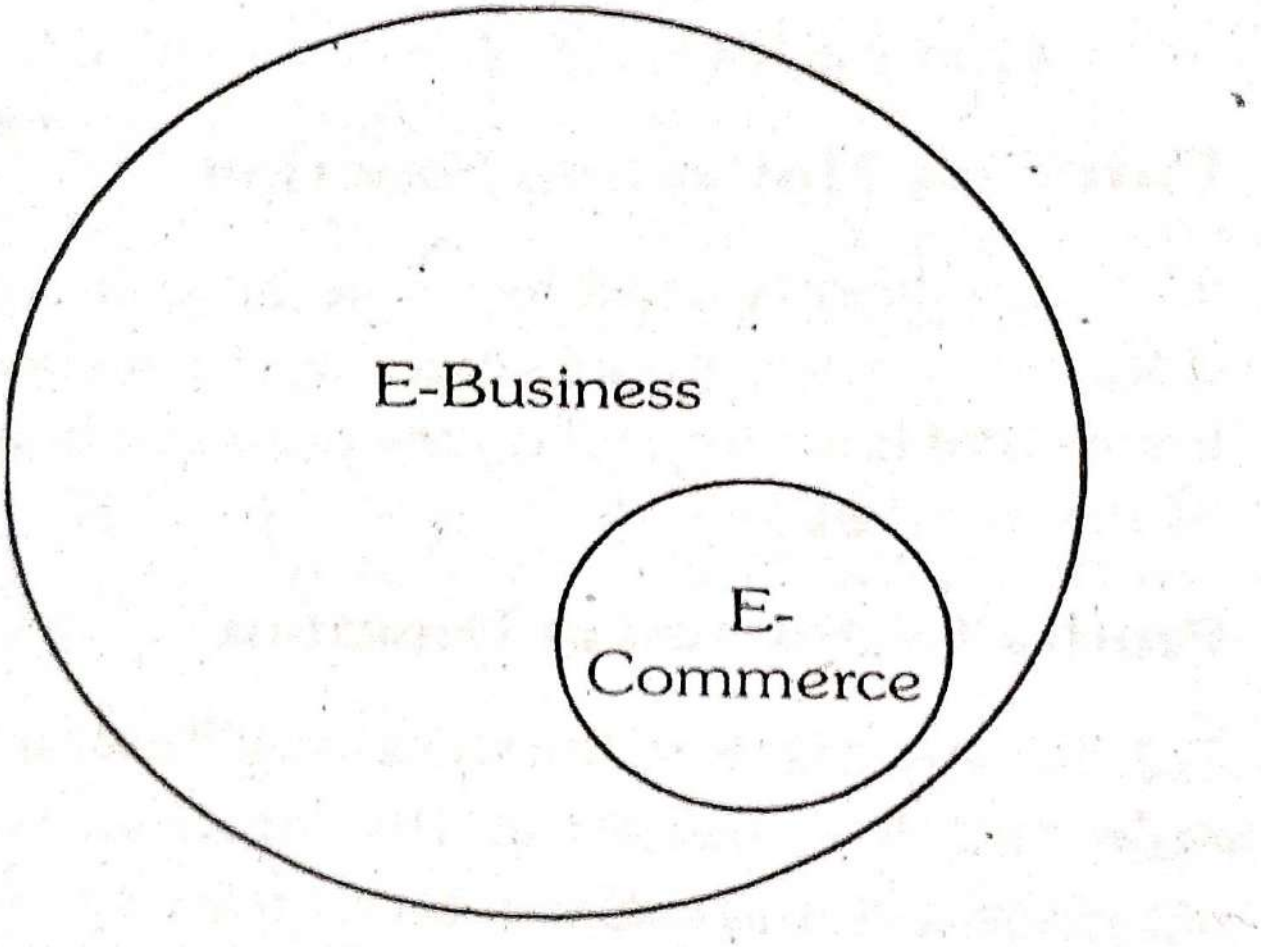
This approach, popularly known as Porter's value chain model, pinpoints specific activities in the business where competitive strategies can be best applied, and where information systems are likely to have a greater strategic impact. This model advocates that information technology can best be used to gain competitive advantage by identifying specific, critical leverage points.

UNIT - II

E-Business Systems

Meaning

E-business is the use of the Internet and other networks and information technologies to support electronic commerce, enterprise communications and collaboration, and web-enabled business processes both within an internetworked enterprise, and with its customers and business partners.



E-business application architecture presents an overview of E-business applications and their interrelationships within an internetworked E-business enterprise. Organizations are building interrelationships to each other and to customers, employees, business partners, and other stake-holders of an internetworked E-business enterprise

Three key areas are particularly important for e-business:

1. E-procurement

The electronic sourcing of products and services by companies, focused on reducing costs and effort.

2. Online store

The electronic sale of products and services via appropriate platforms, such as online stores.

3. Online marketplaces

Electronic commerce via digital networks, connecting the buyers and suppliers of products and services.

There are also two further areas of e-business:

(i) Online communities

Electronic communication network between individuals and organizations, which supports data and knowledge sharing as well as the preparation of transaction decisions.

(ii) Online companies

Electronic business cooperation for connecting individual company services, resulting in a virtual business with a common transaction offer.

Functional Business Systems

Business information system in marketing, manufacturing, and human resources with a special emphasis on computer integrated manufacturing. It describes the most widely used types of accounting information systems as well as information needed for the effective financial management of a firm.

Functional Business information systems:

- Marketing
- Production/operations
- Accounting
- Finance
- Human resource management

Marketing information system (MKIS)

The role of MKIS is to assess the marketing managers information needs then develop the framework for collecting information and distribute the information gathered to the end users in time. The marketing information system is generally carried out marketing need analysis, planning, and implementation and control functions of marketing managers.

The needed information is developed through internal company records, marketing intelligence activities, marketing research and marketing decision support analysis.

Different parts of MKIS

1. accounting information system

2. marketing, sales and customer services

- sales force automation
- saves company labors hours and
- telephone expenses capture customer data
- response time to customer inquiries

3. market research and intelligence information system

- customer research
- market research
- .competitor intelligence
- Competitor's products.
- Competitor's Operating strengths and weaknesses.
- Customer service level and customer policies.
- New product line.

The important functions of the marketing process are discussed below,

1. Marketing Identification Function

It is important to determine the potential buyers and their characteristics so that their needs and desires can be made satisfiable. This will help the marketer to know about the buyers with the following information,

- Buyers location
- Time of buying
- Buying routine
- Quantity of buying.

2. Purchase Motivation Function

This function is used to make an evaluation of different social, economical and psychological forces that have impact on the purchase behaviour of the market.

3. Product Adjustment Function

This function is used to perform all those activities essential for matching the product/ services offerings with the market. Since the requirements of customer keeps on varying, therefore some corresponding modification is needed in the form of product planning.

4. Physical Distribution Function

This function considers the actual movement of goods starting from the production to the consumption.

5. Communication Function

This function is used to establish communication between the buyers and the sellers for exchange of information and messages. This function contains decisions related to advertisement personal selling, publicity, sales promotion, issues of packaging and so on.

6. Transaction Function

This function is used to perform all those activities that can help in transferring of ownership title of goods or services between the parties in a transaction. Some examples of such activities may include invoicing, insurance policy, credit arrangement and so on.

7. Post-transaction Function

This function is used to obtain the feedback regarding the performance of the product or service from the customer. This feedback helps in assuming the quality of product or service to satisfy the customer.

Manufacturing information system

Manufacturing information system is a complete set of tool for managing the flow of manufacturing production data throughout the enterprise. This IS was designed to provide tools for both IT and operations personnel who would deliver services to anyone in the plant.

Manufacturing consists of many different disciplinary areas including product engineering, facility design and scheduling, fabrications, and quality control management. Each of them can be dramatically improved by using information systems.

A manufacturing system takes material, equipment, data management and information systems technology as the input and uses manufacturing and information processes to generate better final product as output. The manufacturing designed around the transaction -process of raw materials into usable components or materials. These systems are value added processes such as materials processing or support systems such as scheduling.

The decisions to be taken in manufacturing systems are as follows,

1. Product design

2. Plant location and layout

3. Production planning and control

4. Quality control

1. Product Design

Product design is also called product engineering. It refers to the scenario of the product development starting from the initial stage to the start level of the manufacturing stage. Product design includes

activities such as preparation of drawings, specifications, experimental and developmental efforts. Currently, product design involves CAD (Computer Aided Design) and CAE (Computer Aided Engineering) approaches.

2. Plant Location and Layout

Plant location is used for determining specific. region or place to establish an organisation. It is useful for partial determination of operating and capital costs. And each eventual location involves a new allocation of capacity to the corresponding market region. Plant location is a continuous process

On the other hand, plant layout usually represents the physical arrangement of machines, equipments and other services within a pre-designed building with the assurity of steady, smooth and economical flow of material. It is also a continuous process, because there is always scope for enhancement over the existing design.

3. Production Planning and Control

Production planning and control includes the function of organizing the entire manufacturing system for producing a product. It is the planning for the production in manufacturing firm prior to the commencement of the actual production and then controlling it in order to make sure that the planned production is achieved in terms of quality, quantity, cost of its production and schedule of delivery.

Production planning and control is the foremost activity of production process wherein firms make decisions regarding the materials and physical facilities so as to optimally achieve the pre-determined objectives. It involves the planning, allocating and coordinating activities.

4. Quality Control

Quality control is usually a process in which the entire development process is inspected, analyzed deeply and suitably tested so as to make sure that the product produced satisfied all the specifications, which were laid prior to the development process.
When the product is analyzed through all the above mentioned processes, a feedback report is developed and is provided to the development team. This is an important activity through which, if any limitations existed in the product, can be easily eliminated. Hence, quality control mechanisms check to see that the product is up to date with all specifications and requirements.

Accounting information system

Accounting information system is the part of organizations information system. The information system processes a mixture of quantitative and qualitative data but the accounting information system focuses almost entirely on processing quantitative data. The accounting system and information system must work together in an effective and efficient way.

Accounting information system provide efficient delivery of information needed to perform necessary accounting work and to assist in delivery of accurate and informative data to users especially those who are not familiar with the accounting and financial reporting areas itself. A high value of data

processing characterizes these applications. Data processing consists of 4 major tasks- data gathering, data manipulation, data storage, and document preparation.

Sources

- Procedures manual
- Management accounts / balance sheets
- Financial data
- Accounting policies
- Tax details
- Working capital

Types

- **General ledger system**:

This module helps organizations leverage the GL processing speeds available streamline accounting processes and reduce the period end close cycle.

- **Asset management:**

this module help streamline tracking, depreciation and maintenance scheduling of asset improve productivity with easier access to critical information derive maximum tax benefits and minimize risk of loss or damage to capital assets. It maintains an inventory of the company's long term assets.

- **Order entry system:**

it captures and manages different kinds of data relating to a transaction such as number of units sold customer billing.

- **Account receivable and payable system:**

this module helps organizations bill customers automatically from any sales channel, streamline accounts receivables processing and automate the invoicing process.

- **Inventory control system:**

it captures processes and manages all issues related to the company's inventory such as items in inventory, inventory cost, lost items and damages items.

- **Payroll system:**

it captures and processes data related to salaries including taxes, other deductions, benefits, overtime and other related data.

- **Cash management:**

this module helps organizations forecast cash flows in any currency and in multiple time periods, streamline the reconciliation process, monitor exceptions and fraud and manage the cash cycle efficiently with control.

Financial information system

Financial information system is a sub system of organizational management information system. This sub system supports the decision making process of financial functions at the level of an organization.

A brief description of each of the financial decisions that a financial manager has to take is given below.

- **Capital budgeting decision:**

In this decision funds are allocated to long term asset which would yield benefits in the future. Example: funds allocated for land, building, machinery, etc...

- **Financial decision:**

The financial manager has to decide about the proportion of equity and debt capital.

- **Dividend decision:**

This decision relates to the dividend policy of the organisation. A decision whether the organisation should distribute all profits or retain them or distribute a portion and retain the balance has to be taken by the financial managers.

- **Current asset management:**

In order to safeguard the organization against liquidity or insolvency current assets of the organisation are also required to be efficiently managed.

Human resources information system

This functional information system supports the functions of human resource management of an organization. The function involves:

(i)Manpower planning

It is about deciding the present and future needs of manpower in the organisation.

(ii) Staffing

This function includes recruitment, selection and placement of employees. Recruitment refers to attracting qualified and competent people for different jobs.

(iii) Training and development

The need to train and develop the employees is felt due to

A gap between the job requirements and competence of the employee.

The need to develop lower level managers to assume higher level responsibility when required.

(iv)Performance evaluation

This task is concerned with evaluating employee performance at work in terms of pre determined standards and norms. Evaluation or performance appraisal includes the formulation of performance appraisal plans, development of appraisal techniques and programs etc...

(v) Separation activities

The employee employer relations may come to an end due to the resignation of an employee, layoff, death or retirement. HRM besides the above mentioned functions is also responsible for the wages and salary administration, sustaining and maintaining the work force in the organization and maintaining of healthy and peaceful labor management relations.

It contains 3 function flow of human resource information system.

- **Transaction data:**

It is a basis for various types of output information or analysis. The data includes employee number, name, qualification, experience, joining data etc... Categories and grades of posting and daily performance etc....

- **Environmental data:**

Includes data about the availability of personnel, trends in the labor force, competition, market offering to the employees, government and labor laws etc...

- **Organizational plans:**

It also provides an important input in human resource information system, on the basis of which future planning for recruitment, job assignment, etc...

CRM

Meaning

The concept of customer relationship management as a cooperative and collaborative process has tended to be more common. Its purpose is mutual value creation on the part of the marketer and customer.

Definition

According to white whale, customer relationship management which is sometimes referred to as relationship or marketing or one to one marketing is defined by as: the integration is a process, culture and systems to recognize, differentiate, service and develop an organizations most valuable customers.

Processes in CRM

The key processes under CRM are as follows:

1. **Marketing**: This process involves decision regarding which customers to target, how to target customers, and what products to offer, how to price products and how to manage the actual campaigns targeting customers.
2. **Sell**: It focus on making an actual sale to a customer. The sell process includes providing the sale force the information they need to make a sale and then executing the actual sale.
3. **Order management**: The process of managing customer orders as they flow through an enterprise is important for the customer to track his order and for the enterprise to plan and executives order fulfillment.
4. **Call/services center**: It is often the primary point of contact between a company and its customer. Is center helps customer place orders, suggest products, solves problems, and provides information on order status.

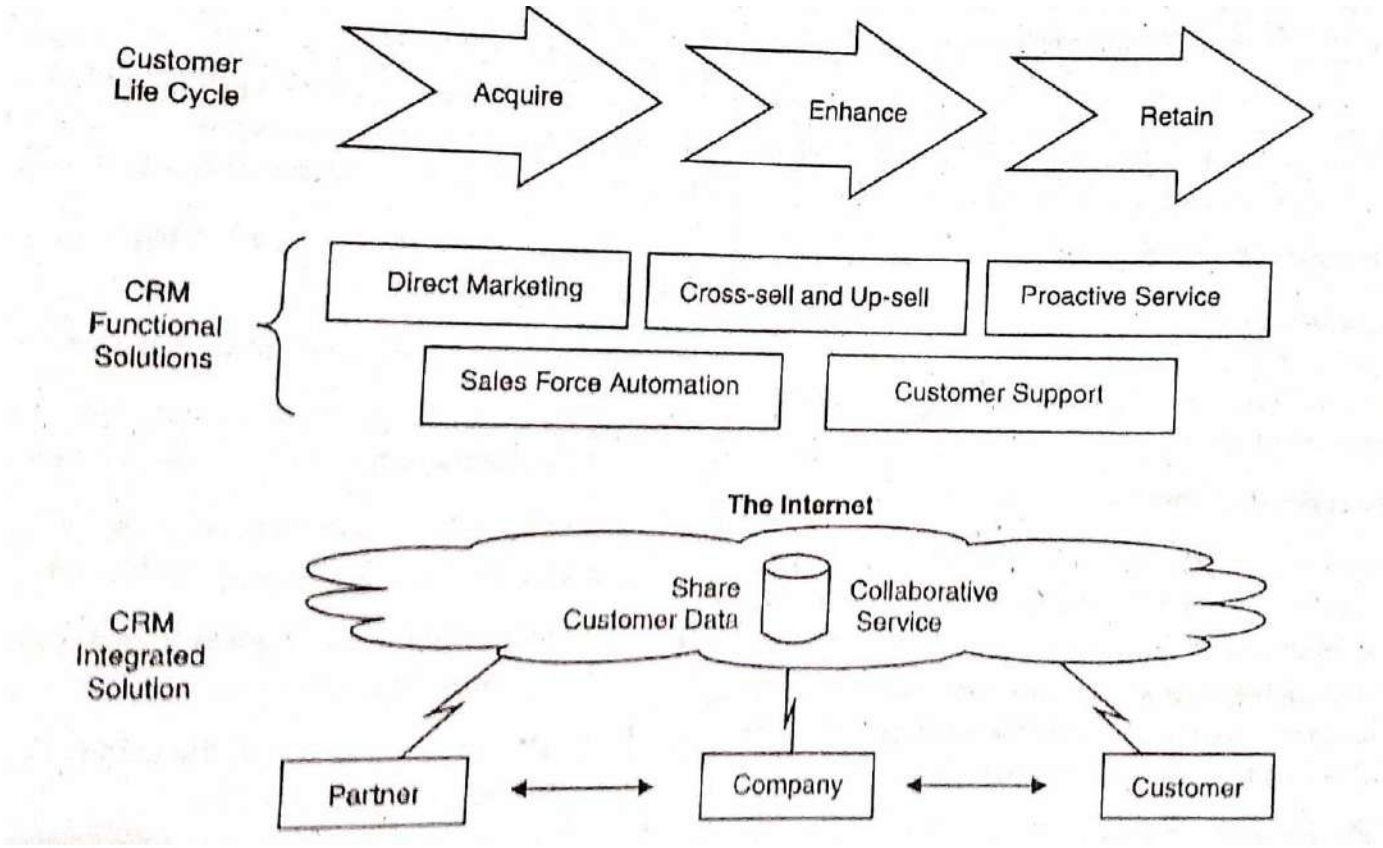
Different Phases of Customer Relationship Management

(1)Acquire

A business relies on CRM systems, which helps to acquire new customers by doing a superior job of contract management, sales prospecting, selling, direct marketing, and fulfillment. The goal of these CRM functions is to help customers perceive the value of a superior product offered by an outstanding company.

(ii)Enhance

Web-enabled CRM account management and customer service and support tools helps to keep customers happy by supporting superior service from a responsive networked team of sales and service specialists and business partners. CRM sales force automation and direct marketing and fulfillment tools help company's cross-sell and up-sell to their customers, thus increasing their profitability to the business. The value perceived by customers is the convenience of one-stop shopping at attractive prices.



(iii) Retain

CRM analytical software and databases help a company proactively identify and reward its most loyal and profitable customers to retain and expend their business via targeted marketing and relationship marketing programs. The value perceived by customers is of a rewarding personalized business relationship with "their company".

The benefits and failures of Customer Relationship Management

Benefits

- CRM allows a business to identify and target their best customers; those who are the most profitable to the business, so they can be retained as lifelong customers for greater and more profitable services.
- CRM enables real-time customization and personalization of products and services based on customer wants, needs, buying habits, and life cycles.
- CRM can keep track of when a customer contacts the company, regardless of the contact point.
- CRM enables a company to provide a consistent customer experience and superior service and support across all the contact points a customer chooses.

Failures

- Major reason for the failure of CRM systems is the lack of understanding and preparation.
- Rely on CRM to solve business problem without first developing the business process changes and change management programs that are required.
- CRM projects implemented without the participation of the business stakeholders

Different categories of Customer Relationship Management

Four types (or) categories of CRM that are being implemented by many companies today include:

(i) Operational CRM

Supports customer interaction with greater convenience through a variety of channels.Synchronizes customer interactions consistently across all channels.

(ii) Analytical CRM

Extracts in-depth customer history, preferences, and profitability information from data warehouse and other databases. Allows analyzing, predicting, and deriving customer value and behavior and forecasting demand. Customers are given offers that are tailored to their needs.

(iii) Collaborative CRM

Enables easy collaboration with customers, suppliers, and partners. Improves efficiency and integration throughout the supply chain. Allows greater responsiveness to customer needs through sourcing of products and services outside of your enterprise

(iv) Portal-based CRM

Provides all users with the tools and information that fit their individual roles and preferences. Empowers all employees to respond to customer demands more quickly and become truly customer-focused. Provides the capability to instantly access link, and use all internal and external customer information.

BPR

Evolution of BPR:

Business process reengineering, also called BPR, is the redesign and analysis of workflow, in an effort to make it more efficient.

In the early 1990's, Michael Hammer and James Champy published a book, "Reengineering the Corporation", that stated that in some cases, radical redesign and reorganization within a company were the only way to reduce costs and improve service quality. To this end, they said, information technology was the key element for allowing this to happen.

Hammer and Champy said that most large companies made (now invalid) assumptions about their goals, people and technology that were limpacting the workflow. They suggested seven principles

that could be used to reengineer and help streamline workflows, thus improving quality, time management and cost.

Hammer and Champy suggested the following seven principles in their book.

1. Organize around outcomes, not tasks.
2. Identify all the processes in an organization and prioritize them in order of redesign urgency.
3. Integrate information processing work into the real work that produces the information.
4. Treat geographically dispersed resources as though they were centralized.
5. Link parallel activities in the workflow instead of just integrating their results.
6. Put the decision point where the work is performed, and build control into the process.
7. Capture information once and at the source.

Essentially, for a successful BPR effort, it is important to look at all the tasks that are working to achieve the same goal. This exercise can then allow several jobs to be combined into one.

In addition, parallel processes leading to the same outcome should be connected within the process rather than just combining results at the end. Also, it is important to look at all available resources and place the actual work where it makes the most sense.

To make the process most efficient, the power to make decisions regarding it should be given to the people performing the process and any unnecessary control systems should be eliminated.

Instead of having extra processes to record Information relating to the process, a resource within the process should provide all necessary data to increase accuracy and reduce redundancy

Development after 1995

With the publication of critiques in 1995 and 1996 by some of the early BPR proponents, coupled with abuses and misuses of the concept by others, the reengineering fervor in the U.S. began to wane.

Since then, considering business processes as a starting point for business analysis and redesign has become a widely accepted approach and is a standard part of the change methodology portfolio, but is typically performed in a less radical way than originally proposed.

More recently, the concept of Business Process Management (BPM) has gained major attention in the corporate world and can be considered a successor to the BPR wave of the 1990s, as it is evenly driven by a striving for process efficiency supported by information technology. Equivalently to the critique brought forward against BPR, BPM is now accused of focusing on technology and disregarding the people aspects of change.

Business Process Reengineering

Meaning

Business process reengineering (BPR) is the practice of rethinking and redesigning the way work is (- done to better support an organization's mission and reduce costs.

Advantages

(i) BPR revolves around customer needs and helps to give an appropriate focus to the business.
(ii) BPR provides cost advantages that assist the organization's competitive position.
(iii) BPR encourages a long-term strategic view of (i operational processes by asking radical questions about how things are done and how processes could be improved.
(iv) BPR helps overcome the short-sighted approaches that sometimes emerge from excessive concentration on functional boundaries. By focusing on entire processes the exercise can streamline activities throughout the organization.
(v) BPR can help to reduce organizational complexity by eliminating unnecessary activities.

Criticisms

(i) BPR was sometimes seen (incorrectly) as a means of making small improvements in existing practices. In reality, it should be a more radical approach that questions whether existing practices make any sense in their present form.
ii) BPR was often perceived (incorrectly) as a single, once-for-all cost-cutting exercise. In reality, it is not primarily concerned with cost cutting (though cost reductions often result), and should be regarded as on-going rather than once-for-all. This misconception often creates hostility in the minds of staff who see the exercise as a threat to their security.
(iii) BPR requires a far-reaching and long-term commitment by management and staff. Securing this is not an easy task, and many organizations have rejected the whole idea as not worth the effort.
(iv) In many cases business processes were not redesigned but merely automated.
(v) In some cases the efficiency of one department was improved at the expense of the overall process. To make BPR work requires a focus on integrated processes (as discussed above) that often involves obliterating existing processes and creating new ones.
(vi) Some companies became so focused on improving internal processes that they failed to keep up with competitors' activities in the market.

Objectives of BPR

When applying the BPR management technique to a business organization the implernentation team effort is focused on the following objectives:

(i) Customer Focus

Customer service oriented processes aiming to eliminate customer complaints.

(ii) Speed

Dramatic compression of the time it takes to complete a task for key business processes. For instance, if process before BPR had an average cycle time 5 hours, after BPR the average cycle time should be cut down to half an hour.

(iii) Compression

Cutting major tasks of cost and capital, throughout the value chain. Organizing the processes a company develops transparency throughout the operational level reducing cost.
For instance the decision to buy a large amount of raw material at 50% discount- is connected to eleven cross checking in the organizational structure from cash flow, inventory, to production planning and marketing.

These checking become easily implemented within the cross-functional teams, optimizing the decision making and cutting operational cost.

(iv) Flexibility

Adaptive processes and structures to changing conditions and competition. Being closer to the customer the company can develop the awareness mechanisms to rapidly spot the weak points and adapt to new requirements of the market.

(v) Quality

Obsession with the superior service and value to the customers. The level of quality is always the same controlled and monitored by the processes, and does not depend mainly on the person, who servicing the customer.

(vi) Innovation

Leadership through imaginative change providing to organization competitive advantage.

(vi) Productivity

Improve drastically effectiveness and efficiency. In order to achieve the above mentioned adjectives the following BPR project methodology is proposed.

Business process reengineering is a radical change activity that cannot be repeated if it goes wrong the first time. It is often a high risk activity that involves monetary investment and a risk of demotivated employees. In is essential to have buy in all the way from top management down and it should have a broad functional scope.

ERP SYSTEM

What is ERP and the Evolution of ERP

Meaning

Enterprise Resource Planning (ERP) consists of techniques and concepts to improve the efficiency of integrated business management and to make effective use of the management resources ERP packages contain functions for the management of primary business processes and fundamental planning for different ERP modules like sales management, product management, financial and accounting systems, etc. These packages contains functions not only for manufacturing industry but for various types of industries) It uses an ERP software to model and automate many core processes of the business. It integrates major business processes of an organization such as customer order fulfillment and manufacturing that allows the information to flow automatically.

Evolution of ERP

Enterprise Resource Planning (ERP) is evolved in number of steps. The following figure shows the evolution of ERP.

1. Inventory Management and Control

Inventory management and control evolved in the year 1960. It combines the business processes and information technology to maintain the appropriate inventory stock level in a warehouse. The inventory management performs the activities that include determining the requirements for

inventory, providing techniques and options for replenishment, setting targets, examining the usages of items, reporting the status of inventory and unifying the inventory balances.

2. MRP

In mid 1960's Bill of Materials (BOM) was The main stream. The growth in the BOM process resulted in MRP (Materials Requirement Planning). MRP has evolved in 1960's but it become popular in 1970s, It fulfilled the needs of manufacturing and production people mainly in ordering

materials and components. To know the products that are going to be produced in the industry MRP makes use of Master Production Schedule (MPS). It gets the information about the required material from the BOM and stock related details from inventory records. With MRP manufacturing process became simple.

3.Closed-loop MRP

Apart from preparing material reordering schedules, MRP even records all the order due dates and reminds if an item failed to arrive on the due date. This will be useful in production process to reduce uncertainty These capabilities resulted in the development of new tools and techniques for requirement planning, production schedules, sales planning, capacity planning, forecasting, production levels and atomizing processes across entire organization. These achievements finally, helped in the creation of closed loop MRP

Closed-loop MRP evolved in 1970, which included series of functions to automate production processes and supports planning and execution. It gives priorities to the processes and depending on these priorities it updates the planning functions.

4.MRP II

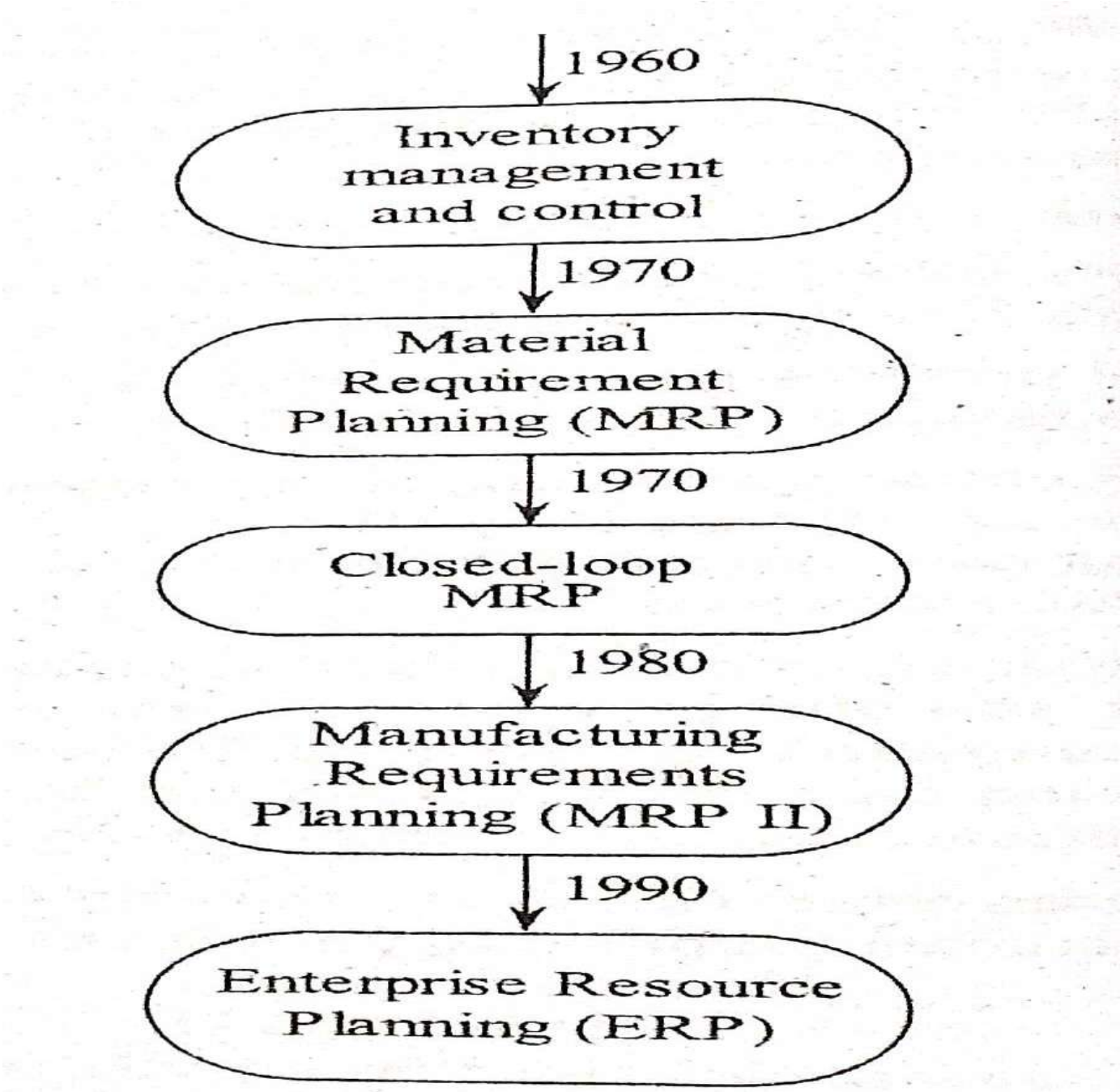
MRP II (Manufacturing Resource Planning) evolved after the closed-loop MRP. It includes some extra features like operational planning, financial interface and capabilities for decision-making. It includes functions related to execution support systems, capacity requirements planning, demand management, production planning, material requirement planning, master scheduling, business planning, sales and operational planning. The results from the above functions is integrated based on the financial reports, shipping budget etc.

5.ERP (Enterprise Resource Planning)

ERP has evolved in 1990, the basics of ERP are similar to MRP II. It is an extension of MRP and includes the capabilities of MRP II.

To improve the level of performance of business processes ERP makes use of multi-module application software.-It includes application modules for finance, accounting, human resources and marketing. They integrate 'business activities from different functional departments such as production planning, inventory control, order fulfillment, order tracking, purchasing and product distribution.

ERP is a collection of planning and scheduling tools, it connects suppliers, customers and provides foundation for effective supply-chain management and e-commerce. It coordinates sales, operations, logistics, marketing, finance, human resource, purchasing and product development. It focuses at productivity cost reduction, inventory turnover and customer services. ERP contains only one set of resource planning tools for entire enterprise.



Life Cycle of ERP

1.Pre-selection Screening

This is the first phase of the ERP implementation system. When an organization decides to use the ERP system, it initially searches for the best ERP package. There are many packages available in the market and most of them are similar to each other.

The companies choose few packages to evaluate their features. It is better to limit the selection to not more than five. This is because, the process of package evaluation is time consuming. Each package has its own merits and demerits, the pre-selection screening process eliminates those packages which are of no use to the organization.

2. Detailed Package Evaluation

This is an important phase in the implementation of ERP system, since it determines whether the selected package results in the successful project or an unsuccessful project. Before purchasing the package, it is necessary to ensure that the purchased package alone can perform the required functionality. This is because if the selected package fails, then it is very difficult to switch to another process as it consumes both time as well as cost. While analyzing the package, the decision-making team should note that none of the packages are capable of fulfilling all the requirements of the company.

Therefore, the primary objective of selection process is not to search for the package that fulfill

all the requirement of the company but to identify a package that is flexible for satisfying the requirements of the company.

3.Project Planning Phase

In this phase, the designs of implementation process is carried out by a committee consisting of team leaders. This committee is in turn supervised by ERP incharge who regularly review the planning process.

4. Gap Analysis

It is one of the important phase of ERP implementation. In this step, the company develops a model that determines the existing progress level of the company and also the level where the company is deciding to move in the future. In other words, it can be said that, the model developed helps in determining the functional gaps. While evaluating the ERP packages, it has been inferred that even the best ERP package is not capable of fulfilling all the functional requirements of the company.

5. Reengineering

This phase considers the human factors that effect the ERP implementation. Re-engineering have been used as a "downsizing" tool by the top management officials to reduce the number of employees

working in the organization. They have made purchase of the ERP package as the basis of the cut-down in employee strength.

The implementation of the ERP system changes the business process and employee responsibilities and makes the process easy and efficient. Therefore, implementation of ERP system must be considered as an investment for growth of the business rather than a tool to reduce the number of employees. In addition to this, another perspective of reengineering in ERP field is Business Process Reengineering (BPR), which is an ERP implementation mode.

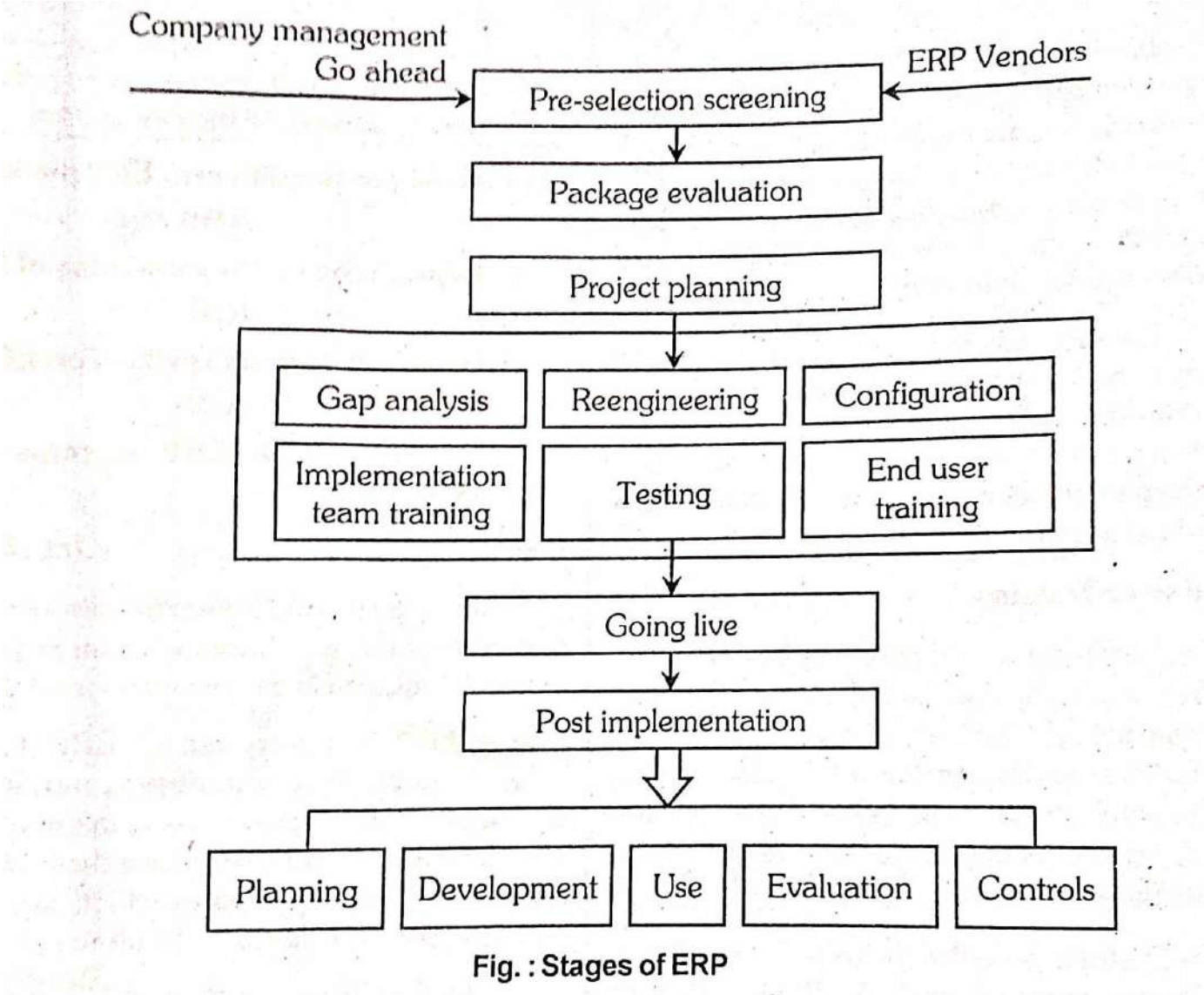


Fig. : Stages of ERP

6. Customization

It is one of the major functional area of ERP implementation process. As an ERP package is not perfect in satisfying all the requirements of a company, it is necessary to configure and customize the existing business process with regards to the ERP package.

This is done by completely under-standing the business processes and then mapping these processes such that they matches with the overall objectives of the company. However, while performing the mapping activity it is necessary for the company to simultaneously perform their operations. This can be achieved by developing a prototype which generally is a simulation of the actual business process.

7. Team Training

When the customization phase is underway, the management starts training the employees regarding the way of implementing the system. The employees are trained to adapt to the change bought by the ERP system and to run the business process in a new and efficient way. The employees are selected based on their capabilities and knowledge i.e., employees who are enthusiastic, good learners and have the potential are trained to use the ERP system.

8.Testing

Testing is a phase where the capability of the implemented system is tested. The system is tested so as to determine what actions are carried out when,

(1) An invalid data is entered

(ii) Hacker tries to hack into the system

(iii) The system is overloaded

9.Going-live

It is a phase where the ERP system is practically implemented by all the members of the organization. From the technical perspective, all the required operations are performed including the data conversion. And from the functional perspective, the prototype is configured, tested and is used for performing the activities. The ERP system is considered operational even if the implementation team members are testing and executing it successfully only for certain period of time. Whenever, the new system is being implemented, then the existing system needs to be removed.

10.End-user Training

This phase is performed prior to going-live phase. In this phase, the end-users (i.e., the real users) who are going to use the ERP system and carryout the business activities are trained. Depending upon the capabilities, talent and skills, the employees are distributed among different groups and trained about the new system. This training helps the users to get used to the new system and understand their responsibilities regarding the new method of business process. This training is of high importance as the success and failure of the ERP system depends on the usage of the end-users.

Apart from this, the users are also trained about the task that they needs to perform after the ERP system goes live. However, because of the ignorance towards computers and technology, many people are scared to leave the traditional ways of business process. This makes it difficult for them to get adapted to new system and hence they become resistant towards the change. So, to overcome these situations, the top management of the company needs to take necessary measures such as interacting with the employees and building confidence in them.

End-user training is not only important but is also a complex process in contrast to the implementation team training. Hence, end-user training is taken up seriously and is given high priority by the organizations.

11. Post Implementation Phase

This phase deals with the operation and maintenance of the installed ERP system. After the implementation of the ERP system, the responsibilities of vendors and consultants are completed. Now, to achieve the benefits of ERP system it needs to be adapted by every individual employee of the organization. The employees or the users must be capable of handling any problem that may arise during the implementation of the new system. The company consists of technical expertise who have the ability of performing any improvements and enhancements within the system irrespective of the time.

