UNIT - VI

CHAPTER 7

Information System within Organization

Syllabus

Transaction Processing Systems, Functional Area Information System, ERP and ERP Support of Business Process

Acquiring Information Systems and Applications: Various System Development Life Cycle Models

7.1 Introduction

This chapter introduces the fast-changing world of information system applications used within the organizations. Many companies today are using information technology to develop integrated cross-functional enterprise systems that cross the boundaries of traditional business functions in order to reengineer and improve vital business processes all across the enterprise. These cross-functional enterprise systems are used as a strategic way to use IT to share information resources and improve the efficiency and effectiveness of business processes, and develop strategic relationships with customers, suppliers, and business partners. Companies first moved from functional mainframe-based systems to integrated cross-functional applications. These changes introduced applications based on transaction processing which later gave way to *enterprise resource planning, supply chain management, and customer relationship management* software. Such enterprise software focuses on supporting integrated business processes involved in the operations of a business.

Behind the development of all these enterprise-based application development there lies a careful and complex development system. Such a system is called system development lifecycle. You are going to learn the steps of system/application development.

7.1.1 Transaction Processing System

Many companies today are using information technology to develop integrated cross-functional enterprise systems in order to reengineer and improve vital business processes all across the enterprise. These organizations view cross-functional enterprise systems as a strategic way to use IT to share information resources and improve the efficiency and effectiveness of business processes, and develop strategic relationships with customers, suppliers, and business partners.

Companies all across the globe are using the World Wide Web and their intranets and extranets as a technology platform for their cross-functional and enterprise information systems. **Transaction processing systems (TPS)** are cross-functional information systems that process data resulting from the occurrence of business transactions.

Transactions are events that occur as part of doing business, such as sales, purchases, deposits, withdrawals, refunds, and payments. Think, for example, of the data generated whenever a business sells something to a customer on credit, whether in a retail store or at an e-commerce site on the web. Data about the customer, product, salesperson, store, and so on, is captured and processed. This need prompts additional transactions, such as credit checks, customer billing, inventory changes, and increases in accounts receivable balances, which generate even more data.

Thus, **transaction processing** activities are needed to capture and process such data, or the operations of a business would grind to a halt. Transactions ensure that data-oriented resources are not permanently updated unless all operations within the transactional unit complete successfully. By combining a set of related operations into a unit that either completely succeeds or completely fails, you can simplify error recovery and make your application more reliable. Therefore, transaction processing systems play a vital role in supporting the operations of most companies today.

Transaction processing systems capture and process data describing business transactions, update organizational databases, and produce a variety of information products. They consist of computer hardware and software hosting a transaction-oriented application that performs the routine transactions necessary to conduct business.

To ensure predictable behaviour, all transactions must possess the basic ACID properties. The following list contains a definition and a description of each ACID property:

- **Atomic:** A transaction must execute exactly once and must be atomic—either all of the work is done or none of it is. Operations within a transaction usually share a common intent and are interdependent. By performing only a subset of these operations, the system could compromise the overall intent of the transaction. Atomicity eliminates the chance of processing only a subset of operations.
- **Consistent:** A transaction must preserve the consistency of data, transforming one consistent state of data into another consistent state of data. Much of the responsibility for maintaining consistency falls to the application developer.
- **Isolated:** A transaction must be a unit of isolation, which means that concurrent transactions should behave as if each were the only transaction running in the system. Because a high degree of isolation can limit the number of concurrent transactions, some applications reduce the isolation level in exchange for better throughput.
- **Durable:** A transaction must be recoverable and therefore must have durability. If a transaction commits, the system guarantees that its updates can persist even if the computer crashes immediately after the commit. Specialized logging allows the system's restart procedure to complete unfinished operations required by the transaction, making the transaction durable.

7.1.2 Transaction Processing Cycle

1. Data entry

The first step of the transaction processing cycle is the capture of business data. For example, transaction data may be collected by point-of-sale terminals using optical scanning of bar codes and credit card readers at a retail store or other business. Transaction data can also be captured at an e-commerce website on the Internet.

2. Transaction processing

Transaction processing systems process data in two basic ways:

(a) **Batch processing:** Here transaction data are accumulated over a period of time and processed periodically. Examples are

Cheque clearance

- Written order asking a bank to transfer an amount of money to an account
- People deposit them into their account
- Involves checking whether the person has the correct funds(takes up to 3 days)
- Money is withdrawn when cheque has been cleared

Bill generation

- Invoice is given to a customer for supplied goods or service
- Generated at a scheduled time so the user can effectively manage their time
- Done as a group

(b) **Real-time processing** (also called online processing): Here data are processed immediately after a transaction occurs. All online transaction processing systems incorporate real-time processing capabilities. Many online systems also depend on the capabilities of *fault tolerant* computer systems that can continue to operate even if parts of the system fail. Examples are

Reservation systems

- Used in any type of business involved in setting aside a product or server for a customer(Ex. train tickets)
- Requires an acceptable response time

Point of sale terminals

- Used by retail stores to sell goods and services
- Minimizes the cost of batch handling by converting the data to a form that can be easily transmitted through a communication system
- Correct price of the product is received once the product number is entered

3. Database maintenance

An organization's databases must be updated by its transaction processing systems so that they are always correct and up-to-date. Therefore, transaction processing systems serve to assist in maintaining the corporate databases of an organization to reflect changes resulting from day-to-day business transactions. For example, credit sales made to customers will cause customer account balances to be increased and the amount of inventory on hand to be decreased. Database maintenance ensures that these and other changes are reflected in the data records stored in the company's databases.

4. Document and report generation

Transaction processing systems produce a variety of documents and reports. Examples of transaction documents include purchase orders, paychecks, sales receipts, invoices, and customer statements. Transaction reports might take the form of a transaction listing such as a payroll register, or edit reports that describe errors detected during processing.

5. **Inquiry processing**

Many transaction processing systems allow you to use the internet, intranets, extranets, and web browsers or database management query languages to make inquiries and receive responses concerning the results of transaction processing activity. Typically, responses are displayed in a variety of pre-specified formats. For example, you might check on the status of a sales order, the balance in an account, or the amount of stock in inventory and receive immediate responses at your PC.

7.1.3 Features

- **Rapid response:** The response time of a transaction processing system (TPS) is important because a business cannot afford to have their customers waiting for long periods of time before making a transaction.
- **Reliability:** A good TPS must be very reliable because if it were to break down, businesses could lose a huge portion of revenue because customers would not be able to purchase their products.
- **Inflexibility:** The TPS must work the same way for every transaction as long as the TPS is being used. The formality and structure should never change.
- **Controlled processing:** The TPS must be able to allow authorized employees to be able to access it at any time.