Various Modules of ERP

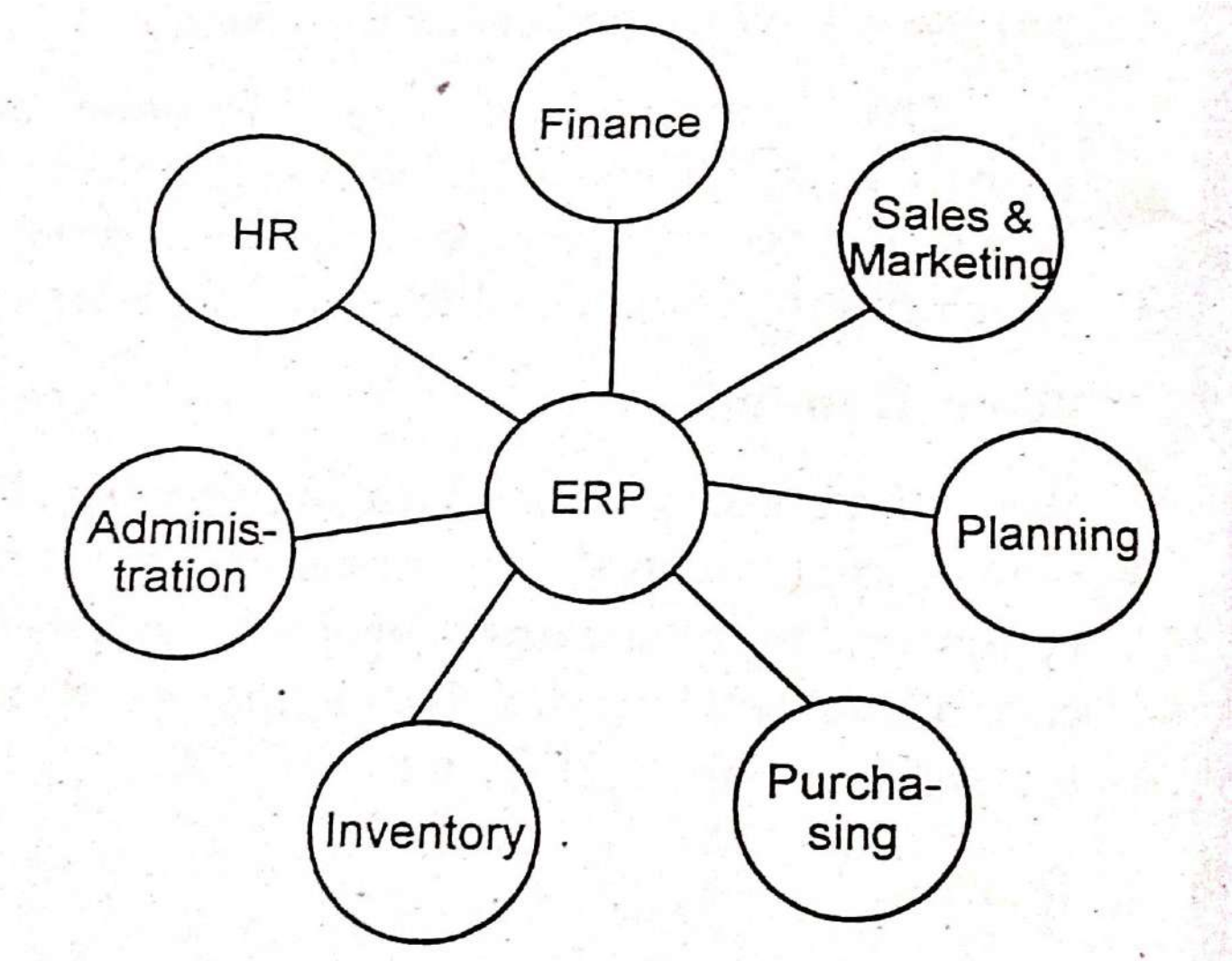


Fig. : Modules of ERP

In today's world Enterprise Resource Planning is termed as intelligent business solution that works to enhance productivity and increase profitability. The main purpose of ERP system is to interconnect different departments within an organization and improve flow of information. An ERP system consist several erp modules that work to improve different business processes which leads to overall increase in the efficiency of workforce.

In simple language, an ERP module can be referred as a group of software programs that performs an important function in ERP software. Let's take a look at different ERP modules present in ERP software.

i) Administration module

The admin module in the ERP looks over defining and assigning role to User's. in simple language, it tells who has to do what in the ERP system. It also controls and manages User's password policy. User session tracking, back-up, and database check are some of the functions and routine activities performed by Admin module.

(ii) Finance module

It is one of the important ERP modules. The finance ERP module collects financial data and generates reports such as quarterly financial statements, overall balance sheets, Profit and Loss A/c, Creditors balance, ledgers and several other financial reports. The finance ERP module is capable of taking care of all financial entries in the database and their effect on the system

(iii) Sales and Marketing module

The Sales ERP module manages different business processes such as order scheduling, order placement, order execution, invoicing, and shipping.

Some ERP software companies offer combined Sales and Marketing module in ERP system. A combined Sales and Marketing module also handles business processes such as direct mailing campaign, lead generation and several other important marketing and sales functions.

(iv) Human Resources module

The main function of ERP HR module is to maintain employee data such as contact information, attendance, salary details, performance evaluation and several other important employee details. The HR ERP module stores and manages all employee information from application to retirement. In some ERP software solutions, the HR ERP module is divided in four major sections that include Recruitment, Training, Attendance and Payroll functions.

(v) Inventory module

The primary function of ERP Inventory module is to maintain appropriate stock in a warehouse. The module recognizes inventory requirement, monitor item utilization, provide replenishment options, and report inventory status of all items in warehouse.

(vi) Purchasing module

The purchasing ERP module streamlines procurement of raw materials. Different processes such as recognizing potential suppliers, price negotiation, awarding purchase order and billing requires no human intervention. The Purchase module is strongly integrated with other modules such as production planning, inventory control to avoid over purchasing.)

These are some of the functional ERP modules in a generic and customized ERP system. Nowadays, large and small businesses approach ERP Software Company to order customized ERP solutions. When you order a customized ERP solution for your business, the ERP software company developing the software studies different business processes within your organization and designs and develops an ERP system that streamlines flow of information and enhances efficiency of all employees. A customizer ERP system may contain ERP modules other than mentioned above.

Some of the Emerging trends in ERP market

Modem companies are putting an end to legacy systems and consolidating their fragmented IT environment. Moreover, small companies are also getting ready to implement integrated business systems. The AMR report gives the following trends of ERP market in the year 2004.

1. The use of Service-Oriented Architecture (SOA) in ERP packages is a major step towards new technology. The ERP market has already started this transition phase.

2. Big companies are acquiring small ERP firms. Recently, Oracle acquired 'Retek' even though it had already acquired PeopleSoft and JD Edwards. Moreover, small ERP vendors like Sage group, Epicor, SSA global etc., are actively participating in mergers and acquisitions and hence their market is rapidly increasing.

3.Now-a-days ERP customers do not purchasing large, up-front packages. Instead they are buying functional ERP modules incrementally. This paved way for discounting and smaller deals.

4. The vendors of ERP offers with large number of solutions related to enterprise application such as CRM and SCM. These applications are sold to present ERP customer base we observe that many specialized enterprise application vendors are taken over by large enterprise vendors as their survival becoming difficult.

The issues related to ERP maintenance and support

1.Managing Transitions

The ongoing maintenance and support of ERP system is based upon how successful is the transition from implementation to support team. The management of ERP implemen- tation and support is done by two different teams. In other words, the support team must acquire necessary knowledge transfer document handover and changes of open issues from implementation team.

As soon as the implementation team finishes its project, it leaves the site within weeks of 'Go Live'. After this, the new team acquires the site and manages the system. At this point, the support team faces the challenges in the inception because, there exist various issues.

2.Managing Multiple Vendors

The organization demands one or many individual vendors for support of the ERP such that one vendor for hardware support and other vendor for network support. This becomes a challenge as issues flow from one support to another.

3.Managing Regular Upgrades

Many ERP vendors consistently provide latest upgrades of their packages. Consequently, the ERP systems does not support the older versions of the packages. But, these systems needed to be updated even though the latest versions offers many new features which are of no use to the ERP vendors..

This updation can be expensive at time. As a consequence most of the companies perform only technical upgradation, this ascertains that the vendors are capable of supporting latest versions. The vendors treat every single upgrade as an individual project which consumes financial and different organizational resources.

4.Getting Right People

Getting the right people and making them do the same job regularly is a big challenge because highly qualified people show interest in new implementation rather than continuing in support role. As a consequence many organizations these days hire expertise IT organization to handover ERP maintenance job.

5.Technology Obsolesce

The outdated technology or technology obsolesce is said to be a biggest challenge in ERP systems. We observe that SaaS and cloud computing alters those models in which ERP solutions are established without the hardware and software investments. While the business requirements demands large developments previously, but now they are treated as a part of standard applications.

The SOA is new software development model whereas mobile collaborative applications are the necessity. Thus, organizations should manage technology obsolesce and newly introduced technologies in an effective way.

6.Managing Large Application Portfolios

The ERP vendors introduces various applications for a particular business needs such as data warehousing applications reporting applications, supplier relationship management applications, customer relationship management applications and product life cycle management applications. Interestingly, such applications are obtained from multiple vendors such as ERP from SAP, CRM from siebel and SRM from Ariba. Thus, management of these portfolio could be a challenging task for one or many vendors as they may have different support skills

The challenges for the implementation of ERP system

- ERP systems are very expensive to purchase and implement.
- Extensive change is required to existing process.
- It can be difficult to integrate the ERP systems with existing legacy systems.
- There is an inherent risk associated with having a single vendor for all information systems.

- The risk and impact of implementation failure is increased.
- The conversion of data to the ERP systems from legacy systems is a complex process.

Supply chain management

Supply chain management (SCM) is a management concept that integrates the manage- ment of supply chain processes. Many companies are making SCM a top strategic objective of their E-business initiatives. It is an absolute requirement if they want to meet their E-commerce customer value imperative. Companies are reengineering their supply chain processes through the aid of Internet technologies and supply chain management software.

Definitions

(i)According to Jones and Riley, "Supply chain management deals with the total flow of material from supplier through end user".

(ii) According to Cooper and Ellram, "Supply chain management is an integrative philosophy to manage the total flow of distribution channel front the supplier to the ultimate user".

(iii) According to Marty Weil, "Supply chain management is the ability to get closer to the customer".

(iv) According to Professor Douglas M. Lambert, "Supply chain management as the integration of business process from the end user through original suppliers who provide products, services, and information that adds value for the customer".

The goal of supply chain management is to:

- Give customer what they want
- Give customers what they want, and where they wants it
- Give customers what they want, where they want it, and at the lowest possible cost.

Evolution of supply chain management

1. Creation Era

The term supply chain management was first coined by a U.S. industry consultant in the early 1980s. However, the concept of a supply chain in management was of great importance long before, in the early 20th century, especially with the creation of the assembly line. The characteristics of this era of supply chain management include the need for large-scale changes, re-engineering, downsizing-driven by cost reduction programs, and widespread attention to the Japanese practice of management.

2. Integration Era

This era of supply chain management studies was highlighted with the development of Electronic Data Interchange (EDI) systems and developed through the introduction of Enterprise Resource Planning (ERP) systems. This era has continued to develop into the 21st century with the expansion of internet- based collaborative systems. This era of supply chain evolution is characterized by both increasing value-adding and cost reductions through integration.

3.Globalization Era

The third movement of supply chain management development, the globalization era, can be characterized by the attention given to global systems of supplier relationships and the expansion of supply chains over national boundaries and into other continents. Although the use of global sources in the supply chain of organizations can be traced back several decades (e.g., in the oil industry), it was not until the late 1980s that a considerable number of organizations started to integrate global sources into their core business. This era is characterized by the globalization of supply chain management in organizations with the goal of increasing their competitive advantage, value-adding, and reducing costs through global sourcing.

4.Specialization Era-Phase One: Outsourced Manufacturing and Distribution

Companies abandoned vertical integration, sold off non-core operations, and outsourced those functions to other companies. This changed management requirements by extending the supply chain well beyond company walls and distributing management across specialized supply chain partnerships.

This transition also re-focused the fundamental perspectives of each respective organization. An Original Equipment Manufacturer (OEM) became brand owners that needed deep visibility into their supply base.

5.Specialization Era-Phase Two: Supply Chain Management as a Service

Specialization within the supply chain began with the inception of transportation brokerages, warehouse management, and non-asset-based carriers and has matured beyond transportation and logistics into aspects of supply planning, collaboration, execution and performance management.

At any given moment, market forces could demand changes from suppliers, logistics providers, locations and customers, and from any number of these specialized participants as components of supply chain networks. **6.Supply Chain Management 2.0 (SCM 2.0)**

Building on globalization and specialization, the term SCM 2.0 has been coined to describe both the changes within the supply chain itself as well as the evolution of the processes, methods and tools that manage it in this new "era".

Web 2.0 is defined as a trend in the use of the World Wide Web that is meant to increase creativity, information sharing, and collaboration among users. At its core, the common attribute that Web 2.0 brings is to help navigate the vast amount of information available on the Web in order to find what is being sought.

Objectives of Supply chain management

The objectives of supply chain integration are to supply superior quality goods faster, with efficient processes and in essence be more responsive to the perceptions of the marketplace and be able to change directions at will. Some of the consequences of supply chain integration result in.

1.Supply chain planning

Planning sets directions for the enterprise

2. Procurement

Establishing what needs to be purchased, selecting suppliers & managing relations with them, reducing costs, improving possibly raw material.

3.Inventory management

Managing levels of inventory in order to satisfy internal and external customers demand.

4.Packaging

Ensuring correct package design in order to encourage the recycling of packaging and reducing packages costs.

5.Facility design

This includes insuring the best design that suits the internal or external customers. Here we are concerned with the issue such as: Size, Lightning, facilities, equipment, safety and security.

10.

6.Warehousing

This includes stock management, efficient facility operations, layouts for effective transportation, safety, storage methods and equipment.

7.Transportation

This includes transportation modes, costs, transportation management, terminal utilization, and in-transit care of goods.

8.Reverse logistics

The reduction where possible of product errors so that reverse logistics may be reduced.

9.Logistics Systems

This includes decision support systems, technology and software

10.Customer service and marketing

This includes customer relationships, customer solicitation and retention and issues pertaining to the marketing mix variables.

State the functions of Supply chain management

1. Minimizing Uncertainty

Supply uncertainty due to unreliability of vendors, process planning information and joint attention to transport arrangements. Process uncertainty is due to machine breakdowns, uncertain yields and

absenteeism, which can be addressed through good maintenance practices, better technology, etc. Demand uncertainty can be reduced to some extent by forecasting techniques and by better communication with customers.

2.Reducing Lead Times

Lead times at the stages of procurement, conversion and distribution can be cut down by faster modes of transport, better planning practices and process technologies.

3.Minimizing the Number of Stages

In general, the number of stages that goods and services flow through adds to the complexity of SCM. Unification of tasks and reducing the number of stages make the coordination of decisions easier. This is the essence of another management concept, namely Business Process Re-engineering.

4.Improving Flexibility

Reducing set up or change overtimes in various processes and the use of flexible manufacturing and assembly techniques improves the flexibility of response. In transport, the use of smaller vehicles provides flexibility in making dispatches at short notice without being constrained by batching economies. As an extended principle, wherever possible, batch processes should be made continuous processes.

5.Improving Process Quality

A prerequisite to effective SCM in the light of reducing inventories and wastage is to do things right, the first time. This is deal for improving process quality. The techniques for this include statistical process control, root cause analysis of poor quality and improvement of process capability.

6.Minimizing Variety

Variety is one of the major causes for inventory in the downstream part of supply chains. One response appropriate promotion and branding. This will enable a better control of the supply chain, right from demand generation.

7.Delaying Differentiation

The value addition through product differentiation should be postponed as far as possible, so that precise customer needs can be met without holding committed stocks in the entire chain. There are numerous examples of how this can be done, such as shipping of component level goods to major points and assembling according to customer needs, postponing, finishing operations like grinding and mixing of additives to cement till near the final point of consumption, etc.

8.Kitting of Supplies

In assembly systems, a major source of delay is the staging delay where some components for assembly have to wait since matching components are not available. Vendors or internal facilities that supply components can be arranged so that all components required for an assembly (or major sub assembly) are manufactured or supplied to one stage where they are kitted into sets of matching

components, ready for assembly and further operations. This could involve some restructuring of vendors or internal activities and some vertical integration.

9.Focusing on 'A' Category

This is a well-known idea from classical economies and inventory theory, where items that account for a large part of the value, or which are critical, and/or customers who are significant, and / or territories that are important, receive special attention.

10. Planning for Multiple Supply Chains

doing better SCM would often require different supply chains for different customer segments based on response requirements. The tendency to club supply chains in the interest of efficiency can be counter - productive for effectiveness.

11. Modifying Performance Measures

These need to move from being single- actor focused to multi-actor focused in the supply chain. For example, in the context of a warehouse, instead of warehouse space utilization as the primary measure of warehouse performance the retrieval time would be more in tune with SCM, since this focuses on both the warehouse and the downstream actor. Similarly, a transporter like the railways would focus more on time taken for delivering a wagon / rake to a customer from the time the indent is placed, rather than wagon utilization / turnaround.

12.Competing on Service

The big opportunity in SCM for long - term competitive advantage is on the service aspects of value delivery to the customer. Product quality and features can only be short term advantages.

13. Moving from Functions to Processes

Improving supply chain practices will require integrated process orientation rather than functional organization. Job rotation, flatter and lean organizations will help.

14. Taking Initiatives at an Industry Level

This is very essential, especially in dealing with poor infrastructure. Industry level (rather than firm - level) initiatives in specific product categories can focus on say transport and/ or warehousing inadequacies and help to develop appropriate service providers. There is a big opportunity for third party logistics services here.

E-Commerce

Meaning

- Electronic commerce, commonly known as E-commerce is trading in products or services using computer networks, such as the Internet.

- Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems.
- Modern electronic commerce typically uses "The World Wide Web for at least one part of the transaction's life cycle, although it may also use other technologies such as e-mail.
- Sharing business information, maintaining business relationships and conducting business transactions using computers connected to telecommunication network is called E-Commerce.
- Interactive marketing, ordering, payment, and customer support processes at E- commerce sites on the World Wide Web
- Extranet access of inventory databases by Customers and suppliers
- Intranet access of customer relationship management systems by sales and customer service.
- Customer collaboration in product development via Internet newsgroups and E- mail exchanges.

Categories

1. Electronic Markets

Electronic Markets Present a range of offerings available in a market segment so that the purchaser can compare the prices of the offerings and make a purchase decision.

2.Electronic Data Interchange (EDI)

- It provides a standardized system
- A Coding trade transactions
- Communicated from one computer to another without the need for printed orders and invoices & delays & errors in paper handling
- It is used by organizations that a make a large no. of regular transactions

3. Internet Commerce

- It is use to advertise & make sales of wide range of goods & services.
- This application is for both business to business & business to consumer transactions.

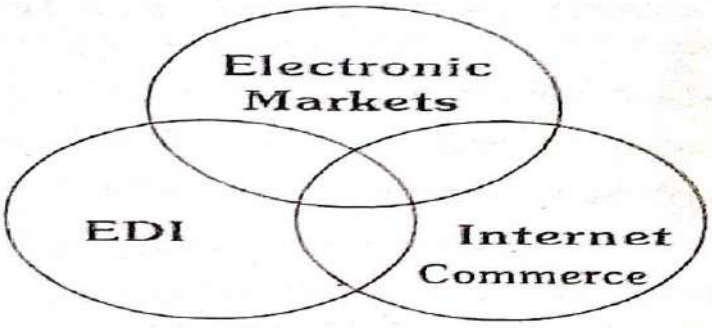


Fig.: The three categories of e-commerce

Scope

- Companies involved in E-commerce as either buyers or sellers rely on Internet-based technologies and E-commerce applications and services to accomplish marketing, discovery, transaction processing, and product and customer service processes.
- The Internet, Intranets, and Extranets provide vital electronic commerce links between the components of a business and its customers, suppliers, and other business partners.

The classification of E-Commerce

1. Business-to-Consumer (B2C) Commerce

In this form of electronic commerce, businesses must develop attractive electronic marketplaces to entice and sell products and services to customers. Companies may offer:

- E-commerce websites that provide virtual storefronts and multimedia catalogs.
- Interactive order processing
- Secure electronic payment systems
- Online customer support

2. Business-to-Business (B2B) Commerce

This category of electronic commerce involves both electronic business marketplaces and direct market links between businesses. Companies may offer.

- Secure internet or Extranet E-commerce websites for their business customers and suppliers.
- Electronic data interchange (EDI) via the Internet or Extranets for computer-to- computer exchange of E-commerce documents with their larger business customers and suppliers.
- B2B E-commerce portals that provide auction and exchange markets for businesses.

3. Consumer-to-Consumer (C2C) E- Commerce

Successes of online auctions like e-Bay, allow consumers (and businesses) to buy and sell with each other in an auction process at an auction website.

- Online consumer or business auctions are an important E-commerce alter- native for B2C or B2B E-commerce.
- Electronic personal advertising of products or services to buy or sell by consumers at electronic newspaper sites, consumer E-commerce portals, or personal websites is an important form of C2C E-commerce.

State the Advantages & Limitations of E-Commerce

Advantages of E-commerce

E-Commerce advantages can be broadly classified in three major categories.

1. Advantages to Organizations

2. Advantages to Consumers

3. Advantages to Society

1. Advantages to Organizations

- Using e-commerce, organizations can expand their market to national and international markets with minimum capital investment. An organization can easily locate more customers, best suppliers, and suitable business partners across the globe.
- E-commerce helps organizations to reduce the cost to create process. distribute, retrieve and manage the paper based information by digitizing the information.
- E-commerce improves the brand image of the company.
- E-commerce helps organization to provide better customer services.
- E-commerce helps to simplify the business processes and makes them faster and efficient.
- E-commerce reduces the paper work.
- E-commerce increases the productivity of organizations. It supports "pull" type supply management In "pull" type supply management, a business process starts when a request comes from a customer and it uses just-in-time manufacturing way.

2. Advantages to Customers

- It provides 24x7 support. Customers can enquire about a product or service and place orders anytime, anywhere from any location.
- E-commerce application provides users with more options and quicker delivery of products.
- E-commerce application provides users with more options to compare and select the cheaper and better options.
- A customer can put review comments about a product and can see what others are buying, or see the review comments of other customers before making a final purchase.
- E-commerce provides options of virtual auctions.
- It provides readily available information. A customer can see the relevant detailed information within seconds, rather than waiting for days or weeks
- E-Commerce increases the competition among organizations and as a result, organizations provides substantial discounts to customers.

3. Advantages to Society

- Customers need not travel to shop at product, thus less traffic on road and low air pollution.
- E-commerce helps in reducing the cost of products, so less affluent people can also afford the products.
- E-commerce has enabled rural areas to access services and products, which are otherwise not available to them.
- E-commerce helps the government to deliver public services such as healthcare, education, social services at a reduced cost and in an improved manner.

Limitations of E-Commerce

1. Security

The biggest drawback of e-commerce is the issue of security. People fear to provide personal and financial information, even though several improvements have been made in relation to data encryption. Certain websites do not have capabilities to conduct authentic transactions. Fear of providing credit card information and risk of identity limit the growth of e-commerce.

2. Lack of privacy

Many websites do not have high encryption for secure online transaction or to protect online identity. Some websites illegally collect statistics on consumers without their permission. Lack of privacy discourages people to use internet for conducting commercial transactions.

3. Tax Issue

Sales tax is another bigger issue when the buyer and seller are situated in different locations Computation of sales tax poses problems when the buyer and seller are in different states. Another factor is that physical stores will lose business if web purchases are free from tax.

4. Fear

People fear to operate in a paperless and faceless electronic world. Some of the business organizations do not have physical existence, People do not know with whom they are conducting commercial transactions. This aspect makes people to opt physical stores for purchases.

5. Product suitability

People have to rely on electronic images to purchase products. Sometimes, when the products are delivered, the product may not match with electronic images. Finally, it may not suit the needs of the buyers. The lack of 'touch and feel' prevent people from online shopping.

6. Cultural obstacles

E-commerce attracts customers from all over the world. Habits and culture of the people differ from nation to nation. They also pose linguistic problems. Thus, differences in culture create obstacles to both the business and the consumers.

7. High Labor cost

Highly talented and technically qualified workforce are required to develop and manage the websites of the organization. Since internet provides a lot of job opportunities, business organizations have to incur a lot of expenses to retain a talented pool of employees,

8. Legal issues

The cyber laws that govern the e-commerce transactions are not very clear and vary from country to country. These legal issues prevent people from entering into electronic contracts.

9. Technical limitations

Some protocol is not standardized around the world. Certain software used by vendor to show electronic images may not be a common one. It may not be possible to browse through a particular page due to lack of standardized software. Insufficient telecommunication bandwidth may also pose technical problems.

10. Huge technological cost

It is difficult to merge electronic business with traditional business. Technological infra- structure may be expensive and huge cost has to be incurred to keep pace with ever changing technology. It is necessary to allocate more funds for technological advancement to remain competitive in the electronic world.

The essential e-commerce processes required for successful operation of management

1. Access Control and Security

E-commerce processes must establish mutual trust and secure access between the parties in an E-commerce transaction by authenticating users, authorizing access, and enforcing security features.

2. Profiling and Personalization

Profiling processes gather data on an individual and their website behavior and choices, and build electronic profiles of your characteristics and preferences. User profiles are developed using profiling tools such as user registration, cookie files, website behavior tracking software, and user feedback.

3. Search Management

Efficient and effective search processes provide a top E-commerce website capability that helps customers find the specific product or service they want to evaluate or buy.

4. Content and Catalog Management

Content management software helps E- commerce companies develop, generate deliver, update, and archive text data, and multimedia information at E-commerce websites. E-commerce content frequently takes the form of multimedia catalogs of product information. Generating and managing catalog content is a major subset of content management.

Content and catalog management may be expanded to include product configu- ration processes that support Web-based customer self service and the mass customization of a company's products. Configuration software helps online customers select the optimum feasible set of product features that can be included in a finished product.

5. Workflow Management

E-business workflow systems help employees electronically collaborate to accomplish structured work tasks within knowledge-based business processes. Workflow management in both E-business and E-commerce depends on a workflow software engine containing software models of the business processes to be accomplished. The workflow model expresses the predefined sets of business rules,

roles of stakeholders, authorization requirements, routing alternatives, databases used, and sequence of tasks required for each E-commerce process.

6. Event Notification

Most E-commerce applications are event- driven systems that respond to a multitude of events. Event notification processes play an important role in E-commerce systems, since customers, suppliers, employees, and other stakeholders must be notified of all events that might affect their status in a transaction.

7. Collaboration and Trading

This category of E-commerce processes are those that support the vital collaboration arrangements and trading services needed by customers, suppliers, and other stakeholders to accomplish E-commerce transactions.

Various application of E commerce

1. Supply Chain Management

Supply chain management is the process of procuring the raw materials and distributing the products to suppliers, distributors as well as consumers. It is the link between the partners who are involved in the supply and processing of goods. With this the manufacturers and the customers can obtain their raw materials and products respectively.

2. Manufacturing e-Commerce

It is also being applied in supply chain operations of a company. Some of the companies can form an electronic exchange by clubbing together the buying and selling of goods, trade market information, and run back office operations, such as inventory control.

This approach can speed up the flow of raw material and finished products among the members of the business community, and this will reduce the inventory that is required to be maintained by the company. However, this model has its own limitations, as there may be various issues relating to strategic and competitive issues. Many companies may not trust their competitors and may fear that they may lose trade secrets through participation in such electronic exchanges.

3. Finance

Nowadays a large number of e-Commerce applications are also found in the area of finance Financial companies are applying e- Commerce in a big way. On-line banking enabled the customers to check balances of their saving and loan accounts, transfer money to other accounts, order for checkbooks, demand drafts online, pay their bill through E- Banking. Online stock trading is another important application of e- Commerce in the financial stock. Many sites provide access to news, charts, company profiles, and analyst ratings on the stocks.

4. Retail and Wholesale

There are a large number of e-Commerce applications in retail and wholesale. e-Tailing, is a popular term, being used for online retailing. It is a direct sale from business to consumer through electronic storefronts, which are designed using electronic catalog and shopping cart model. There are numerous electronic retail websites, selling directly to the consumers.

Cybermall, another way to support e- tailing, is a single website that offers many products and services at one web location. An Internet cybermall attracts multiple buyers and sellers together into one virtual space through a web browser. Similarly, e- Commerce sites are used in wholesale buying and selling by different companies.

5. Marketing

Most of the companies are forced to change their marketing strategies due to various pressure on the business.

They obtain information from E- commerce about the customers requirement and preference certain enhancements can be done through this information. A good relationship can be build and maintained with the customers through e-commerce.

The various methods of online payments

1. Cards

Online payment using cards can be divided into three types

(i) Credit cards

(ii) Debit cards

(iii) Charge cards

(i) Credit cards

If a customer purchased any product or service using credit card then he can simply transfer his card details to the service provider and then the credit-card company processes transaction.

(ii) Debit cards

In this type of retailing payment, the customer can pay in advance for enjoying the privileges of information to be retrieved. Examples for such prepaid payment system is electronic purse.

(iii) Charge cards

Charge-card is a way of getting a short- term loan for a purchase. It is similar to credit card, except that the customer makes an agreement with the financial institutions that he will pay some fixed charges to it each month. Example of charge-card payment includes American Express.

2. Internet

Online payments involve the customer transferring money or making a purchase online via the internet. Consumers and businesses can transfer money to third parties from the bank or other account, and hey can also use credit, debit and prepaid cards to make purchases online.

Current estimates are that over 80% of payments for online purchases are made using a credit card or debit card. At present, most online transactions involve payment with a credit card. While other forms of payment such as direct debits to accounts or pre-paid accounts and cards are increasing, they currently represent a less developed transaction methodology.

3. Mobile Payments

Mobile phones are currently used for a limited number of electronic transactions. However, the percentage seems likely to increase as mobile phone manufacturers enable the chip and software in the phone for easier electronic commerce.

Consumers can use their mobile phone to pay for transactions in several ways. Consumers may send an SMS message, transmit a PIN number, use WAP to make online payments, or perform other segments of their transaction with the phone. As phones develop further, consumers are likely to be able to use infrared, Bluetooth and other means more frequently to transmit full account data in order to make payments securely and easily from their phone.

4. Biometric Payments

Electronic payments using biometrics are still largely in their infancy. Trials are underway in the United States, Australia and a limited number of other countries. Most biometric payments involve using fingerprints as the identification and access tool, though companies like Visa International are piloting voice recognition technology and retina scans are also under consideration. Essentially, a biometric identifier such as a fingerprint or voice could replace the plastic card and more securely identifies the person undertaking the transaction. The electronic payment is still charged to a credit card or other account, with the biometric identifier replacing the card, check or other transaction mechanism.

Defines EDI

Electronic data interchange (EDI) involves the electronic exchange of business transaction documents over the Internet and other networks between supply chain trading partners (organizations and their customers and suppliers). Data representing a variety of business transaction documents are electronically exchanged between computers using standard document message formats.

Characteristics of EDI software include:

- EDI software is used to convert a company's own document formats into standardized ED! formats as specified by various industry and international protocols.
- Formatted transaction data are transmitted over network links directly between computers, without paper documents or human intervention.
- Besides direct network links between the computers of trading partners, third-party services are widely used.

- EDI eliminates the printing, mailing, checking, and handling by employees of numerous multiple-copy forms of business documents.

Benefits of the business use of EDI include:

- Reduction in paper, postage, and labor costs
- Faster flow of transactions as formatted transaction data are transmitted over network links directly between computers, without paper documents or human intervention.
- Reductions in errors
- Increases in productivity Support
- Reductions in inventory levels
- Value-added network companies offer a variety of EDI services. They can offer secure, lower cost EDI services over the Internet.
- Smaller businesses can now afford the costs of EDI services.

Decision support systems (DSS) and characteristics of decision support systems

Meaning

The term DSS refers to a class of systems, which supports the process of making decisions. The Emphasis is on "support" rather than on automation of decision. DSS allow the decision maker to retrieve data and test alternative solutions during the process of problem solving.

Definition

According to Scott Morton, "DSS as interactive computer based systems, which help decision makers utilize data and model to solve unstructured problems".

Examples of DSS:

- Group DSS
- Computer support Co-operative work
- Logistics systems
- Financial planning system

Characteristics

- **Provide rapid access to information**: some DSS provides fast the dashboard of a car or truck are used to see how the vehicle is running.
- **Handle large amount of data from different sources**: advanced database management systems and data warehouses have allowed decision makers to search for information with a DSS even when some data resides in different databases on different computer systems or network.
- **Provide report and presentation flexibility**: managers can get the information they want presented in a format that suits their needs. Produce text, tables, line drawings, pie charts, trend lines, and more.

- **Support drill down analysis**: a manager can get more levels of detail when needed by drilling down through data.
- **Perform complex, sophisticated analysis and comparisons using advanced software packages**: marketing research surveys.

The components of the decision support system

A Decision Support System comprises of three main components.

i) A database;

ii) Model base; and

iii) Software providing interactive dialogue facility for the manager

(i) Database

The data in the database typically is a combination of master files (internal corporate data) and data from external sources.

(ii) Model Base

The second component of the DSS is a library of models to manipulate and analyse the data in the desired ways. The model base might include econometric models to forecast demand by industry and simulation models of the corporation.

(iii) Dialogue Box

A user interface is the third component. Through this, the user can communicate with the DSS. The physical interface generally consists of a terminal hooked up to the mainframe computer, either directly or by telephone. Micro-computers with modems are being used ever more frequently for this interface.

Why decision support system are necessary for today's environment

Having discussed the conceptual frame work for decision-making, let us now understand the need for computerized decision support systems. These systems have become necessary for today's manager because of the following reasons:

(i) Fast Computation

A decision-maker can perform a large number of compu-tations very quickly and that too at a low cost with the help of computer support systems. Today, in majority of the decisions, time is the essence.

(ii) Enhanced Productivity

Support systems can enhance productivity of support staff and also enable the group members to discuss the problems among themselves at a distance.

(iii) Data Transmission

Sometimes the data, which may be stored at different locations, may be required to be transmitted quickly from distant locations. Computer support systems can search, store, and transmit the required data quickly and economically

(Iv)Better Decisions:

Computer support systems can help a decision-maker in arriving at a better decision. For example, more alternatives can be evaluated, risk analysis be performed quickly, and views of experts from different places can be collected quickly and at a lower cost.

(v) Competitive Edge:

Decision support systems enable the users to get a competitive edge over their competitors as these systems enable organizations to change their operations frequently, re-engineer processes and structures, empower employees and innovate. Decision support technologies can create useful empowerment by allowing people to make good decisions, even if they lack some knowledge.

In view of the above-stated reasons, decision support systems are important tools in the hands of decision-makers, which come handy especially in their semi-structured to unstructured problems.

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Simons model of decision making

Herbert Simon made key contributions to enhance our understanding of the decision-making process. In fact, he pioneered the field of decision support systems. According to (Simon 1960) and his later work with (Newell 1972), decision-making is a process with distinct stages. He suggested for the first time the decision-making model of human beings. His model of decision-making has three stages:

1**. Intelligence** which deals with the problem identification and the data collection on the problem.

2**. Design** which deals with the generation of alternative solutions to the problem at hand.

3. **Choice** which is selecting the 'best' solution from amongst the alternative solutions using some criterion.

The figure given below depicts Simon's decision-making model clearly.

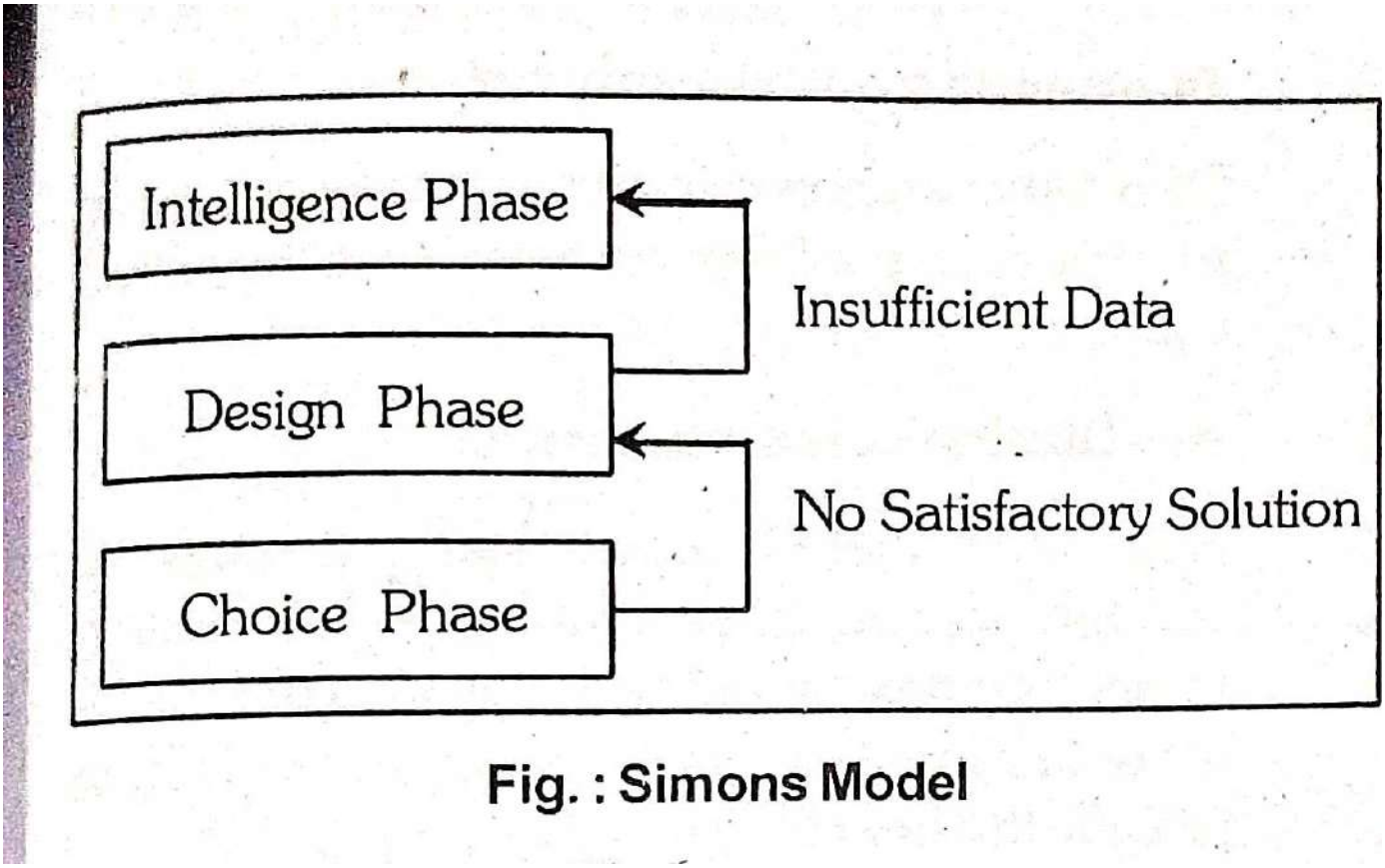


Fig. : Simons Model

1. Intelligence Phase

This is the first step towards the decision- making process. In this step the decision- maker identifies/detects the problem or opportunity. A problem in the managerial context is detecting anything that is not according to the plan, rule or standard. An example of problem is the detection of sudden very high attrition for the present month by a HR manager among workers, Opportunity seeking on the other hand is the identification of a promising circumstance that might lead to better results. An example of identification of opportunity is a marketing manager gets to know that two of his competitors will shut down operations (demand being constant) for some reason in the next three months, this means that he will be able to sell more in the market.

Thus, we see that either in the case of a problem or for the purpose of opportunity seeking the decision-making process is initiated and the first stage is the clear understanding of the stimulus that triggers this process. So if a problem/opportunity triggers this process then the first stage deals with the complete understanding of the problem/ opportunity. Intelligence phase of decision- making process involves:

(a) Problem Searching

(b) Problem Formulation

(a) Problem Searching: For searching the problem, the reality or actual is compared to some standards. Differences are measured & the differences are evaluated to determine whether there is any problem or not.

(b) Problem Formulation: When the problem is identified, there is always a risk of solving the wrong problem. In problem formulation, establishing relations with some problem solved earlier or an analogy proves quite useful.

2. Design Phase

Design is the process of designing solution outlines for the problem. Alternative solutions are designed to solve the same problem. Each alternative solution is evaluated after gathering data about the solution. The evaluation is done on the basic of criteria to identify the positive and negative aspects of each solution. Quantitative tools and models are used to arrive at these solutions. At this stage the solutions are only outlines of actual solutions and are meant for analysis of their suitability alone. A lot of creativity and innovation is required to design solutions.