7.1.4 Storing and Retrieving Data

A TPS must be able to easily be accessed by authorized employees so that information in the TPS can be retrieved. The information that goes through a TPS must never be deleted so that there will not be any confusion of what orders have gone through it. It is a good idea to have a back up hard drive so that older information can still be stored, but will not slow down the server which houses the TPS.

Transaction processing is supported by programs that are called transaction processing systems. Transaction processing systems provide the following functions:

- **System runtime functions**

  Transaction processing systems provide an execution environment that ensures the integrity, availability, and security of data. They also ensure fast response time and high transaction throughput.

- **System administration functions**

  Transaction processing systems provide administrative support that lets users configure, monitor, and manage their transaction systems.

- **Application development functions**

  Transaction processing systems provide functions for use in custom business applications, including functions to access data, to perform inter-computer communications, and to design and manage the user interface.

7.2 Information System for Business Functional Areas

Business managers are moving from a tradition where they could avoid, delegate, or ignore decisions about IT to one where they cannot create a marketing, product, international, organization, or financial plan without IT. There are as many ways to use information technology in business as there are business activities to be performed, business problems to be solved, and business opportunities to be pursued.

As a business professional, you should have a basic understanding of the major ways information systems are used to support each of the functions of business accomplished in any company. Thus, in this section, we will discuss functional business systems.

Information systems (transaction processing, management information, decision support, and so on) support the business functions of accounting, finance, marketing, operations management, and human resource management. As a business professional, it is also important that you have a specific understanding of how information systems affect a particular business function or a particular industry. For example, someone whose career objective is a marketing position in banking should have a basic understanding of how information systems are used in banking and how they support the marketing activities of banks and other firms.

Thus, information systems in this section will be analyzed according to the business function they support by looking at a few key examples in each functional area.

7.3 Marketing Information System

The business function of marketing is concerned with the planning, promotion, and sale of existing products in existing markets, and the development of new products and new markets to better attract and serve present and potential customers. Thus, marketing performs an essential function in the operation of a business enterprise. Business firms have increasingly turned to information technology to help them perform vital marketing functions in the face of the rapid changes of today's environment.

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

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

7.3.1 Components of Marketing Information System

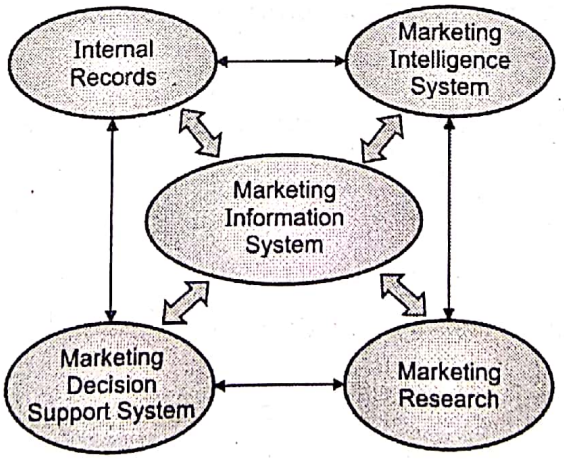

Fig. 7.3.1 Components of marketing IS

- **Internal records :** The company can collect information through its internal records comprising of sales data, customer database, product database, financial data, operations data, etc.

- **Marketing intelligence system :** The marketing intelligence system provides the data about the happenings in the market, i.e. data related to the marketing environment which is external to the organization. It includes the information about the changing market trends, competitor's pricing strategy, change in the customer's tastes and preferences, new products launched in the market, promotion strategy of the competitor, etc.
- **Marketing research :** The marketing research is the systematic collection, organization, analysis and interpretation of the primary or the secondary data to find out the solutions to the marketing problems. Several companies conduct marketing research to analyze the marketing environment comprising of changes in the customer's tastes and preferences, competitor's strategies, the scope of new product launch, etc. by applying several statistical tools.
- **Marketing decision support system :** It includes several software programs that can be used by the marketers to analyze the data, collected so far, to take better marketing decisions. With the use of computers, the marketing managers can save the huge data in a tabular form and can apply statistical programs to analyze the data and make the decisions in line with the findings.

7.3.2 Advantages of Marketing Information Systems

1. **Organized data collection :** Lots of data can be collected from the market. But the main word here is "organized". Organizing data is very important else the data is meaningless. Thus MIS helps you to organize your database thereby improving productivity.
2. **Storage of important data :** Several times in pharmaceuticals, when one drug is being produced they may need data of another drug which was produced years back. Similarly in media, photographs are stored in archives. This storage of important data plays a crucial role in execution and thus proves again that MIS is not important only for information but also for execution.
3. **Avoidance of crisis :** The best way to analyse a stock (share market) is to see its past performance. Top websites like moneycontrol thrive on MIS. Similarly MIS helps you keep track of margins and profits. With an amazing information system established, you can know where your organization is moving and probably avert a crisis long before it has taken place. Ignoring hints received from MIS reports is foolhardy.
4. **Co-ordination :** Consumer durables and FMCG companies have a huge number of processes which needs to be co-ordinated. These companies depend completely on MIS for the proper running of the organization. There are dedicated people for marketing information systems in such organizations. This is mainly because of the speed required to access information and implement it.
5. **Analysis and planning :** MIS is critical for planning. You cannot do planning without information. For planning, the first thing which is needed is the organizations capabilities, then the business environment and finally competitor analysis. In a proper MIS, all these are present by default and are continuously updated. Thus MIS is very important for planning and analysis.
6. **Control :** Just like MIS can help in a crisis, in normal times it provides control as you have information of the various processes going on and what is happening across the company. Thus, it provides you with a sense of control.

7.4 Manufacturing System

There was a time when manufacturers operated on a simple build-to-stock model. They built 100 or 100,000 of an item and sold them via distribution networks. They kept track of the stock of inventory and made more of the item once inventory levels dipped below a threshold. Rush jobs were both rare and expensive, and configuration options limited. Now, things have changed for the better. Concepts like just-in-time inventory, build-to-order (BTO) manufacturing, end-to-end supply chain visibility, the explosion in contract manufacturing, and the development of web-based e-business tools for collaborative manufacturing have revolutionized plant management.

Manufacturing Information Systems (MIS) support the *production/operations* function of an organization that includes all activities concerned with the planning and control of the processes producing goods or services. Thus, the production/operations function is concerned with the management of the operational processes and systems of all business firms.

Information systems used for operations management and transaction processing support firms plan, monitor, and control inventories, purchases, and the flow of goods and services. Therefore, firms such as transportation companies, wholesalers, retailers, financial institutions, and service companies must use production/operations information systems to plan and control their operations.

A variety of manufacturing information systems, many of them web-enabled, today support Computer-Integrated Manufacturing (CIM). The objectives of computer-based systems in manufacturing are to:

- **Simplify** production processes, product designs, and factory organization creating a vital foundation for automation and integration.
- **Automate** production processes and the business functions that support them with computers, machines, and robots.
- **Integrate** all production and support processes using computer networks, cross-functional business software, and other information technologies.

7.4.1 Benefits of Manufacturing Information Systems

1. It streamlines the product production system.
2. It reduces costs, waste, and re-work which results in savings.
3. Increased efficiency in set-up times helps avoid delays.
4. Assessment of correct order priority helps in delivering products on time.
5. Assignment and reassignment of inventory are done as per the necessity.
6. It helps evaluate the optimal times to turn machines on and off.
7. Scheduling and rescheduling of equipment is done better.
8. It improves the reaction time within the supply chain management process.
9. It helps in the timely movement of inventory from one workstation to another.
10. It helps in managing suppliers on the right time and at the right price.
11. It improves operational efficiency.
12. It increases transparency in record-keeping processes.

7.4.2 Applications

- The overall goal of manufacturing information systems is to create flexible, agile, manufacturing processes that efficiently produce products of the highest quality. Implementing such manufacturing concepts prepares a company to respond to and fulfill customer requirements quickly with high-quality products and services.
- Manufacturing information systems help companies simplify, automate, and integrate many of the activities needed to produce products of all kinds. For example, computers are used to help engineers design better products using both *computer-aided engineering* (CAE) and *computer-aided design* (CAD) systems, and better production processes with *computer-aided process planning.*
- They are also used to help plan the types of material needed in the production process, which is called *material requirements planning* (MRP), and to integrate MRP with production scheduling and shop floor operations, which is known as *manufacturing resource planning.*
- Many of the processes within manufacturing resource planning systems are included in the manufacturing module of enterprise resource planning (ERP) software.
- Computer-aided manufacturing (CAM) systems automate the production process. For example, this could be accomplished by monitoring and controlling the production process in a factory or by directly controlling a physical process, a machine tool, or robots.
- Manufacturing Execution Systems (MES) are performance-monitoring information systems for factory floor operations. They monitor, track, and control the five essential components involved in a production process: materials, equipment, personnel, instructions and specifications, and production facilities. MES includes shop floor scheduling and control, machine control, robotics control, and process control systems. These manufacturing systems monitor, report, and adjust the status and performance of production components to help a company achieve a flexible, high-quality manufacturing process.
- Process control is the use of computers to control an ongoing physical process. Process control computers control physical processes in petroleum refineries, cement plants, steel mills, chemical plants, food product manufacturing plants, pulp and paper mills, electric power plants, and so on. A process control computer system requires the use of special sensing devices that measure physical phenomena such as temperature or pressure changes, which are then converted to digital forms and relayed to computers for processing.
- Machine control is the use of computers to control the actions of machines. This is also popularly called *numerical control.* The computer-based control of machine tools to manufacture products of all kinds is a typical numerical control application used by many factories throughout the world.

7.5 HR Information System

The Human Resource Management (HRM) function involves the recruitment, placement, evaluation, compensation, and development of the employees of an organization.

The goal of human resource management is the effective and efficient use of the human resources of a company. **Human Resource Information Systems (HRIS)** play an important role in achieving this goal. They are designed to support

- HR planning to meet the current and future personnel needs of the business
- Planned employees development to its full potential
- Controlling and shaping of all personnel policies and programs.

Originally, businesses used computer-based information systems for limited and routine functions like

- Producing paychecks and payroll reports
- Maintaining personnel records, and
- Analyzing the use of personnel in business operations.

But, now many firms have gone beyond these traditional *personnel management* functions and have developed human resource information systems that also support

- Recruitment, selection, and hiring
- Job placement
- Performance appraisals
- Employee benefits analysis
- Training and development
- Health, safety, and security

7.5.1 HRIS Functions

- **Operational:** A human resources information system functions as a productivity tool for HR operational processes. Increased speed and accuracy result when HR transactions are performed with computer software rather than manually, and routine transactions such as employee headcount, payroll tracking and time and attendance reporting become automated and more cost-effective.
- **Managerial:** An HRIS functions as a managerial information system to gather and provide key data about staffing, turnover, benefits and regulatory compliance issues. Human resources personnel can provide reports on total number of employees, cost to hire, vacant positions, benefits costs, required reports and cost of raises and bonuses. HR managers can more easily present analysis of compensation, recruiting, accidents and injuries.
- **Executive:** A company's HRIS functions as an executive information system to aggregate high-level data for long-range planning such as succession planning. The system provides executive planning information for strategic needs such as forecasting, staffing needs assessment and employee skills assessment.
- **Office automation:** An HRIS also can function as an office automation system to design employee management documents such as applications and job requisitions, to schedule shared resources and schedule and track employee training and recognition. HR reports can be automated and set to run and distribute right from the system, getting information to the people that need it in real time. An HRIS reduces the amount of time the staff spends on daily transaction activities, such as tracking employee status changes, and frees them to work on more planning and strategy aligned with corporate goals.

7.5.2 HRIS Advantages

- **Recruitment :** HRIS are involved in the recruitment of employees through recruitment sections of corporate websites. Companies these days are also using recruitment services which maintain candidates profile databases on the World Wide Web to invite job seekers, posting messages in selected Internet newsgroups, and communicating with job applicants via e-mail. The internet has a wealth of information and contacts for both employers and job hunters. HRIS allow companies to process most common HRM applications over their corporate intranets.
- **Employee services :** HRIS allow the HRM departments to provide around-the-clock services to their employees. They can also disseminate valuable information faster to the concerned employees and departments.
- **Training :** Another benefit of the HRIS is that it can serve as a superior training tool. Employees can easily download instructions and processes to get the information or education they need. In addition, employees using new technology can view training videos over the intranet on demand. Thus, the HRIS eliminates the need to loan out and track training videos.
- **Talent management :** Employees are the most valuable resources in any organization. However, the process of talent management which is attracting, recruiting, engaging, developing, and retaining employees is a complicated process. Also, employee turnover cost is expensive. An HRIS with an exclusive talent management system will help the organization take better care of their employees.
- **Time and absence management :** An HRIS solves the problems associated with leave and time management with a comprehensive set of features such as:
  - Auto-capture and submit timesheet entries
  - Workforce scheduling
  - Leave tracking and management
  - Drill-down and drill-through analytics
  - Integrations with payroll, accounting, etc.
- If not handled properly, timesheets and vacation requests have the potential to stir up a lot of trouble. Mishandled time-off requests can leave a bad impression on the quality of life in the organization, and reduce employee satisfaction. So, streamlining the timesheet and time-off process with an HRIS can control the manual errors and prevent possible disasters.
- **Employee Self-Service(ESS):** Organizations often find it hard to keep their employee-related data updated. Employee Self-Service is an effective way to manage this problem. Giving employees access to view and manage their personal information (profile, time off, benefits, or payroll) can reduce the time HR staffs spend on mundane clerical tasks.