3. Choice Phase

It is the stage in which the possible solutions are compared against one another to find out the most suitable solution. The 'best' solution may be identified using quantitative tools like decision tree analysis or qualitative tools like the six thinking hats technique, force field analysis, etc.

This is not as easy as it sounds because each solution presents a scenario and the problem itself may have multiple objectives making the choice process a very difficult one. Also uncertainty about the outcomes and scenarios make the choice of a single solution difficult.

List out the characteristics of DSS

1. DSS provide support for decision-makers mainly in semi-structured and unstructured situation by bringing together human judgments and computerized information. Such problem cannot be solved (or cannot be solved conveniently) by other computerized systems or by standard quantitative methods or tools.

2. Support is provided for various managerial levels, ranging from top executives to line managers.

3. Support is provided to individuals as well as to groups. Less-structured problems often require the involvement of several individuals from different departments and organizational levels or even from different organizations.

4. DSS provide support to several inter- dependent and/or sequential decisions. The decision may be made once, several times, or repeatedly.

5. DSS support all phases of the decision-making process: intelligence, design, choice, and implementation.

6. DSS support a variety of decision-making processes and styles.

7. DSS are adaptive over time. The decision- maker should be reactive, able to confront changing condition quickly, and be able to adapt the DSS to meet these changes, DSS are flexible, and so user can add, delete, combine, change or rearrange basic elements.

8. Users must feel at home with DSS. User- friendliness, strong graphical capabilities, and an English-like interactive human machine interface can greatly increase the effectiveness of DSS. DSS attempt to improve the effectiveness of decision-making (accuracy, timeliness, quality) rather than its efficiency (the cost of making decisions).

9. The decision-maker has complete control over all steps of the decision-making process in solving a problem. A DSS specifically aims to support and not to replace the decision- maker.

10. End users should be able to construct and modify simple systems by themselves. Larger systems can be built with assistance from information system (IS) specialists.

11. A DSS usually utilizes models for analyzing decision-making situations. The modeling capability enables experimenting with different strategies under different configurations.

Advantages and disadvantages of DSS

Advantages

1.Improving personal efficiency

many DSS do not do anything. A person could not do himself or herself. People prepared budgets for centuries before spreadsheet software came in to use. DSS help them do it faster and with less change of error.

2. Improving problem solving

DSS can make it possible for a person or a group to solve problem faster or better, than they could without it.

3. Facilitating communications

After found that DSS facilitating interpersonal communication in several ways. In addition technology developments that have occurred since his or her research have opened up lo DSS to provide this benefit

4. Promoting learning or training

Using a DSS can also help people learned more about using computers and about software package that are in the DSS although this is seldom a specific objective of developing the DSS it can be valuable by project.

5. Increasing organizational control

Some DSS can also control information about an individual's decision to his or he managers.

Disadvantages

1. Limited storage capability

Due to its small memories and limited storage capabilities, DSS has definite computational constraints

2. Slow

It is slow compared to the speed of large mainframes.

3. Limited Information sharing

Most DSSS are designed for Individual use but they can be designed so that several computers can be linked for limited information sharing.

4. Difficult

It is difficult to know interdependencies d functions provided by system

5. Require extensive knowledge

There are applications that require extensive knowledge of specific problem domain of technical knowledge.

6. Translation problems

Users have to deal with several databases and model each with different data models and resulting translation problems.

7. Confliction

Users may have to work on several decision scenarios at same time. As a consequence they have to keep track of what they done for each of them.

The applications can be used in DSS

Application of a DSS can be classified into following three categories:

1. Independent problems

The independent problems are "Standalone problems" whose solutions are independent of other problems. The goal is to find the best solution to the given problem.

2. Interrelated problem

In interrelated problems solutions are interrelated by each other to find the most effective solution to the group of interrelated problem. These types of problems usually require team effort.

3. Organizational problems

In Organizational problems all departments within an organization are included. Such problem required team effort. TQM is a good example of an organizational effort because for it to be effective it requires a joint effort from all departments units in the organization.

Business Analytics

Business Analytics is, methodical exploration of an organization's data, with an emphasis on statistical analysis. Business analytics is used by companies that are committed to making data- driven decisions. Data-driven companies treat their data as a corporate asset and actively look for ways to turn into a competitive advantage. Successful business analytics depends on data quality, skilled analysts who understand the technologies and the business, and an organizational commitment to using data to gain insights that inform business decisions.

Different types of Business Analytics

1. Descriptive

The application of simple statistical technique that describes what is contained in a data set or database.

Example: An age bar chart is used to depict retail shoppers for a department store that wants to target advertising to customers by age.

2. Predictive

An application of advanced statistical, information software, or operations research methods to identify predictive variables and build predictive models to identify trends and relationships not readily observed in a descriptive analysis.

Example: Multiple regressions is used to show the relationship (or lack of relationship) between age, weight, and exercise on diet food sales. Knowing that relationships exist helps explain why one set of independent variables influences dependent variables such as business performance.

3. Prescriptive

An application of decision science, management science, and operations research methodologies (applied mathematical techniques) to make best use of allocable resources.

Example: A department store has a limited advertising budget to target customers. Linear programming models can be used to optimally allocate the budget to various advertising media.

Importance of Business Analytics

1. Business analytics is a methodology or tool to make a sound commercial decision. Hence it impacts functioning of the whole organization. Therefore, business analytics can help improve profitability of the business, increase market share and revenue and provide better return to a shareholder.

2. Facilitates better understanding of available primary and secondary data, which again affect operational efficiency of several departments.

3. Provides a competitive advantage to companies. In this digital age flow of information is almost equal to all the players. It is how this information is utilized makes the company competitive. Business analytics combines available data with various we thought models to improve business decisions.

4. Converts available data into valuable information. This information can be presented in any required format, comfortable to the decision maker.

Business intelligence and Importance of Business intelligence

Business intelligence (BI) is a set of theories, methodologies, architectures, and technologies that transform raw data into meaningful and useful information for business purposes. BI can handle enormous amounts of unstructured data to help identify, develop and otherwise create new opportunities.

The purpose of the BI is to improve the quality of the input for decision making. It helps the managers to understand the internal capabilities of the organization. The trends and future directions in the markets. It also tells about the behavior of the competition.

The following reasons illustrate the importance of business intelligence.

1. Better Information Extract

As already discussed that there are lots of business transactions processed everyday an huge amount of data is generated. Manual tabulating and accessing is no longer feasible Therefore, business intelligence provide effective ways of monitoring and accessing relevant data whenever required.

2. Decision Making

Most of the business projects fail due to the in appropriate decision making and lack of information availability. BI provides detailed past and present performance of all the operations related to the organization which helps in taking appropriate decision by considering the future predictions.

3. Boost Productivity

With effective methods of BI, data gathering and creating reports can be done be done very easily and quickly. This makes the employees to be more productive on their own tasks.

With all these features (creating quick reports, decreased operating costs, improved quality and timeliness provides a good RO (Return on Investment) to the company.

Various styles of Business Intelligence

1. Enterprise Reporting

Broadly deployed pixel-perfect report formats for operational reporting and score cards/dashboards targeted at information consumers and executives.

2. Cube Analysis

OLAP slice-and-dice analysis of limited data sets, targeted at managers and others who need a safe and simple environment for basic data exploration within a limited data. range of

3. Ad Hoc Query and Analysis

Full investigative query into all data, as well as automated slice and-dice OLAP analysis of the entire database down to the transaction level of detail if necessary. Targeted at information explorers and power users.

4. Statistical Analysis and Data Mining

Full mathematical, financial, and statistical treatment of data for purposes of correlation analysis, trend analysis, financial analysis and projections. Targeted at the professional information analysts.

5. Alerting and Report Delivery

Proactive report delivery and alerting to very large populations based on schedules or event triggers in the database. Targeted at very large user populations of information consumers, both internal and external to the enterprise.

The various benefits of Business Intelligence

1.Time Savings

One of the key advantages of Business Intelligence is that most business processes are automated, which generates important savings both in time and costs, and in turn contributes to increasing overall productivity levels.

2. Easier and quicker access to information

It is clear that, over the last few years, the amount of business data has propelled. Therefore, it is important that companies focus their efforts on digitizing and collecting their data via document management software. However, it is equally important that Business Intelligence tools offer easily accessible information that clearly shows the evolution of the data and, this way, allows companies to anticipate future events.

3. Correct and relevant decisions

In order to stand apart from the competition, reduce costs, and increase profits, a company must make intelligent decisions. To do this, these decisions must logically be based on trustworthy and relevant data, and this is exactly where traditional methods begin to fail.

List out the various disadvantages of business intelligence

Some of the major Business Intelligence disadvantages are:

(1) Piling of Historical Data

The major objective of Business intelligence system is to stockpile past data about a firm's deals and reveal it in such a way that it permits professionals in decision making. On the flip side, this information generally amounts to a small portion of what the firms actually require to function, besides its restrained worth. While in other situations, the user may not have interest in historical data as many markets that the company regulates are in frequent alteration.

(ii) Cost

Business intelligence at times can be a little too much for small as well as for medium sized enterprises. The use of such system can be expensive for basic business transactions.

(iii) Complexity

Another disadvantage of business intelligence could be its complexity in implementation of data. It can be so intricate that it can make business techniques rigid to deal with. In the view of such premise, many business experts have predicted that these intricacies can ultimately throttle any business.

(iv) Muddling of commercial settings

Business Intelligence can cause commercial settings to turn out to be much more muddled.

(v) Limited use

Like all improved technologies, business intelligence was first established keeping in consideration the buying competence of affluent firms. Even today Bl system cannot be afforded by most of the companies Although, traders in the past few years have started modifying their services towards medium and small sized industries, but the fact is that many of such firms does not consider them to be highly essential, for its complexity.

(vi) Time Consuming Implementation

Many firms in today's fast paced industrial scenario are not patient enough to wait for the execution of Business intelligence in their organization. It takes around 18 months data warehousing system to completely implement the system

Data Warehouse and Characteristics of Data Warehousing

A data warehouse is a logical collection of information, gathered from many different database and thus a data warehouse may be called as a large database containing historical transactions and other data.

The purpose of data warehouse is permanent storage of detailed information. Data entered into a data warehouse needs to be processed to ensure that it is clean, complete, and in the proper format. Data warehouses are intended as permanent storage facilities. Many a times, a data warehouse is subdivided into smaller repositories called data marts. A data mart is a subset of a data warehouse, in which only the required portion of the data warehouse Information is kept.

Data warehousing provides architecture and tools for business executives to systematically organize, understand and use their data for decision- making Data warehouse systems play important role in today's competitive, fast-evolving world. Organization are moving from a situation where they looked at what happened to a situation where they can influence what will happen.

Characteristics

A common way of introducing data ware- housing is to refer to its fundamental characteristics.

1. Subject Oriented

Data are organized by detailed subject, such as sales, products, or customers, containing only information relevant for decision support. Subject orientation enables users to determine not only how their business is performing, but why. A data warehouse differs from an operational database in that most operational databases have a product orientation and are tuned to handle transactions that update the database. Subject orientation provides a more comprehensive view of the organization.

2. Integrated

Integration is closely related to subject orientation. Data warehouses must place data from different sources into a consistent format. To do so, they must deal with naming conflicts and discrepancies among units of measure A data ware-house is presumed to be totally integrated

3. Time Variant (time series)

A warehouse maintains historical data. The data do not necessarily provide current status (except in real-time systems). They detect trends, deviations, and long-term relationships for forecasting and comparisons, leading to decision making. Every data warehouse has a temporal quality Time is the one important dimension that all data warehouses must support. Data for analysis from multiple sources contains multiple time points (e.g. daily, weekly, monthly views).

4. Non-volatile

After data are entered into a data warehouse, users cannot change or update the data. Obsolete data are discarded, and changes are recorded as new data

These characteristics enable data warehouses to be turned almost exclusively for data access. Some additional characteristics may include the following

5. Web Based

Data warehouses are typically designed to provide an efficient computing environment for web-based applications.

6. Client/Server

A data warehouse uses the client/server architecture to provide easy access for end users.

7. Metadata

A data warehouse contains metadata (data about data) about how the data are organized and how to effectively use them.

Define Data mining

Data mining refers to extracting or mining knowledge from large amounts of data. The term is actually a misnomer. Thus, data mining should have been more appropriately named as knowledge mining which emphasis on mining from large amounts of data.

It is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine The learning, statistics, and database systems. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use.

- The key properties of data mining are
- Automatic discovery of patterns
- Prediction of likely outcomes
- Creation of actionable information
- Focus on large datasets and databases

Characteristics of Data Mining

Data mining service is an easy form of information gathering methodology where in which all the relevant information goes through some sort of identification process.

And eventually at the end of this process one can determine all the characteristic of the data mining process.

1. Increased Quantities of Data

In earlier days, data mining system can be determined with the help of their clients and customers, but in today's date, one can acquire any number of Information without the help of those clients. Moreover, after this kind of revolution in the mining system, it also added one more problem and that is large quantities of work.

With the help of these information technology, one can acquire a large number of information without any extra burden or trouble.

2. Provides Incomplete Data

Most of the people provide incomplete information about themselves in some of the survey conducted with the help of data mining systems.

Therefore, people ignore the value of their information and that is why they provide incomplete information about themselves in those surveys conducted for the benefit of the mining systems.

Moreover, these mining systems changed the perspective of people and because of that, people fear the exchange of their personal information.

3. Complicated Data Structure

Data mining is a form where in which all the information is gathered and incorporated with the help of information collection techniques. These information collecting techniques are more of manual and rests are technological.

Therefore, most of the understanding and determination of these mining can be a bit complicated than other structure of information technology.

Steps involved in data mining

Steps

1. Problem Definition

A data mining project starts with the understanding of the business problem. Data mining experts, business experts, and domain experts work closely together to define the project objectives and the requirements from a business perspective. The project objective is then translated into a data mining problem definition.

In the problem definition phase, data mining tools are not yet required.

2. Data Exploration

Domain experts understand the meaning of the metadata. They collect, describe, and explore the data. They also identify quality problems of the data. A frequent exchange with the data mining experts and the business experts from the problem definition phase is vital.

In the data exploration phase, traditional data analysis tools, for example, statistics, are used to explore the data.

3. Data Preparation

Domain experts build the data model for the modeling process. They collect, cleanse, an format the data because some of the mining functions accept data only in a certain format. They also create new derived attributes, for example, an average value.

In the data preparation phase, data is tweaked multiple times in no prescribed order. Preparing the data for the modeling tool by selecting tables, records, and butes are typical taker in this phase. The meaning of the data is not changed.

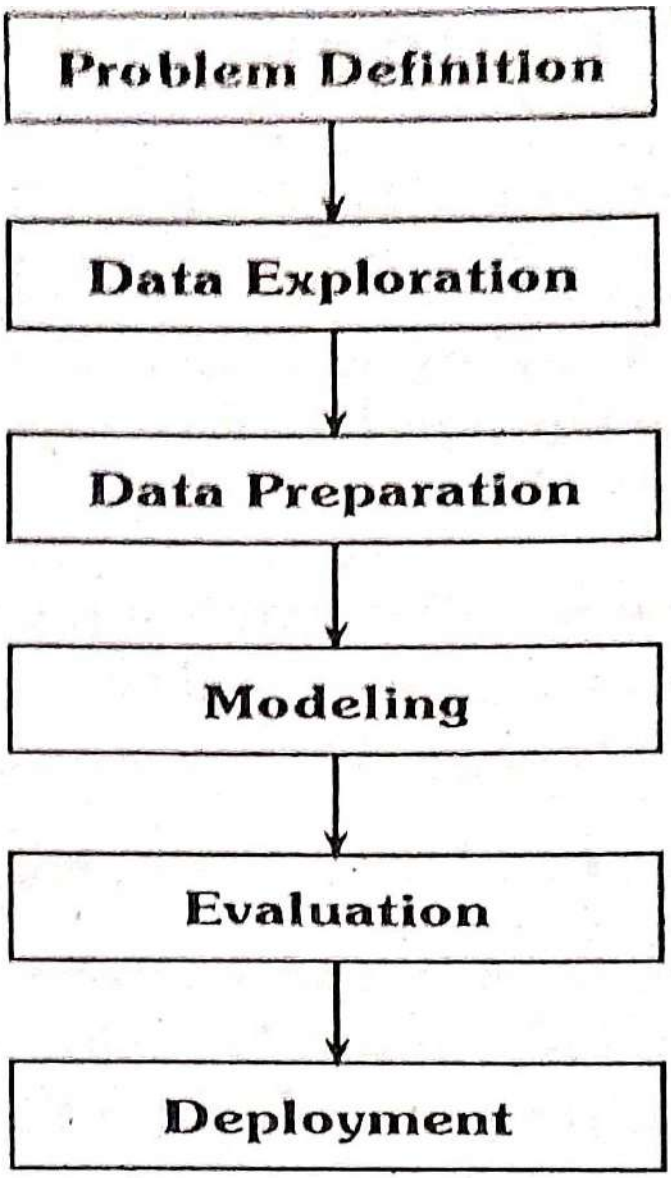


Fig. : Process of Data Mining

4. Modeling

Data mining experts select and apply various mining functions because you can use different mining functions for the same type of data mining problem. Some of the mining functions require specific data types. The date mining experts must assess each model.

In the modeling phase, a frequent exchange with the domain experts from the data preparation phase is required.

The modeling phase and the evaluation phase are coupled. They can be repeated several times to change parameters until optimal values are achieved. When the final modeling phase is completed, a model of high quality has been built.

5. Evaluation

Data mining experts evaluate the model. I the model does not satisfy their expectations, they go back to the modeling phase and rebuild the model by changing its parameters until optimal values are achieved. When they are finally satisfied with the model they can extract business explanations and evaluate the following questions:

- Does the model achieve the business objective?
- Have all business issues been A considered?
- At the end of the evaluation phase, the data mining experts decide how to use the data mining results.

6. Deployment

Data mining experts use the mining results by exporting the results into database tables or into other applications, for example, spreadsheets

The Intelligent Miner products assist you to follow this process. You can apply the functions of the Intelligent Miner products independently, iteratively or in combination.

The following figure shows the phases of the Cross Industry Standard Process for data mining (CRISP DM) process model.

IM Modeling helps you to select the input data, explore the data, transform the data, and mine the data. With IM Visualization you can display the data mining results to analyze and interpret them. With IM Scoring, you can apply the model that you have created with IM Modeling.

Applications of business intelligence

The following are the applications of business intelligence are:

1. Retailing

2. Credit card Management

3. Insurance

4 Telecommunications

5. Telemarketing

6. Human resource management.

1. Retailing

Retailers in general and grocery stores in particular, can get valuable predictive information from data mining. Grocery stores generate huge amount of data that require automated tools for analysis. Now-a-days, data mining tools can be employed on this data stored in data warehouse to find the likings, disliking, shopping behavior and other patterns, etc., and thus become very effective in formulating and implementing retailing strategies.

2. Credit Card Management

Data mining can also be used in credit card management. From a large number of credit card users, banks can find out the most profitable customers and also can target its credit card campaign to the right set of potential customers. Data warehouses provide information that allows issuers more accurately predict what the customer is interested in, as well as the customer's potential value to the issuer.

3. Insurance

The insurance industry can also find useful applications of data mining tools to detect frauds and to market its products. By linking names, telephone numbers, streets, birthdays, and other information with slight variations, patterns indicating fraud can be identified. Consolidating data internal and external to the insurance company creates a data mart that can be used for advanced search.

4. Telecommunications

In the last two decades, telecommunication industry has seen a new revolution. With so many players, it has really become difficult to retain the customers. The phenomenon of a customer switching carriers is referred to as chum, a fundamental concept in telephony as well as in other fields Analysis using data mining can reduce this customer chum to a great extent.

5. Telemarketing

Telephone providers are among the many marketing operations utilizing telemarketing. Data mining can be used on the collected data to determine segments based on common characteristics, like the set of customers who respond to new promotions; the set of customers who respond to discounts; or the set of customers who respond to new product offers. Once segments have been defined, on-line analytic processing tools can be used to explore in greater depth.

6. Human Resource Management

In the human resources field, this analysis can lead to identification of individuals who are liable to leave the company unless additional compensation or benefits are provided. A firm might know that 20 per cent of its employees use 80 per cent of services offered, but may not know which particular individuals are in that 20 per cent.

Business intelligence provides a means of identifying segments so that programs can be devised to cut costs and increase productivity. Data mining can also be used to examine the way in which an organization uses its people. It can help determine whether the most talented people are working for those business units with the highest priority or where they will have the greatest impact on profit.

Components of a contemporary business intelligence infrastructure

Components of a Contemporary Business Intelligence

The infrastructure of the business intelligence offers array of tools for attaining information through distinct types of data utilized by the business. This also takes into account structured and unstructured big data.

The components of contemporary business intelligence infrastructure includes.

1. Datawarehouses

2. Data marts

3. Hadoop

4. In-memory processing

5. Analytical platforms

1. Data warehouses

It encompasses current storage and historical data from various operational transaction systems. It combines and standardizes information from across the enterprise. It also provides query, analysis and reporting tool.

2. Data Marts

It is a subset of data warehouse. It encompasses summarized or highly focused part of firms data particular, for large population of users. It is used for only one subject or line of business.

3. Hadoop

It is an open-source software framework. It allows distributed parallel processing of large quantity of data speeded across computers. The existing problems are disintegrated into on a distributed network having smaller computers. The generated result then Integrated into smaller data set. The size is small because, it is easy to analyze. It emphasizes on processing of non-relational database, structured, semi structured and unstructured.

4. In-memory Processing

It is based on computer's main memory for storing the data. It minimizes the drawback such as bottlenecks caused from retrieving and ready the data within the traditional database. It also lessens the query response times. The in-memory computing is possible in complicated contemporary computer hardware.

5. Analytical Platforms

It emphasizes upon relational as well as non- relational technology for large datasets analyses. They uses preconfigured software and hardware system processing the queries and analytics.

Knowledge Management System

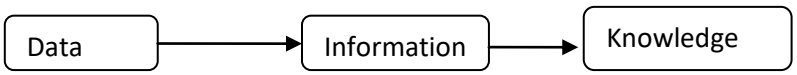
Meaning

Knowledge Management System (KM System) refers to a (generally IT based) system for managing knowledge in organizations for supporting creation, capture, storage and dissemination of information. It can comprise a part (neither necessary nor sufficient) of a Knowledge Management initiative.

The idea of a KM system is to enable employees to have ready access to the organization's documented base of facts, sources of information. and solutions. For example a typical claim justifying the creation of a KM system might run something like this: an engineer could know the metallurgical Composition of an alloy that reduces sound in gear systems. Sharing this information organization wide can lead to more effective engine design and it could also lead to ideas for new or improved equipment.

The term KMS can be associated to Open Source Software, and Open Standards. Open Protocols and Open Knowledge licenses, initiatives and policies.

Knowledge hierarchy



Components

The basic components of the model are

1. A knowledge asset: knowledge assets often contain the context behind the activity, recommendations for how to do the activity in future.

2. Learning before: knowledge is assessed at the start of the project or a piece of work, to ensure that you start the work with a full knowledge base.

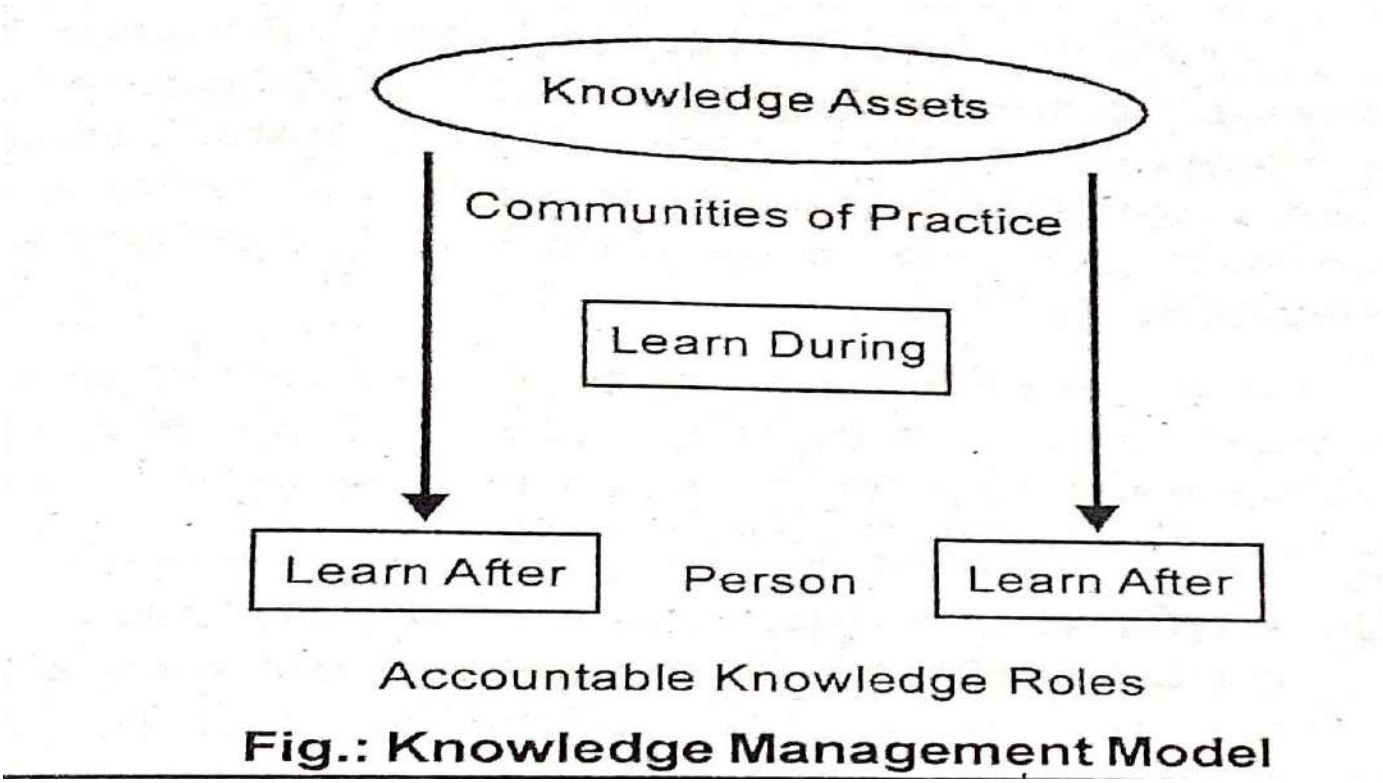


Fig.: Knowledge Management Model

3. Learning after: after completion of a project cycle, the knowledge is collected from all those who took part and collated for future use.

4. Accountable knowledge roles: they are represented by the face with in the business activity cycle at the bottom of the model picture.

Enterprise applications Improve organizational performance

The organizations mostly operates in increasingly competitive and global environment. An ideal successful organization put there emphasis on the efficient and accurate execution of processes, customer services and delivery to market. At this point, it is important to know - what an enterprise application is? For this, let us consider, a system or a program which operates multiple department or functional businesses within a firms. They affect one or many stages of management, since they assists the organization in attaining flexibility and production in carrying out business.

Thus, the benefits attained. Consequently, the applications of enterprise such as enterprise systems, supply chain management system, customer relationship management systems and knowledge management systems are developed so as to substantiate organization processes. It maintains the relationship with supplier in order to optimize the planning, sourcing, manufacturing and. product delivery. In addition to operating multiple firms, the organization can tie up to other businesses of other organization.

Moreover, the enterprise systems subsumes (include) vital business processes corresponding to a single software system. This derives the information flow across the organization. Thereby, enhancing coordination, efficiency and process of decision making.

All the businesses are coordinated in customer relationship management by using information systems. The complete process is encircles the organizations communications with its counterparts or customers to optimize the revenue included and attaining customer satisfaction. Also, the knowledge management system allows the organizations to optimize the creation, sharing, knowledge distribution. Thus, increasing the business processes and management decisions.

The Importance of systems for collaborations and social business and identify the technologies they use in this context

The term collaboration can be defined as the ability to work together, achieve and share specific goals, Ideally, collaboration together with team work helps to successfully Increase the business. it easer certain factors like globalization, decision making, growth of jobs. A collaborative environment can be observed in businesses, organizations and between the businesses. The spam or duration of the collaboration can vary based on the complexity of the task and also on the cordial relationships among the participants which could be many-to- one or one-to-one.

Teamwork

Working in teams within the organizations is necessary for successful accomplishment of mission. They collaborate on contracts and together attain the goals set by the organization. Similar to the

collaboration, the longitivity of the team depends upon the occurring issues sporadically. Additionally, the time required to solve the problem also accumulates in the longtitivity of the tasks. Mostly, the tasks holds less duration of time.

The social businesses is typically the use of internal and external social networking platforms. This keeps the employees, customers and suppliers engage in the work, thereby improving the collaborative work with the commencement of the decentralization of decision making, growth in innovation and globalization has led to the rapid increase of collaboration and social businesses.

The following reasons signifies the importance of both collaboration and social business,

1. Transient Nature of Work

Today many jobs are require face to face interaction referred to as "Interaction jobs". Here, the interaction takes place wit. employees, managers, vendors and customers. The organizations employ systems that permits the interaction to incorporate communication, collaborate and brain storming.

2. Growth of Professional Work

The professional jobs within the service sector demands keen coordination and collaboration.

3. Changing Organization of the Firm

The work is stream lined into groups and 152 teams whose job is to generate their own methods and set strategies to accomplish the task. Thus, dismissing the traditional hierarchical fashion of streamlining the work. Le

4. Changing the Scope of Firm

The scope of the work relates to the u segregation of the work across various n geographical locations.

5. Emphasis on Innovation

The innovation can be created from multiple groups and teams instead of single individual.

6. Changing Culture of Work and Business

The incorporation of different teams can being out better outputs at faster rates.

Technology

The technology element corresponding to the social collaboration is mostly ignored during the course of time. It plays a cardinal (vital) role in modern collaboration. Its absence may results in disastrous consequences for the companies who perform out-sourcing.

Some of the different technological platforms that support social collaboration includes,

1. Social Business Software (SBS)

This type of technological platform acts as a portal permitting employees to carryout discussion, document sharing, scheduling meeting and other essential task.

2. Teleconferencing/SKYPE/VOIP

In this type, the interaction perform through skype, VOIP phone system or other tool seamlessly allows the employees to have meeting, signing contracts, discuss issues.

3. Integration with Existing Systems

In this type, collaborating software and teleconferencing tools with already existing systems can save many catastrophic situations. For example, loss of sales, inventory and other existing systems during shuffling while transacting in high socially collaborative environment.

Define Big data and technologies used in big data

Meaning

The term Big-data can be used to describe huge volumes of data both in structured and unstructured format taken from webtraffic, e-mail messages and content of social media such as tweets and status messages. Interestingly, the big data moves beyond the processing ability to capture, store and analyze typical database systems. As a consequences large quantity of data is generated which moves ast and fail to fit into the structures of database. The big data is measured in the range of petabyte and in Exabyte.

Technologies

The most popular technologies for collecting, storing, processing and analyzing Big-data are as follows,

1. MapReduce framework, including Hadoop distributed file system (HDFS)

2. NOSQL (Not only SQL) data stores

3. MPP (Massively Parallel Processing) databases

4. In-memory database processing.

1. MapReduce Framework, Including Hadoop Distributed File System (HDFS)

The Hadoop project includes both distributed file system called HDFS (Hadoop Distributed File System) modeled on google file systems (GFS) and distributed processing framework by implementing MapReduce concepts.

Inorder to acquire a broader understanding of the technology in Hadoop, it is necessary to accentuate MapReduce programming model. The name of the model is taken from map and reduces functions. It carries out parallel processing on large sets of data using huge number of computer nodes connected through network interconnect in the form of cluster. It has four characteristics such as parallelism, fault tolerance, scalability and data locality.

2. NOSQL (Not only SQL) Data Stores

traditional database systems, big data requirements corresponding to data storage and retrieval, data are different Alt unstructured large data usually demands high-speed insertion, deletion and retrieval, where as if the data is structured it is given minimum importance. Thus, it is necessary to focus upon the capabilities to store and retrieve large amount of data.

As a consequence, need for highly efficient storage and retrieval has entailed on additional class of database systems called NOSQL (Not only SQL). The NOSQL make use of various approaches for managing the unstructured data or non-relational data. Such systems are also referred to as key-value stores which focuses upon large scaling "on- demand" data model flexibility and easy application development and deployment.

3. MPP (Massively Parallel Processing) Databases

The MPP databases system is an essential elements of the Big data technology. The standard size of the MPP database system is from few terabytes to few petabytes of structured data.

4. In-memory Database Processing

The in-memory database offers many trends and technologies. Here compute and memory architectures changes consistently. A part from this, multi-core architectures and main-memory also changes. Such changes produce real-time analytics and fast response times to the systems using large datasets.

UNIT-III

Information system planning

Meaning

Organizations that plan their information systems (IS) tend to achieve better results than organizations. The business organizations today are quite dynamic and exist in an ever-increasing competition. Accordingly, they have to develop and update their information systems in a systematic way. This requires an overall plan for the information system in the organization. The IS plan is a comprehensive one which is derived from the organizational strategic plan. The information system plan generally includes the goals, objectives and structure of information systems, the available information system resources and future developments which may affect the plan. There are a wide variety of methodologies for information system planning.

- **Objectives**

Objectives are the desired future positions and destinations the organization intends to reach in order to fulfill its mission.

- **Strategies**

A strategy is a general direction in which an objective is to be sought. For example, if an objective is to increase earnings per share, it can be attained through action in many directions new products, acquiring small companies, selling more in existing or new markets and even disinvestment of losing propositions. Each of these then will be termed as a strategy.

- **Policies**

A policy is a general guideline that directs and constrains decision-making within an organization. In other words, a policy is a statement of intended behavior for the organization. Policy limits the scope of alternatives to be considered in decision- making in the implementation of a strategy.

The NOLAN Stage Model

Richard Nolan (1974) has discussed a framework for IS planning, popularly known an Nolan stage model. The basic premise of the model is that any organization will move through stages of maturity with respect to the use and management of IS. While progressing, an organization must go through each stage of growth before it can move to the next stage. In fact Nolan stage model is a contingency model that helps managers diagnose the stage(s) of IS in an organization and thus provides a set of limits to planning.

The Nolan stage model has identified four stages of information system growth. A description of these stages is given below

Stage 1 Initiation

The first growth stage is known as initiation stage in this stage, the technology placed in the organization. A few applications in the organization are computerized There are only a small number of users. This stage is characterized by minimum planning

Stage 2 Expansion (or) Contagion

This growth stage is called expansion or contagion stage During this stage rapid and uncontrolled growth in the number and variety of IT applications takes place. Many users adopt computers in solving their IT-related problems

Stage 3 Control

This stage is known as formalization or control stage because in this stage, organizations gain cont over the technology's resources by implementing formal control processes and standards Thus organizations are able to apply cost-effectiveness criteria. However, controls sometimes become barrier in attaining potential benefits.

Stage 4 Maturity (or) Integration

Nolan has described this growth stage as maturity or integration stage, as by this stage organizations gain sufficient experience and maturity in IS/IT applications. In this stage, applications are integrated, controls are adjusted. Planning is well-established. That is why this growth stage sometimes is also called the stage of perfection.

The shape of the IS growth curve is similar to sigmoid or S curve.

Stage 5 Data Administration

This is the stage of data administration. This stage features a new emphasis on managing corporate data rather than IT. Thus, in this stage, controls are further lowered to encourage development of systems which contribute to strategic advantage to the organization.

Stage 6 Maturity Stage

In the enhanced growth model, this stage is termed as the maturity stage. This stage indicates that the application portfolio is complete and matches the objectives of the organization. Thus, planning and development of IS in the organization is embedded into the business development.

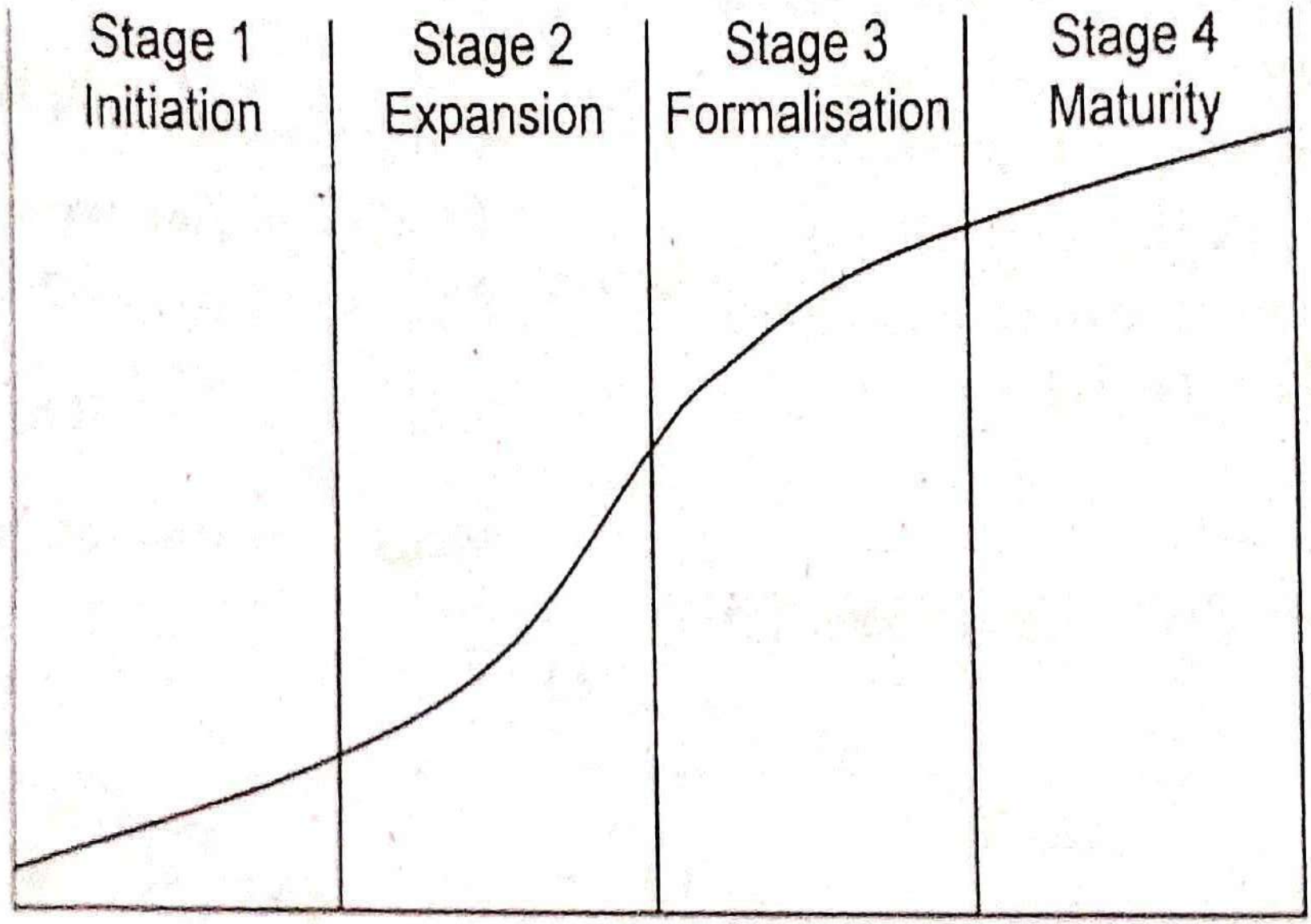


Fig.: Stages of Nolan's Growth Model

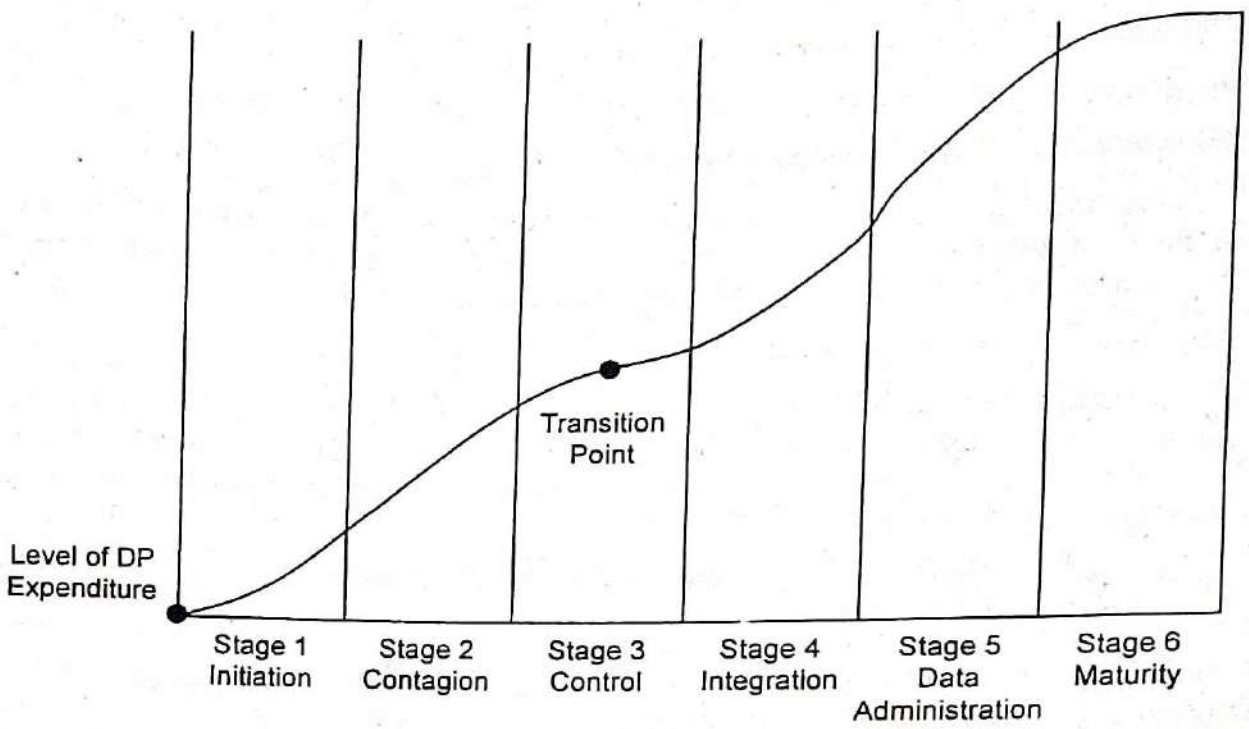


Fig.: Six Stages of Nolan's Enhanced Model

The Four Stage Model of IS Planning

This model describes the four generic planning activities, namely, strategic planning, requirement analysis, resources allocation and project planning.