By extending a self-service option to their employees' organizations can:

- Empower employees
- Decrease clerical tasks
- Cut down admin time
- Improve employee engagement
- Reduce HR paperwork

- With a self-service portal, every HR process from employee on boarding to reporting will become more efficient. If the HRIS has multi-channel accessibility, employees can view, edit, and retrieve all work-related information right from their mobile phones.
- **Centralized database:** With an automated database that collects, stores, and displays up-to-date, consistent information about the personnel, policies, and procedures in an organization, HR leaders can finally break up with spreadsheets and paper files. Storing all confidential information in a centralized cloud-based HRIS software will:
  - Promote data integrity
  - Reduce process and data redundancy
  - Improve productivity
  - Enhance efficiency of HR staff and
  - Reduce cost

A centralized database that is seamlessly integrated with other HR modules will offer great accessibility to all end users. Any updates or changes made to the master database will reflect immediately across all modules, saving a considerable amount of time and effort HR staff put into matching and duplicating all records manually.

- **Payroll:** Several organizations still use a stand-alone system to manage their payroll process. However, an HRIS software can manage the payroll process end-to-end with its broad range of features that:
  - Automate payout process
  - Auto-compute taxes
  - Ensure statutory compliance
  - Deliver automated reminders
  - Extend employee self-service options

7.6 Information System for Accounting

Accounting information systems are the oldest and the most widely used information systems in business. They record and report business transactions and other economic events. Computer-based accounting systems record and report the flow of funds through an organization and produce important financial statements such as balance sheets and income statements.

Such systems also produce forecasts of future conditions such as projected financial statements and financial budgets. A firm's financial performance is measured against such forecasts by other analytical accounting reports.

Operational accounting systems emphasize legal and historical record-keeping and the production of accurate financial statements. Typically, these systems include transaction processing systems such as order processing, inventory control, accounts receivable, accounts payable, payroll and general ledger systems.

Management accounting systems focus on the planning and control of business operations. They emphasize cost accounting reports, the development of financial budgets and projected financial statements, and analytical reports comparing actual to forecasted performance.

Many accounting software packages are available for these applications. It should come as no surprise that the accounting information systems are being transformed by internet technologies. Using the internet and other network changes, accounting information systems now monitor and track business activity.

The interactive nature of online accounting systems calls for new forms of transaction documents, procedures, and controls. This particularly applies to systems like order processing, inventory control, accounts receivable, and accounts payable. These systems are directly involved in the processing of transactions between a business and its customers and suppliers. So naturally, many companies are using internet and other network links to these trading partners for such online transaction processing systems.

7.7 Financial Management System

Computer-based financial management systems support business managers and professionals in decisions concerning

- The financing of a business
- The allocation and control of financial resources within a business

Major financial management system categories include cash and investment management, capital budgeting, financial forecasting, and financial planning.

7.7.1 Applications

- The **capital budgeting** process involves evaluating the profitability and financial impact of proposed capital expenditures.
- Long-term expenditure proposals for facilities and equipment can be analyzed using a variety of **return on investment** (ROI) evaluation techniques. This application makes heavy use of spreadsheet models that incorporate present value analysis of expected cash flows and probability analysis of risk to determine the optimum mix of capital projects for a business.
- Financial analysts also typically use electronic spreadsheets and other **financial planning** software to evaluate the present and projected financial performance of a business. They also help determine the financing needs of a business and analyze alternative methods of financing. Financial analysts use financial forecasts concerning the economic situation, business operations, types of financing available, interest rates, and stock and bond prices to develop an optimal financing plan for the business.
- Electronic spreadsheet packages, DSS software, and web-based groupware can be used to build and manipulate financial models. Answers to what-if and goal-seeking questions can be explored as financial analysts and managers evaluate their financing and investment alternatives.

7.7.2 Building Blocks of an FMIS

There are many elements that make up an FMIS, each with its own function. Some of them have to do with the accounting functions of the organization; others are concerned with planning, others analysis, and others reporting. The following are the main elements you will find in most financial management information systems:

- The general ledger.
- The accounts payable.

- The accounts receivable.
- A budgetary accounting module.
- A payroll system.
- A procurement module.
- A project ledger module.
- An asset module.

7.7.3 Advantages of a Financial Management Information System

Faster decision-making process

The information provided by the financial management information system has some important qualities: It is timely, reliable, accurate, and verifiable. That makes it much easier and faster to make decisions. Because of the financial reporting capabilities of the financial management information system, it helps the management of the business to evaluate the economic advantages and disadvantages of various business strategies they are trying out. This brings about more certainty to the implementation of business strategies and decisions.

Helps in planning

Having an FMIS system implemented increases your capacity to schedule and forecast. With that capability, the process of allocating financial resources become much more effective, and the targets set become more realistic. Capacity to plan realistically allows you to achieve your goals much faster.

More efficient business

With a financial management information system, your business stands a chance to become much more efficient. The system gives you all the information and control you need to prevent the misuse of the business's financial resources while giving you the ability to mitigate potential risks that you cannot foresee. Because of its reporting capabilities, a financial management information system also allows you to use past performance to inform your current as well as future strategies.

Competitive advantage

With a financial management information system, your business will have a competitive advantage over other businesses. An FMIS is simply a way to bring more productivity to the business and more satisfaction to the customer. The business will be able to see everything that is going on in a financial sense and respond in a timely manner to remain a step ahead of its competitors at all times.

Integration

With a financial management information system, the process of integration becomes much easier. The functions and resources of the business can all be controlled within a single system. This makes it easier and faster to process transactions and convey financial information. Redundant activities are eliminated, and shared services are centralized to save on operational costs. The end result is a more efficient business with a more robust bottom line.

7.8 Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) systems help unleash the true potential of companies by integrating business and management processes. It is an integrated, real-time, cross-functional enterprise application, an enterprise-wide transaction framework that supports all the internal business processes of a company. The central feature of all ERP systems is a shared database that supports multiple functions used by different business units such as sales order processing, inventory management and control, production and distribution planning, and finance. In practice, this means that employees in different divisions—for example, accounting and sales—can rely on the same information for their specific needs.

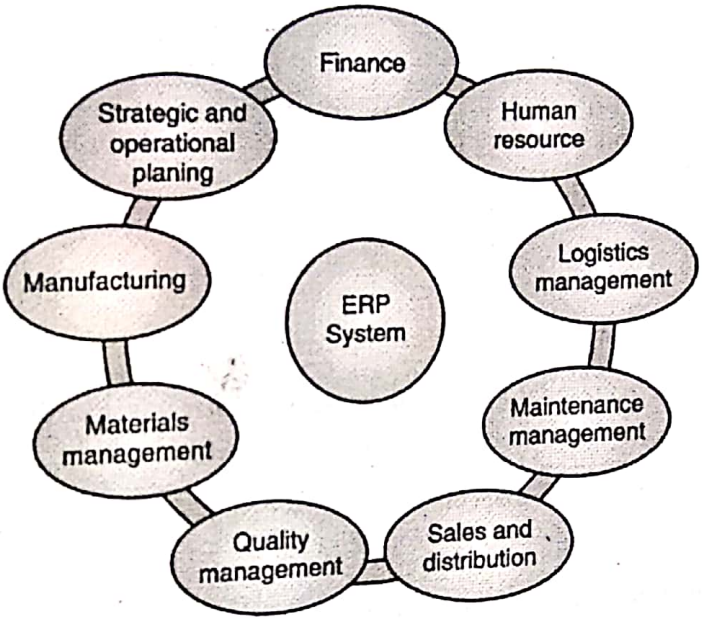

Fig. 7.8.1 : ERP system

7.8.1 History

The term ERP was coined in 1990 by Gartner, but its roots date to the 1960s. Back then, the concept applied to inventory management and control in the manufacturing sector. Software engineers created programs to monitor inventory, reconcile balances, and report on status. By the 1970s, this had evolved into Material Requirements Planning (MRP) systems for scheduling production processes.

In the 1980s, MRP grew to encompass more manufacturing processes, prompting many to call it MRP-II or Manufacturing Resource Planning. By 1990, these systems had expanded beyond inventory control and other operational processes to other back-office functions like accounting and human resources, setting the stage for ERP as we've come to know it.

7.8.2 Need of ERP

ERP is very helpful in the following areas –

- Business integration and automated data update
- Linkage between all core business processes and easy flow of integration
- Flexibility in business operations and more agility to the company

- Better analysis and planning capabilities
- Critical decision making
- Competitive advantage
- Use of latest technologies

7.8.3 Features of ERP

The following are the features of ERP –

- Accommodating variety
- Seamless integration
- Resource management
- Integrated management information
- Supply chain management
- Integrated data model

7.8.4 Scope of ERP

- **Finance** : Financial accounting, managerial accounting, treasury management, asset management, budget control, costing, and enterprise control.
- **Logistics** : Production planning, material management, plant maintenance, project management, events management, etc.
- **Human resource** : Personnel management, training and development, etc.
- **Supply chain** : Inventory control, purchase and order control, supplier scheduling, planning, etc.
- **Work flow** : Integrate the entire organization with the flexible assignment of tasks and responsibility to locations, position, jobs, etc.

7.8.5 Advantages and Disadvantages of ERP

Advantages

- Reduce your overhead costs by folding a number of business tools and applications into one system
- Cause individual operations/departments (warehouse, accounting, HR, etc.) to work faster
- Automate specific processes that would otherwise require manpower to complete
- Improve business data analytics for better, more accurate and actionable insights
- Positively impact customer relationships by being an overall faster, more efficient company to work with
- Be customized to focus on the aspects of your business that are most aligned with your current goals and needs

Disadvantages

- Expensive and time consuming in implementation
- Difficulty in integration with other system

- Risk of implementation failure
- Difficulty in implementing changes
- Risk in using one vendor

7.8.6 Benefits of Implementing ERP Software for an Organization

Organizations become more competitive

It's a fact that ERP software requires a major investment, but there's also an even bigger cost in not making the investment. While some manufacturers choose to stick to the tried and true traditional methods, others seek technological solutions. Manufacturers cannot afford to put off an ERP package implementation while their competition invests in ERP and starts achieving the many benefits we'll touch on below.

Efficiency improves

An ERP solution eliminates many repetitive processes and greatly reduces the need to manually enter information. This system will also streamline business processes and make it easier and more efficient for companies to collect data, no matter what department they're working in.

Better forecasting

Enterprise resource planning software gives to users, and especially managers, the tools they need to create more accurate forecasts in business activities. The information within ERP is as accurate as possible. Businesses can make realistic estimates and more effective forecasts.

Collaboration in the organizational functions

Nobody wants to run a business with each department functioning separate from the other. Collaboration between departments is a crucial task and often necessary part of the business processes. With the data entered into ERP systems being centralized and consistent, there is no reason why departments cannot work together. The ERP package also touches on almost every aspect of a business, thus naturally encouraging collaborative efforts.

Scalability improves

A structured ERP system allows the addition of new users and functions to grow the initially implemented solution over time. When your business is ready to grow or needs extra resources, enterprise resource planning software should be able to facilitate that growth.

Integrated information

No more issues with data spread across separate servers; all information will be housed at a single location. We can integrate platforms like CRM software with the ERP system, keeping data consistent, accurate, and unique. ERP facilitates know your customer, their orders, and your inventory, all in one place.

Cost Savings

With one source of accurate, real-time information, ERP software reduces operational costs. It allows manufacturers to proactively manage its operations, preventing disruptions, delays and breaking up of information.

7.8.7 Types of ERP Architecture

Currently ERP systems are divided into two categories: **monolithic** and **postmodern**. Each type has its own characteristics and different levels of flexibility.

Monolithic systems

These systems have all the needed business management tools in one suite or application. They are developed with a single tech stack and by a single vendor. This way, users always know whom to contact if there's any performance issue. So despite their implementation cost, traditional systems were able to find their customers, gaining a significant market share.

But nowadays business owners have no interest in monolithic ERP systems that seem complex and are not flexible to business changes. In addition, small companies cannot afford to replace the whole ERP suite with each new process update as the system requires.

Postmodern suites

Postmodern suites are more simple and user-friendly, compared to their predecessors. They are agile and do not contain lots of redundant tables and other complex solutions that were required for scalability in monolithic systems. And unlike traditional systems, postmodern ERPs are based on a few applications, not a single suite.