S.No.	IS Planning Activity	Description
(i)	**Strategic Planning**	Matching the overall organizational plan with the IS Plan.
(ii)	**Information Requirement Analysis**	Identifying broad, organizational information requirements. Analysis
(ii)	**Resource Allocation**	Allocating resources for IS development and operation.
(iv)	**Project Planning**	Formulating a plan giving resource requirements for specific IS projects and schedules.

1. Strategic Planning

As the name indicates, in the IS strategic planning stage, objectives, goals and strategies of information systems are aligned with the objectives, goals, and strategies of the organization. The foilowing techniques are used at this stage:

(i) Derivation from the organizational plan,

(ii) The strategic information system grid,

(iii) Strategic fit with organizational culture,

(iv) Strategy set transformation.

(i) Derivation from the Organizational Plan

In this technique, IS objectives, goals and strategies are derived from the objectives, goals and strategies of the organization. An analysis is made of each objective, goal and strategy in the plan to find out the required information system support, which becomes their basis.

(ii) Strategic Information System Grid

This technique, known as McFarlan-McKenney strategic grid, provides four types of IS planning situations, arranged in the form of a grid. The strategic grid defines the strategic importance of the existing information system applications to the business and the strategic importance of the IS applications to be planned for development

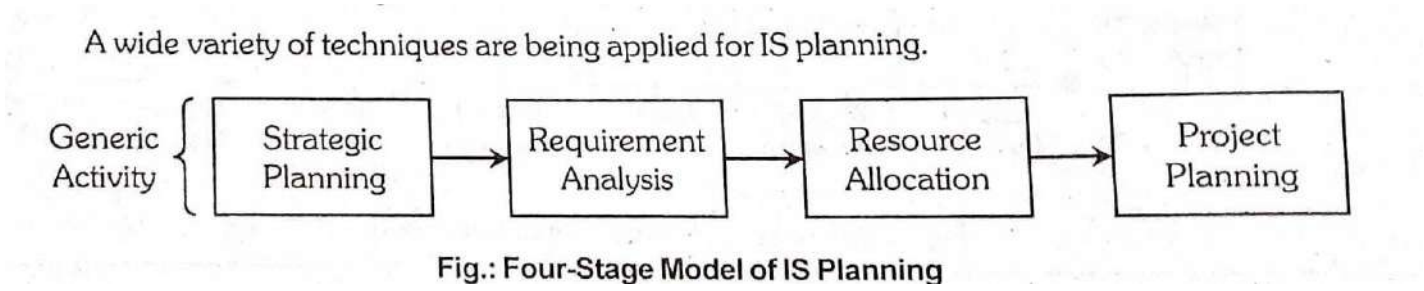


Fig.: Four-Stage Model of IS Planning

(iii) Strategic Fit with Organizational Culture

In this technique, the organizational culture is understood and the information systems are developed in such a way that these fit into the organizational culture. This helps to avoid the risk of IS failures because of resistance from the employees. In order to understand the culture, planners may collect relevant cues from top-management behavior, incidents in the organizations, subjects and order of agenda, rituals, etc.

(iv) Strategy Set Transformation

This approach has been proposed by William R. King, in which the overall organizational strategy is viewed as an IS set consisting of objectives, goals and strategies. Strategic IS planning is the process of converting the organizational strategy set into an IS strategy set.

2. Information Requirement Analysis

After the strategic planning stage, in which goals, objectives and strategies for IS are formulated, is over, the second phase of the IS planning model starts and is known as information requirement analysis stage. This stage does not deal with the detailed information requirement analysis; rather current and future needs for IS to support decision-making and operations of the organization are assessed. This stage of the model ensures that various ISs and databases are integrated and a master plan for IS development is formulated.

To undertake information requirement analysis, the following steps are followed:

(i) Define underlying organizational requirements.

(ii) Develop sub-system matrix.

(iii) Define and evaluate information requirements for organizational sub-systems.

(iv) Prioritization of Information Systems.

3. Resource Allocation

This stage provides the framework for personnel planning, technology procurement and budgeting to provide services to users. There have been a number of methods for allocating scarce resources.

4. Project Planning

Having decided the requirements of IS applications and the sequence in which these applications are to be implemented in the organization, management needs to take a decision whether to develop these applications in-house; get them developed from the vendors (outsource/ offshore development) or get the services of application service provider (ASP).

Resource Allocation

1. Return On Investment (ROI)

Return on investment is a technique for analyzing cost-benefit and is used in different planning applications and also' in IS projects which are account for having measurable economic costs and measurable economic benefits, these are the major elements for calculating the Return On Investment (ROI). The different projects having high Return On Investment (ROI) are selected by using a decision rule based on ROI. In general, the uses and costs of IS projects are interrelated, difficult and hard to estimate, due to which the Return On Investment (ROI) method became less popular for planning.

2. Charge Out

Charge out is typically an accounting procedure which is used to charge the costs of IS resources given to its users. The process of charging is in two ways,

In first method, the IS department allocates a standard cost to the different users of the organization for the provided IS services. In this method, the user does not have any control over the allocation of cost to the sub- systems in the organization. Mostly, it is used In controlling of IS costs and facilitate itself as a support in internal planning.

In second method, the IS departments allocates the cost to the users according to the information services and they provide a range of information services. But, in this method of user has control over the costs by selecting a different method or a supplier, or by decreasing the number of services. The drawback of this method is, it encourages the local nationality than the justification for the overall organization.

3. Portfolio Approach

The portfolio approach works on an assumption that the evaluation of IS projects should not only be done on individuals, but also on group of portfolio of different IS projects. This can have an impact on the organization. Therefore, the IS application portfolio must have a balanced approach concerning, support for strategic directions, project risk and suitable applications in accordance to the development in different organizational subsystems.

4. Steering Committees Approach

Steering committees method is known as the alternative approach to single executive decisions which consists of executives from higher functions in the organization. It takes the survey for the requirements and then decide about the resource allocation.

Information Resource Management (IRM)

It is a concept that focuses on the information, its availability and its usage. The emphasis of IRM is on the efficient management of information. The organizations, which adopt IRM concept, view information as a key resource and invest in information technology to gain a competitive advantage. In this approach, organizations ensure the availability of the required information to all themusers Thus, the IRM is a perspective, it is also an approach to organizing and Integrating the diverse elements of an information system. In other words, IRM's focus is on management of these elements and the information of the organization in a coordinated manner. In managing Information, IRM takes the perspective that information as a resource of the entire organization, has value and should be managed in much the same way in which other resources are managed. IRM advocates applying normal resource management techniques to information.

Information, when compared with other resources of the organization like money, men, machine, and materials, shows the following similarities:

(1)It has a cost.

(ii) It has a return on investment.

(iii) It requires organization for its efficient use.

(iv) It has an opportunity cost.

However, information is different from other resources in the following terms.

(i) It can be reused.

(ii) It is intangible.

(iii) The marginal cost per additional usage is low.

Many organizations now have an information centre. Because this is a new type of information activity, there is as yet little agreement about its activities and purposes. All information resources of an organization should be under the overall umbrella of IRM. These should include the following

(i)Business data processing

(ii)Information System development

(iii) Data management

(iv) Networking

(v) Office automation and word processing

(vi) End-user computing

(vii) Information centre management

However, most of the information centers today, are created primarily to assist end users acquire and develop their own computing systems.

Read the following problem and answer the questions that follow.

Sterling Industries is a $200 million company in the textile manufacturing Industry. The director of processing, Malcolm Rogers, has been with the firm of 20 years. Most of the information systems that have been developed use traditional files. Because many of those systems have been developed piecemeal, many of the data elements about customer, products, vendors and other are stored in many different database. Managers at Sterling Industries are demanding that new applications be developed in the areas of sales and distribution, conversion of an old batch order entry and inventory control system to an on-line system is major need. However, managers in virtually every areas of their own critical needs and are becoming impatient with the five to six years backlog of information systems development projects that currently exists.

Questions: -

(a) Explain how would you use the business systems planning method as a remedial measures some of the problems that Sterling Industries is experiencing.

(b) In your answer, describe the steps and the outcomes of such a study.

(c) What would be the roles and responsibilities of data processing management and user management in conducting the study?

(a) Business System Planning

'Business system planning is a method developed by IBM Corporation. It is used by the managers so as to effectively determine the managerial information requirements of the organization. The main purpose of BSP method is to develop an information plan that is capable of supporting short term as well as long term process of BSP, it is essential for strategic level managers to develop a good report with information system professional in order to build information system projects that are profitable to the organization.

Use of BSP in sterling industries avoids the step wise-development process of information systems where some of the information systems were developed using traditional files and others involve some other type of files. This is because BSP develops the entire information system at once. It also avoids maintenance issues that arise due to such development variations involving an overhead of storing each part of information system in a separate database. Such a storage also involves redundancy and inconsistency issues. Inconsistency issues arise because of the requirement of reflecting changes made in one database into other.

(b) Steps in the Study

The following steps are involved in the BSP,

1. Arranging a Study Team

The initial step performed in BSP is to organize a team that prepares and conducts a study. Basically, this team includes different functional managers who are responsible for conducting interviews.

2. Obtaining Management Authorization to Prepare and Conduct for Study

Once the study team has been organized, the next step is to prepare a study. However, this step can be performed only after receiving proper authorization from top-level managers.

3. Arranging a Kick-off Meeting

After the study has been initiated, there is a need for arranging a kick-off meeting. Here, the team leaders describe the plan of study and IT managers inform about the present state of an information system.

4. Identifying Business Strategy/Process

It this step, the business strategies and processes present within the organization are identified. Business processes are required so as to efficiently manage the resources present in the business. It is necessary to select the most relevant processes that are profitable to an organization. Based on these processes, BSP study team can easily understand the information requirements and identify the essential data requirements.

BSP method uses different matrices like process/organization matrix, so as to define the relationship that exist between the organization, processes requirements.

5. Defining Data Classes

In this step, the data classes that support the business process are identified. The number of data classes in a single unit basically depends on the size of the organization. The relationship between data class and process can be understood using data class/process matrix which provides the manager with the following information,

- Different process in the organization
- Different data classes
- Different data classes on which a process depends
- Different process supporting a data class.

6. Analyzing the Existing Information System so as to Gather Executives Perspectives

In this step, every application used by an organization is analyzed so as to determine which application is critical from executives point of view.

7. Determining the Business Problems

BSP study team conduct interviews and query of different functional managers in order to identify the problems occurred during the project implementation. It does this to determine the priorities that are based on certain factors. The information gathered after conducting the interview is analyzed and presented in the form of summary reports. During the interview, managers need to,

- Identify the major problems encountered due to which it becomes difficult to perform remaining activities.
- Identify the possible solution for solving the identified problem.
- Identify a value statement that determines the level of changes taking place in the organization after solving the problem.
- Determine whether additional information is required for performing the job or not.

8. Defining an Information Architecture

In this step, an information architecture of the organization is defined, which is done by analyzing the relationship between the data class and processes. Such analysis enables the manager to identify different system projects.

9. Determining Priorities

Once the projects are identified, they need to be prioritized based on the following factors.

(c) Roles and Responsibilities of Data Processing Management

The roles and responsibilities of data processing management in the development of new technologies in sterling industries are,

1. To efficiently handle the backlog data.
2. To manage system development along with analyzing resources
3. Keeping track of sales order on inventory.
4. Updating the data on a regular basis.
5. Providing technical support to the new employees who are unaware with the type of processing.
6. Deciding on the network design.

Different alternatives to in-house development

There are generally four alternatives to in- house development, which are mentioned as below.

(a) Outsourcing

(b) Software licensing

(c) Software as a service (saas)

(d) End users development.

(a) Outsourcing

Generally, outsourcing refers to hiring the services of another organization or individual to perform some of the work that otherwise would be performed by the organization, itself. Outsourcing, with regards to IT, refers to hiring some organization for the development of information system or to hire the services of another company to manage all or parts of the services that otherwise would be rendered by an IT unit of the organization.

(b) Software Licensing

These days, a large number of high quality packaged software are available in the market for purchase. These packages are usually available for a large number of users. Therefore, purchasing prepackaged software should be the first alternative considered when a company needs to acquire a new system. Typically "purchased" software refers to licensed software. The purchaser actually purchases a license to use the software, not the software itself. Thus, the term "licensing" means purchasing a license to use.
Ready-made software may be used as routine applications or as enterprise wide applications and accordingly, these packages may be classified into two groups:

(i) Small applications which are relatively inexpensive software, such as Microsoft Office, Accounting application and similar suites etc.

(ii) Large software applications that support whole organizational functions, such as marketing management and financial management, or enterprise applications that span the entire organization. Such packages include ERP SCM and CRM applications.

(c) Software as a Service (SaaS)

Software as a service (SaaS) has started recently, which means renting out the applications through the Web. An organization that offers the use of software through communication lines is called as application service provider (ASP). The concept is called software as a service (SaaS) or software by subscription. Many companies including IBM Global Services, US internetworking (USI), and Oracle Corporation offer such services.

(d) End user Development

When the application is simple and it is not available as a readymade package in the market or the organization does not want to take any risk in purchasing or renting it, the organization has got another alternative, known as end user application development. In this approach, the user managers, even without any background of programming, write their own business applications.

Steps involved in system requisition

1. Requirement Analysis

Requirements for the system configuration are identified and decisions are made for obtaining the system.

2. Preparing Tender Specifications

Once the configuration is decided, the next step is to prepare the tender documents containing the specifications for sake of vendors. Such specifications are,

- Acquiring the procedure and schedule
- Specification for equipment
- Format of the quotation
- Proposed terms for contract
- Extra information if required.

3. Inviting Tenders

Tenders are invited on the completion of tender specifications. It will be based upon the cost of the equipment acquired. Tenders are invited in the following ways,

- Open tender
- Limited tender
- Purchasing directly from the market
- Propriety purchase.

4. Technical Scruting and Short listing

The below activities are performed at this step,

- The data and time are predefined for opening the tendered bids.
- Modifications done in the specifications are recorded for every bid.
- A summary containing the technical features of the tenders is prepared.

5. Précised Evaluation

At this step, a detailed evaluation is done on the technical aspects such as visit to customer sites and inspections on factory'. The product is further tested using benchmark tests if a particular performance requirement is specified.

6. Negotiations and Procurement Decision

The vendors of the computer systems offer good concessions due to huge competition. These concessions are maximized by organizing discussions/meetings among the organizations and vendors. But some organizations does not allow this and follow some other methods.

7. Delivery and installation

The hardware/software is delivered to the organization which ordered them. The buyer's organization will match the specifications first and then allows them to be installed.

8. Post-Installation Review

The system is evaluated after installation to know whether it works according to the plan. A review is performed where the specifications as well as the requirements are analyzed. Corrective measures are taken by considering the feedback of this review.

Advantages and are Disadvantages of outsourcing IT services

Advantages of outsourcing IT services

(i) Increased attention to core business

when IT services are outsourced, it will save some of their time. This saved time can be used to concentrate on the core businesses of the organization.

(ii) Improved financial planning

Outsourcing allows the organization to know exactly what the cost of its IS functions will be over the period of the contract, which is usually 1-3 years. This allows for better financial planning, as they would know the exact financial liability for IT services.

(iii) Reduced license and maintenance fee

Professional IS firms often get the advantage of discounted prices for IT resources, based on volume purchases, which is normally passed on to their client organizations. Shorter implementation cycles: IT vendors can usually complete a new application project in less time than an in-house development team can, because of their experience with development projects of similar systems for other clients.

(iv) Reduction of personnel and fixed costs

By outsourcing IT services, organizations can save on their fixed and variable costs in terms of manpower and other equipments infrastructure etc.

(v) Increased access to highly qualified know-how

Outsourcing allows clients to tap into one of the greatest assets of an IT vendor. Experience gained through work with many clients in different environments.

(vi) Availability of ongoing consulting as part of standard support

Most outsourcing contracts allow client companies to consult the vendor for all types of IT advice, which otherwise would not be available.

Disadvantages of outsourcing IT services

(i) Loss of control

With outsourcing, the organization may loose control to outsiders. The organization must evaluate the nature of the industry in which it operates. While outsourcing can be a good option in a relatively stable industry, it is highly risky in one that is quickly changing. In the changing industry, the IS service provider may not able to adapt to the changes in the business of the client organization, and thus when the ISS would not be able to meet the changes, the client organization stands suffer.

(ii)Loss of experienced employees

Outsourcing often involves transferring employees of the outsourcing organization to the IS vendor. Thus in the process, the organization may loose its well trained people to the vendor organization.

(iii) Risks of losing a competitive advantage

Innovative ISS should not be outsourced, as outsourcing the development or maintenance of strategic systems means disclosing trade secrets. Secondly, a competitor may hire the same vendor to build his IS for the same purpose, which would eliminate the competitive advantage of the organization.

Systems Implementation and features of Systems Implementation

Meaning

Implementation is a process of coding, testing, installation, documentation, training and support. In other words, during implementation phase, physical system specifications are converted into working and reliable software and hardware and the system is installed at the user's premises so as to continuously getting the output it was designed to generate. The thus implemented system may be a replacement of a manual system (or) a major modification to an already existing computer-based information system.

Features

(i)Technical Tasks

The number of personnel for the implementation process should possess the technical skills and technical support to perform the tasks such as creating the databases and the usage of database etc.

(ii) Client Acceptance

This factor is considered as the final stage in the implementation process. Determine whether the clients will accept the system or not. This factor is an important factor which judges the implementation of the system. If the system does not meet the client requirements, then the system is considered as useless system.

(iii) Monitoring and Feedback

It is a control process in which, the key personnel gets the feedback o: the progression of the system at every stage. MIS manager can analyze the problems, makes corrections and ensures no deficiencies, if he' uses monitoring and feedback mechanisms.

In addition, the performance of the personnel's should be monitored by making use of this monitoring and feedback mechanism.

(Iv) Communication

Communication is considered as a very important factor for successful system implementation. These should be communication between the personnel's and also with the clients and organization. It provides the exchange of information between the clients and also the rest of the organization concerning the goals of the implementation process, status reports, changes in procedures and policies etc.

(v) Troubleshooting

The successful implementation process not only focuses on avoiding the problem but also take the accurate steps in order to prevent the problem. The problem can be detected through testing.

Various stages of system implementation

1. Implementation Planning

First step is to plan the implementation and it is called as pre-implementation activity. The below things are done in this step,

- Activities that contribute to system implementation are identified.
- The relationship between these activities and their sequence of execution is decided.
- Estimate cost and time for all the attributes which are acquired.
- The schedule and plan are defined through the use of tools such as gantt charts, network diagrams etc.

2. Acquisition of Facilities and Space Planning

Once the plan is prepared, all the facilities such as office, computer library, computer room etc., are acquired. Proper estimates for floor space requirements including the space occupied by the computers and their peripherals, people and their movement etc., are evaluated. Other facilities such as types of exits, storage areas, air conditioning, utility location, safety and security factors are also considered.

3. Development of Procedure and MIS

Organization The MIS manager is responsible for guiding the implementation task and also make the line/user know their role and responsibilities. The users must feel that the system is their own system so that the manager can know the resistance of the users and can enhance by hiring others. In addition to this, appropriate procedures need to be developed for several activities. Such as hardware selection or evaluation, software development, implementation strategies, system testing etc.

4. Hardware and Software Acquisition

The selection of appropriate hardware and software is a complex and time consuming task. Hardware such as ribbons, papers, compact disks, floppies, tapes etc., and necessary software for hardware installation need to be gathered. Other requirements for installing the hardware for site preparation, computer room layout, communication lines, air-conditioning and electric connections etc., should also be considered.

5. Coding

During coding stage, the physical design specifications created by the system designer team are turned into working computer code by the programming team. Depending on the size and complexity of the system, coding can be an involved, intensive activity. Immediately after the coding has started, the testing process can begin and proceed in parallel. As each programmer module is produced, it needs be tested individually, then as part of a large programmer and then again as part of a large system.

6. Testing

Tests should be performed in accordance wit the test specifications at each and every phase However, it is more important al implementation because, testing at this stage is done under real operating conditions with factual data. Testing can be done with only a small representative data but it should be done at various levels, starting from elements to sub-systems and finally to the system as a whole. The elements may include equipment, forms, programs, work procedures and formats, etc., and may be tested relatively independently of the system to which they belong. These tests are performed mainly for accuracy, range of inputs, frequency of inputs, operating conditions and reliability, etc.

7. Creation of Forms and Database

Forms are very important for transmitting data. They are also required for input to the system and output from the system. For implementation of MIS, the required forms should be generated, but care must be taken that these are generated in the context of the entire MIS. Moreover, forms being the key user interfaces, become all the more important in the general acceptance of the system. Similarly, in the implementation stage, the actual data should be obtained and the database created, which is used, in the first instance, for the initial testing and then for the actual operation of the information system.

8. Documentation

Broadly speaking, documentation can be understood as of two types, namely, system. documentation and user documentation. System documentation, which is intended primarily for maintenance programmers or technical persons, records detailed information about a system's design specifications, its internal working, and its functionality.

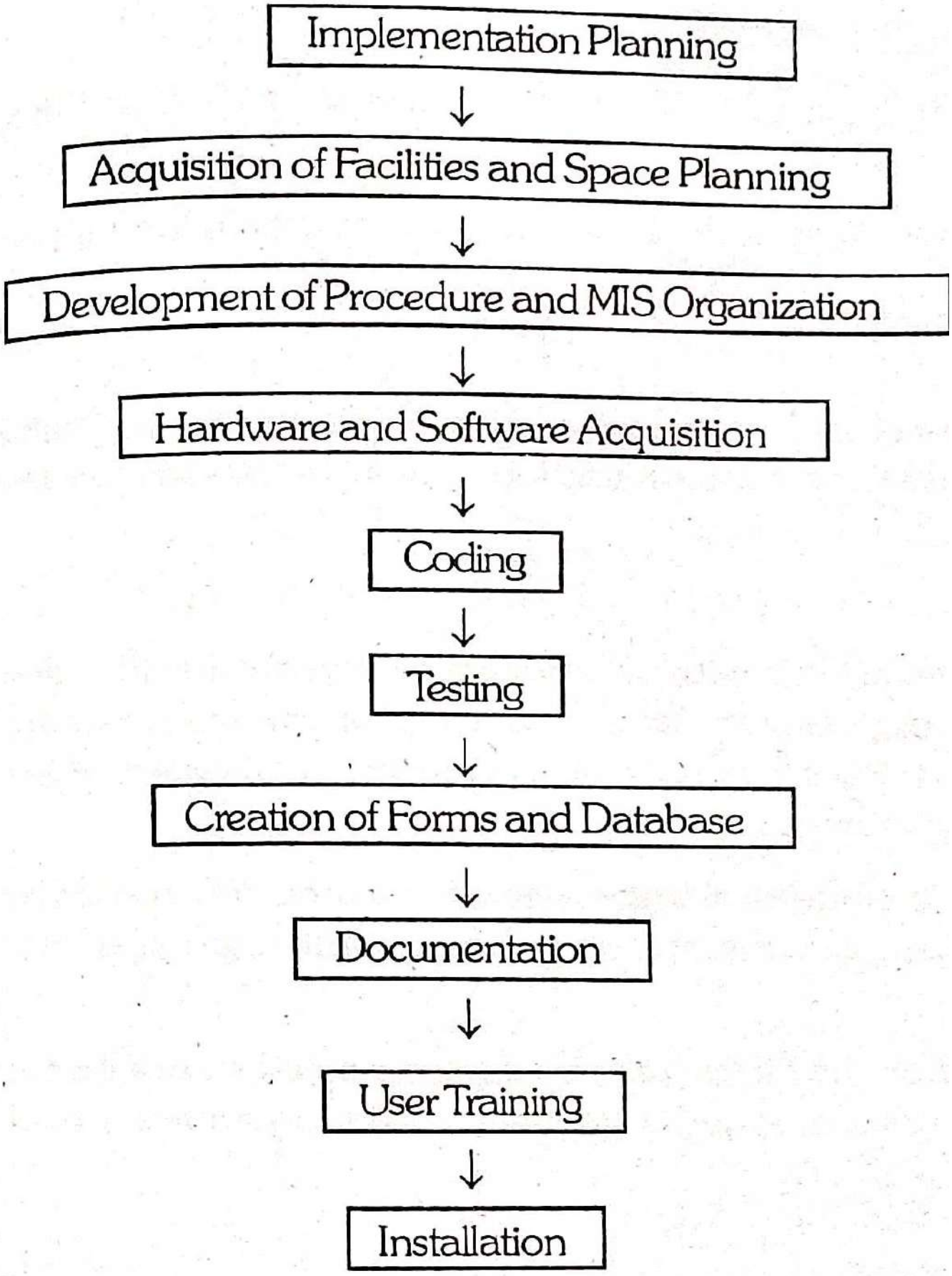


Fig. : Process of System Implementation

9. User Training

Adequate user training is very important for successfully implementing an information system. The users may be identified and classified differently on the basis of the operations/functions performed by them. For example, clerical or managerial, frequent users versus occasional users. These classes are not necessarily exclusive, as they quite often overlap.

10. Installation

Installation or changeover is the event of switch-over from the old system to the new system, which takes place after the system is tested and found reliable. The existing system is replaced by the new system in this phase. Conversion from the old system to the new system may be accomplished by selecting one or a combination of various conversion approaches.

A brief description of conversion approaches is given below.

(i) For New Organization/Operation

If the organization is a new one or when the old system does not exist, there is only one method for implementing the newly developed system, i.e. install the system.

The newly developed system is implemented as there is no old system in operation and thus no question of replacement of the old or existing system arises.

(ii) For Existing Organization/Operation

When the old system is in existence, there may be four different strategies, namely:

(i) Direct Approach

(ii) Parallel Approach

(iii) Modular Approach

(iv) Phase-in Implementation

Write a short note on :

(a) Management of Change

(b) Organizational Learning

(c) Stimulus response theory of learning

(a) Management of Change

The following three steps may be useful in managing the resistance to change.

(i) Create a climate for change

(ii) Develop effective agents of change

(iii) Modify the 'required' organizational system.

(i) Create a climate for change

First of all, organizations should create a suitable climate for change. Such a culture may be created by getting the employees to feel dissatisfied with the present system. Employees may be exposed to a series of seminars and conferences with the main focus on the shortcomings of the present systems and ways to overcome those shortcomings. In this process, A thinking would be developed that some change is required in their organization.

(ii) Develop effective agent of change

To win the support of the employees, organizations should identify their informal leaders and they should be sent to workshops or seminars. This will stimulate new ideas in the minds of the leaders This in turn will help gain the support of other employees.

(iii) Modify the 'required' organization

A technically ideal organization is termed as the 'required' organization. However, for achieving the working relationships of the users, rearrangements of the organization should be made to fr the anticipated emergent organization behavior.

(b) Organizational Learning

Organizational learning, which exhibits adaptive behavior, is the process by which an organisation identifies action-outcome relationships, identifies and corrects errors, stores the experience in organizational personnel who teach the other employees of the organization, and stores the experience in procedures, systems, rules, computer programs and other forms for transferring experience. For example, a user of an information system is imparted training on how to use the new system by information system specialists. Existing literature, manuals, etc., through previous organizational experience can educate users on how to use the system. The learning of the users is father enhanced when they informally exchange related stories on the system. These related stories may consist of unwritten rules, tips, and guidelines or learning experiences of other employees in the organization.

(c) Stimulus response theory of learning

Organization learning is also supported by the information and information systems. The process of learning contains four elements with respect to stimulus response theory.

(1) Drive: Drive is an encouragement which forces any action. It also prepares and makes an individual to respond to that action.

(b) Cue: Cue is also an encouragement in the form of an object which motivates and defines the response.

(c) Reinforcement: Reinforcement is the reward which causes the drive and stimulus that comes over from a response to get reduced. It makes the responses to learn.

(d) Response: Responses are the actions at the top level of mental processes.

The cues and responses are provided by the information systems in three ways, in order to assist the learning process.

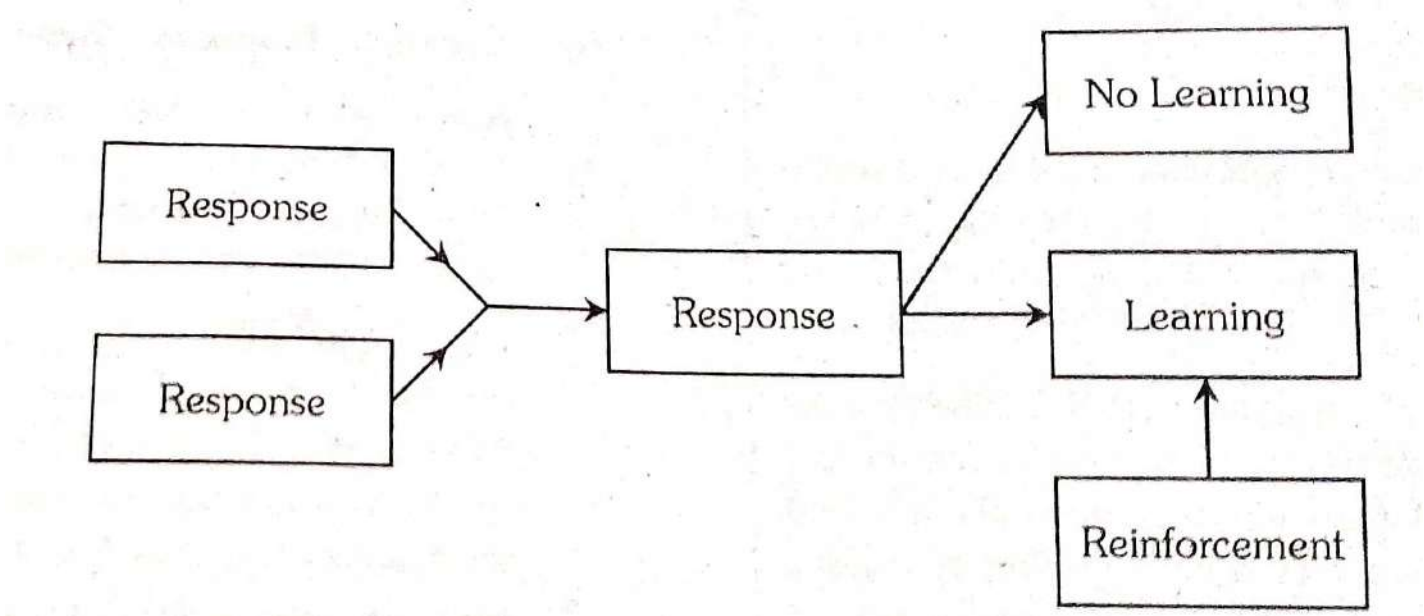


Fig.: A Learning Process

System Development models

The Water fall model:

The Waterfall Model was the first Process Model to be introduced. It is also referred to se a linear sequential line cycle model it is very simple to understand and use. In a waterfall model, each phase must be completed before the next phase can begin and there is no overlapping in the phases

The Waterfall model is the earliest SDLC approach that was used for software development

The waterfall Model illustrates the software development process in a linear sequential flow. This means that any phase in the development process begins only if the previous phase is complete. In this waterfall model, the phases do not overlap.

Waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In "The Waterfall" approach, the whole process of software development is divided into separate phases. In this Waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially.

The sequential phases in Waterfall model are:

1. Requirement Analysis

All possible requirements of the system to be developed are captured in this phase and documented in a requirement specification document.

2. System Design

The requirement specifications from first phase are studied in this phase and the system design is prepared. This system design helps in specifying hardware and system requirements and helps in defining the overall system architecture.

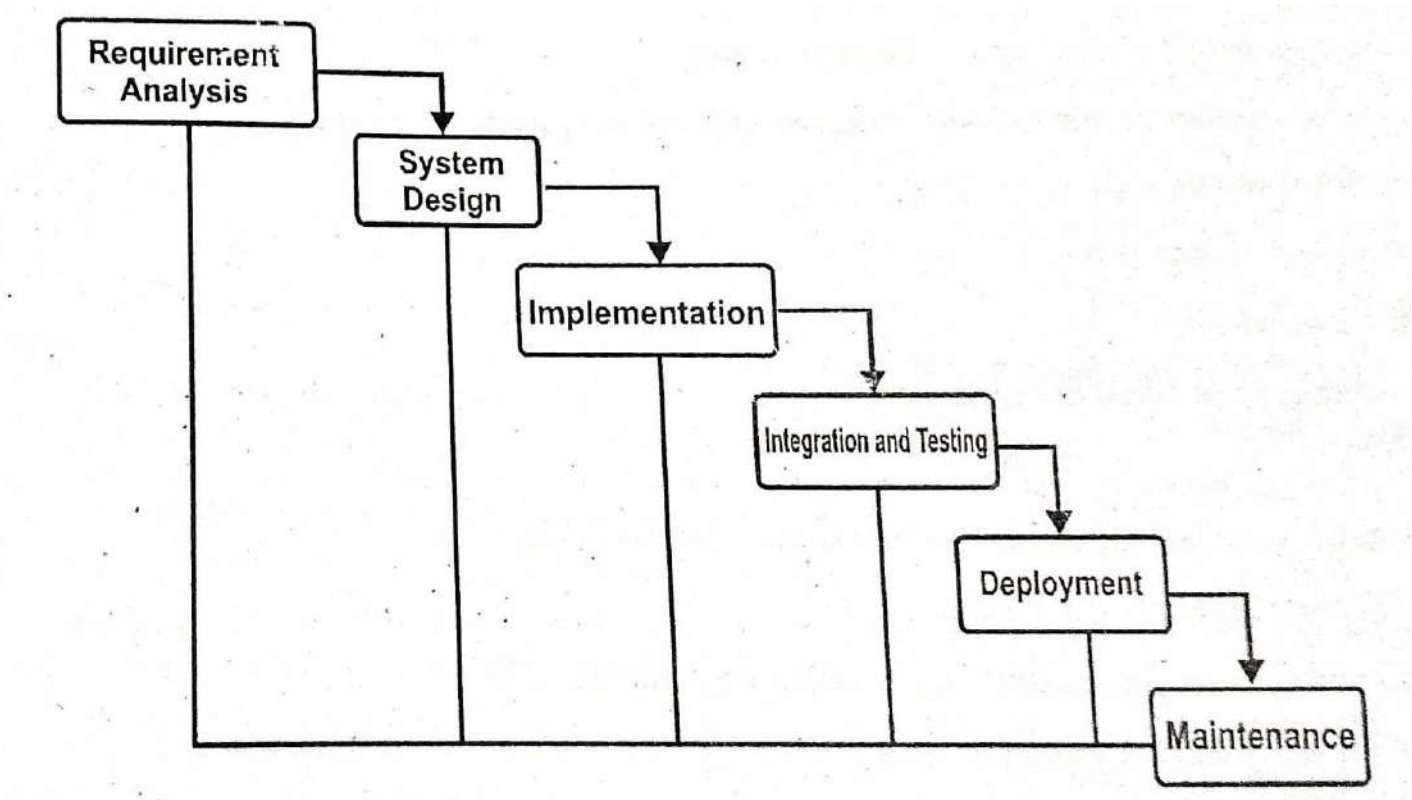


Fig.: Waterfall Model

3. Implementation

With inputs from the system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality, which is referred to as Unit Testing.

4. Integration and Testing

All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.

5. Deployment

Once the functional and non-functional testing is done the product is deployed in the customer environment or released into the market.

6. Maintenance

There are some issues which come up in the client environment. To fix those issues, patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

Advantages of water fall model

- Simple and easy to understand and use
- Easy to manage due to the rigidity of the model. Each phase has specific deliverables and a review process.
- Phases are processed and completed one at a time.
- Works well for smaller projects where requirements are very well understood.
- Clearly defined stages.
- Well understood milestones.
- Easy to arrange tasks.
- Process and results are well documented.

Disadvantages of water fall model

- No working software is produced until la during the life cycle.
- High amounts of risk and uncertainty
- Not a good model for complex and object oriented projects. .
- Poor model for long and ongoing projects.
- Not suitable for the projects where requirements are at a moderate to high risk of changing. So, risk and uncertainty is high with this process model.
- It is difficult to measure progress within stages.
- Cannot accommodate changing requirements.
- Adjusting scope during the life cycle can end a project.
- Integration is done as a "big-bang at the very end, which doesn't allow identifying any technological or business bottleneck or challenges early.

3.4.2 System Development Life Cycle

In order to develop a system successfully, it is managed by breaking the total development process into smaller basic activities or phases. Any system development process, in general, is understood to have the following phases:

1. System Investigation

Some problem may be bothering a business organization. The managers in the organization (user) may or may not be very clear about the problem. The user may invite a system analyst or information analyst (consultant) to assist him/her in defining and resolving the problem in a clear way.

Preliminary investigation is the first step in system development project. The preliminary investigation is a way of handling the user's request to change, improve or enhance an existing system. The objective is to determine whether the request is valid and feasible before any recommendation is made to do nothing, improve or modify the existing system, or build altogether a new one. It is not a design study,

nor does it include the collection of details to completely describe the business system. These objectives should be accomplished, while working on the preliminary investigation. System investigation includes the following two sub-stages:

(i) Problem definition, and

(ii) Feasibility study.

(i) Problem Definition

Although the need for problem definition may seem obvious, this is perhaps the most frequently bypassed step in the entire system development process. So the first responsibility of a system analyst is to prepare a written statement of the objectives and scope of the problem. Based on interviews with the user, the analyst writes a brief description of his/her understanding of the problem, and reviews it with both groups, ideally in a joint user/information analyst meeting. People respond to written statements. They ask for clarifications and they correct obvious errors or misunderstandings. This is why a clear statement of objectives is so important.

Here are some possible definitions of problems:

(i) The existing system has a poor response time, i.e. it is slow.

(ii) It is unable to handle the workload.

(iii) The problem of cost, i.e. the existing system is not economical.

(iv) The problem of accuracy and reliability

(11) Feasibility Study

The literal meaning of feasibility is viability. This study is undertaken to know the likelihood of the system being useful to the organization. Feasibility study, is basically, a high-level capsule version of the entire process, intended to answer a number of questions like what is the problem? Is the problem even worth solving? However, as the name indicates in preliminary investigation, feasibility study should be relatively brief, as the objective at this stage is only to get an idea of the scope. The finding of this study should be formally presented to the user management. This presentation marks a crucial decision point in the life of the project. If the management approves the project, the feasibility study report represents an excellent model of the system analyst's understanding of the problem and provides a clear sense of direction for the subsequent development of the system.

2. System Analysis

Analysis is a detailed study of the various operations of a business activity (system), along with its boundaries. The objective of this phase is to determine exactly what must be done to solve the problem. Many system analysis have a technical background. The temptation of many technically trained people is to move too quickly to program design, to become pre-maturely physical. Such a temptation must be avoided. Rather a logical model of the system should be developed using various modern tools such as

data flow diagrams, an elementary data dictionary and rough descriptions of the relevant algorithms. System analysis involves a detailed study of:

(i) The information needs of the organization and its end users.

(ii) Existing information systems (their activities, resources and products).

(ii) The expected information system (in terms of capabilities of IS required to meet the information needs of users).

3. System Design

System analysis describes WHAT a system should do to meet the information needs of users. System design specifies HOW the system will accomplish this objective. The term design refers to the technical specification (analogous to the architect's blue prints) that will be implied in constructing the system. System design should stress on the following three activities:

(i) User interface,

(ii) Data design, and

(iii) Process design.