They do have core ERP modules, but they can be easily extended with external solutions. For example, basic modules would cover financial and order management, while additional solutions can help with HR or service quality management. Postmodern suites are moving with the times so they are driven by social media, mobile trends and cloud-based solutions.

7.8.8 ERP Software Examples

SAP ERP

SAP SE is the largest European software enterprise based in Germany, and its most popular product is SAP ERP software. The system collects and combines data from various modules and ensures accurate enterprise resource planning. Its main modules include financial and asset accounting, QA management, HR management, product planning and many other. It's also possible to customize the ERP suite according to the business needs of a company.

Infor LN

Infor is an enterprise software company with headquarters in New York, the USA. Their InforLN ERP solution is designed to automate business processes in companies working with high-tech manufacturing as well as with complex logistics systems.

Main modules include financials, HR management, purchasing management, inventory and manufacturing management, QA management, product technology, etc. **Customization** is also allowed.

Oracle ERP Cloud

Oracle Corporation (USA) is famous for its CRM solutions and flagship Oracle database. But their ERP systems also play an important role in the company's success. Oracle Enterprise Resource Planning Cloud is used for finance, project management, risk management, procurement, and other everyday business activities. The system has cloud ERP architecture and can be easily **customized**.

7.9 System Development Life Cycle (SDLC)

The **systems development life cycle**, also referred to as the **application development life-cycle**, is a term used in systems engineering, information systems and software engineering to describe a process for planning, creating, testing, and deploying an information system. The systems development lifecycle concept applies to a range of hardware and software configurations, as a system can be composed of hardware only, software only, or a combination of both.

7.9.1 The Seven Phases of the System-Development Life Cycle

1. **Planning**

This is the first phase in the systems development process. It identifies whether or not there is a need for a new system to achieve a business's strategic objectives. The purpose of this step is to find out the scope of the problem and determine solutions. Resources, costs, time, benefits and other items should be considered at this stage.

2. **Systems analysis and requirements**

The second phase is where businesses will work on the source of their problem or the need for a change. In the event of a problem, possible solutions are submitted and analyzed to identify the best fit for the ultimate goal(s) of the project. This is where teams consider the functional requirements of the project or solution. It is also where system analysis takes place. Systems analysis is vital in determining what a business's needs are, as well as how they can be met, who will be responsible for individual pieces of the project, and what sort of timeline should be expected.

3. **Systems design**

The third phase describes, in detail, the necessary specifications, features and operations that will satisfy the functional requirements of the proposed system which will be in place. This is the step for end users to discuss and determine their specific business information needs for the proposed system. It's during this phase that they will consider the essential components (hardware and/or software) structure (networking capabilities), processing and procedures for the system to accomplish its objectives.

4. **Development**

The fourth phase is when the real work begins when a programmer, network engineer and/or database developer are brought on to do the major work on the project. This work includes using a flow chart to ensure that the process of the system is properly organized. The development phase marks the end of the initial section of the process. Additionally, this phase signifies the start of production. The development stage is also characterized by instillation and change.

5. **Integration and testing**

The fifth phase involves systems integration and system testing carried out by a Quality Assurance (QA) professional to determine if the proposed design meets the initial set of business goals. Testing may be repeated, specifically to check for errors, bugs and interoperability. This testing will be performed until the end user finds it acceptable. Another part of this phase is verification and validation, both of which will help ensure the program's successful completion.

6. Implementation

The sixth phase is when the majority of the code for the program is written. Additionally, this phase involves the actual installation of the newly-developed system. This step puts the project into production by moving the data and components from the old system and placing them in the new system via a direct cutover. Both system analysts and end-users should now see the realization of the project that has implemented changes.

7. Operations and maintenance

The seventh and final phase involves maintenance and regular required updates. This step is when end users can fine-tune the system, if they wish, to boost performance, add new capabilities or meet additional user requirements.

7.9.2 SDLC Models

Waterfall SDLC Model

Waterfall – is a cascade SDLC model, in which development process looks like the flow, moving step by step through the phases of analysis, projecting, realization, testing, implementation, and support. This SDLC model includes gradual execution of every stage completely. This process is strictly documented and predefined with features expected to every phase of this software development life cycle model.

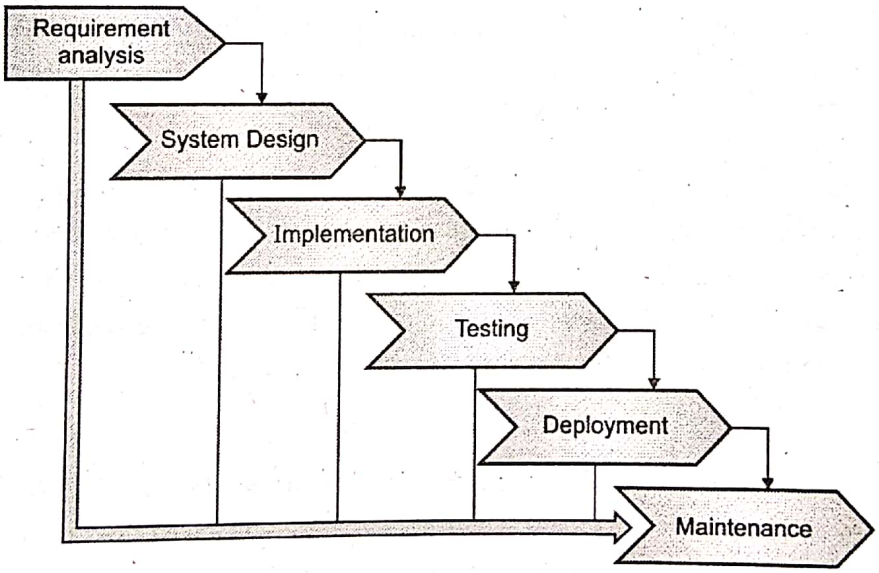

Fig. 7.9.1. : Waterfall SDLC model

Advantages

- Simple to use and understand
- Management simplicity thanks to its rigidity: every phase has a defined result and process review
- Development stages go one by one

Disadvantages

- The software is ready only after the last stage is over
- High risks and uncertainty
- Not the best choice for complex and object-oriented projects

Iterative SDLC Model

The Iterative SDLC model does not need the full list of requirements before the project starts. The development process may start with the requirements to the functional part, which can be expanded later. The process is repetitive, allowing to make new versions of the product for every cycle. Every iteration (which last from two to six weeks) includes the development of a separate component of the system, and after that, this component is added to the functional developed earlier. Speaking with math terminology, the iterative model is a realization of the sequential approximation method; that means a gradual closeness to the planned final product shape.