4. Construction and Testing

Once the system specifications are understood, the system is physically created. The required programs are coded, debugged, and documented. The system should be tested with some test data to ensure its accuracy and reliability. In fact, construction of the system takes place on the basis of the system design specifications. So in this phase, the various directions as per system specifications are followed. In addition to the activities performed during system development, some activities are performed after the basic development is complete. Such activities are covered under the implementation phase and maintenance phase.

5. Implementation

The system implementation stage involves hardware and software acquisition, site preparation, user training and installation of the system. Here again, testing of the system, involving all components and procedures should be done. It must be realized that implementation may be the most crucial phase of System Development Life Cycle, because this step is vital in assuring the success of any newly developed system.

6. Maintenance

System maintenance involves the monitoring, evaluating and modifying of a system to make desirable or necessary improvements. In other words, maintenance includes enhancements, modifications or any change from the original specifications. Therefore, the informa.ion analyst should take chance as his/her responsibility so as to keep the system functioning at an acceptable level.

The different categories of Feasibility study

The literal meaning of feasibility is viability. This study is undertaken to know the likelihood of the system being useful to the organization.

The aim of a feasibility study is to assess alternative systems and to propose the most feasible and desirable system for development. Thus, feasibility study provides an overview of the problem and acts as an important checkpoint that should be completed before committing more resources.

Categories

The feasibility of a proposed system can be assessed in terms of four major categories. These are summarized below.

(i) Organizational Feasibility

The extent to which a proposed information system supports the objective of the organization's strategic plan for information systems determines the organizational feasibility of the system project. The information system must be taken as a sub- set of the whole organization.

(ii) Economic Feasibility

In this study, costs and returns are evaluated to know whether returns justify the investment in the system project. The economic questions raised by analysts during the preliminary investigation are for the purpose of estimating the following:

(a) The cost of conducting a full system investigation.

(b) The cost of hardware and software for the class of application being considered.

(c) The benefits in the form of reduced costs, improved customer service, improved resource utilization or fewer costly errors.

(iii) Technical Feasibility

Whether reliable hardware and software capable of meeting the needs of the proposed system can be acquired or developed be the organization indhe vequired time is a major concern of the technical feasibility. In other words, technical feasibility includes questions like

(a) Does the necessary technology exist to do what is suggested, if it does then can it be acquired? (b) Does the proposed equipment have the technical capacity to hold the data required to use the new system?

(2) Will the proposed system provide adequate responses to inquiries, regardless of the number of locations and users?

(d) Can the system be expanded?

(e) Is there any technical surety of accuracy, reliability, ease of access and data security?

(iv) Operational Feasibility

The willingness and ability of the management, employees, customers, suppliers, etc., to operate, use and support a proposed system come under operational feasibility. In other words, the test of operational feasibility asks if the system will work when it is developed and installed. Are there major barriers to implementation. The following questions are asked in operational feasibility.

(a) Is there sufficient support from the management? From employees? From customers? From suppliers?

(b) Are current business methods acceptable to the users?

(c) Have the users been involved in the planning and development of the system project?

3.4.3 V-Model

The V-model is an SDLC model where execution of processes happens in a sequential manner in a V-shape. It is also known as Verification and Validation model.

The V-Model is an extension of the waterfall model and is based on the association of a testing phase for each corresponding development stage.

Under the V-Model, the corresponding testing phase of the development phase is planned in parallel. So, there are Verification phases on one side of the 'V' and Validation phases on the other side. The Coding Phase joins the two sides of the V-Model.

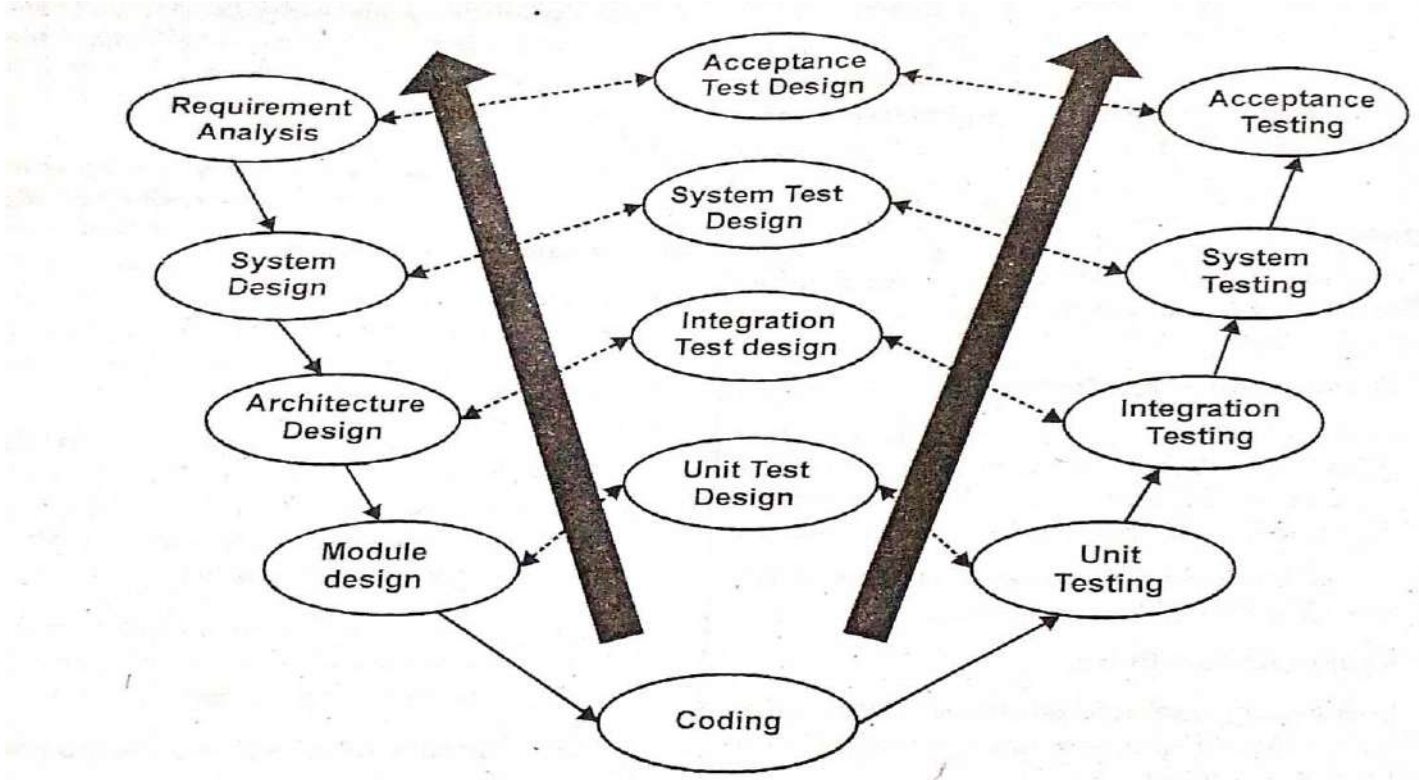


Fig.: V - Model

There are several **Verification phases** in the V-Model, each of these are explained in detail below.

- **Business Requirement Analysis**

This is the first phase in the development cycle where the product requirements are understood from the customer's perspective. This phase involves detailed communication with the customer to understand his expectations and exact requirement. This is a very important activity and needs to be managed well, as most of the customers are not sure about what exactly they need. The acceptance test design planning is done at this stage as business requirements can be used as an input for acceptance testing.

- **System Design**

Once you have the clear and detailed product requirements, it is time to design the complete system. The system design will have the understanding and detailing the complete hardware and communication setup for the product under development. The system test plan is developed based on the system design. Doing this at an earlier stage leaves more time for the actual test execution later.

- **Architectural Design**

Architectural specifications are understood and designed in this phase. Usually more than one technical approach is proposed and based on the technical and financial feasibility the final decision is taken. The system design is broken down further into modules taking up different functionality. This is also referred to as High Level Design (HLD).

The data transfer and communication between the internal modules and with the outside world (other systems) is clearly understood and defined in this stage. With this information, integration test can be designed and documented during this stage.

- **Module Design**

In this phase, the detailed internal design for all the system modules is specified, referred to as Low Level Design (LLD). It is important that the design is compatible with the other modules in the system architecture and the other external systems. The unit tests are an essential part of any development process and helps eliminate the maximum faults and errors at a very early stage. These unit tests can be designed at this stage based on the internal module designs.

- **Coding Phase**

The actual coding of the system modules designed in the design phase is taken up in the Coding phase. The best suitable programming language is decided based on the system and architectural requirements.

The coding is performed based on the coding guidelines and standards. The code goes through numerous code reviews and is optimized for best performance before the final build is checked into the repository.

Validation Phases

The different Validation Phases in a V-Model are explained in detail below.

- **Unit Testing**

Unit tests designed in the module design phase are executed on the code during this validation phase. Unit testing is the testing at code level and helps eliminate bugs at an early stage, though all defects cannot be uncovered by unit testing.

- **Integration Testing**

Integration testing is associated with the architectural design phase. Integration tests are performed to test the coexistence and communication of the internal modules within the system.

- **System Testing**

System testing is directly associated with the system design phase. System tests check the entire system functionality and the communication of the system under development with external systems. Most of the software and hardware compatibility issues can be uncovered during this system test execution.

- **Acceptance Testing**

Acceptance testing is associated with the business requirement analysis phase and involves testing the product in user environment. Acceptance tests uncover the compatibility issues with the other systems available in the user environment. It also discovers the non-functional issues such as load and performance defects in the actual user environment.

Advantages of V-Model

- This is a highly-disciplined model and Phases are completed one at a time.
- Works well for smaller projects where requirements are very well understood.
- Simple and easy to understand and use.
- Easy to manage due to the rigidity of the model. Each phase has specific deliverables and a review process.

Disadvantages of V-Model

- High risk and uncertainty.
- Not a good model for complex and object- oriented projects.
- Poor model for long and ongoing projects.
- Not suitable for the projects where requirements are at a moderate to high risk of changing.
- Once an application is in the testing stage, it is difficult to go back and change functionality.
- No working software is produced until late during the life cycle.

What is meant by Prototyping and various stages involved in Prototype model

Prototype is considered as the working model of a product or information system that is developed for the purpose of demonstration. In the process of software development the prototype is made first Based on it the final product will be developed.

The model, in general, has the following four steps.

(i) Identify the user's basic information requirements

In this step, the user identifies his requirements in the form of outputs required from the system The information analyst, on the basis of user expectations, estimates the cost of a workable prototype.

(ii) Develop the initial prototype system

Here, the initial prototype system, which meets the user's basic information requirements, is developed. It is developed in the minimum possible time. The speed of building rather than efficiency of the prototype is the main consideration.

(iii) Use of the prototype system to refine the user's requirements

The initially developed prototype is delivered to the user to allow him to gain hands on experience with the system to identify further refinements/changes required in the prototype.

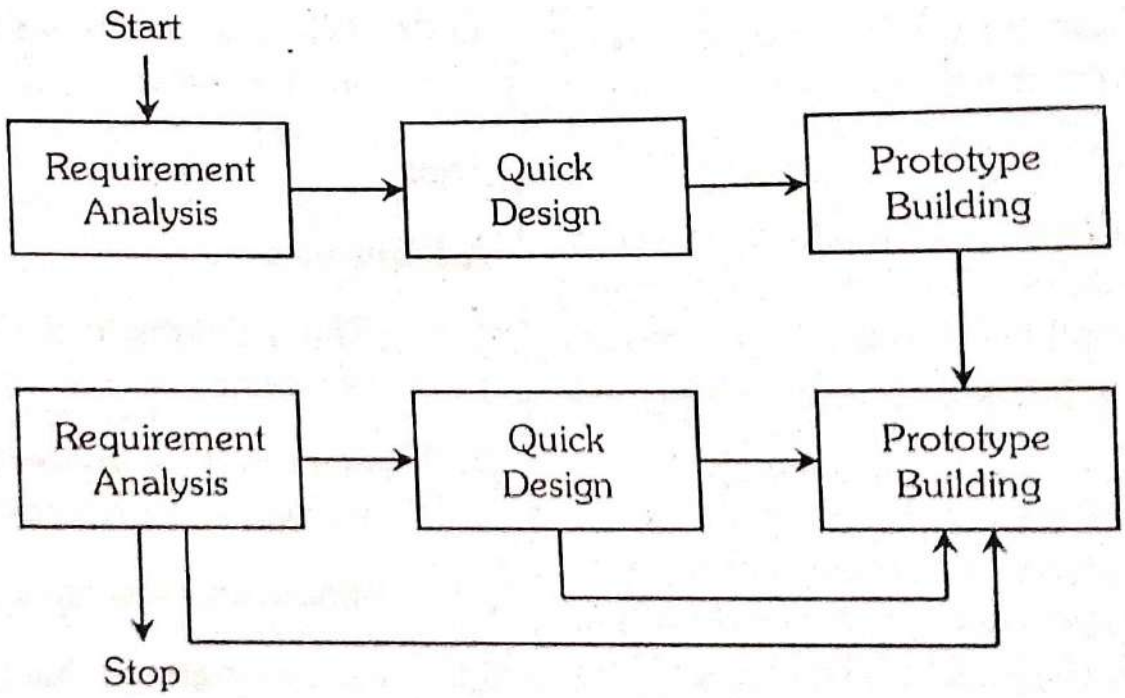


Fig.: Steps of Prototype

(iv) Revise and enhance the prototype system

In this stage, the designer makes the necessary changes/refinements pointed out by the user after using the prototype. Steps (iii) and (iv) are repeated again and again till the prototype is refined to the satisfaction of the user. Prototyping approach may not be cost-effective in small organizations. It is more suitable for larger organizations, where it is difficult to identify user requirements.

The prototyping approach has the following significant advantages in the development of a system:

- A Ability to 'try out' ideas without incurring large costs.

- A Lower overall development costs when requirements change frequently.
- The ability to get a functioning system into the hands of the user quickly.

3.4.5 Iterative Model

The Iterative Enhancement model

In an iterative enhancement model, the system is developed in increments and each increment adds some functional capabilities to the system, until the full system is developed. Additions and modifications can be done at each step. To begin with, only a subset of the overall problem is considered in developing the system. The selected subset may be one of the important subsets, which may contain some of the key aspects of the problem. The iterative enhancement process model is understood to have only three phases, namely, analysis, implementation and design, as shown in Fig.

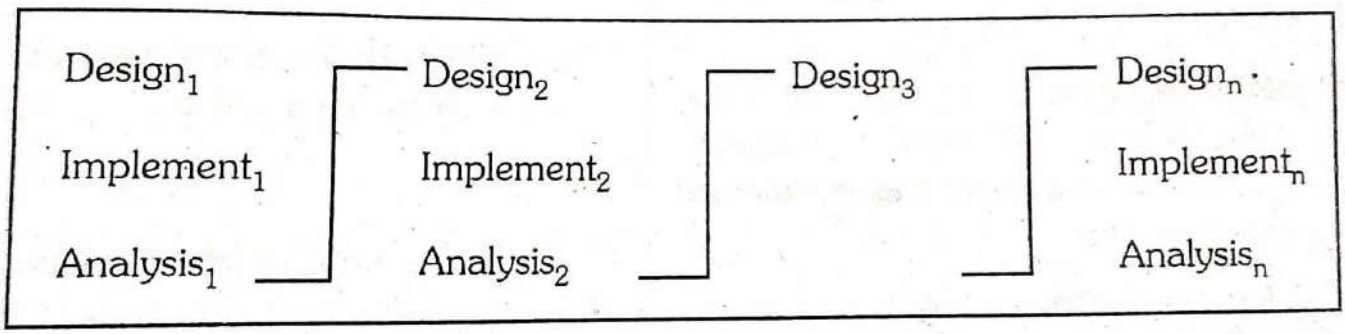


Fig.: The iterative enhancement model

Advantage

- It can result in better testing, as testing each increment is relatively easier than testing the entire system, (as in the waterfall model).
- A It is in prototyping, the increments provide feedback to the user which is useful for determining the final requirements of the system.
- Iterative enhancement model combines the benefits of both prototyping and the waterfall model.

Limitations

However, iterative enhancement model also suffers from the following limitations:

- The modal does not give a complete system and thus may of the details may not be incorporated in the developed system.
- As the model is based on a "modify-it-again" approach, it may be time-consuming and is not cost-effective.

3.5 COMPUTER ASSISTED AND SOFTWARE ENGINEERING TOOLS (CASE)

Computer-aided software engineering (CASE) sometimes called computer aided systems engineering provides software tools to automate the methodologies we have just described to reduce the amount of repetitive work the developer needs to do. CASE tools also facilitate the creation of clear documentation and the coordination of team development efforts. Team members can share their work easily by

accessing each other's files to review or modify what has been done. Modest productivity benefits can also be achieved if the tools are used properly.

CASE tools provide automated graphics facilities for producing charts and diagrams, screen and report generators, data dictionaries, extensive reporting facilities, analysis and checking tools, code generators, and documentation generators. In general, CASE tools try to increase productivity and quality by:

- Enforcing a standard development methodology and design discipline
- Improving communication between users and technical specialists
- Organizing and correlating design components and providing rapid access to them using a design repository
- Automating tedious and error-prone portions of analysis and design
- Automating code generation and testing and control rollout

CASE tools contain features for validating design diagrams and specifications. CASE tools thus support iterative design by automating revisions and changes and providing prototyping facilities. A CASE information repository stores all the information defined by the analysts during the project. The repository includes data flow diagrams, structure charts, entity-relationship diagrams, data definitions, process specifications, screen and report formats, notes and comments, and test results.

To be used effectively, CASE tools require organizational discipline. Every member of a development project must adhere to a common set of naming conventions and standards as well as to a development methodology. The best CASE tools enforce common methods and standards, which may discourage their use in situations where organizational discipline is lacking.

3.6 EVALUATION & MAINTENANCE OF INFORMATION SYSTEM

Why is evaluation of MIS important

Evaluation of MIS is an integral part of the management control process, in which the organizations determine or appraise the quality or worth of their information systems. In other words, evaluation of MIS is a process of measuring performance of organizational information systems. The feedback so obtained helps determine the necessary adjustments to be made in their information systems.

The scope of different evaluation approaches of MIS

(i) Quality Assurance Review

Quality assurance reviews or technical reviews focus on assessing the information system's technical quality, e.g. comparison to standards and operations acceptance procedures. Technical evaluation includes variables like data transmission rate, main/secondary storage, CPU capacity, etc. Technical reviews are performed by MTS development/ operations personnel or a separate quality assurance group within the MIS function.

(ii) Compliance Audits

Compliance audits or application control reviews assess the adequacy and completeness of controls for the system inputs, outputs, processing, security and access. Compliance audits are typically performed by an autonomous internal audit function.

(iii) Budget Performance Review

Evaluation of MIS budget performance concentrates on compliance with a predetermined budget expenditure level for the MIS development or operations process. Evaluation of user budget performance has its focus on MIS resource consumption by the user. Both may be supported by a chargeback mechanism.

(iv) MIS Personnel Productivity Measurement

The capability of MIS personnel is typically determined in terms of productivity. Examples of productivity measures include lines of code per unit time for the programming (development) personnel and keystrokes per unit time for the data entry (operations) personnel.

(v) Computer Performance Evaluation

The production capability of the computer hardware is typically evaluated in terms of performance efficiencies and bottlenecks that limit production. For example, computer performance evaluation measurements are made on per cent uptime, actual throughput, and IO channel utilization.

(vi) Service Level Monitoring

Service level monitoring focuses on assessing the information and support provided to the user, based on the terms established between the MIS and the user personnel. Assessment of the information provided include turnaround time, response time and error rates. Assessment of the support provided include the time required to respond to the user's problems and requests for changes.

(vii) User Attitude Survey

User attitude survey method is used in operational evaluation. Operational considerations refer to whether the input data is adequately provided and the output is usable. This type of attitude surveys are conducted through questionnaires and/or interviews to appraise the user's perceptions of the information and support given by the MIS function. User attitude surveys typically assess such aspects as the quality and timeliness of reports, quality of service and MIS-user communication.

(viii) Post-Installation Review

The focus of a Post-Installation Review (PIR) is often on estimating whether the system meets the requirement definition, the scope of the PIR may include a post-hoc review of the development and operation processes, an examination of the information and support provided, an analysis of the actual use process, and cost/benefit analysis of the system and its effects on the user performance.

(ix) Cost/Benefit Analysis

Cost/Benefit analysis is also known as economic evaluation. The analysis quantifies the system's effect on organizational performance in terms of dollars, e.g. direct cost savings or tangible financial benefits. Cost/Benefit analysis is often used in capital budgeting to gauge the return on investment.

Two major class of performance measurement

Evaluation of performance measurement consists of two major classes, as given below.

(i) Effectiveness

This refers to the quality of the outputs from the system. Effectiveness means doing the 'right' thing in the right manner so that desired result may be achieved. Information System is said to be effective if its product (i.e. output) is of quality, and the process of producing output is right (effective).

(ii) Efficiency

It is a measure of the amount of resources required to achieve the output, i.e. the use of system resources to get results. Being efficient implies the system is operating the 'right' way.

The relationship between effectiveness and efficiency is that effectiveness is a measure of the 'goodness' of output, while efficiency is a measure of the resources required to achieve the output.

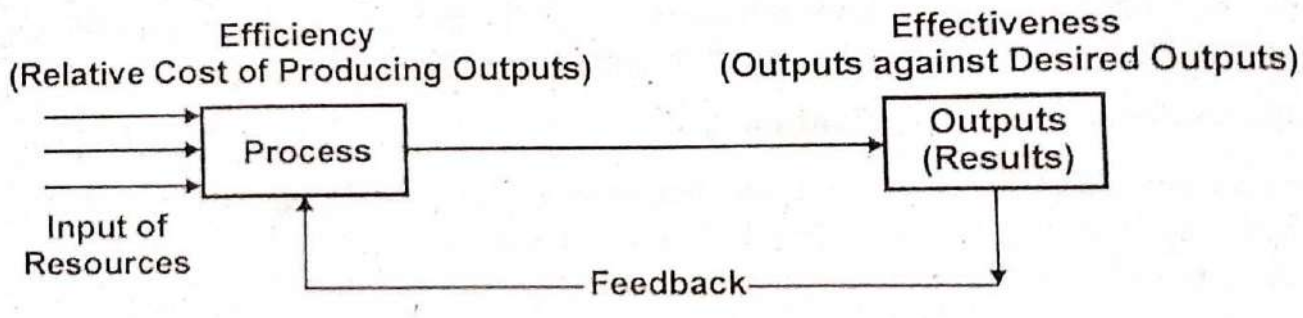


Fig.: Relationship between Efficiency and Effectiveness

There are various dimensions of information systems that should be evaluated. These may include the development process, which, concerns whether the system was developed following set standards information being provided and the system's performance. Depending upon the dimensions of the information system to be evaluated, an appropriate evaluation approach may be adopted.

Product based evaluation and detail the model which may be employed for product based MIS evaluation

The product-based evaluation is concerned with the product (i.e., information support) output which is received by the system. Therefore, it is an effective evaluation. This makes use of a model in order to evaluate the output effectiveness. The structure of the model consists of information attributes which are recognized as the components of a model so as to evaluate its effectiveness in an organization.

The attributes are timeliness, relevance, accuracy, completeness, adequacy, explicitness and exception based.

The MIS of an organization produces different kinds of outputs/reports. These are evaluated with respect to attributes in order to known their effectiveness. Managers of an organization are requested to give rating on the outputs/reports for each of the attribute. A five point scale is used for the purpose of rating which is based on the number of reports/outputs. Rating respond is received through mailed questionnaire or through personal interview in the form of numerical values.

Cost benefit analysis

Cost benefit analysis is considered as a best method of estimating the financial impact of developing an information system, which is a kind of business investment similar to new warehouse development process. This analysis is performed in order to determine whether alternative design options are economically feasible or not. It is very much essential to compare the benefits of information system against the benefits of capital budgeting projects.

Benefits of information Systems

The benefits of information system is measured based on the financial, economical impact the project has on the organization. The following are the different benefits of information system,

(a) Tangible benefits

(b) Intangible benefits.

(a) Tangible Benefits

Tangible benefits are the benefits that are measured in terms of money or profit i.e., they are quantitative.

Examples

- Increased revenue Decreased costs
- Reduce processing errors
- Faster turnaround
- Reduced inventory cost
- Reduced administrative expenses
- Reduced cost of paperwork processing.

(b) Intangible Benefits

Intangible benefits are another important type of benefits that cannot be measured in terms of money i.e., they are not quantitative.

Examples

- Better customer service
- Improved employee's moral values
- A Better decision making
- Increased customer goodwill
- Improved job satisfaction.

Costs of Information System

The cost associated with the development of information system needs to be estimated both by users as well as system analyst. Though cost may overweight the benefit factor, the latter is very important when compared to former as the selection of project is done mostly based on benefit factor i.e., if cost is more than benefit, then it is not feasible to develop such projects. Some of the different types of costs are as follows,

(a) Initial development costs

(b) Capital costs

(c) Annual costs.

(a) Initial Development Costs

These are nonrecurring (i.e., onetime) costs that are incurred while performing

- System analysis
- System design
- Coding, testing and debugging
- Training and conversion
- Inspections and walkthrough
- Documentation.

(b) Capital Costs

Capital costs are nonrecurring (i.e., one time) costs. These costs are incurred while,

- Purchasing new equipments, software package
- Performing file conversion
- Installing the equipments

In addition to these costs, there is a possibility that some extra costs may be incurred while using a new software, purchasing new peripheral devices.

(c) Annual Costs

Operations and maintenance are recurring costs that are initiated as soon as the system installation is completed. These costs include usage cost, overhead cost (power, insurance), supply cost, personnel cost (salaries), programmer's maintenance cost. In addition, an extra ongoing cost is incurred while performing personnel training.

The various types of system maintenance

The classes (or) types of maintenance acre,

1. Corrective maintenance

2. Adaptive maintenance and.

3. Perfective maintenance

1. Corrective Maintenance

This class indicates the removal of errors present in a program which occurred because of faulty design or incorrect presumption. However, the processing or performance failures will be repaired / rectified.

2. Adaptive Maintenance

This class indicates the modifications done to the program functions to allow the information system to satisfy the information requirements of the users. Due to the following organizational changes, this kind of maintenance might be compulsory.

(i) Alterations made to organizational procedures

(ii) Alterations made to organizational objectives, goals, policies and so on.

(iii) Alterations made to forms.

(iv) Alterations made to information required by manager.

(v) Alterations made to security need, system control and so on.

3. Perfective Maintenance

This class is responsible for addition of new programs or modifications in existing program so that the performance of the information system gets improved. It responds to additional requests of the user made due to the alterations inside or outside the organization. The alteration to outside the organization are environmental changes such as governmental policies, governmental laws, economic conditions, competitive conditions and updated technologies.

Importance of System Maintenance

- System maintenance is a process of making desirable improvements by monitoring, evaluating and modifying the existing information systems.
- It helps the organization in determining the effectiveness of information system by using the output of the evaluation process.
- This evaluation technique is a continuous process because the organizations are present in the dynamic and competitive environment.
- The organization must respond y taking appropriate measures depending on the result obtained from the evaluation process.

Define Maintenance of Information System

- System maintenance is a process of making desirable improvements by monitoring evaluating and modifying the existing information systems.
- It helps the organization in determining the effectiveness of information system by using the output of the evaluation process.

- This evaluation technique is a continuous process because the organizations are present in the dynamic and competitive environment.
- The organizations must respond by taking appropriate measures depending on the result obtained from the evaluation process
- The system maintenance phase consumes high amount of time and cost when compared to other initial development phases.
- During this phase organizations must develop an appropriate change management standards and procedures so as to ensure modifications.
- Various aspects like major, routine and emergency software modifications and software patches must he addressed by change controls.
- In addition, change controls must also provide procedures for requesting, evaluating, approving, testing, installing, and documenting software modifications.
- However, maintaining accurate, up-to-date hardware and software inventories is a complex task among all change management processes.
- System managers should document all modifications carefully in order to ensure accurate system inventories. Moreover, system maintenance also involves coordination of technical variations wherein an appropriate party is made responsible for monitoring software patch management programs.
- Software maintenance cost involves more than half of the total software development cost. But, without maintaining software it is not possible to resolve the issues that may occur after the release of a product. Having a good knowledge about the characteristics of a software helps in maintaining the software more efficiently.
- Therefore, software maintenance involves more aspects of service than a product and so it occupies large portion of the life span of a system.

Define the term security and the Implication of IS security and controls

The term security refers to state of being protected from harm or from those that cause negative effects. Examples can be protecting banks from robbery, computers from viruses, data from unauthorized access etc. Also, in information technology, security is applied upon different aspects such as, information network, database etc..

IS Security Technologies

(a) Firewall

A firewall refers to a protection device that selectively discriminates against data flowing out or into the organization based on the pre defined rules. A firewall protects unauthorized access to ISs over the Internet. may be a hardware and software that stops access to ISs resources. Thus, a firewall, which acts like a watchman, will not allow any unauthorized user to access the server of an organization. A firewall can also be used as a front line defense against attacks, as through a firewall, only a few types of protocols can be allowed to enter and thus the incoming data for any probable viruses or any attempt to attack on the IS resources can be screened. In other words, a firewall can restrict the sites from viewing which might have threat of attacks.

(b) Proxy Servers

A proxy server, as the name implies, acts as a representative of the true server of an organization. It is another approach of IS security measures which performs actions on behalf of another system. A proxy server is configured to look like a web server with the domain name of the true server of the organization. When any person from outside requests a particular web page, the proxy server receives the request, and in turn asks for the information from the true server, and then responds to the request of a person as a proxy for the true web server. Thus the person gets the information without getting in direct contact with the true web server.

(c) Authentication and Data Encryption

As already mentioned, these controls refer to the restrictions imposed for unauthorized access to IS resource. Before gaining an access to IS resource, it is important to prove the identity of the user as well as to authenticate the message sent by an individual or an organization. Authentication is the validation of a user's identity. For the authorized access, a user is given a password or personal identification number, which is a private word or combination of characters.

The password is known only to the authorized person. It is suggested that the password should not be simple to guess, meaning it should not be associated with the user, such as a spouse's, children's name, date of birth, car number, etc. Also the password must be changed at regular intervals. ID cards, ATM cards, smart cards are the other access control measures, through which the user's identity is proved.

A smart card contains a chip that can verify and validate a number of pieces of information along with the PIN, whereas ID cards, or ATM cards, contain magnetic stripes, on which user personal identification number is stored, which is compared against the input of the user. Under bio-metric access control, the human characteristics, which are considered as unique and can be used to recognize a person, namely, fingerprints and retina of the eye are scanner, and converted to images and are stored in digitized format. The subsequent scan, used to verify the authenticity, is also digitized and then compared with the stored digitized value.

(d) Digital Signatures

Digital signatures, which are analogous to physical signatures, are used to authenticate the identity of the sender of a message and also guarantee that the sent message has not been modified. Digital signatures are encrypted messages that are verified as authentic by an independent central facility. The digital signatures, which are implemented with public-key cryptography, are created in two phases. First, the encryption program uses a mathematical algorithm/ formula to create a message digest for the message is to be transmitted.

(e) Digital Certificates

A digital certificate is an electronic document, which is attached to the message certifying that the message is from the sender it claims to be from and has not been modified from the original format. Thus, a digital certificate is like a digital signature, which is used to authenticate the sender as well as the content. A digital certificate associates one's identity with one's public key. Digital certificates are issued by organization which is then called a certificate authority. The information like sender's

name, serial number, expiration date, and a copy of the certificate holder's Public key along with the digital signature of the certificate authority are stored on the digital certificate. This information is used to verify the authenticity of the certificate.

IS Controls

Similarly, the organization can plan and implement various kinds of IS controls so as to avoid, reduce and manage the risks of the potential threats to information systems. These controls can Le understood under the following five categories, namely

i) Physical Controls

(ii) Technical Controls

(iii) Administrative Controls

(iv) General Controls

(v) Application Controls

(i) Physical Controls

As the name implies, these controls refer to the protection of computer facilities and other IS resources. This includes protecting computer hardware, computer software database, computer networks, etc. Physical security of the IS resources include various controls such as:

- The location and layout of the computer centre must be decided keeping in view the physical security of the IS resources. For example, organizations would like to decide that the site of computer centre should be water proof and fire proof.
- The site should have proper air- conditioning systems, extinguishing systems, adequate drainage facilities and emergency power shutoff and backup systems.

(ii) Technical Controls

The technical controls are the controls which are implemented in the application of IS itself. These types of controls include access controls, data security controls, communication controls, etc.

Access Controls:

These controls refer to the restrictions imposed for the unauthorized access of any user to IS resource. In other word, a user, in order to gain access, must be authorized and before he/she is given an access, must be authenticated. The identification of the user can be obtained through a unique user identifier, such as the password, a smart card, digital signature, voice, finger print.

Unique user identifier is normally implemented through bio-metric controls. A biometric control is an automated method of verifying the identity of an individual, based on physiological or behavioral characteristics.

Data Security Controls:

To protect data from accidental or intentional disclosure to unauthorized person, or from unauthorized changes or destruction, data security controls are very useful, which can be implemented through operating systems, database security, access control programmers, backup and recovery procedures, etc. Organizations should make sure that in the event of any security breach, there is no data loss. For this, organizations must have a clear cut policy in place and must implement data security controls like taking of backup of all data periodically, duplicate the data automatically on regular intervals, etc..

Communication Controls:

With an increased use of the Internet, intranet and electronic commerce, communications controls have become all the more important Various communication controls include access control, data encryption, firewalls, etc.

(iii) Administrative Controls

Administrative controls which include clear guidelines, policies of the organizations with regards to the use and deployment of IS resources are very important in protecting ISs. For example, email policy, internet use policy, access privileges of employees, programming and documentation standards, etc., fall under the category of administrative controls.

(iv) General Controls

There may be some controls, which are categorized as general controls. These controls are implemented so as to ensure that ISs are protected from various potential threats.

For example, system development controls like budgeting, schedule, quality, etc., are meant to ensure that a quality system is developed within the budgeted cost and competed on time.

(v) Application Controls

The application controls, as the name implies, are embedded within the application itself. These controls are usually written as validation rules. These controls are popularly known as input controls, processing controls, and output controls.

UNIT-IV

4.1 SYSTEM DEVELOPMENT AND ORGANIZATIONAL CHANGE

Building new systems produce organizational change

Meaning

Building a new information system is one kind of planned organizational change. The introduction of a new information system involves much more than new hardware and software. It also includes changes in jobs, skills, management, and organization. When we design a new information system, we are redesigning the organization.

Information technology can promote various degrees of organizational change, ranging from incremental to far-reaching. Figure shows four kinds of structural organizational change that are enabled by information technology:

1. Automation

2. Rationalization

3. Business process redesign, and

4. Paradigm shifts.

1. Automation

The most common form of IT-enabled organizational change is automation. The first applications of information technology involved assisting employees with performing their tasks more efficiently and effectively.

Calculating paychecks and payroll registers, giving bank tellers instant access to customer deposit records, and developing a nationwide reservation network for airline ticket agents are all examples of early automation.

A deeper form of organizational change one that follows quickly from early automation is rationalization of procedures. Automation frequently reveals new bottlenecks in production and makes the existing arrangement of procedures and structures painfully cumbersome.

2. Rationalization

Rationalization of procedures is the streamlining of standard operating procedures. For example, CIMB Bank's system for handling retail banking accounts is effective not only because it uses computer technology but also because the company simplified the business process for opening a customer account.

Rationalization of procedures is often found in programs for making a series of continuous quality improvements in products, services, and operations, such as total quality management (TQM) and six sigma.

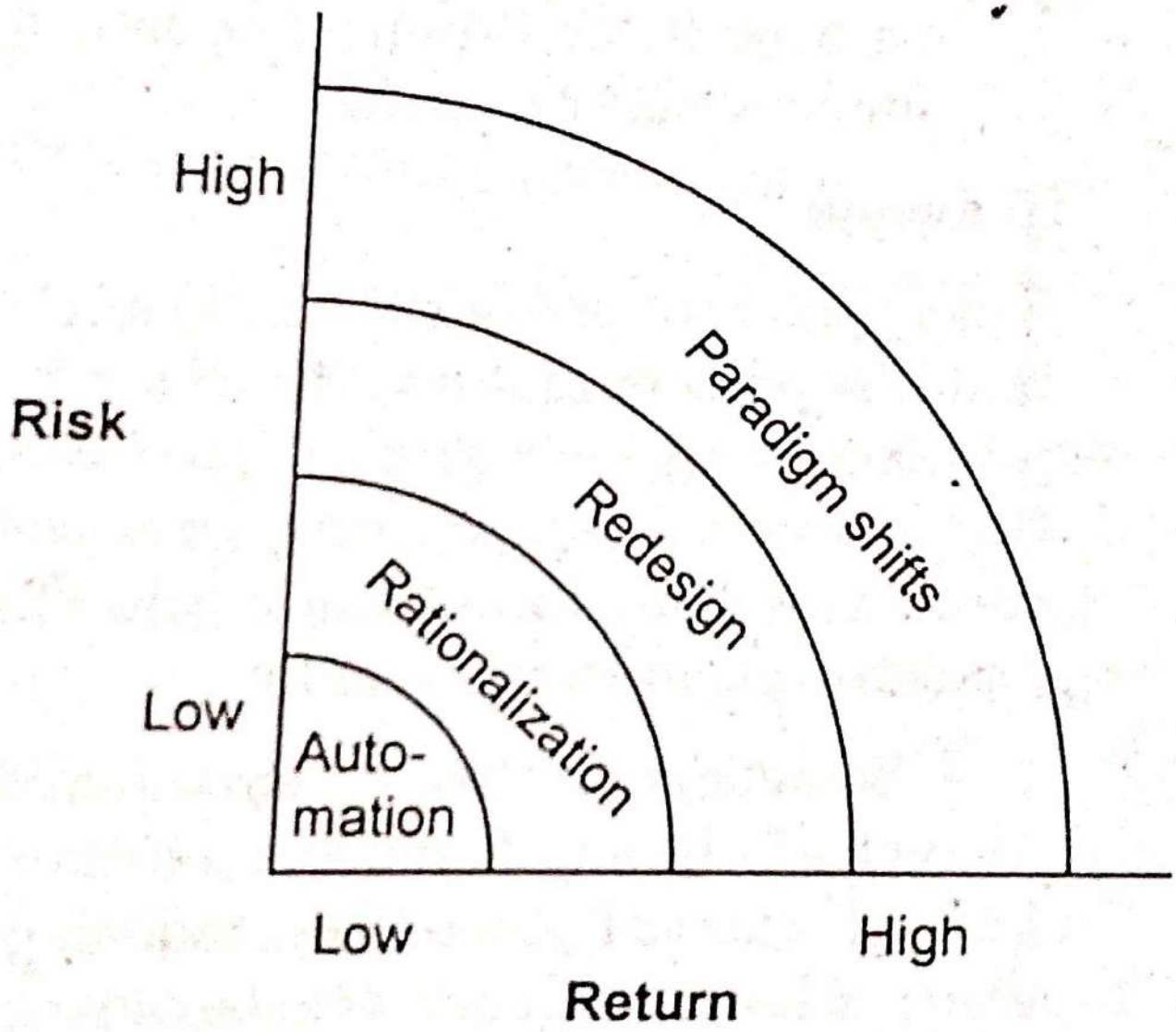


Fig. : Organizational Change Carries Risks and Rewards

(Total quality management (TQM) makes achieving quality an end in itself and the responsibility of all people and functions within an organization.

TQM derives from concepts developed by American quality experts such as W. Edwards Deming and Joseph Juran, but it was popularized by the Japanese.

(ii) Six sigma is a specific measure of quality, representing 3.4 defects per million opportunities. Most companies cannot achieve this level of quality, but use six sigma as a goal for driving ongoing quality improvement programs.

3. Redesign

A more powerful type of organizational change is business process redesign. in which business processes are analyzed, simplified, and redesigned. Business process redesign reorganizes workflows, combining steps to cut waste and eliminate repetitive, paper-intensive tasks.

Sometimes the new design eliminates jobs as well. It is much more ambitious than rationalization of procedures, requiring a new vision of how the process is to be organized.

Rationalizing procedures and redesigning business processes are limited to specific parts of a business. New information systems can ultimately affect the design of the entire organization by transforming how the organization carries out its business or even the nature of the business.

4. Paradigm shifts

The more radical form of business change is called a paradigm shift. A paradigm shift involves rethinking the nature of the business and the nature of the organization.

Paradigm shifts and reengineering often fail because extensive organizational change is so difficult to orchestrate.

4.2 BUSINESS PROCESS REDESIGN

Meaning

Business process management provides a variety of tools and methodologies to analyze existing process design new processes, and optimize those processes, BPM is never concluded because process improvement requires continual change.

Steps

Companies practicing business process management go through the following steps:

1. Identify processes for change

One of the most important strategic decisions that a firm can make is nbt deciding how to use computers to improve business processes, but understanding what business processes need improvement.

When systems are used to strengthen the wrong business model or business processes, the business can become more efficient at doing what it should not do.

As a result, the firm becomes vulnerable to competitors who may have discovered the right business model. Considerable time and cost may also be spent improving business processes that have little impact on overall firm performance and revenue.

Managers need to determine what business processes are the most important and how improving these processes will help business performance.

2. Analyze existing processes

Existing business processes should be modeled and documented, noting inputs, outputs. resources, and the sequence of activities.

The process design team identifies redundant steps, paper intensive tasks, bottlenecks, and other inefficiencies.

3. Design the new process

Once the existing process is mapped and measured in terms of time and cost, the process design team will try to improve the process by designing a new one. A new streamlined "to-be" process will be documented and modeled for comparison with the old process.

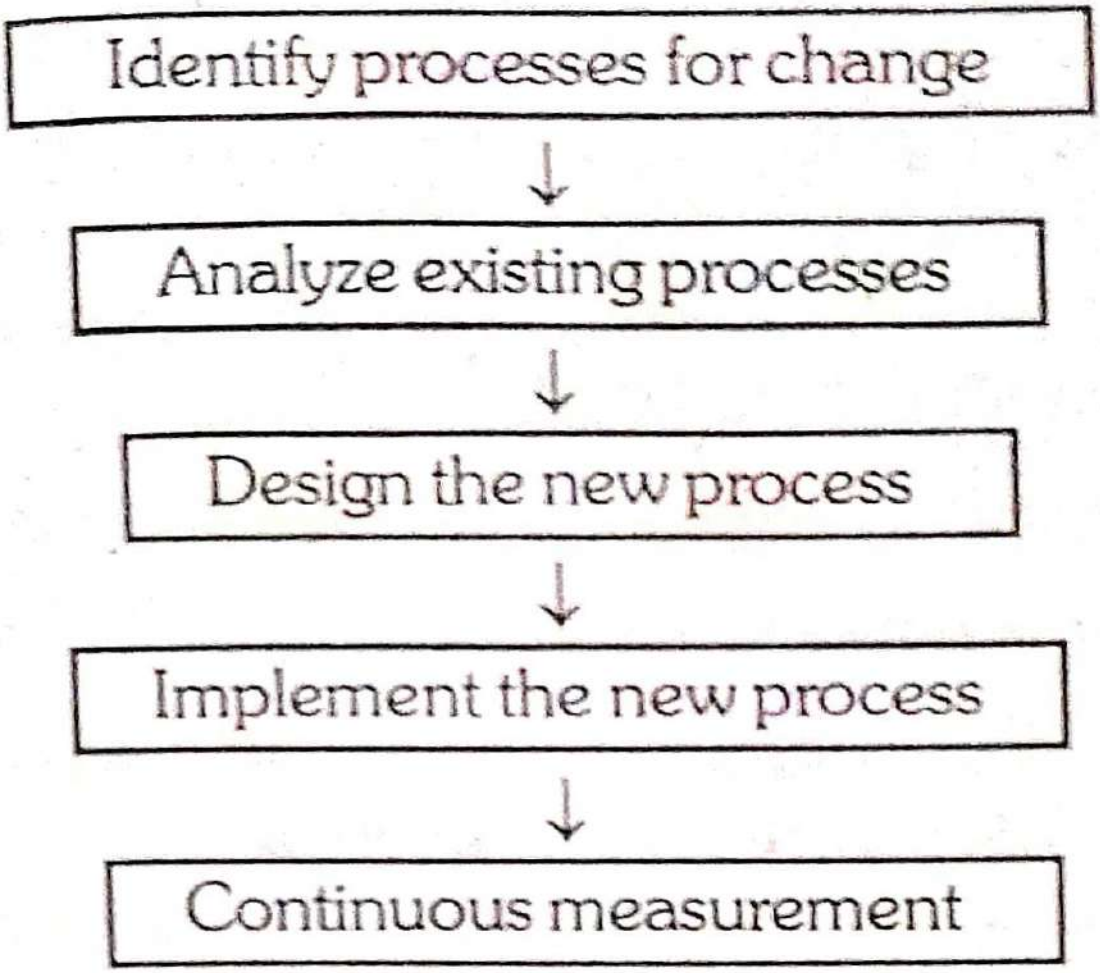


Fig.: Business process management

4. Implement the new process

Once the new process has been thoroughly modeled and analyzed, it must be translated into a new set of procedures and work rules. New information systems or enhancements to existing systems may have to be implemented to support the redesigned process.

The new process and supporting systems are rolled out into the business organization. As the business starts using this process, problems are uncovered and addressed. Employees working with the process may recommend improvements.

5. Continuous measurement

Once a process has been implemented and optimized, it needs to be continually measured. Processes may deteriorate over time as employees fall back on old methods, (or) they may lose their effectiveness if the business experiences other changes.

4.3 SYSTEMS ANALYSIS

Meaning

System analysis may be understood as a process of collecting and interpreting facts, identifying problems and using the information to recommend improvements in the system. In other words, system analysis means identification, understanding and examining the system for achieving pre-determined goals/objectives of the system.

Objectives

System analysis is carried out with the following two objectives.

(i) to know how a system currently operates, and

(ii) to identify the users' requirements in the proposed system.

System analysis is a detailed study of all important business aspects under consideration and the existing system, and thus, the study becomes a basis for the proposed system. System analysis is regarded as a logical process.

The emphasis in this phase, is on investigation to know how the system is currently operating and to determine what must be done to solve the problem.

The system analysis phase is very important in the total development efforts of a system. The user may be aware of the problem but may not know how to solve it. During system analysis, the developer (system designer) works with the user to develop a logical model of the system.

4.3.1 Requirement Determination

Meaning

Requirement determination, which is also termed as a part of software requirement specification (SRS) is the starting point of the system development activity.

This activity is considered as the most difficult and also the most error-prone activity because of the communication gap between the user and the developer.

This may be because the user usually does not understand software and the developer often does not understand the user's problem and application area.

The requirement determination is a means of translating the ideas given by the user, into a formal document, and thus to bridge the communication gap.

Process

(a) Understanding the Basic Process

The system analyst can understand the process if he/she has the information about.

(i) The purpose of carrying out business activity.

(ii) The steps being performed along with the time and location.

(iii) The individual who is performing the steps.

(iv) The frequency, time and user of the resulting information.

(b) Identifying Data to be Generated

Here, the system analyst must have the knowledge of using data for performing every activity. Apart from gathering data, it is even important for an analyst to gather information generated after a business transaction. As this information may be helpful to the manager in making decisions.

(c) Determining Constraints with Respect to Time, Frequency and Volume

System analyst must collect information so as to maintain the record of the number of time a particular activity is executed and the volume of items that are to be managed.

(d) Knowing the Performance Controls

System analyst must gather information about the system controls, because it helps in maintaining the way of carrying out business functions.

Various strategies for requirement determination

In order to collect information so as to study the existing system and to determine Information requirement, there are different strategies, which could be used for the purpose.

These strategies are discussed below.

1. Interview

The interview is a face-to-face method used for collecting the required data. In this method, a person (the interviewer) asks questions from the other person being interviewed.

The interview may be formal or informal and the questions asked may be structured or unstructured. The interview is the oldest and the most often used device for gathering information

about an existing system. The respondents are generally current users of the existing system or potential users of the proposed system. Although it is one of the preferred techniques, interviewing is not always

the best source of application data.

Because of the time required for interviewing and the inability of the users to explain the system in detail, other methods are also used to gather information.

The analyst must plan the interviews and must know clearly in advance regarding the following issues:

(i) Whom to interview?

(ii) When to interview?

(iii) What to ask?

(iv) Where to hold the interview?

(v) How to begin the interview?

(vi) How to conclude the interview?

2. Questionnaire

A questionnaire is a term used for almost any tool that has questions to which individuals respond. The use of questionnaires allows analysts to collect information about various aspects of a system from a large number of persons.

The questionnaire may contain structured or unstructured questions. The use of a standardised questionnaire may give more reliable data than other fact-finding techniques.

3. Record Review

Record review is also known as review of documentation. Its main purpose is to establish quantitative information regarding volumes. frequencies, trends, ratios, etc. In record review, analysts examine information that has been (- recorded about the system and its users.

Records/documents may include written policy manuals, regulations and standard operating procedures used by the organization as a guide for managers and other employees. Procedures, manuals and forms are useful sources for the analyst to study the existing system.

4. Observation

Another information-gathering tool used in system studies is observation. It is the process of recognizing and noticing people, objects and occurrences to obtain information. Observation allows analysts to get information, which is difficult to obtain by any other fact-finding method.

This approach is most useful when analysts need to actually observe the way documents are handled, processes are carried out and whether specified steps are actually followed.

Determining requirements of Information system are difficult

(i) To substantiate a business or other activity, the rudimentary factor required is information. This necessity is fulfilled by system analysts who transforms information requirements into functional specification.

(ii) Typically, requirements can be specified as lists of detailed transactions including orders, purchases and summarized data derived from master records such as customers, vendors and employees.

(iii) Information requirements are considered as one of the essential elements in information system planning process. If the gathered requirements are correct and complete then it would be easier for the manager to implement information system applications and to build databases

(iv) Consider an example of determining information requirements for a warehouse. Here, it is essential to design a database that can be shared by other cross-functional areas (like sales, production. accounting).

(v) The reason of sharing the data about information requirements is to assist the managers in making correct decision on pricing, marketing strategy.

(vi) However, failure in sharing data may result in lack of interaction between the managers of different departments, due to which they become unaware of the business processes being implemented in other functional areas.

(vii) The process of determining correct and complete information requirement is the most challenging task because of the following problems,

(viii) Managers do not have any knowledge about the information requirements of other functional areas

(ix) Managers are not allowed to use JAD applications completely while interviewing and collecting data

(x) Every user and analysts have their own perspective of defining requirements due to which there is a possibility of misconception.

4.4 SYSTEM DESIGN

Meaning

Systems design shows how the system will fulfill this objective. The design of an information system is the overall plan or model for that system. Like the blueprint of a building or house, it consists of all the specifications that give the system its form and structure.

The systems designer details the system specifications that will deliver the functions identified during systems analysis. These specifications should address all of the managerial, organizational, and technological components of the system solution.

Like houses or buildings, information systems may have many possible designs. Each design represents a unique blend of all technical and organizational components. What makes one design superior to others

is the ease and efficiency with which it fulfills user requirements within a specific set of technical, organizational, financial, and time constraints.

Objectives

The objectives to be considered while designing an information system are,

(i)The system must be easier to use as well as easier to understand even for a naive user.

(ii) The system must be flexible enough to adapt the dynamic changes requested by the users.

(iii) The system must efficiently carry out its activities or operations within the specified time.

(iv) The system must be secure, in the sense that it should have reliable hardware, it should provide physical security of data as well as detect and prevent frauds.

The steps involved in system design

The steps involved in conceptual design are as follows,

Step 1: Problem Definition

The first step in conceptual MIS design is to clearly understand and define the problem to be solved it should be noted here that there are not only the current problems, which are of concern; rather MIS design should be related to long range planning for the organization so as to solve future problems further, MIS function is supposed to solve the problems relating to information needs for the business organization.

Thus information needs of the organization are to be identified and understood in this step, which can be determined by understand the mission, objectives, and strategic and operating plans for the business.

Step 2: Determine System Objectives

In this step, system analyst involves the users for setting up the system's objectives based on the problem definition. It is very important for an analyst to assure the users that the information system is beneficial rather than disadvantageous.

Which setting up the objectives, it is important to note that these objectives provide a measure of performance. Therefore, it is better to define the objectives in quantitative terms instead of qualitative terms.

Step 3: Constraints Identification

In this step. constraints are identified which helps the designer in restricting the system design. This restriction helps the designer in achieving the set system objectives. Basically, a system constraint is divided into following types,

(i) External constraints

(ii) Internal constraints.

(i) External Constraints

These are the constraints that are external to the organization.

(ii) Internal Constraints

These are the constraints that are defined internally within the organization.

Step 4: Information Requirement identification

In this step, the information requirements of managements are identified, which helps the organization in carrying out their functions smoothly. Before specifying the information need, a user must to have clear information about,

- What is actually required as output from the information system
- Elements of information, which are required for achieving the set objectives.

It is the responsibility of a system analyst to collect information requirement from the user either by employing direct or indirect approach.

(i) Direct Approach

In this approach, system analyst queries the user about their responsibilities together with the items required for fulfilling those responsibilities.

(ii) Indirect Approach

In this approach, a system analyst queries the user to describe their respective decision-making process.

Step 5: Information Sources Identification

In this step, the sources from where the information requirement has been gathered is identified. This helps in identifying the input data, its source, format. In order to determine the information sources, a system analyst must study the existing system.

This is because, the identification of information sources helps in structuring the new system. Therefore,

a system analyst must identify the information sources sites with fitting these sources, Basically, source of information can be categorized as,

(i) Internal and External Records

The internal records may be in written form like files, inputs and outputs, correspondence, reports, documentation of the present or planned systems, etc., whereas external sources may include trade publications, government statistics, etc.

(ii) Managers and Operating Personnel

User managers and operating personnel may be an important source for understanding input. output and data processing requirements of an information system.

However, gathering data from this source involves interviewing the managers and operating personnel, which requires proper planning and skill.

Step 6: Designs Development

In this step, a system analyst develops various conceptual designs for the system. These designs define the following.

(1) Main decision points

(ii) Information flows

(iii) Sources of information

(iv) Responsibilities of user-manager.

A system analyst generates these MIS designs by considering alternative combinations of input, storage, processing, communication and output. Among these various conceptual designs, a design which is optimum and fulfills the following criteria is selected,

(1) The design must meet the requirements of the users

(ii) The design must meet the requirements of the organization

(iii) The design must be cost effective.

The following criterion may be adopted as a basis for evaluating the designs:

(i) Economic Basis:

A preliminary cost-benefit analysis of each of the designs is made.

(ii) Performance Basis

Each alternative is objectively evaluated for the anticipated performance with the objectives of the systems s previously developed.

(iii) Operational Basis:

For each alternative, analysis is made to determine the strong and weak points in respect of quality of the database, information, potential breakdown points, etc.

Step 7: Conceptual Design Documentation

The final selected conceptual alternative is documented in specific terms. The documentation of the conceptual design involves:

(1) Overall system flow,

(ii) System inputs,

(iii) System outputs, and

(iv) Other documentations like activity sheet and system description, etc.

Step 8: Report Preparation

In this step, the document prepared is approved by the management so as to initiate the detailed design activity. The report prepared must describe the following,

(i) Problem

(ii) Objectives

(iii) System's overview

(iv) Reason for selecting one alternative design among the other designs

(v) Time and resources required for developing the system.

The documentation prepared must be appended within the annexure of the report or must be given in another volume of report. Once the report has been prepared, it is submitted to higher level management for approval. If the report is approved, the detailed design is initiated,

Various methods for designing information system

The popular methods for designing information systems are,

(1) Problem Partitioning

(ii) Structured design

(iii) Top-down design.

(i)Problem Partitioning

The method is based on the principle of 'divide and conquer'. In this method instead of solving the entire problem at once, the problem is divided into small manageable parts (modules) that can be solved separately

The problem partitioning method aims at reducing complexity because each module can be developed, coded red tented relatively independently of the others. Also, maintenance is minimized if each module can be modified separately

(ii) Structured Design

In structured design, a series of logical specifications are collected and converted into a series of physical specifications. The main aim of structured design is changeability

A changeable system provides flexibility by changing according to the requirements of the user Basically, n change in information system is due to change in lines of business, management structure, placing and salary plans. Using changeable system, the system designer can decrease the overall cost of developing the system

The changeable system is developed using a set of modules that are functionally independent of other modules By functional independency, the modules can be removed, changed and replaced without affecting the workings of any other modules in the system.

In structured design, documentation is carried out using a structure chart that organizes the modules in a hierarchical structure. This chart also shows the hierarchy or relationship that exists among modules in the system.

Figure below depicts hierarchical arrangement of modules.

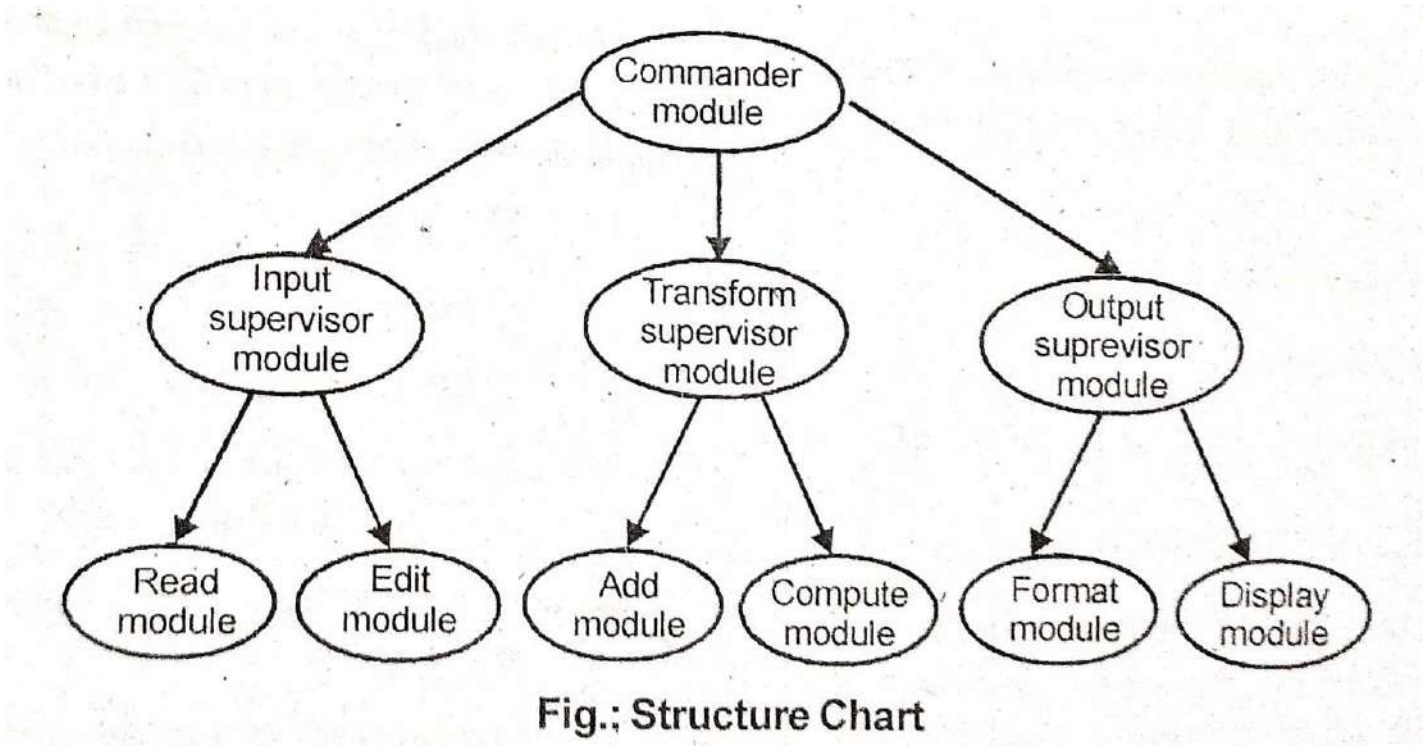


Fig.: Structure Chart

Among ail these modules, the commander module (shown at the top) is the "boss" that governs other modules. An input supervisor module carries out input functions and handovers work to read and edit modules. An output supervisor module caries out output functions and handovers output work to format and print modules.

Two characteristics that are essential for good structured design are,

(a) Cohesion

(b) Coupling.

(a) Cohesion

It refers to the degree to which modules within the program perform a single function. Modules performing only one function are said to be more cohesive. Programs with cohesive modules are much

For instance, if a user wants updations in customer record then the system designer, who is responsible for making updations opens edit module, changes the logic without affecting the other

modules in the system. Changes to cohesive module do not show impact on other modules.

But, modules containing multiple functionalists do not process cohesion. It is not easy to modify or reuse the modules that contain several functionalists due to which the probabilities of encountering errors Increases.

(b) Coupling

It refers to the degree of connection that exists between modules. It is however, very difficult to maintain the modules that are interconnected with each other. Higher coupling results in "ripple" effect, wherein a bug in one module creates a bug in other modules.

Reusability is an important feature of good structured design. Cohesive modules can be reused either in the same program or in the other program. Now a days programmers are using "canned" modules that consist of code for executing common functions like editing, updating and reporting.

The main responsibility of system designer is to design a program structure wherein the modules are organized in such a way that it becomes easy for the designer to use as well as reuse the modules. Basically the system designer organizes a set of modules into a hierarchical form using documentation tool i.e., structure chart.

(iii) Top-down Design

The top-down design is based on the concept of a system which suggests that a system consists of sub-systems components), which have sub- systems of their own.

In other words, a system may be termed as a hierarchy of sub-systems, the highest level sub- system corresponding to the total system. Accordingly, this method involves the identification of the main components of the system, decomposing them into their lower-level components and iterating until the desired level of detail is reached.

It attempts to smoothen the path of system design by starting at the top and designing the broad modules first. At each stage, adequate attention is paid to subsequent interfacing so that as the system expands further, modules can be added without trouble.

Various phases of system design

Detailed system design involves the following phases.

1. Project Planning and Control

2. Involve the User

3. Define the Detailed Sub-Systems

4. Input/ Output Design

5. Feedback from the User

6. Database Design

7. Procedure Design

8. Design Documentation

1. Project Planning and Control

In order to ensure an effective and efficient design of an MIS, it is very important that a detailed design process should in itself be considered a complete project.

Therefore, the first step in the detailed design is planning and controlling, so that standards may be established and a proper follow-up is made.

Some of the main points, which are important in planning and control of a detailed design are given here.

Project Planning

(i) Formulate the project objectives.

(ii) Define the project tasks.

(iii) Prepare a network diagram of all events and activities so as to specify sequential and parallel events.

(iv) Schedule the work as per the requirements of the user.

(v) Prepare a budget for the project.

Project Control

Get a feedback of the actual performance of the project with respect to time, cost and work of the project and compare it with schedules, budgets and technical plans.

(1) Take corrective action where required so as to maintain control.

2. Involve the User

System designers must inform the users regarding the new information system being developed and gain their support and acceptance. In this phase, users are assured that changes will benefit them or that they will not be at disadvantage because of the new system. It is also important to take users in confidence so as to obtain Information for the design of the system.

This will also help managing resistance to change and would ensure successful implementation of the system.

3. Define the Detailed Sub-Systems

In detailed system design, every system needs to be broken down to ascertain all activities required and their respective inputs and outputs. In some of the cases, sub-systems are broadly defined in the conceptual design phase, but at this stage they are specifically defined to work out every detail concerning the sub-system.

4. Input/ Output Design

(i) Output Design

The term output implies any information printed or displayed, produced by an MIS. At this stage, the following activities take place.

(a) Specific outputs which are required to meet the information needs are identified.

(b) Methods for presenting information are selected.

(c) Reports, formats or other documents that act as carrier of information, produced by an MIS, are designed.

Objectives

An output from an MIS should meet one or more of the following objectives:

(a) It should provide information about the past, present or future events. Outputs at the operational control level provide information of the past and the present events, whereas outputs which are required at the strategic planning level include information on future projections.

(b) It should signal important events, opportunities and problems. For example, exceptional reports indicate such happenings.

(c) It should trigger an action in response to some event. A set of rules is pre defined for such a trigger. For example, an order is prepared when inventory reaches a certain level,

(ii) Input Design

Generally, output from a system is regarded as the main determinant of the system's performance, yet as already mentioned, output from the system are affected by the inputs to the system. Therefore, input design is equally important for the system designer.

Objectives

The main objectives which guide the input design are briefly discussed as follows:

(i) Control the volume of input data: Try to reduce data requirements and avoid capturing unnecessary data. Constant and system-computable data should not be captured.

(ii) Avoid processing delays during data entry: Automating data capturing may reduce this delay.

(iii) Avoid data entry errors: Checks in the data entry programs, which are called input validation techniques may help.

(iv) Keep the process simple: The system should be kept as simple and easy to use as possible.

5. Feedback from the User

In this phase, users are again involved by the designers so as to know their feedback regarding the new information system. This phase leads to the acceptance of this new MIS system. It is the responsibility of a system analyst to show a demo on the new MIS to users.

6. Database Design

A database is an orderly arrangement of all the ecords related i to each other. Its serves as a data resource for the MIS of an organization.

To have optimum performance, storage and fast retrieval of data, database design is an important phase in the detailed design of a system. For designing a database, the designer should keep the following points in mind:

(i) Identify all data tables and record types.

(ii) Identify fields for each table, the key fields for each table and relations between various tables.

(ii) Determine the data type and width for each field of the tables.

(iv) Normalize the data tables.

(v) Properly document data dictionary.

7. Procedure Design

Procedures are the rules, standards or methods designed to increase the effectiveness of the information system. The procedures detail about the tasks to be performed in using the system.

They serve as ready reckoners for the designers as well as for the users. Sometimes they perform the task of a supervisor over operators. There is a wide variety of procedures, which include the following:

(i) Data Entry Procedures

These are the methods designed for data entry, e.g. data entry sequence.

(ii) Run-time Procedures

The actions to be taken by the users to achieve the intended results, e.g. a procedure may instruct the user to load printer with a specific size of paper.

(iii) Error-handling Procedures

These procedures help the user in detecting and correcting errors.

(iv) Security and Backup Procedures

Through these procedures information is provided regarding actions required to be taken to protect the system against damage.

(v) Software Documenting Procedures

The programmers get instructions on how to document the programs, In designing procedures, designers should:

(a) understand the purpose and quality standard of each procedure

(b) develop a step-by-step direction for each procedure, and

(c) document all the procedures.

8. Design Documentation

Detailed design starts with the performance specifications given by the conceptual design and ends with a set of design specifications for the construction of MIS.

The outputs from the detailed design, i.e. design specifications, are handed over to the programmers for writing codes to translate system specifications into a physical MIS.

Therefore, the system analyst should very carefully document the detailed design. In fact, design documents should consist of comprehensive details of all the design phases. Design documen-tation of detailed design report, generally, consists of the following:

(i) System objectives

(ii) Design constraints

(iii) Inputs/outputs

(iv) Data files

(v) Procedures (manual)

(vi) Proposed system (a summary and detailed flow charts)

(vii) Input/output specifications

(viii) Program specifications

(ix) Database specifications

(x) Cost of installation and implementation

(xi) System test conditions

4.5 SYSTEM DEVELOPMENT PROCESS

Core activities in the system development process

It consists of

(Programming

(ii) Testing

(1) Conversion

(iv) Production and

(v) Maintenance

(i) Programming

During the programming stage, system specifications that were prepared during the design stage are translated into software programs code.

Today, many organizations no longer do their own programming for new systems. Instead, they purchase the software that meets the requirements for a new systems from external sources such as

software packages from a commercial software vendor, software services from an application service provider, or outsourcing firms that develop custom application software for their clients.

(ii) Testing

Exhaustive and thorough testing must be conducted to ascertain whether the system produces the right results.

Testing an information system can be broken down into three types of activities:

(a) unit testing

(b) system testing, and

(c) acceptance testing.

(a) Unit Testing

Unit testing, or program testing, consists of testing each program separately in the system. It is widely believed that the purpose of such testing is to guarantee that programs are error-free, but this goal is realistically impossible.

Testing should be viewed instead as a means of locating errors in programs, focusing on finding all the ways to make a program fail. Once they are pinpointed, problems can be corrected,

(b) System Testing

System testing tests the functioning of the Information system as a whole. It tries to determine whether discrete modules will function together as planned and whether discrepancies exist between the way the system actually works and the way it was conceived

Among the areas examined are performance time, capacity for file storage and handling peak loads, recovery and restart capabilities, and manual procedures.

(c) Acceptance Testing

Acceptance testing provides the final certification that the system is ready to be used in a production setting.

Systems tests are evaluated by users and reviewed by management. When all parties are satisfied that the new system meets their standards, the system is formally accepted for installation.

The systems development team works with users to devise a systematic test plan. The test plan includes all of the preparations for the series of tests we have just described

(iii) Conversion

Conversion is the process of changing from the old system to the new system. Four main conversion strategies can be employed:

(a) The parallel strategy

(b) The direct cutover strategy

(c) The pilot study strategy, and

(d) The phased approach strategy.

(a) The Parallel Strategy

In a parallel strategy, both the old system and its potential replacement are run together for a time until everyone is assured that the new one functions correctly.

This is the safest conversion approach because, in the event of errors or processing disruptions, the old system can still be used as a backup.

However, this approach is very expensive, and additional staff or resources may be required to run the extra system

(b) The Direct Cutover Strategy

The direct cutover strategy replaces the old system entirely with the new system on an appointed day.

It is a very risky approach that can potentially be more costly than running two systems in parallel if serious problems with the new system are found. There is no other system to fall hack on. Dislocations, disruptions, and the cost of corrections may be enormous.

(c) The Pilot Study Strategy

The pilot study strategy introduces the new system to only a limited area of the organization, such as a single department or operating unit.

When this pilot version is complete and working smoothly, it is installed throughout the rest of the organization, either simultaneously or in stages.

(d) The Phased Approach Strategy

The phased approach strategy introduces the new system in stages, either by functions or by organizational units.

(iv) Production

After the new system is installed and conversion is complete, the system is said to be in production.

During this stage, the system will be reviewed by both users and technical specialists to determine how well it has met its original objectives and to decide whether any revisions or modifications are in order. In some instances, a formal post implementation audit document is prepared.

(v) Maintenance

After the system has been fine-tuned, it must be maintained while it is in production to correct errors, meet requirements, or improve processing efficiency.

Changes in hardware, software, documentation, or procedures to a production system to correct errors, meet new requirements, or improve processing efficiency are termed maintenance.

4.6 METHODOLOGY FOR MODELING AND DESIGNING SYSTEM

Principle methodologies for modeling and designing systems

(i) Structured methodologies have been used to document, analyze, and design

(ii) Information systems since the 1970s. Structured refers to the fact that the techniques are step by step, with each step building on the previous one.

(iii) Structured methodologies are top-down, progressing from the highest, most abstract level to the lowest level of detail - from the general to the specific.

(iv) Structured development methods are process- oriented, focusing primarily on modeling the processes, or actions that capture, store, manipulate, and distribute data as the data flow through a system.

(v) These methods separate data from processes. A separate programming procedure must be written every time someone wants to take an action on a particular piece of data. The procedures act on data that the program passes to them.

4.6.1 Structured Methodologies

Structured analysis is a structured methodology that is responsible for performing the following activities.

(i) Defining inputs, processes and outputs that are related to the system.

(ii) Developing a logical mode) of the proposed system.

(iii) Partitioning the entire system into many manageable modules each of which defines different level of details.

(iv) Defining the processes or transformations to be performed on every individual modules.

(v) Defining the interfaces that exist between the modules

The advantage of performing structured analysts that it helps the analyst in detecting the errors in the early stage of analysis process, thereby reducing the time as well as cost incumed, when compared to the cost and time incurred in detecting errors in the later stages of development prose

Tools for Performing Structured System Analysis

Structured analysis is performed using graphical tools that are easily understood by the users. Some of the important tools are as follows:

1. Data flow diagrams

2. Data dictionary

3. Structured Chart

4. Decision trees

5. Decision tables.

4.6.1.1 Data flow Diagram (DFD)

Meaning

A Data Flow Diagram (DFD) is a graphical representation normally designed by a system analyst and is used as a reference point by the programmer which portrays the "flow" of data through an information system.

It is primarily used for the visualization of data processing for the structured design of an information system. It is common practice for a database designer to begin the process by drawing a context-level DFD, which shows the interaction between the system and outside entities.

This context-level DFD is then "exploded" to show more detail of the system that is begin modeled.

- This is also called a bubble chart
- It has four symbols Square (defines sources arrow (defines data flow), circle (defines proce and open rectangle (defines data store)
- It is the starting point in the system design the decomposes requirements to the lowest level of detail.
- It identifies major transformations that eventually become programs in system design.
- It consists of a series of bubbles joined by lines Bubbles represent transformations and the lines represent the data flows in the system.

Symbols

Data Flow Diagrams are composed of the four basic symbols shown below. Any system can be represented at any level of detail by these four symbols

(i) External Entity

(ii) Data Flow

(iii) Data Store

(iv) Process

(i) External Entity

The External Entity symbol represents sources of data to the system or destinations of data from the system. External entities determine the system boundary.

They are external to the system being studied. They are often beyond the area of influence of the developer. These can represent another system or subsystem. These go on margins/edges of data

flow diagram. External entities are named with appropriate name.

(ii) Data Flow

The Data Flow symbol represents movement of data. Data flow represents the input (or output) of data to (or from) a process ("data in motion"). Data flows only data, not control. Represent the minimum essential data the process needs. 

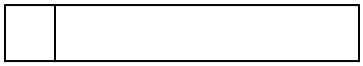
Using only the minimum essential data reduces the dependence between processes. Data flows must begin and or end at a process. Data flows are always named. Names should be some dentifying noun. For example, order, payment.

(iii) Data Store

The Data Store symbol represents data that is not moving. Data Stores are repository for data that are temporarily or permanently recorded within the system. It is an "inventory" of data.

These are common link between data and process models. Only processes may connect with data stores. There can be two or more systems that share a data store.

This can occur in the case of one system updating the data store, while the other system only accesses the data.



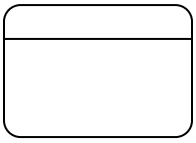
Data stores are named with an appropriate name, not to include the word "file", Names should consist of plural nouns describing the collection of data. Like customers, orders, and products.

These may be duplicated. These are detailed in the data dictionary or with data description diagrams.

(iv) Process

The Process symbol represents an activity that transforms or manipulates the data. Processes are work or actions performed on incoming data flows to produce outgoing data flows.

These show data transformation or change. Data coming into a process must be "worked on" or transformed in some way. Thus, all processes must have inputs and outputs.



In some (rare) cases, data inputs or outputs will only be shown at more detailed levels of the diagrams. Each process in always "running" and ready to accept data.

Major functions of processes are computations and making decisions. Each process may have dramatically different timing: yearly, weekly, daily.

Advantages and disadvantages of Data Flow Diagram

Advantages

(i) It gives further understanding of the interestedness of the system and sub-systems.

(ii) It is useful from communicating current system knowledge to the user.

(iii) Used as part of the system documentation files.

(iv) Dataflow diagram helps to substantiate the logic underlining the dataflow of the organization.

(v) It gives the summary of the system.

(vi) DFD is very easy to follow errors and it is also useful for quick reference to the development team for locating and controlling errors.

Disadvantages

(i) DFD is likely to take many alteration before agreement with the user.

(ii) Physical consideration are usually left out.

(iii) It is difficult to understand because it ambiguous to the user who have little or no knowledge.

4.6.1.2 Data Dictionary

It is a structured repository of data. Although we give descriptive names to the data flows, process and data stores in a DFD, it does not give the details.

Hence to keep the details of the contents of data flows, process and data stores we also require a Data Dictionary.

This is a structured repository of data. It clearly documents the list of contents of all data flows, processes and data stores.

The three classes to be defined are:

1. Data Elements: This the smallest unit of data. Further decomposition is not possible. The ISO-11179 Standards give rules for creating Data Element names.

2. Data Structure: This is a group of Data Elements which together form as a unit in a data structure.

3. Data flows and Data stores: Data flows are data structured in motion. Data Stores are data structures in store. (Data structures in a data store - a data store is a location where data structures are temporarily located):

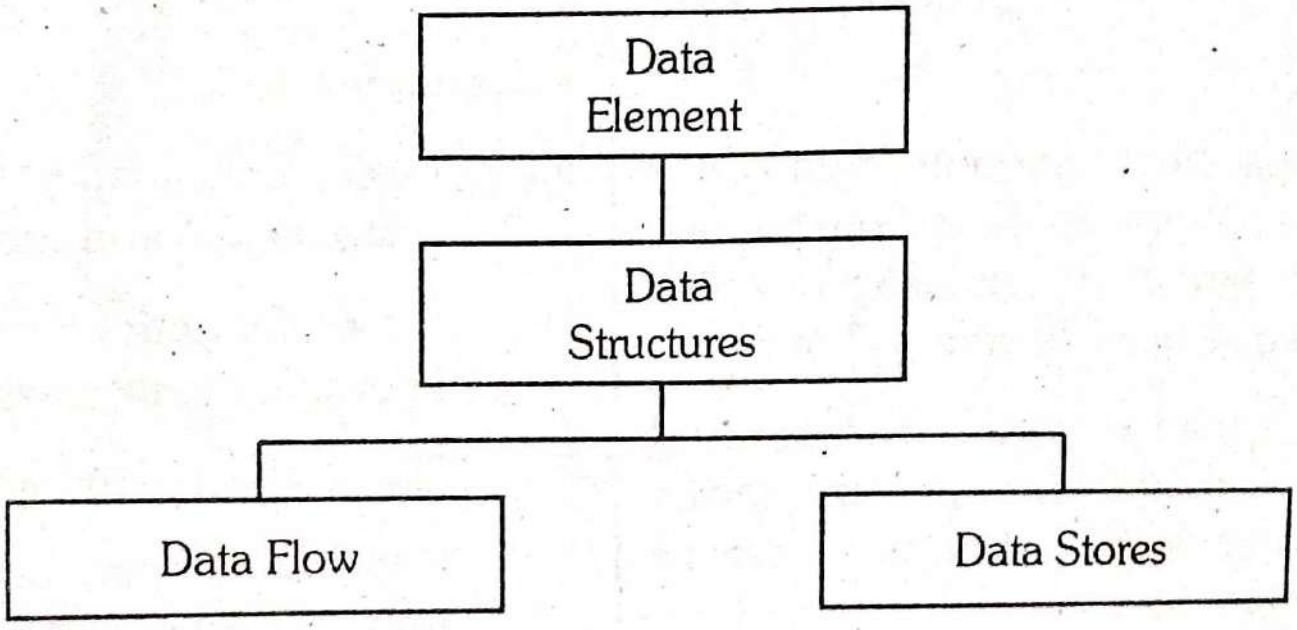


Fig.: Logical Data Description Hierarchy

4.6.1.3 Structured Charts

In structured methodology, software design is modeled using hierarchical structure charts. The structure chart is a top-down chart, showing each level of design, its relationship to other levels, and its place in the overall design structure.

The design first considers the main function of a program or system, then breaks this function into sub functions, and decomposes each sub function until the lowest level of detail has been reached.

It shows a high-level structure chart for a payroll system. If a design has too many levels to fit onto one structure chart, it can be broken down further on more detailed structure charts. A structure chart may document one program, one system (a set of programs), or part of one program.

4.6.1.4 Decision Trees

Meaning

The decision tree is a tree-structure, where each non-leaf node represents the test on an attribute, branches represents the outcome of the test and the leaf nodes represents the class labels.

The decision tree shown in the above figure, enables the organization to identify the number of students who are going to join a software company. Some decision trees are binary and some trees are nonbinary.

Decision trees are mostly used for classification rules for tuples which don't have class label identifier for them. The class predictions can be made by traversing from root node to the leaf node.

Advantages

- Easy to understand
- Map nicely to a set of business rules
- Applied to real problems
- Make no prior assumptions about the data
- Able to process both numerical and categorical data

Disadvantages

- Output attribute must be categorical
- Limited to one output attribute
- Decision tree algorithms are unstable
- Trees created from numeric datasets can be complex

4.6.1.5 Decision Tables

A decision table is a table of contingencies for defining a problem and the actions that need to be taken for It is a single representation of the relationships between conditions and actions, these pairs of condition sets and actions sets are known as rules.

A condition is usually given a value of 'Y' for 'Yes, it is true", 'N' for 'No' and a dash for 'Do not care' in each rule, A decision tree fails to tell us what conditions to test. Where a decision table wins over a decision tree it bat it can clearly call out the conditions that need to be tested.

Whereas a decision tree fails to tell us what conditions to test, a decision table can clearly call out the conditions to test. Another advantage is that a decision table can be used to generate code in a procedural application language which is optimized for performance based on the expected likelihood of a rule being valid in the data.

It has following features:

- It defines problems and action that has to be taken.
- It's a relationship between condition and action.
- It has two parts: stub and entry.
- Stub has two parts:
    1. Condition Stub
    2. Action Stub
- Entry has two parts:
    1. Condition Entry
    2. Action Entry

Condition Stub	Condition Entry							
	1	2	3	4	5	6	7	8
Preferred customer	Y	Y	Y	Y	N	N	N	N
Ordered more than ₹1,000	Y	Y	N	N	Y	Y	N	N
Used our charge card	Y	N	Y	N	Y	N	Y	N
5% discount	X	X						
Additional 5% discount X								
₹ 25 bonus coupon		X						
₹ 5 bonus coupon			X	X	X	X	X	
Action Stub					Action	Entry		

Fig.: Decision Tables

Advantages

(i)They provide concise descriptions of logically complex situations.