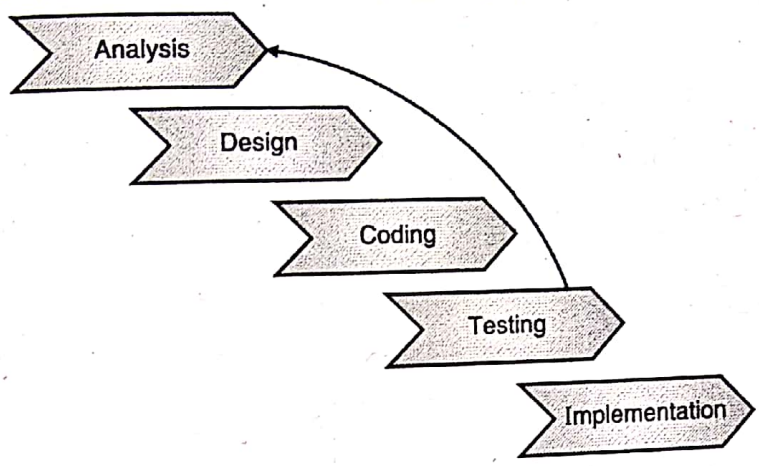

Fig. 7.9.2. : Iterative SDLC model

Advantages

- Some functions can be quickly developed at the beginning of the development lifecycle
- The paralleled development can be applied
- The progress is easily measurable

Disadvantages

- Iterative model requires more resources than the waterfall model
- Constant management is required
- Issues with architecture or design may occur because not all the requirements are foreseen during the short planning stage

Spiral SDLC Model

Spiral model – is SDLC model, which combines architecture and prototyping by stages. It is a combination of the iterative and waterfall SDLC models with the significant accent on the risk analysis. The main issue of the spiral model – is defining the right moment to make a step into the next stage. The preliminary set time frames are recommended as the solution to this issue. The shift to the next stage is done according to the plan, even if the work on the previous stage isn't done yet. The plan is introduced basing on the statistic data, received during the previous projects even from the personal developer's experience.

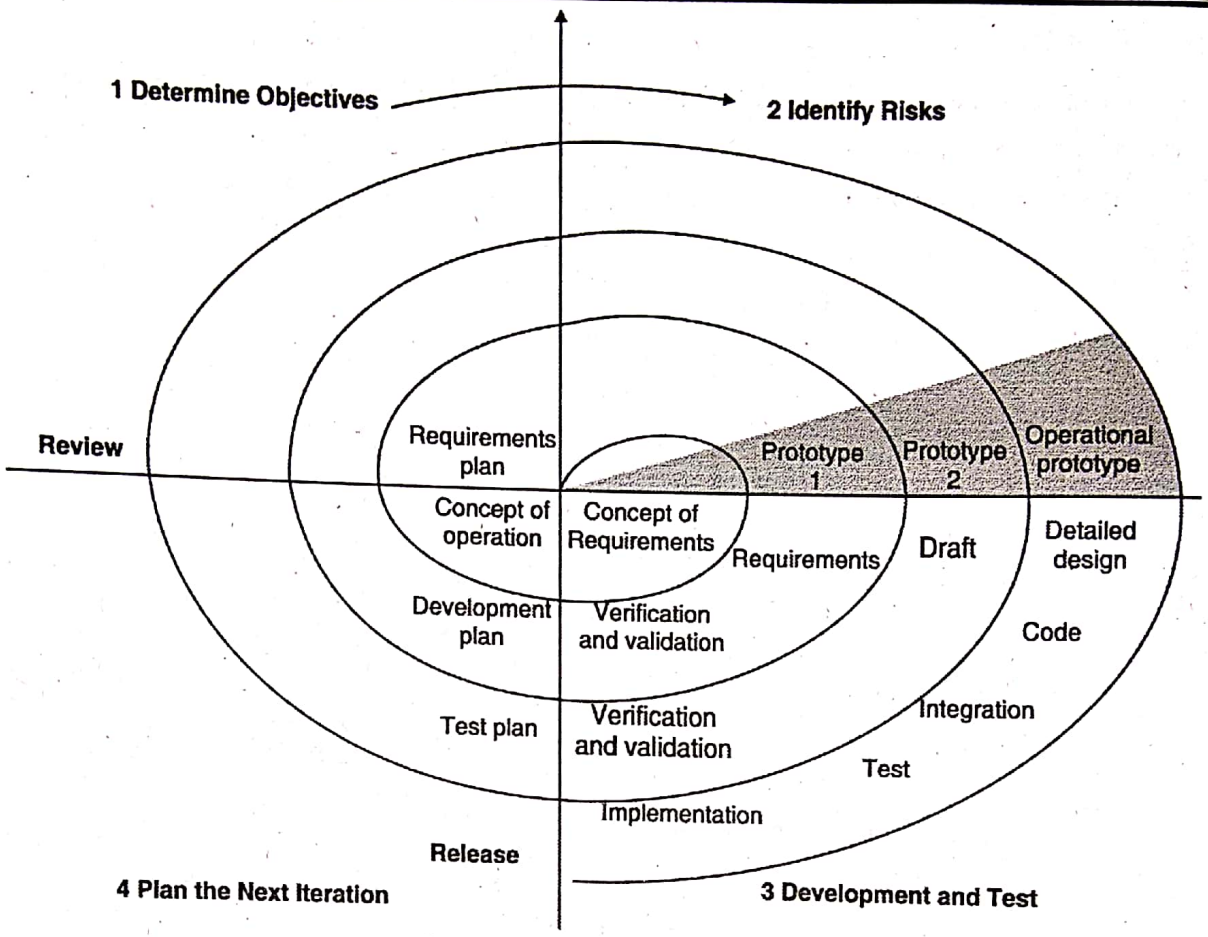

Fig. 7.9.3. : Spiral SDLC model

Advantages

- Lifecycle is divided into small parts, and if the risk concentration is higher, the phase can be finished earlier to address the treats.
- The development process is precisely documented yet scalable to the changes.
- The scalability allows to make changes and add new functionality even at the relatively late stages.

Disadvantages

- Can be quite expensive
- The risk control demands involvement of highly-skilled professionals.
- Can be ineffective for small projects

V-shaped SDLC Model

V-shaped SDLC model is an expansion of classic waterfall model and it's based on associated test stage for every development stage. This is a very strict model and the next stage is started only after the previous phase. This is also called "validation and verification" model. Every stage has the current process control, to make sure that the conversion to the next stage is possible.