(ii)They are easier to draw and change than flowcharts.

(iii) They provide more compact documentation. A small table can replace several pages of flowcharts.

(iv) It is also easier to follow a particular path down one column than through several flowcharts pages.

Limitations

Large decision tables can become in- comprehensible and difficult to modify.

4.6.2 Object Oriented Methodology

Object-oriented development uses the object as the basic unit of systems analysis and design. An object combines data and the specific processes that operate on those data.

Data encapsulated in an object can be accessed and modified only by the operations, or methods, associated with that object. Instead of passing data to procedures, programs send a message for an object to perform an operation that is already embedded in it.

The system is modeled as a collection of objects and the relationships among them. Because processing logic resides within objects rather that in separate software programs, objects must collaborate with each other to make the system work.

Object-oriented modeling is based on the concepts of class and inheritance. Objects belonging to a certain class, or general categories of similar objects, have the features of that class.

Classes of objects in turn can inherit all the structure and behaviors of a more general class and then add variables and behaviors unique to each object. New classes of objects are created by choosing an existing

class and specifying how the new class differs from the existing class, instead of starting from scratch each time.

4.7 ALTERNATIVE METHODS FOR BUILDING INFORMATION SYSTEM

The various approaches to build information system includes:

1. Traditional system life cycle

2. Prototyping

3. End user development

4. Application software packages and

5. Outsourcing

1. Traditional system life cycle

The systems life cycle is one of the conventional method for developing information systems.

Originally, the life cycle methodology is a phased approach for transforming the systems into formal stages by doing system development and segregating them. Although, the process as how to segregate the system is still under development stage.

The systems life cycle methodology operates by creating a formal division corresponding to labor between end users and information systems specialists.

Subsequently, the task of analyzing the design of the system, implementation work are taken care by technical specialist team such as system analysts and programmers.

Finally, end users job is to restricted in providing information requirements and review of technical staff. Apart from this, it also focuses upon the formal specifications and paperwork.

2. Prototyping

Prototyping consists of building an experimental system rapidly and inexpensively for end users to evaluate. By interacting with the prototype, users can get a better idea of their information can be used as a template to create the final system.

The prototype is a working version of an information system or part of the system, but it is meant to be only a preliminary model. Once operational, the prototype will be further refined until it conforms precisely to users' requirements. Once the design has been finalized, the prototype can be converted to a polished production system.

The process of building a preliminary design, bying it out, refining it, and trying again has been called an iterative process of systems development because the steps required to build a system can be repeated over and over again.

Prototyping is more explicitly iterative than the conventional life cycle, and it actively promotes system design changes. It has been said that prototyping replaces unplanned rework with planned iteration, with each version more accurately reflecting users' requirements.

Steps

It has a four-step model of the prototyping process, which consists of the following:

Step 1: Identify the user's basic requirements. The system designer (usually an information systems specialist) works with the user only long enough to capture the user's basic information needs.

Step 2: Develop an Initial prototype. The system designer creates a working prototype quickly, using tools for rapidly generating software.

Step 3: Use the prototype. The user is encouraged to work with the system to determine how well the prototype meets his or her needs and to make suggestions for improving the prototype.

Step 4: Revise and enhance the prototype. The system builder notes all changes the user requests and refines the prototype accordingly. After the prototype has been revised, the cycle returns to Step 3. Steps 3 and 4 are repeated until the user is satisfied.

3. End user development

Some types of information systems can be developed by end users with little or no formal assistance from technical specialists.

This phenomenon is called end-user development. A series of software tools categorized as fourth-generation languages makes this possible.

Fourth-generation languages are software tools that enable end users to create reports (or) develop software applications with minimal or no technical assistance.

Some of these fourth-generation tools also enhance professional programmers' productivity.

Fourth-generation languages tend to be nonprocedural, (or) less procedural, than conventional programming languages. Procedural languages require specification of the sequence of steps, or procedures, that tell the computer what to do and how to do it.

Non procedural languages need only specify what has to be accomplished rather than provide details about how to carry out the task.

End-user computing also poses organizational risks because it occurs outside of traditional mechanisms for information systems management and control.

4. Application software packages

The software packages serves as a basis for creating applications. They eliminate the need for a company to rewrite its own software, if an existing software package is able to fulfill many of the organization's requirements.

Thus, the use of existing software packages saves considerable time and money in system development.

Software packages are capable of performing customization wherein, the package is modified to address a unique requirement of an organization without effecting the package integrity.

However, performing large amount of customization may require additional programming which in tum increases the amount of cost and time.

If software packages are used in system development process then package evaluation process becomes a part of system analysis.

5. Outsourcing

Outsourcing refers to the process where one organization purchases materials, parts or services from other organization instead of building those materials in-house or performing those services by themselves. Ideally, the functions which are outsourced are considered as non-core to the business.

For example, an automobile company does not posses skills, resources and assets that are required to develop a software for themselves.

Therefore, the automobile firm may outsource the job of developing a software to a software development firm. This will be the best way for the firm as it saves time and will be less expensive than developing the software in-house.

Types

Basically, there are two types of outsourcings. H They are,

(i) Domestic Outsourcing

If the vendor to which work is outsourced is within the country then it is called domestic outsourcing. This is mainly done by a firm if it does not have required skills, resource and assets for carrying out the work.

(ii) Offshore Outsourcing

If the vendor to which work is outsourced is located in a different country, then it is called offshore outsourcing. The decision for off shore outsourcing is mainly dependent on cost factor.

4.8 NEW APPROACHES FOR SYSTEM BUILDING IN THE DIGITAL FIRM ERA

In the digital firm environment, organizations need to be able to add, change, and retire their technology capabilities very rapidly to respond to new opportunities.

Companies are starting to use shorter, more informal development processes that provide fast solutions. In addition to using software packages and external service providers, businesses are relying more heavily on fast-cycle techniques such as rapid application development, joint application design, agile development, and reusable standardized software components that can be assembled into a complete set of services for e- commerce and e-business.

1. Rapid Application Development (RAD)

(i) Object-oriented software tools, reusable software, prototyping, and fourth- generation language tools are helping systems builders create working systems much more rapidly than they could using traditional systems-building methods and software tools.

(ii) The term rapid application development (RAD) is used to describe this process of creating workable systems in a very short period of time.

(iii) RAD can include the use of visual programming and other tools for building graphical user interfaces, iterative prototyping of key system elements, the automation of program code generation, and close teamwork among end users and information systems specialists.

(iv) Simple systems often can be assembled from prebuilt components. The process does not have to be sequential, and key parts of development can occur simultaneously.

(v) Sometimes a technique called joint application design (JAD) is used to accelerate the generation of information requirements and to develop the initial systems design.

(M) Joint Application decision brings end users and information systems specialists together in an interactive session to discuss the system's design. Properly prepared and facilitated, Joint Application decision sessions can significantly speed up the design phase and involve users at an intense level.

(vi) Agile development focuses on rapid delivery of working software by breaking a large project into a series of small subprojects that are completed in short periods of time using iteration and continuous feedback.

(vii) Each mini-project is worked on by a team as if it were a complete project, including planning, requirements analysis, design, coding, testing, and documentation.

(ix) Improvement or addition of new functionality takes place within the next iteration as developers clarify requirements. This helps to minimize the overall risk, and allows the project to adapt to changes more quickly.

(x) Agile methods emphasize face-to-face communication over written documents, encouraging people to collaborate and make decisions quickly and effectively.

2. Component-based Development and Web Services

(i) Some of the benefits of object-oriented development for building systems that can respond to rapidly changing business environments, including Web applications.

(ii) To further expedite software creation, groups of objects have been assembled to provide software components for common functions such as a graphical user interface or online ordering capability that can be combined to create large-scale business applications.

(iii) This approach to software development is called component-based develop-ment, and it enables a system to be built by assembling and integrating existing software components.

(iv) Increasingly, these software components are coming from cloud services.

(v) Businesses are using component-based development to create their e-commerce applications by combining commercially available components for shopping carts, user authentication, search engines, and catalogs with pieces of software for their own unique business requirements.

(iii) Web Services and Service-Oriented Computing

(i) Web services as loosely coupled, reusable software components delivered using Extensible Markup Language (XML) and other open protocols and standards that enable one application to communicate with another with no custom programming required to share data and services. In addition to supporting internal and external integration of systems.

(ii) Web services can be used as tools for building new information system applications or enhancing existing systems.

(iii) Because these software services use a universal set of standards, they promise to be less expensive and less difficult to weave together than proprietary components.

(iv) Web services can perform certain functions on their own, and they can also engage other Web services to complete more complex transactions, such as checking credit, procurement, or ordering products.

Potential IT threats faced in business organization

Potential IT Threats

1. Disruption

Disrupting your business is a powerful way for cybercriminals to distract you, cost you time and money, bait you into making quick and unsecure fixes, or put you at their mercy.

For instance, they can use premeditated internet outages to disrupt your organization, hampering business functions and employee productivity.

2. Distortion

With the development of technology comes the development of bots and vehicles of misinformation.

This could cause more members of the public to distrust the integrity of information they encounter: Or it could cause the opposite people might mistakenly trust false information.

In either case, it's often bad for business. It makes it difficult to communicate with consumers or maintain their trust, especially if cybercriminals have falsified information about you or Impersonated you.

Hackers are distorting the data and technologies businesses use, too. For instance, criminals who hack into your company cloud might upload fake documents that instruct employees to move money into the hackers' account or compromise your security even further.

3. Deterioration

The deterioration of a company's complete control over its business practices can open it up to a variety of risks, which cybercriminals are quick to take advantage of.

For example, more and more businesses are implementing Al to increase their efficiency. But if you deploy untested Al, it could lead to unexpected outcomes, including higher exposure to cybercrimes.

Rapid technological advancement can also mean new federal laws to regulate it, lessening companies control.

Many expect that increases in surveillance laws could put corporations at risk of having their information exposed. Increased privacy regulations can prevent businesses from effectively monitoring employees, making it harder to identify any insider threats.

4.9 AGILE SYSTEM

Meaning

Agile software development is based on an incremental, iterative approach. Instead of indepthplanning at the beginning of the project, Agile methodologies are open to changing requirements over time and encourages constant feedback from the end Cross-functional teams work on iterations of a product over a period of time, and this work is organized Into a backlog this prioritized based on business or customer value.

The goal of each iteration is to produce a working product. In Agile methodologies, leadership encourages teamwork, accountability, and face-to-face communication

Business stakeholders and developers must work together to align the product with customer needs and company goals.

Principles

The Agile Manifesto lists 12 principles to guide teams on how to execute with agility.

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

2. Welcome changing requirements, even late in development. Agile processes harness-change for the customer's competitive advantage.

3. Deliver working software frequently, from a couple of weeks to a couple of months, with preference to the shorter timescale

4. Business people and developers must work together daily throughout the project.

5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.

6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

7. Working software is the primary measure of progress.

8. Agile processes promote sustainable development. The sponsors, developers, and user sshould be able to maintain a constant pace indefinitely.

9. Continuous attention to technical excellence and good design enhances agility.

10. Simplicity -- the art of maximizing the amount of work not done -- is essential.

11. The best architectures, requirements, and designs emerge from self-organizing teams

12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Advantages and disadvantages of Agile Methodology

Advantages

Agile evolved from different lightweight software approaches in the 1990s and is a response tosome project managers' dislike of the rigid, linear Waterfall methodology. It focuses onflexibility, continuous Improvement, and speed.

(i) Change is embraced

With shorter planning cycles, it's easy to accommodate and accept changes at any time during the project. There is always an opportunity to refine and reprioritize the backlog, letting teams introduce changes to the project in a matter of weeks.

(ii) End-goal can be unknown

Agile is very beneficial for projects where the end- goal is not clearly defined. As the project progresses, the goals will come to light and development can easily adapt to these evolving requirements.

(iii) Faster, high-quality delivery

Breaking down the project into iterations (manageable units) allows the team to focus on high-quality development, testing, and collaboration Conducting testing during each iteration means that bugs get identified and solved more- quickly. And this high-quality software can be delivered faster with consistent, successive iterations.

(iv) Strong team interaction

Agile highlights the importance of frequent communication and face-to-face interactions. Teams work together and people are able to take responsibility and own parts of the projects.

(v) Customers are heard

Customers have many opportunities to see the work being delivered, share their input, and have a real impact on the end product. They can gain a sense of ownership by working so closely with the project team.

(vi) Continuous improvement

Agile projects encourage feedback from users and team members throughout the whole project, so lessons learned are used to improve future iterations.

Disadvantages

Here are some of the disadvantages of Agile:

(i) Planning can be less concrete

It can sometimes be hard to pin down a solid delivery date.

Because Agile is based on time-boxed delivery and project managers are often reprioritizing tasks, it's possible that some items originally scheduled for delivery may not be complete intime. And, additional sprints may be added at any time in the project, adding to the overall timeline.

(ii) Team must be knowledgeable

Agile teams are usually small, so team members must be highly skilled in a variety of areas. They also must understand and feel comfortable with the chosen Agile methodology.

(iii) Time commitment from developers

Agile is most successful when the development team is completely dedicated to the project. Active involvement and collaboration is required throughout the Agile process, which is more time consuming than a traditional approach. It also means that the developers need to commit to the entire duration of the project.

(iv) Documentation can be neglected

The Agile Manifesto prefers working software over comprehensive documentation, so some team members may feel like it's less important to focus on documentation.

While comprehensive documentation on its own does not lead to project success, Agile teams should find the right balance between documentation and discussion.

(v) Final product can be very different

The initial Agile project might not have a definitive plan, so the final product can look much different than what was initially intended,

Because Agile is so flexible, new iterations may be added based on evolving customer feedback, which can lead to a very different final deliverable.

Various phases of Agile Methodology

Following are the various phases of Agile Methodology:

(i) Planning

Once an idea is deemed viable and feasible, the project team comes together and works to identify features. The goal of this phase is to break down the idea into smaller pieces of work (the features) then to prioritize each feature and assign it to an iteration.

(ii) Requirements analysis

This phase involves many meetings with managers, stake-holders, and users to identify business requirements. The team needs to gather information like who will use the product and how they will use it. These requirements must be quantifiable relevant and details.

(iii) Design

The system and software design is prepared from the requirements identified inthe previous phase. The team needs to think about what the product or solution will look like. The test team also comes up with a test strategy or plan to proceed.

(iv) Implementation, coding or development

This phase is all about creating and testing-features, and scheduling iterations for deployment (following the iterative and incremental development approach [IID]).

The development phase starts with iteration 0, because there are no features being delivered. This iteration lays down the foundation for development, with tasks like finalizing contracts, preparing the environments, and funding.

(v) Testing

Once the code has been developed, it is tested against the requirements to make sure the product is actually solving customer needs and matching user stories. During this phase, unit testing, integration testing, system testing, and acceptance testing are done.

(vi) Deployment

After testing, the product is delivered to customers for them to use. However, deployment isn't the end of the project. Once customers start using the product, they may run into new problems that the project team will need to address. Methodologies That Are Used to Implement Agile.

UNIT-V

5.1 INTRODUCTION TO CYBER CRIME

5.1.1 Cyber Space

(i) Cyberspace allows users to share information, interact, swap ideas, play games, engage in discussions or social forums, conduct business and create intuitive media, among many other activities.

(ii) The term cyberspace was initially introduced by William Gibson in his 1984.

(iii) Gibson criticized the term in later years, calling it "evocative and essentially meaningless." Nevertheless, the term is still widely used to describe any facility or feature that is linked to the Internet. People use the term to describe all sorts of virtual interfaces that create digital realities.

(iv) Cyberspace refers to the virtual computer world, and more specifically, an electronic medium that is used to facilitate online communication.

(v) Cyberspace typically involves a large computer network made up of many worldwide computer sub networks that employ TCP/IP protocol to aid in communication and data exchange activities.

(vi) Cyberspace's core feature is an interactive and virtual environment for a broad range of participants.

In many countries, speech through cyberspace has proven to be another means of communication which has been regulated by the government.

The Open Net Initiative, whose mission statement is "to investigate and challenge state filtration and surveillance practices" in order to "generate a credible picture of these practices" has released numerous reports documenting the filtration of internet-speech in various countries.

While China has thus far proven to be the most rigorous in its attempts to filter unwanted parts of the internet from its citizens, many other countries, including Singapore, Iran, Saudi Arabia, and Tunisia, have engaged in similar practices. In one of the most vivid examples of information-control, the Chinese government for a short time transparently forwarded requests to the Google search engine to its own, state-controlled search engines.

5.1.2 Cyber Law

Cyber law, also known as cyber crime law, is legislation focused on the acceptable behavioural use of technology including computer hardware and software, the internet, and networks. Cyber law helps protect users from harm by enabling the investigation and prosecution of online criminal activity.

applies to the actions of individuals, groups, the public, government, and private organizations. A framework which is established to legally Identify all the possible risks that may be associated with the usage of computers and computer networks.

There are various aspects within the cyber law. They are, intellectual property, protection and restoration of private data, freedom of expression and crimes committed using computers.

The ITA 2000 was the first cyber law passed by the Indian parliament with the purpose of providing legal infrastructure for successfully carrying out E-Commerce in India.

This law mainly deals with all kinds of issues, legal results and conflicts related to cyberspace and internet. Indian ITA, 2000 Act provides security to electric data interchange and also to the transactions taking place through electronic networks.

Reasons for the enactment of cyber laws in India

1. Indian legal system covers almost all situations and cases that took place or might occur in the future. But, in case of recently developed internet technology sector, there are no such laws made. Therefore, it is important to enact relevant laws as there has been an increased usage of internet in India.

2. It is required to provide legal recognition to the internet because, in modem era, internet has become the main source for dealing with the business activities.

3. Cyber terrorism has emerged with the growth of the internet. Cyber terrorism is a type of cybercrime which deals with disruptive activities i.e., causing problems or intentionally offending social, ideological, religious and political objectives or to offence any person relating to such objectives in the cyber world.

Hence, cyber laws are essential to protect the users from cyber terrorism and other unethical activities which imposes risks to the interest of users.

Considering all the above reasons, Indian parliament passed the information technology bill on 17th May, 2000 which is commonly referred to as ITA, 2000.

UNCITRAL law for E-commerce forms the basis for the introduction of this law. It emphasizes on cyber laws and establishes a legal system for maintaining electronic records and also for maintaining information related to business activities performed electronically.

5.1.3 E-Business

E-business (electronic business) is the conduct of business processes on the internet. These e-business processes include buying and selling goods and services, servicing customers, processing payments, managing production control, collaborating with business partners, sharing information, running automated employee services.

According to IBM "E-business is a secure, flexible and integrated approach to deliver differentiated business value by combining the systems and processes that run core business operations with the simplicity and reach made possible by Internet technology".

Advantages

1.Advantages for Sellers

(i) Increased sales opportunities

(ii) Decreased costs

(iii) 24 hours a day, 7 days a week sales

(iv) Access to narrow market segments (v) Access to global markets

(vi) Increased speed and accuracy information delivery

(vii) Data collection and customer preference tracking.

2.Advantages for Buyers

(i) Wider product availability

(ii) Customized and personalized information and buying options

(iii) 24 hours a day, 7 days a week shopping

(iv) Easy comparison shopping

(v) Access to global markets Quick delivery of digital products and Information

(vii) Access to rich media describing products and services.

Disadvantages

1. Disadvantages for Sellers

(i) Growing competition from other e-business.

(ii) Rapidly changing technologies

(iii) Greater telecommunications capacity or bandwidth demands

(iv) Difficulty of integrating existing business systems with e-business transactions

(v) Problems inherent in maintaining e-business systems

(v) Global market issues: diverse languages, unknown political environments, and currency conversions.

2. Disadvantages for Buyers

(1) Difficulty differentiating among so pay online sellers

(ii) Unpredictable transaction security and privacy

(ii) Dealing with unfamiliar, possibly, untrustworthy, sellers

(iv) Inability to touch and feel products before buying them.

(v) Unfamiliar buying processes and concerns about vendor reliability

(vi) Issues with state sales tax charges and logistical difficulties of product returns.

Different types of e-business

There are three types of E-business. They are,

1. Business-to-Business (B2B)

2. Business-to-Customers (B2C) and

3. E-Business within the organisation.

1. Business-to-Business (B2B)

Business-to-business transactions are carried out on extranet. Extranet comprises of two

linked through internet. Through extranet, the two organizations can share their confidential information with one another.

Usually, the information which is required for doing the business is only made available on the extranet. Business-to-business networks came into existence long back before the introduction of Internet.

Before the introduction of Internet, most of the companies opted private networks to transact with their business partners. Private networks are very cost consuming networks.

The costs involved in carrying out business- to-business dealings by using Internet have decreased drastically. Virtual Private Networks shortly known as VPNs consume less cost and keep the business dealings confidential.

2. Business-to-Customer (B2C)

B2C transactions is the process of selling goods and services to wide number of customers across the world via Internet. Previously, this process was considered as "E-commerce' by many people. E-commerce refers to online selling of products.

Under B2C, business organizations set virtual shops and offer goods and services to the visitors of their web sites.

3. E-business within the Organisation

Intranet is used to carry out E-business within the organization. Intranet users can have access to the organization-specific websites. But outsiders cannot see organization-specific websites due to the restrictions and security constraints kept on the use of Intranet.

The ability of the people to connect Internet to Intranet relies upon the security constraints of the organization.

5.1.4 E-Consumers

E-consumers are consumers who are buying, consuming or selling goods or services using digital medium (Internet or any other electronic platform). It is interesting to note that the e-consumer's ant consuming both tangible (physical) goods as well as intangible (digital) goods

The digital medium helps e-consumers to place buy orders for physical goods using e-commerce business models, like business to consumer (B2C), consumer-to- business (C2B) and consumer-to-consumer (C2C), it also helps them to download digital goods in the form of MP3 music files, data, databases, content, software etc.

Advantages

(a) Easy Transactions

Shopping or exchanging over web can be done 24 hours a day and 7 days a week. This is offered by e-commerce to its consumers so that they can shop or do other transactions from any location and at any time.

(b) Wider Range

The range of products offered by e-commerce is wider than the range offered by many vendors. Customers can choose from this wider range and do a satisfying e-shopping.

(c) Quick Delivery

E-commerce offers the most desirable feature "Quick delivery" to customers. The quick delivery is more quicker in case of digitized products.

(d) Less Expensive Products and Services

The cost of products and services offered by e- commerce to its customers is very less when compared to the ones offered by other vendors. E-commerce also allows its customers to shop in many places and do quick comparison. Thus, achieving good customer satisfaction.

5.1.5 Spam & Phishing

Spam

Spam is the abuse of electronic messaging systems (including most broadcast media, digital delivery systems) to send unsolicited bulk messages indiscriminately.

Although the most widely recognized form of Spean is E-Mail Spam, the term is applied to similar abuses in other media: instant messaging Spam, Usenet newsgroup Spam, web search classified ads Spam, mobile phone m Spam. Internet forum Spam. transmissions, social networking sharing network Spam, video sharing sites

Spamming is difficult to control because has economic viability advertisers have operating costs beyond the management of the mailing lists and it is difficult to hold send accountable for their mass mailings Spam are numerous, the volume of unsolicited mail h become very high because the barrier to entry& low.

The costs, such as lost productivity and fraud, are borne by the public and by Internet service providers (ISPs), who are forced to add extra capacity to cope with the deluge Spamming is widely detested, and has been the subject of legislation in many jurisdictions for example, the CAN-SPAM Act of 2003.

Phishing

The term was coined in 1996 by hackers who were stealing AOL Internet accounts by scanning passwords from unsuspecting AOL users. As hackers have a tendency of replacing "f" with "ph" term Phishing came into being

(i)According to Wikipedia:

It is the criminally fraudulent process of attempting to acquire sensitive information such as usernames, passwords and credit card details by masquerading as a trustworthy entity in an electronic communication

(ii) According to Webopedia:

It is an act of sending an E-Mail to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for ID theft.

The E-Mail directs the user to visit a website where they are asked to update personal information, such as passwords and credit card, social security and bank account numbers that the legitimate

organization already has. The website. however, is bogus and set up only to steal the users' information.

Some of the websites by which users get lured are as follows,

Claim your lucky draw by clicking on the site below, www.claimdraw.com

"Security breach", it is to hereby inform that due to some security reasons customers are requested to provide their account details by clicking on the site below,

www.banking.com

As shown in the above example the moment one clicks on the above websites, they are redirected to some which resembles with the original bank website.

Different methods of phishing attacks

Following are the different methods of phishing attacks:

1. Dragnet: This method involves the use of spammed E-Mails, bearing falsified corporate identification (e.g... corporate names, logos and trademarks), which are addressed to a large group of people (e.g., customers of a particular financial institution or members of a particular auction site) to websites or pop-up windows with similarly falsified identification.

2 Rod-and-reel: In this method, phishes identify specific prospective victims in advance, and convey false

3 Lobsterpot: This method focuses upon use of spoofed websites. It consists of creating of bogus/phony websites, similar to legitimate corporate ones, targeting a narrowly defined class of victims, which is likely to seek out

4 Gillnet: This technique relies far less on social engineering techniques and phishers introduce Malicious Code into E-Mails and websites. They can, for example, misuse browser functionality by injecting hostile content into another site's pop-up window. Merely by opening a particular E-Mail, or browsing a particular website, netizens may have a Trojan Horse introduced into their systems. In some cases, the Malicious Code will change settings in user's systems so that users who want to visit legitimate banking websites will be redirected to a look alike Phishing site.

Differentiate between points phishing and spam.

S.No.	Phishing	S.No.	Spam
1.	Phising is luring users into disclosing valuable information such as credit card details, account passwords, social security numbers, and etc.	1.	Spam is mostly junk newsgroup postings representing email advertising for some sort of counterfeit product.
2.	Phishing is not limited to just emails, but calls, text messages, or social media messages.	2.	Spam is a form of commercial advertising in the form of unsolicited emails.
3.	Phishing begins with a lure which appear to be from legitimate sources.	3.	Spam is unsolicited, unwanted email flooding the inbox.

Cyber Criminal

A cybercriminal is an individual who performs cybercrimes by using computers as their,

1 Target inorder to attack the computer of authorized user for committing malicious activities such as spreading of virus, data tampering etc.

2 Weapon inorder to perform traditional crime such as spam, fraud, illegal gambling.

Classification

Cybercrimes can be divided into five major categories,

1. Cyber Crime against Person

The crimes under this category include e-mail spoofing, on-line frauds, spamming, cyber de defaming, computer sabotage. Cyber harassment is one of the major cybercrime which include sexual harassment, social harassment, religious harassment etc.

2. Cyber Crime against Property

The crimes under this category include computer vandalism, download of harmful program. Apart from this, it also includes credit card frauds, Intellectual property crimes (PP) such as software piracy, copyright infringement, violation of trademarks and Internet time theft.

3. Cyber Crime against Organization

The crimes under this category include hacking. password sniffing, denial of service attacks, logic bomb, data diddling, Trojan horse, salami attack, distribution of pirated software, intrusions in computer network, virus attacks, E-mail bombing and one of the distinct type of crime in this category is cyber terrorism against government organizations

4. Cyber Crime against Society

The crimes under this category includes child pornography, trafficking, financial crimes, distribution of illegal articles, online gambling, forgery, cyber terrorism and web-jacking

5. Cyber Crime through Usenet Newsgroup

The crimes through Usenet Newsgroup can be very harmful and inaccurate. Basically, Usenet group offer very offensive and inappropriate materials and therefore, one should be very careful while using it.

5.2 CYBER CRIME AND INFORMATION SECURITY

Cybercrime is criminal activity done using computers and the Internet. This includes anything from downloading illegal music files to stealing millions of dollars from online bank accounts. Cybercrime also includes non-monetary offenses, such as creating and distributing viruses on other computers of posting confidential business information on the Internet.

Perhaps the most prominent form of cybercrime is identity theft, in which criminals use the Internet to steal personal information from other users. Two of the most common ways this is done is through phishing and pharming

Both of these methods lure users to fake websites (that appear to be legitimate), where they are asked to enter personal information.

This includes login information, such as usernames and passwords, phone numbers, addresses, credit card numbers, bank account numbers, and other information criminals can use to "steal" another person's Identity.

For this reason, it is smart to always check the URL or Web address of a site to make sure it is legitimate before entering your personal information.

Various definitions of term cybercrime include,

1. Cyber space

2. Cyber squatting

3. Cyber punk and cyber warfare

4. Cyber terrorism.

1. Cyber Space

The term cyber space is introduced by William Gibson. It is a worldwide network of computers that uses internet for communication. transmission and exchange of data, chatting. exploring, research and play. Typically, cyber space is a unformulated place where humans Interact over internet, the cyber space employs TCP/IP protocol

2. Cyber Squatting

Cyber squatting is a type of crime where in the hackers register sells and uses domain name of some company with the aim of gaining profit from the goodwill of its trademark. It is the practice of buying the "domain names of popular business names with the intent of selling it to the actual owner to earn profit.

3. Cyber Punk and Cyber Warfare

In tennis of technology the cyber punk is coined as cyber' and 'punk. It signifies two primary aspects of cyberpunk i.e., technology' and individualism, but typically it signifies machine/ computer rebel movement. The purpose of referring it as a cyber punk is to specify the side by side position of punk attitudes and high technology

Cyber warfare refers to a conflict based on internet. It includes malicious attacks on information and information systems. The cyber warfare attacks are capable of disabling official websites and networks and disrupting essential services.

4. Cyber Terrorism

Cyber terrorism is an internet based attacks in terrorist activities. It is a controversial term and is referred to as a deliberate usage of computer networks and public internet inorder to effect the personal objectives by using tools such as computer virus. These objectives include political or ideological in the form of terrorism.

Define the following terms:

(a) Cyber Security

(b) Information Security

(c) Network Security

(a) Cyber Security

Cyber security refers to the body of technologies, processes, and practices designed to protect networks, devices, programs, and data from attack, damage, or unauthorized access. Cyber security may also be referred to as information technology security.

(b) Information Security

Information security refers to the process of protecting data or information from unauthorized user, at the same time allowing legitimate users to access the data.

Hence, it prevents an unauthorized access. use, revelation, alteration or disruption of the data. It usually deals with the confidentiality, integrity and availability regardless of the existential form of the data.

Two major changes in the information security requirements occur before the advancement in the use of data processing equipment. Security to the valuable information in any organization was provided either by physical or by administrative means.

An example of physical security is the usage of rugged filling cabinets along with the proper locking facility for preserving sensitive documents. An example of the administrative approach is personnel screening process employed during recruitment process.

(c) Network Security

Network security refers to the plans or arrangements made in the network Infrastructure along with the various techniques used by the network administrator. This is done for protecting network and its resources from unauthorized access.

As a result with the introduction of distributed systems, networks and various communication facilities are introduced for transmitting data between two computers or between a terminal user and a computer.

The concept of network is not trust worthy because the data processing equipment in any organization is interconnected with a network.

Various reasons for cybercrime

1. Capacity to Store Data in Comparatively Small Space

The computer has unique characteristic of storing data in a very small space. This affords to remove or derive information either through physical or virtual medium makes it much more easier.

2. Easy to Access

The problem encountered in guarding a computer system from unauthorised access is that there is every possibility of breach not due to human error but due to the complex technology.By secretly implanted logic bomb, key loggers that can steal access codes, advanced voice recorders: retina imagers etc. that can fool biometric systems and bypass firewalls can be utilized to get past many a security system.

3. Complex

The computers work on operating systems and these operating systems in turn are composed of millions of codes. Human mind is fallible and it is not possible that there might not be a lapse at any stage. The cyber criminals take advantage of these lacunas and penetrate into the computer. system.

4. Negligence

Negligence is very closely connected with human conduct. It is therefore very probable that while protecting the computer system there might be any negligence, which in turn provides a cybercriminal to gain access and control over the computer system.

5. Loss of Evidence

Loss of evidence is a very common & obvious problem as all the data are routinely destroyed. Further collection of data outside the territorial extent also paralyses this system of crime investigation.

6. Health

Information technology effects the health of an Q1. individual due to excessive use of computers. It causes health issues like eye strain, exposure to radiation, damage to arm and neck muscles. An- stress, etc. Computer monitoring is the reason for computer related stress. Hence there is a need to design healthy work environment for employees safe that boost the morale and productivity of work.

7. Computer Crime

Computer crime is the risk or threat caused by a computer criminal or irresponsible activities of a computer criminal. A computer criminal misuses the computer networks and imposes impact on safety, integrity and quality of information systems.

Following are some of the computer crimes,

(1) Unauthenticated access and modification of software or hardware.

(ii) Unauthenticated release of data

(iii) Unauthenticated duplication of software

8. Working Conditions

Information technology has changed the nature of work and eliminated tedious and tiresome tasks of offices or organizations that were previously performed by many people.

For example, tasks like word processing and desktop publishing produces office documents quickly by consuming less time and effort. In the field of automotive industry the robots have taken up the jobs of repetitive welding and spray painting.

9.Privacy

Information technology allow users to store, retrieve, gather, interchange and retrieve information quickly and Feasibly both technically and economically. This attribute of IT lays an advantages: effect on effectiveness and efficiency of information systems based on computers.

10. Employment

The effect of information technology on employment is one of the vital ethical issue and is concerned with the use of computers. We observe that, information technology gave rise to new jobs and increased the productivity. Computers are used to achieve automation.

The most important tools and technologies for safeguarding information resources

The following are tools and technologies for safeguarding information resources

(i) Firewalls

When private networks/systems are connected to the internet then firewalls restrict unauthorized users from accessing them.

(ii) Intrusion Detection System

These systems control private networks and provides access to the corporate systems.

(iii) Authentication Techniques

System users are authenticated by means of passwords, tokens, biometrics and smart cards

(iv) Antivirus and Antispyware Software

Antivirus software helps in removing system infections that are caused by viruses and wonns. On the other hand antispyware software fights with intrusive and harmful spyware programs.

(v) Encryption

This technique is widely used for protecting electronic transmissions over unsecured networks.

Global perspective on cybercrime

The enactments are made by a legislature globally and expressed in a formal document for cybercrimes. There are some laws which are described in Australia according to Cyber Crime Act 2001 which shows details about computer frauds and data.

In Australia, cybercrime has a narrow statutory C meaning as used in the Cyber Crime Act 2001, which details offenses against computer data and systems.

However, a broad meaning is given to cybercrime at an international level. In the Council of Europe's (CoEs) Cyber Crime Treaty, cybercrime is used as an umbrella term to refer to an array of criminal activity including offenses against computer data and systems, computer-related offenses, content offenses and copyright offenses.

This wide definition of cybercrime over-laps in part with general offense categories that need not be Information & Communication Technology (ICT) dependant, such as white-collar crime and economic crime. Although this status is from the International Telecommunication Union (ITU) survey conducted in 2005, we get an idea about the global perspective.

About 30 countries have enacted some form of anti-Spam legislation. There are also technical solutions by ISPs and end-users.

However, in spite of this, so far there has been no significant impact on the volume of Spam with spammers sending hundreds of millions of messages per day

The growing phenomenon is the use of Spam to support fraudulent and criminal activities including attempts to capture financial information (e.g., account numbers and passwords) by masquerading messages as originating from trusted companies ("brand-spoofing" or "Phishing") and as a vehicle to spread viruses and worms. On mobile networks, a peculiar problem is that of sending of bulk unsolicited text messages aimed at generating traffic to premium rate numbers.

As there are no national "boundaries" to such crimes under cybercrime realm, it requires international cooperation between those who seek to enforce anti- Spam laws.

Thus, one can see that there is a lot to do toward building confidence and security in the use of ICTs and moving toward international cooperation agenda. This is because in the 21" century, there is a growing dependency on ICTs that span the globe.

There was a rapid growth in ICTs and dependencies that led to shift in perception of cybersecurity threats in mid-1990s. The linkage of cyber security and critical infrastructure protection has become a big issue as a number of countries have began assessment of threats, vulnerabilities and started exploring mechanisms to redress them.

Indian perspective on cybercrime

India has the fourth highest number of Internet users in the world. According to the statistics, there are 45 million Internet users in India, 37% of all Internet accesses happen from cyber cafes and 57% of Indian and Internet users are between 18 and 35 years.

The population of educated youth is high in India. It is reported that compared to the year 2006, cybercrime under the Information Technology (IT) Act recorded a CT) whopping 50% increase in the year 2007.'

A point to note is that the majority of offenders were under 30 years. The maximum cybercrime cases, about 46%, were related to incidents of cyber- pornography, followed by hacking. In over 60% of these cases, offenders were between 18 and 30 years, according to the "Crime in 2007" report of the National Crime Record Bureau (NCRB).

The Indian Government is doing its best to control cybercrimes. For example, Delhi Police have now trained 100 of its officers in handling cybercrime and placed them in its Economic Offences Wing. At the of writing this, the officers were trained for 6 weeks in computer hardware and software, computer networks comprising date communication networks, network protocols, wireless networks and network security.

Indian Act 2000 with respect to Cybercrime

In 1996, the United Nations Commission on International Trade Law (UNCITRAL) adopted the model law on electronic commerce (e-commerce) to bring uniformity in the law in different countries. Further, the General Assembly of the United Nations recommended that all countries must consider this model law before making changes to their own laws. India became the 12th country to enable cyber law after it passed the Information Technology Act, 2000.

The objectives of the Act are as follows:

(i) Grant legal recognition to all transactions done via electronic exchange of data or other electronic means of communication or e-commerce, in place of the earlier paper-based method of communication.

(ii) Give legal recognition to digital signatures for the authentication of any information or matters requiring legal authentication

(iii) Facilitate the electronic filing of documents with Government agencies and also departments

(iv) Facilitate the electronic storage of data

(v) Give legal sanction and also facilitate the electronic transfer of funds between banks and financial institutions

(vi) Grant legal recognition to bankers under the Evidence Act, 1891 and the Reserve Bank of India Act, 1934, for keeping the books of accounts in electronic form.

The key provisions under the Indian ITA 2000 (before the amendment)

The key provisions under the Indian ITA 2000 (before the amendment)

Section Ref. and Title	Chapter of the Act and Title	Crime	Punishment
Sce. 43 (Penalty for damage to computer, computer system, etc.)	CHAPTER IX Penalties and Adjudication	Damage to computer	Compensation for ₹ 1 crore (₹ 10,000,000).
Sec. 66 (Hacking ith computer system)	CHAPTER XI Offences	Hacking (with intent (or) knowledge).	Fine of ₹ 2 lakhs (₹ 200,000) and imprisonment for 3 years.
Sec. 67 (Publishing of information which is obscene in electronic form)	CHAPTER XI Offences	Publication of obscene material in electronic form.	Fine of ₹ 1 lakhs (₹ 100,000), imprisonment of 5 years and double conviction on second of offence.
Sec. 68 (Power of controller to give directions)	CHAPTER XI Offences	Not complying with of controller.	Fine up to ₹ 2 lakhs (₹ 200,000) and imprisonment of 3 years.

Sec. 70 (Protected system)	CHAPTER XI Offences	Attempting (or) securing to computer of another person without his/her knowledge	Imprisonment up to 10 years
Sec. 72 (Penalty for breach of confidentially and privacy)	CHAPTER XI Offences	Attempting (or) securing access to computer for confidentiality of the information of computer.	Fine up to ₹ lakhs (₹ 100,000) and imprisonment up to 2 years.
Sec. 73 (Penalty for publishing Digital Singnature Certificate false in certain particulars)	CHAPTER XI Offences	Publishing false digital signaturces, false in certain particulars.	Finance of ₹ 1 lakh (₹ 100,000) (or) imprisonment of 2 years or both.
Sec. 74 (Publication for fraudulent purpose)	CHAPTER XI Offences	Publication of Digital Signatures for fraudulent purpose.	Imprisonment for the term of 2 years and fine of ₹ 1 lakh (₹ 100,000).

Features of IT Act 2000

(i) All electronic contracts made through secure electronic channels are legally valid.

(ii) Legal recognition for digital signatures.

(iii) Security measures for electronic records and also digital signatures are in place

(iv) A procedure for the appointment of adjudicating officers for holding inquiries under the Act is finalized

(v) Provision for establishing a Cyber Regulatory Appellant Tribunal under the Act. Further, this tribunal will handle all appeals made against the order of the Controller or Adjudicating Officer

(vi) An appeal against the order of the Cyber Appellant Tribunal is possible only in the High Court

(vii) Digital Signatures will use an asymmetric cryptosystem and also a hash function

(viii) Provision for the appointment of the Controller of Certifying Authorities (CCA) to license and regulate the working of Certifying Authorities. The Controller to act as a repository of all digital signatures.

(ix) The Act applies to offences or contraventions committed outside India

(x) Senior police officers and other officers can enter any public place and search and arrest without warrant

(xi) Provisions for the constitution of a Cyber Regulations Advisory Committee to advise the Central Government and Controller.

Discuss the measures taken in India to reduce the cybercrimes.

Though by passage of time and improvement in technology to provide easier and user friendly methods to the consumer for make up their daily activities, it has lead to harsh world of security threats at the same time by agencies like hackers, crackers etc. various Information technology

methods have been introduced to curb such destructive activities to achieve the main objects of the technology to provide some sense of security to the users.