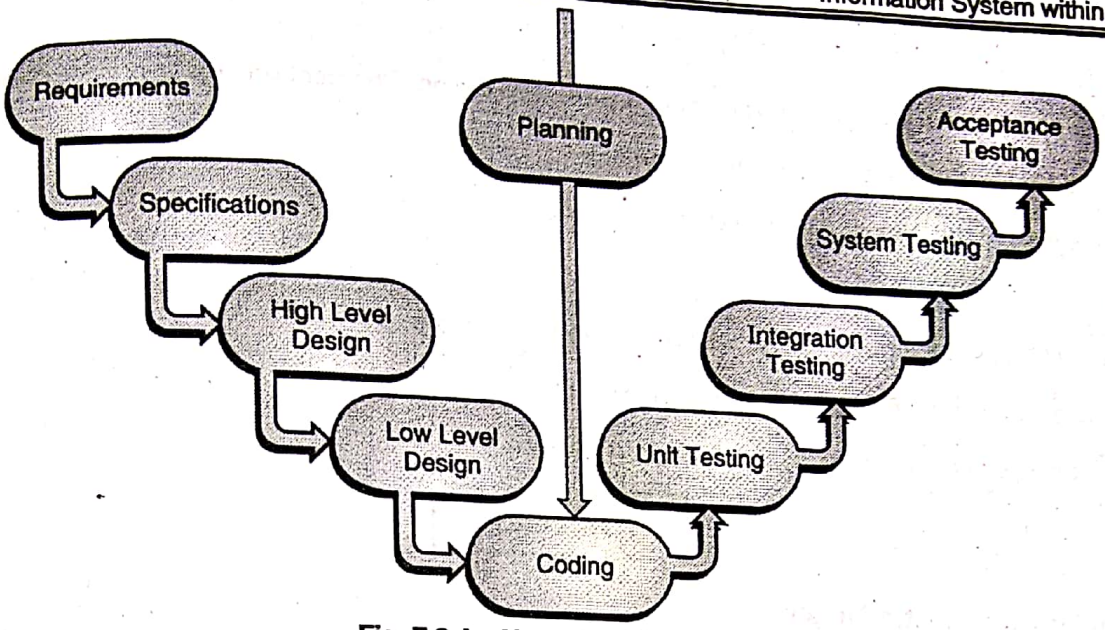

Fig. 7.9.4. : V-shaped SDLC model

Advantages

- Every stage of V-shaped model has strict results so it's easy to control
- Testing and verification take place in the early stages
- Good for the small projects, where requirements are static and clear

Disadvantages

- Lack of the flexibility
- Bad choice for the small projects
- Relatively big risks

Agile SDLC Model

In the agile methodology after every development iteration, the customer is able to see the result and understand if he is satisfied with it or he is not. This is one of the advantages of the agile software development life cycle model. One of its disadvantages is that with the absence of defined requirements it is difficult to estimate the resources and development cost. Extreme programming is one of the practical use of the agile model. The basis of such model consists of short weekly meetings – Sprints which are the part of the Scrum approach.

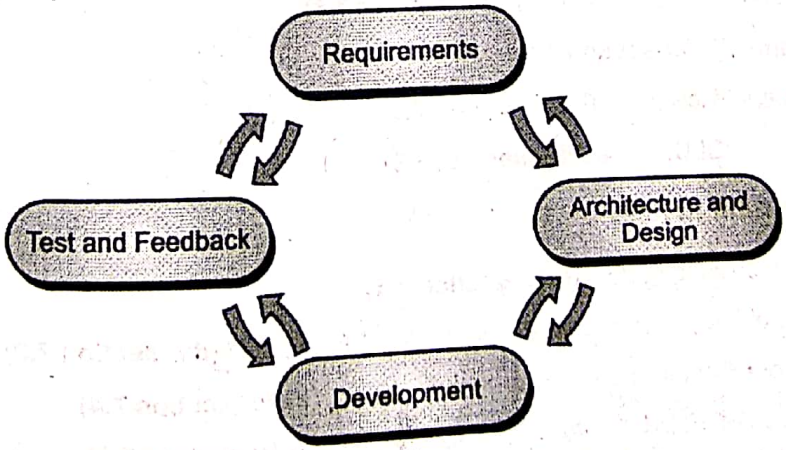

Fig. 7.9.5. : Agile SDLC model

Advantages

- Corrections of functional requirements are implemented into the development process to provide competitiveness
- Project is divided by short and transparent iterations
- Risks are minimized thanks to the flexible change process

Disadvantages

- Difficulties with measuring the final cost because of permanent changes
- The team should be highly professional and client-oriented.
- New requirements may conflict with the existing architecture.

Exercises

Answer the following question in short

Q. What is a transaction? Give an example. **(Refer section 7.1)**
Q. Define a transaction processing system. **(Refer section 7.1)**
Q. What is ACID? Explain. **(Refer section 7.1)**
Q. What are the functions of Transaction Processing systems? **(Refer section 7.1)**
Q. What is marketing information system? **(Refer section 7.3)**
Q. What is the use of information system in manufacturing? **(Refer section 7.4)**
Q. Define HR information system. **(Refer section 7.5)**
Q. How does HRIS help in office automation? **(Refer section 7.5)**
Q. Explain the role played by HRIS in training. **(Refer section 7.5)**
Q. What is the role of financial management system? **(Refer section 7.7)**
Q. What are the building blocks of financial management system? **(Refer section 7.17)**
Q. Describe the role of financial management system in bringing competitive advantage. **(Refer section 7.7)**
Q. What is ERP? **(Refer section 7.8)**
Q. What are the needs of HRP in an organization? **(Refer section 7.8)**
Q. State the features of ERP. **(Refer section 7.8)**
Q. State any four advantages of ERP. **(Refer section 7.8)**
Q. How does ERP save cost of an organization? **(Refer section 7.8)**
Q. What is monolithic system? **(Refer section 7.8)**
Q. Define system development lifecycle. **(Refer section 7.9)**
Q. Describe waterfall model of SDLC. **(Refer section 7.9)**

Answer the following question in long

Q. Explain the transaction processing cycle. **(Refer section 7.1)**
Q. What are the advantages of information system in marketing? Explain. **(Refer section 7.3)**
Q. Discuss the applications of information system in manufacturing. **(Refer section 7.4)**
Q. What are the advantages of HRIS in HR management? Explain. **(Refer section 7.5)**

Q. Discuss the role of information system in accounting. **(Refer section 7.6)**

Q. Explain the advantages of financial management information system. **(Refer section 7.7)**

Q. What are the benefits of implementing ERP in an organization? **(Refer section 7.8)**

Q. Describe the phases of system development lifecycle. **(Refer section 7.9)**

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