Few basic prominent measures used to curb cybercrimes are as follows:

1. Encryption

This is considered as an important tool for protecting data in transit. Plain text (readable) can be converted to cipher text (coded language) by this method and the recipient of the data can decrypt it by converting it into plain text again by using private key.

This way except for the recipient whose possessor of private key to decrypt the data, no one can gain access to the sensitive information.

2. Synchronized Passwords

These passwords are schemes used to change the password at user's and host token. The password on synchronised card changes every 30-60 seconds which only makes it valid for one time log-on session.

Other useful methods introduced are signature, voice, fingerprint identification or retinal and biometric recognition etc. to impute passwords and pass phrases

3. Firewalls

It creates wall between the system and possible intruders to protect the classified documents from being leaked or accessed. It would only let the data to flow in computer which is recognised and verified by one's system. It only permits access to the system to ones already registered with the computer.

4. Digital Signature

Are created by using means of cryptography by applying algorithms. This has its prominent use in the business of banking where customer's signature is identified by using this method before banks enter into huge transactions.

5. Investigations and Search Procedures

Power of investigation is been given to police officer not below the rank of Deputy Superintendent of police or any officer of the Central Government or a State Government authorised by Central Government. He may enter any public place, conduct a search and arrest without warrant person who is reasonably expected to have committed an offence or about malic to commit computer related crime.

Accused has to be produced before magistrate within 24 hours of arrest. Provisions of Criminal Procedure Code, 1973 regulate the procedure of entry, search and arrest of the accused.

6. Problems Underlying Tracking of Offence

Most of the times the offenders commit crime and their identity is hard to be identified. Tracking cyber criminals requires a proper law enforcing agency through cyber border co-operation of governments, businesses and institutions of other countries.

Most of the countries lack skilled law enforcement personnel to deal with computer and even broader Information technology related crimes. Usually law enforcement agencies also don't take crimes

serious, they have no importance of enforcement of cybercrimes, and even if they undertake to investigate they are posed with limitation of extra-territorial nature of crimes.

7. Data Protection

Information stored on the owner of the computer would be his property and must be protected there are many ways such information can be misused by ways like 'unauthorized access, computer viruses, data typing, modification erasures etc.

Legislators had been constantly confronted with problem in balancing the right of the individuals on the computer information and other people's claim to be allowed access to information under Human Rights.

What is a computer virus AND How can viruses damage a computer information system

A computer virus is a malicious program that self- replicates by copying itself to another program. In other words, the computer virus spreads by itself into other executable code or documents.

The purpose of creating a computer virus is to infect vulnerable systems, gain admin control and steal user sensitive data. Hackers design computer viruses with malicious intent and prey on online users by tricking them.

One of the ideal methods by which viruses spread is through emails - opening the attachment in the email ,visiting an infected website, clicking on an executable file, or viewing an infected advertisement can cause the virus to spread to your system. Besides that, infections also spread the while connecting with already infected removable storage devices, such as USB drives.

It is quite easy and simple for the viruses to sneak into a computer by dodging the defence systems. A successful breach can cause serious issues for the user such as infecting other resources or system software, modifying or deleting key functions or applications and copy delete or encrypt data.

The recent cybercrime measures taken by the Indian government

1. National Cybercrime Threat Analytics Unit(YOU)

(i) Platform for analysing all pieces of puzzles of cybercrimes.

(ii) Produce cybercrime threat intelligence reports and organize periodic interaction on specific cybercrime centric discussions.

(iii) Create multi-stakeholder environment for bringing together law enforcement specialists and industry experts.

2. National Cybercrime Reporting

(i) Facilitate reporting of all types of cybercrime incidents with special focus on cybercrime against women and children.

(il) Automated routing to concerned State/UT based on information furnished in the reported incident for appropriate action in accordance with law.

(iii) Facilitate complainants to view status of action taken on the reported incident.

3. Platform For Joint Cybercrime Investigation

(i) To drive intelligence-led, coordinated action against key cybercrime threats and targets.

ii) Facilitate the joint identification. prioritization, preparation and initiation of multi-jurisdictional action against cyber- crimes.

4 National Cybercrime Forensic Laboratory (NCFL) Ecosystem

(i) Forensic analysis and investigation of cybercrime as a result of new digital technology and techniques.

(ii) A centre to support investigation process. NCFL and associated Central Forensic Science Laboratory to be well-equipped and well-staffed in order to engage in analysis and investigation activities to keep-up with new technical developments.

5. National Cybercrime Training Centre (NCTC)

(i) Standardization of course curriculum focused on cybercrimes, impact containment and investigations, imparting practical cybercrime detection, containment and reporting trainings on simulated cyber environments.

(ii) Development of Massive Open Online Course on a cloud based training platform.

(iii) National Cybercrime Training Centre to also focus on establishing Cyber Range for advanced simulation and training on cyber-attack and investigation of such cybercrimes.

6. Cybercrime Ecosystem Management Unit

(i) Develop ecosystems that bring together academia, industry and government to spread awareness cybercrimes, establish standard operating procedures to contain the impact of cybercrimes and respond to cybercrimes.

(ii) Provide support for development of all components of cybercrime combatting ecosystem.

7. National Cybercrime Research and Innovation Centre

(i) Track emerging technological developments, proactively predict potential vulnerabilities, which can be exploited by cybercriminals.

(ii) To leverage the strength and expertise of all stakeholders, be it in academia, private sector or inter-governmental organizations.

Create strategic partnerships with all such entities in the area of research and innovation focused on cybercrimes, cybercrime impact containment and investigations.

Impact of cybercrime on social media

Social media platforms are the success story of the century, certainly as far as numbers of users go. To give you an idea of the popularity of this type of software here are some of those numbers:

- Facebook-2.45 billion monthly active users
- Twitter-300 million monthly active users
- Instagram 1 billion monthly active users

Popularity like this means that social media is like honey to a wasp where cybercrime is concerned. Fraudsters see social media users as a captive and trusting audience, that can be manipulated into

performing acts they would normally be more vigilant about. Social media has effectively built a platform, not just for sharing ideas and cat pictures, but as a playground for cybercrime.

Social Media Platforms and the Cybercrime Economy" they describe this conduit for cyber-attacks as "platform criminality". The social media platforms that many of us love and use daily are a portal that opens new opportunities for cybercriminals to exploit.

The nature of social media means data sharing is an inherent part of the apps. Trust is also a crucial sys part of the social media engine.

Social media is also a deep pool of personal data. People feel safe to share personal details on social media platforms; a sense of safety is an important part of being on social media, that is designed to be used between Type friends and family.

However, without due care, personal data, such as name, phone number, address, and even your location can be stolen and used for identity theft or the creation of synthetic identities.

5.3 THREATS AND VULNERABILITIES

Define Threats and different types of Threats

Meaning

A cyber threat is a malicious act that seeks to steal or damage data or discompose the digital network or system. Threats can also be defined as the possibility of a successful cyberattack to get access to the sensitive data of a system unethically. Examples of threats include computer viruses, Denial of Service (DoS) attacks, data breaches, and even sometimes dishonest employees.

Types

Threats could be of three types, which are as follows:

(i) Intentional - Malware, phishing, and accessing someone's account illegally, etc. are examples of intentional threats.

(ii) Unintentional -Unintentional threats are considered human errors, for example, forgetting to update the firewall or the anti-virus could make the system more vulnerable.

(iii) Natural-Natural disasters can also damage the data, they are known as natural threats.

Define Vulnerabilities and different types of Vulnerabilities

Meaning

In cyber security, a vulnerability is a flaw in a system's design, security procedures, internal controls, etc., that can be exploited by cybercriminals. In some very rare cases, cyber vulnerabilities are created as a result of cyber attacks, not because of network misconfigurations. Even it can be caused if any employee anyhow downloads a virus or a social engineering attack.

Types

Vulnerabilities could be of many types, based on different criteria, some of them are:

(i) Network-Network vulnerability is caused when there are some flaws in the network's hardware or software.

(ii) Operating system - When an operating system designer designs an operating system with a policy that grants every program/user to have full access to the computer, it allows viruses and malware to make changes on behalf of the administrator.

(iii) Human-Users' negligence can cause vulnerabilities in the system

(iv) Process-Specific process control can also cause vulnerabilities in the system. Q24. State the differences between Threat and Vulnerabilities.

State the differences between Threat and Vulnerabilities.

S.No.	Threat	Vulnerability
1.	Take advantage of vulnerabilities in the system and have the potential to steal and damage data.	Known as the weakness in hardware, software, or designs, which might allow cyber threats to happen.
2.	Generally, can't be controlled.	Can be controlled.
3.	It may or may not be intentional.	Generally, unintentional.
4.	Can be blocked by managing the vulnerabilities.	Vulnerability management is a process of identifying the problems, then categorizing them, prioritizing them, and resolving the vulnerabilities in that order.
5.	Can be detected by anti-virus software and threat detection logs.	Can be detected by penetration testing hardware and many vulnerability scanners.

5.4 INTER NETWORKS SECURITY DEFENSES

5.4.1 Other Security Measures

Inter network security defences and other security measures

The following are the various inter Network Security Defences are as follows:

1.Encryption

(i) Process of encoding messages in such a way that eaves droppers or hackers cannot read it, but that authorized parties can.

(ii) Important way to protect data and other computer network resources, especially on the Internet. intranets, and extranets.

(iii) Encryption data in transit also helps to secure it as it is often difficult to physically secure all access to networks.

(iv) Encryption can protect confidentiality of Images

(v) Encryption can be used to protect data "at rest, such as files on computers and storage devices

(vi) Encryption programs are sold as separate products or built into other software used for the encryption process.

(vii) RSA and PGP (Pretty Good Privacy) are the top encryption software.

(viii) RSA stands for Ron Rivest, Adi Shamir and Leonard Adleman, who first publicly described the algorithm in 1977.

(ix) Encryption involves using special mathematical algorithms, or keys, to transform digital data into a scrambled code before they are transmitted, and then to decode the data when they are received.

2. Email Monitoring

(i) Email monitoring tools typically focus on the health of email servers because the servers can be a single point of failure in the email environment.

(ii) Email monitoring tools can track both the health of the email serving application itself and that of the server on which the application runs.

(iii) Email monitoring helps email administrators keep email flowing in complex network environments.

(iv) Internet and other online e-mail systems are one of the favourite avenues of attack by hackers for spreading computer viruses or breaking into networked computer.

(v) E-mail is also the battleground for attempts by companies to enforce policies against illegal, personal, or damaging messages by employees versus the demands of some employees and others who see such policies as violations of privacy right.

Virus Defences

(i) Virus defences create to protected our PC from the latest viruses, worms, Trojan horses, malware and other malicious programs that can wreaks havoc on our PC.

(ii) Nowadays, many corporate antivirus protection is a centralized function of information technology.

(iii) The antivirus software runs in the background, popping up every so often to reassure you.

(iv) Many companies are building defences against the spread of viruses by centralizing the distribution and updating of antivirus software as a responsibility of their IS departments.

(v) One reason for this trend is that the major antivirus software companies like a McAfee (Virus Scan) and Symantec (Norton Antivirus) have developed network versions of their programs, which they are marketing to ISPs and others as a service they should offer to all their customers.

3. Denial of Service (DOS)

(i) Major attacks against e-commerce and corporate Web sites in the past few years have demonstrated that the Internet is extremely vulnerable to a variety of assaults by criminal hackers.

(ii) Depends on three layers of networked

computer systems:

(a)The victim's Web sites,

(b) The victim's Internet services providers (ISP), and

(c) The sites of "zombies" or slave computers that the cyber-criminals commandeered.

Defending against Denial of Services

(i) At the zombie machines

Set and enforces security policies. Scan regularly for Trojan horse programs and vulnerabilities. Close unused ports. Remind users not to open .exe mail attachments.

(ii) At the ISP

Monitor and block traffic spikes. Filter spoofed IP address. Coordinate security with network providers.

(iii) At the victim's Web site

Create backup servers and networks connections. Limit connection to each server. Install multiple intrusion detection systems and multiple routers for incoming traffic to reduce choke points.

4. Firewall

(i) Another important method for control and security on the Internet and other networks is the use of firewall computers and software.

(ii) As a gatekeeper systems that protects a company's intranets and other computer networks from intrusion by providing a filter and safe transfer point for access to and from the Internet and other networks.

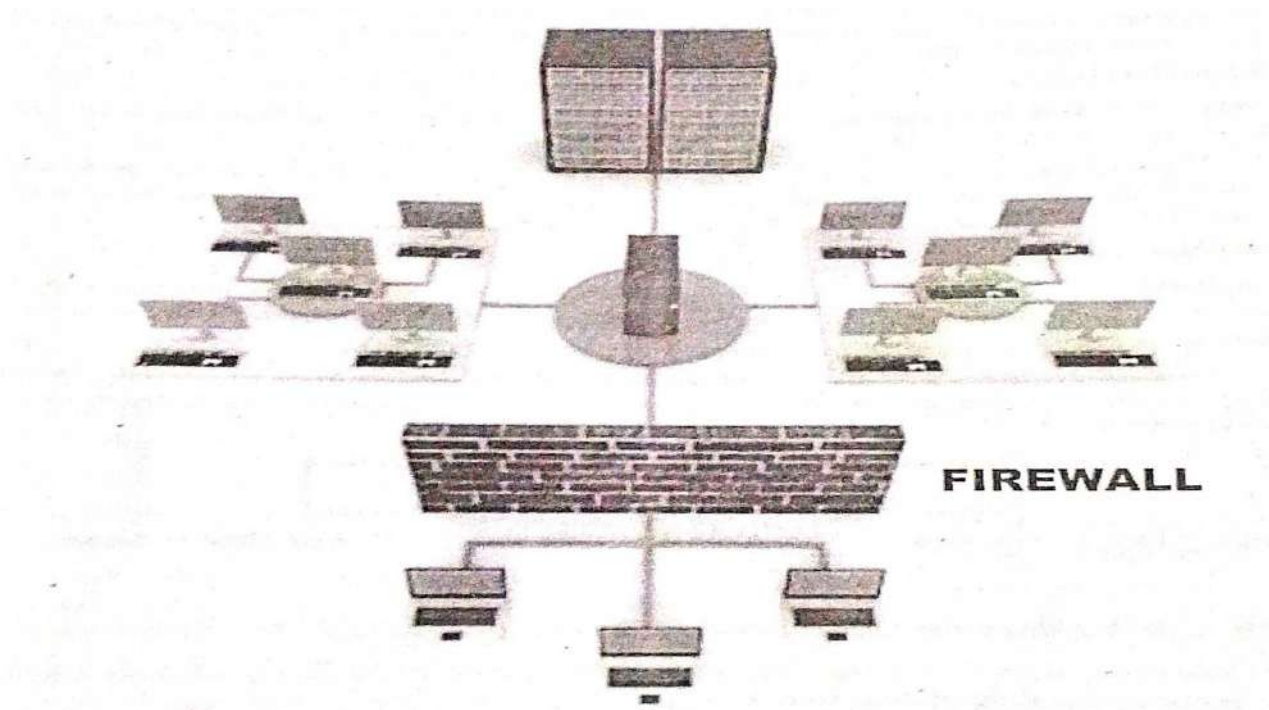
(iii) External firewall keeps out unauthorized Internet users

(iv) Internal firewall prevents users from accessing sensitive human resources or financial data.

(v) Passwords and browser security features control access to specific intranet resources.

(vi) Intranet server features provide authentication and encryption where applicable.

(vii) Network interface software is carefully crafted to avoid creating security holes to back-end resources.



Define hacking and various types of hackers

Meaning

The term "hacking" refers to a process of entering into the computer system or the network by breaking the authentication with some unauthorized techniques. The people who perform hacking are known as hackers. Hackers are sometimes called crackers because, they illegally gain the access rights over the computers) in a network without the owner's consent. These hackers can reconfigure or reprogram a system, can insert viruses, steal data, destroy the database or completely vandalize a system. The hackers and the hacking techniques evolved over the time with respect to the growth in electronic media. Such criminals can gain entry into any system from anywhere provided that the targeted system connected to Internet.

(i) Black Hat Hacker

Black-hat Hackers are also known as an Unethical Hacker or a Security Cracker. These people hack the system illegally to steal money or to achieve their own illegal goals. They find banks or other companies with weak security and steal money or credit card information. They can also modify or destroy the data as well. Black hat hacking is illegal.

(ii) White Hat Hacker

White hat Hackers are also known as Ethical Hackers or a Penetration Tester. White hat hackers are the good guys of the hacker world.

These people use the same technique used by the black hat hackers. They also hack the system, but they can only hack the system that they have permission to hack in order to test the security of the system. They focus on security and protecting IT system. White hat hacking is legal.

(iii) Gary Hat Hacker

Gary hat Hackers are Hybrid between Black hat Hackers and White hat hackers. They can hack any system even if they don't have permission to test the security of the system but they will never steal money or damage the system.

In most cases, they tell the administrator of that system. But they are also illegal because they test the security of the system that they do not have permission to test. Grey hat hacking is sometimes acted legally and sometimes not.

5.5 SYSTEM CONTROL AND AUDIT

Define information system audit and need for audit of information systems

The IS Audit of an Information System environment may include one (or) both of the following: (1) Assessment of internal controls within the IS environment to assure validity, reliability, and security of information and information systems.

(ii) Assessment of the efficiency and effectiveness of the IS environment.

The IS audit process is to evaluate the adequacy of internal controls with regard to both specific computer program and the data processing environment as a whole.

Need

Factors influencing an organization toward controls and audit of computers and the impact of the information systems audit function on organizations are depicted in the Fig.

Let us now discuss these reasons in details:

(i) Organizational Costs of Data Loss: Data is a critical resource of an organization for its present and future process and its amity to adapt and survive in a changing environment.

(ii) Cost of Incorrect Decision Making: Management and operational controls taken by managers involve detection, investigations and correction of the processes. These high level decisions require accurate data to make quality decision rules.

(iii) Costs of Computer Abuse: Unauthorised access to computer systems, malwares, unauthorised physical access to computer facilities and unauthorised copies of sensitive data can lead to destruction of assets (hardware, software, data, information etc.)

(iv) Value of Computer Hardware: Software and Personnel: These are critical resources of an organization,

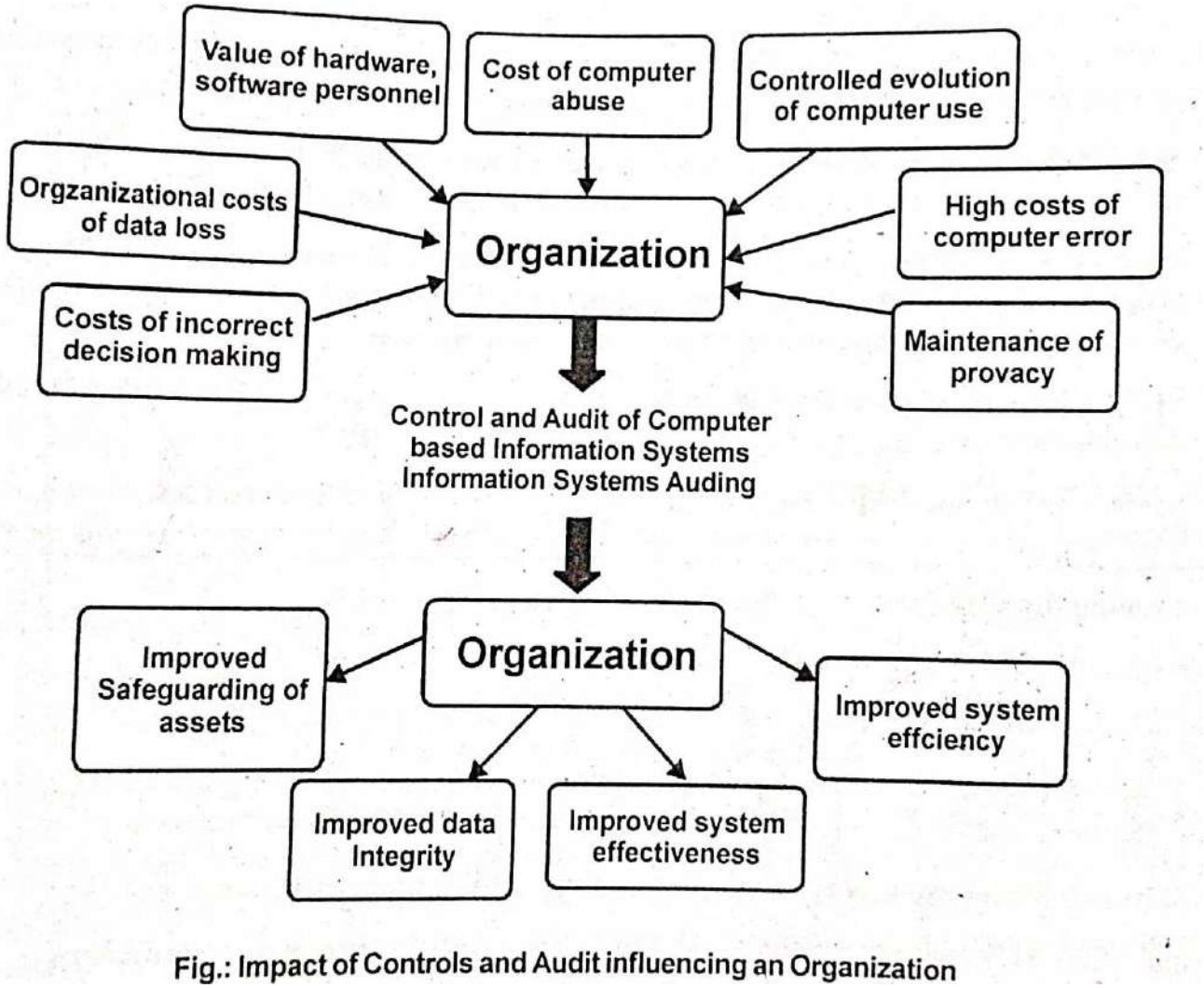


Fig.: Impact of Controls and Audit influencing an Organization

which has a credible impact on its infrastructure and business competitiveness.

(v) High Costs of Computer Error: In a computerised enterprise environment where many critical business processes are performed, a data error during entry or process would cause great damage.

(vi) Maintenance of Privacy: Today, data collected in a business process contains private information about an individual too. These data were also collected before computers but now. there is a fear that privacy has eroded beyond acceptable levels.

(vii) Controlled evolution of computer Use: Use of Technology and reliability of complex computer systems cannot be guaranteed and the consequences of using unreliable systems can be destructive.

Information Systems Auditing

It is the process of attesting objectives (those of the external auditor) that focus on asset safeguarding, data west and management objectives (those of the internal auditor) that include effectiveness and efficiency both This enables organizations to better achieve four major objectives that are as follows:

(i) Asset Safeguarding Objectives: The information system assets (hardware, software, data information etc.) must be protected by a system of internal controls from unauthorised access.

(ii) Data Integrity Objectives: It is a fundamental attribute of IS Auditing. The importance to maintain integrity of data of an organization requires all the time. It is also important from the business perspective of the decision maker, competition and the market environment.

(iii) System Effectiveness Objectives: Effectiveness of a system is evaluated by auditing the characteristics and objective of the system to meet business and user requirements.

(iv) System Efficiency Objectives: To optimize the use of various information system resources (machine time, peripherals, system software and labour) along with the impact on its computing environment.

Skills and functions of information system auditor

Skills

The audit objective and scope has a significant bearing on the skill and competence requirements of an IS auditor. The set of skills that is generally expected to be with an IS auditor include:

(i) Sound knowledge of business operations, practices and compliance requirements;

(ii) Should possess the requisite professional technical qualification and certifications;

(iii) A good understanding of information Risks and Controls;

(iv) Knowledge of IT strategies, policy and procedural controls;

(v) Ability to understand technical and manual controls relating to business continuity; and

(vi) Good knowledge of Professional Standards and Best Practices of IT controls and security.

Therefore, the audit process begins by defining the scope and objectives to adapt the standards and benchmarks for developing information model for collecting and evaluating evidence to execute the audit.

Functions

IS Auditor often is the assessor of business risk, as it relates to the use of IT, to management, The auditor can check the technicalities well enough to understand the risk (not necessarily manage the technology) and make a sound assessment and present risk-oriented advice to management. IS Auditors review risks relating to IT systems and processes; some of them are:

(i) Inadequate information security controls (e.g. missing or out of date antivirus controls, open ports, open systems without password or weak passwords etc.

(ii) Inefficient use of resources, or poor governance (e.g. huge spending on unnecessary IT projects like printing resources, storage devices, high power servers and workstations etc.

(iii) Ineffective IT strategies, policies and practices (including a lack of policy for use of Information and Communication Technology (ICT) resources, Internet usage policies, Security practices etc.

(iv) IT-related frauds (including phishing, hacking etc.

The process of information system audit

Different audit organizations go about IS auditing in different ways and individual auditors have their own favourite ways of working. However, it can be categorized into six stages as shown in Fig.

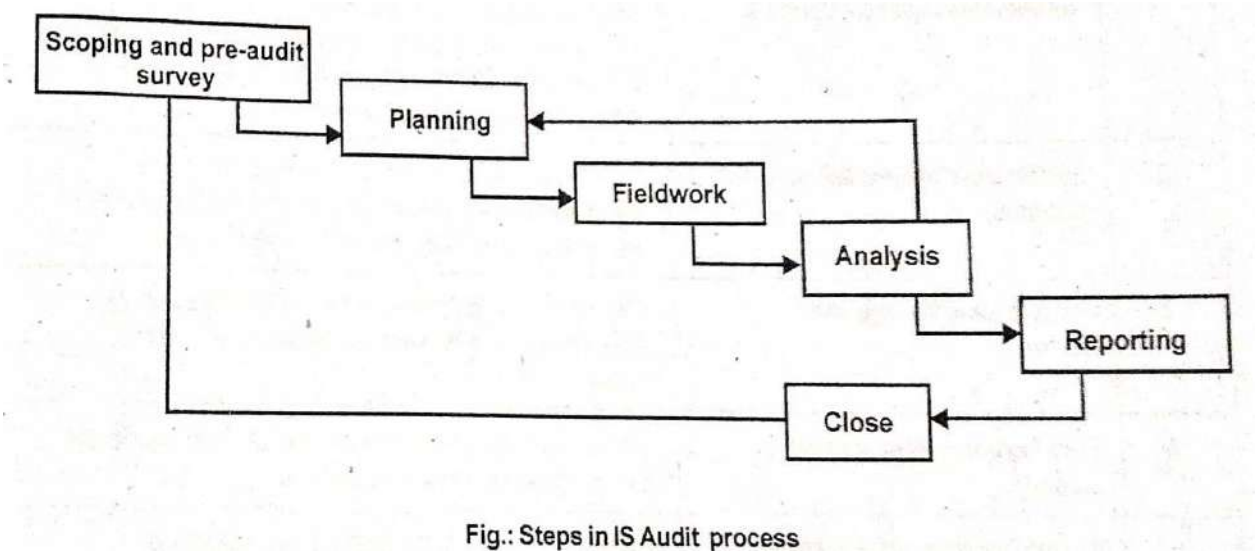


Fig.: Steps in IS Audit process

(i) Scoping and pre-audit survey: Auditors determine the main area/s of focus and any areas that are explicitly out-of-scope, based on the scope-definitions agreed with management. Information sources at this stage include background reading and web browsing, previous audit reports, pre audit interview, observations and, sometimes, subjective impressions that simply deserve further investigation.

(ii) Planning and preparation: During which the scope is broken down into greater levels of detail, usually involving the generation of an audit work plan or risk-control-matrix.

(iii) Fieldwork: This step involves gathering of evidence by interviewing staff and managers, reviewing documents, and observing processes etc.

(iv) Analysis: This step involves desperately sorting out, reviewing and trying to make sense of all that evidence gathered earlier. SWOT (Strengths, Weaknesses, Opportunities, Threats) or PEST (Political, Economic, Social, Technological) techniques can be used for analysis.

(v) Reporting: Reporting to the management is done after analysis of evidence is gathered and analysed.

(vi) Closure: Closure involves preparing notes for future audits and follow up with management to complete the actions they promised after previous audits.

Analysis and reporting may involve the use of automated data analysis tools such as ACL or IDEA, if not Excel, Access and hand-crafted SQL queries. Automated system security analysis, configuration or vulnerability management and security benchmarking tools are also used for reviewing security parameters, and the basic security management functions that are built-in to modern systems can help with log analysis, reviewing user access rights etc.

Secondly, after accepting an engagement, the pre-audit survey is more important, as in this survey auditor has official access to client records and data. The purpose of this survey shall help auditor to assess the audit schedules, audit team size, and audit team components.

Describe the managerial control of information system audit.

S.No.	Controls	Scope
1.	Top Management and Information Systems Management Controls.	Discusses the top management's role in planning, organizing, leading and controlling the information systems function. Also provides advice to topmanagement in relation to long-run policy decisionmaking and translates long-run policies into short-rungoals and objectives.
2.	System Development Management Controls.	Provides a contingency perspective on models of the information systems development process that auditorscan use as a basis for evidence collection and evaluation.
3.	Programming Management Controls	Discusses the major phases in the program life cycle and the important controls that should be exercised in each phase.
4.	Data Resource Management Controls	Discusses the role of database administrator and the controls that should be exercises in each phase.
5.	Quality Assurance Management Controls	Discusses the major functions that quality assurance management should perform to ensure that the development, implementation, operation, and maintenance of information systems conform to quality standards.
6.	Security Management Controls	Discusses the major functions performed by operations by security administrators to identify major threats to the IS functions and to design, implement, operate, and maintain controls that reduce expected losses from these threats toan acceptable level.
7.	Operations Management Controls	Discusses the major functions performed by operations management to ensure the day-to-day operations of the IS function are well controlled.

5.6 BLOCK CHAIN

Define Block Chain and properties of block chain

Meaning

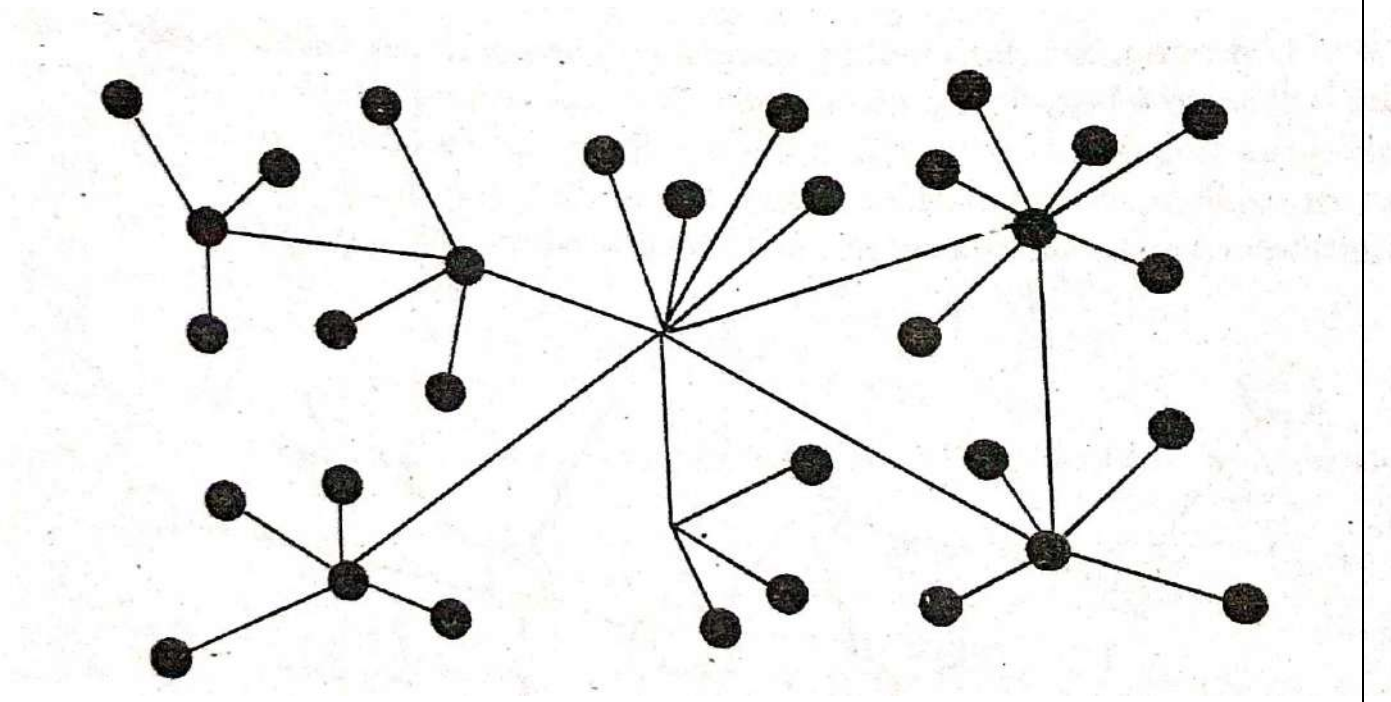
A block chain is a chain of chronological blocks. It is not a company, nor is it an application, but rather an entirely new way of documenting data on authenticates digital information. the internet. It gives internet users the ability to create value and authenticates digital information.

Technically, it is a decentralized, distributed and public digital ledger that is used to record transactions across many computers, so that any involved record cannot be altered retroactively, without the alteration of all subsequent blocks.

The very primitive form of the block chain was the hash tree, also known as a Merkle tree. The block chain is maintained by a peer-to-peer network. The network is a collection of nodes which are interconnected to one another. Nodes are individual computers which take in input and performs a function on them and gives an output.

A block in a block chain is a collection of data. The first block in the Block chain is called Genesis Block. Blocks hold batches of valid transactions that are hashed and encoded into a Merkle tree. Each block includes the cryptographic hash of the prior block in the block chain, linking the two.

The linked blocks form a chain. This iterative process confirms the integrity of the previous block, all the way back to the original genesis block.



Properties

Three main properties of Block chain Technology which has helped it gain widespread acclaim are as follows:

1. Decentralization

2. Transparency

3. Immutability

1. Decentralization: No central authority to control or manipulate it. Blockchain creates a shared system of record among business network members, eliminating the need to reconcile disparate ledgers. All participant talks to each other directly.

2. Transparency: Each member of the network must have access privileges. Information is shared only on a need-to-know basis. In doing so, their computer receives a copy of the blockchain that is updated automatically whenever a new block is added, sort of like a Facebook News Feed that live updates whenever a new status is posted.

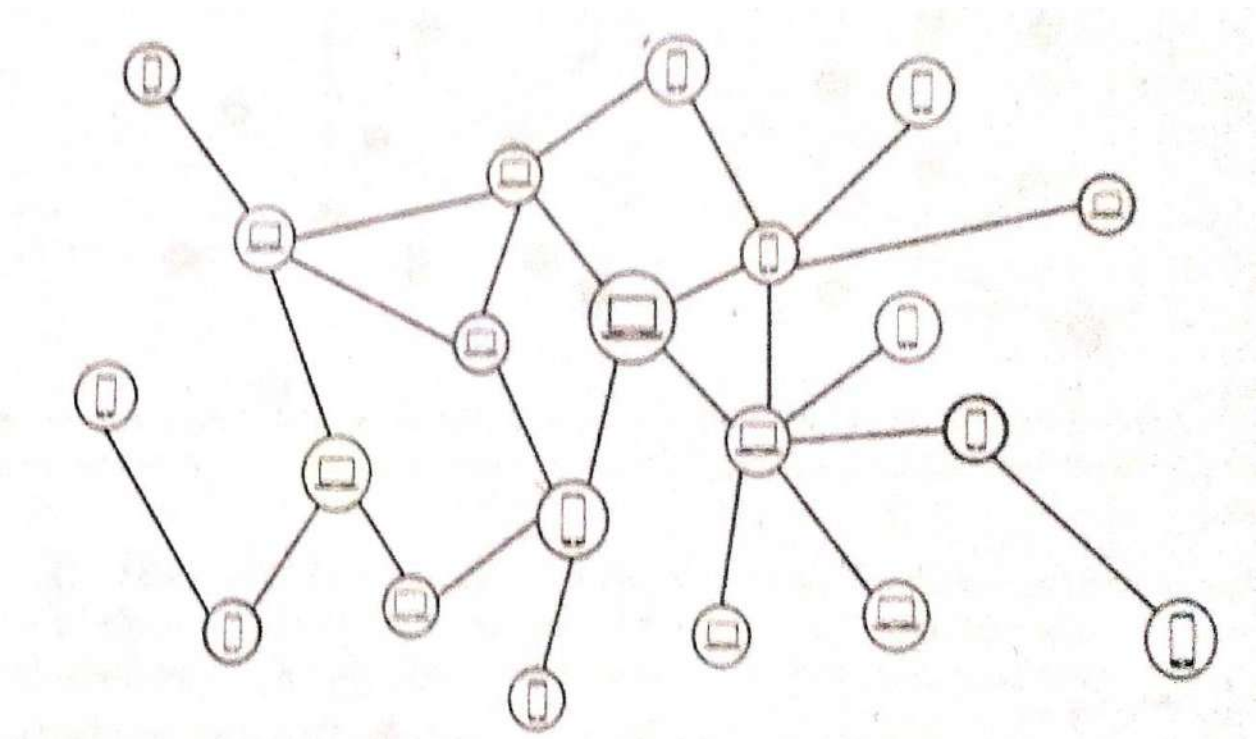
3. Immutability: Consensus is required from all members and all validated transactions are permanently recorded. Even a system administrator can't delete a transaction.

Working mechanism of Block Chain

1. A node starts a transaction by first creating and then digitally signing it with its private key (created via cryptography). As each transaction occurs and the parties agree to its details then it's encoded into a block of digital data and uniquely signed or identified. Each block is identified via a cryptographic hash and timestamp.

2. A transaction is propagated (flooded) by using a flooding protocol, called Gossip protocol, to peers that validate the based on present criteria. The newly created block is verified by thousands,

perhapsmillions of computers distributed around the net. Each block is connected to the on before and after it creating an of irreversible, immutable blockchain. The verified block is added to a chain, which is stored across the net, creating not just a unique record, but a unique record with a unique history.



3.The newly created block now becomes part of the ledger, and the next block links itself cryptographically back to this block. Blocks are chained together, preventing any block from being altered or a block being inserted between two existing blocks. Falsifying a single record would mean falsifying the entire chain in millions of instances. That is virtually impossible. Transactions are then reconfirmed every time a new block is created. Usually, six confirmations in the a

4.network are required to consider the transaction final. The Bitcoin Network is the first successful implementation of block chain technology.

Explain different types and limitations of block chains.

Types

1. Public block chain: It allow anyone to contribute data to the ledger with all participants possessing an identical copy of the ledger.

2. Private Block chain: The only allow invited participants to join the network. These networks are controlled by either a single or series of designated network administrators.

3. Hybrid Block chain: It considered to be semi-decentralized and employ characteristics of both public and private block chains.

Limitations

1. Higher costs: Nodes seek higher rewards for completing Transactions in a business which work on the principle of Supply and Demand

2. Slower transactions: Nodes prioritize transactions with higher rewards, backlogs of transactions build up

3. Smaller ledger: It not possible to a full copy of the Block chain, potentially which can affect immutability, consensus, etc.

4. Transaction costs, network speed: The transactions cost of Bit coin is quite high after being touted as nearly free for the first few years. Risk of error: There is always a risk of error, as long as the human factor is involved. In case a block chain

5. serves as a database, all the incoming data has to be of high quality. However, human involvement can quickly resolve the error.

6. Wasteful: Every node that runs the block chain has to maintain consensus across the block chain. This offers very low downtime and makes data stored on the block chain forever unchangeable. However, all this is wasteful, because each node repeats a task to reach consensus.

Enumerate different types of data security measures to protect the organization's data in the modern era

There are different types of data security measures such as data backup, encryption and antivirus software which will ensure the security of your sensitive data.

The most types of data security are as follows:

1. Data Backup

A data backup process is a most important types of data security measures which copying or archiving data files for the purpose of being able to restore data in case of data loss event. It is secondary storage of data which is used for data protection.

2.Firewall

A firewall is security tools which is designed to monitors incoming and outgoing network traffic. Its main purpose is to create an obstacle between trusted internal network and un trusted external network in order to protect data security.

3.Data Encryption

Encryption software is important types of data security measures that enable encryption and decryption of a data stream during transmission and storage. It enables the encryption of the content of a data object, file, and network packet or application.

4. Use Antivirus Software

Antivirus software is a program that helps to protect your computing devices, data files, and others important files against viruses, worms, Trojan horses, and unwanted threats. It scans every file which comes through the Internet and helps to prevent damage to your system.

5.Digital Signature

A digital signature is a types of data security which used to validate the authenticity and integrity of a digital messages or documents such as e-mail, spreadsheet, and text file.

6.Data Masking

Data masking is important types of data security measures in which hiding original data with modified content (such as characters or other data). It is the process of interchanging or modifying certain elements of the data, enabling security and ensures confidentiality of data.