to make full or complete again by supplying what has been used up
UNIT – IV ERP MODULES /FUNCTIONALITY

- Sales-order-processing,
- MRP,
- Scheduling,
- Forecasting,
- Maintenance,
- Distribution,
- Finance,
- Features of each of the modules and description of data flows across module,
- Overview of the supporting databases,
- Technologies required for ERP.

1. SALES-ORDER-PROCESSING

An ERP system can improve the sales order process in several ways. Since ERP stem use a common database, they can minimize data entry errors and provide accurate information in real time to all users. An ERP system can also track all transactions involved in sales order.

SAP R/3 manages sales order process. In R/3 important transaction and events are assigned a number for record-keeping purposes. The electronic evidence of a transaction in R/3 is called a "document". SAP R/3 sales and distribution software treats the sales order process as a cycle of six events. The events range from free-sales activities to payment of the invoice. Figure 4.1 summarizes the steps in the sales order process.
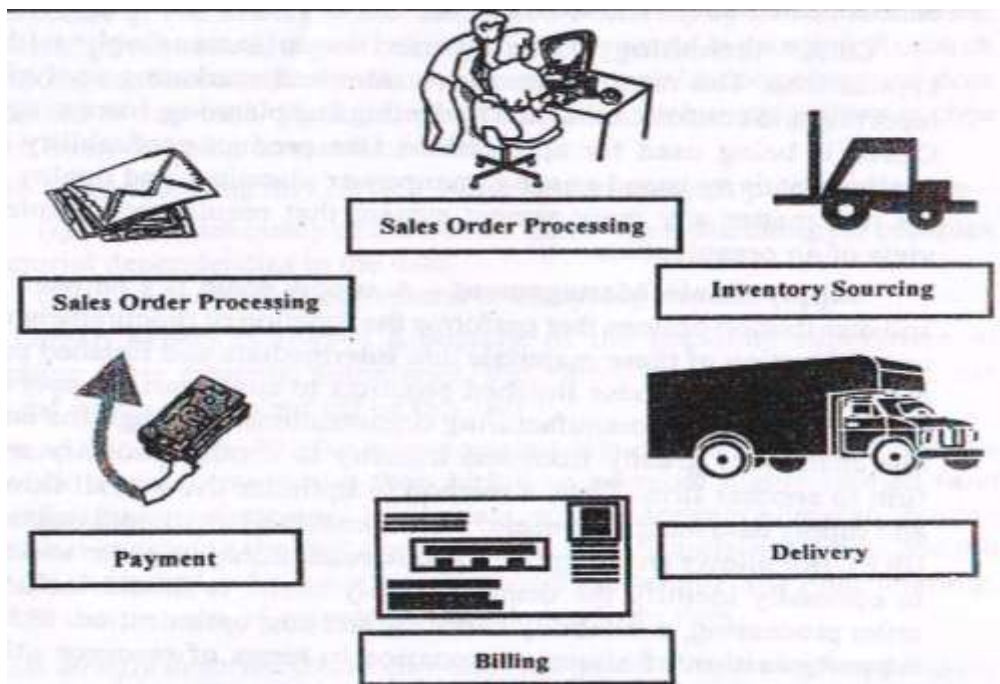

Figure 4.1 The sales and Distribution Process

i. **Pre-sales Activities:** the first step is called Pre-sales activities. At this step, a customer can get pricing information about the company's products. This information can be provided in one of two ways-an inquiry or a price quotation. Both of the above ways provide pricing information to the potential customer. The difference between an inquiry and a quotation is that a written quotation is a binding document- the seller guarantees the buyer that, for some specified time, he can buy the product at the quoted price. Pre-sales activities also include marketing activities such as tracking customer contracts, including sales calls, visits and mailings. Data about customers can be maintained, so mailing lists can be generated based on customer characteristics, which enhances targeted marketing efforts.

ii. **Sales Order Processing:** sales order processing is the series of activities that must take place to record a sales order. Since the R/3 system is integrated, the sales order can start from a previous quotation or inquiry. Any information that was collected from the customer to support the quotation is immediately included in sales order. A critical step in sales order processing is the recording of items to be purchased determining the selling price, and recording the order quantities. A number of pricing ways are available in the R/3 system. For example, product-specific pricing, such as quantity discounts, can be configured, as well as discounts that depend on both the product and a particular customer. The work is required to configure a complex pricing scheme, but once the system is configured, it will automatically calculate the correct price for each customer, eliminating many problems. While the sales order processing is going on, R/3 system checks the customer's credit availability by checking the accounts receivable tables in the R/3 database, adding the value of the order to that balance, and then comparing the result to the customer's credit limit. If the customer has credit available, then the order is completed. If not, corrective action is taken, based on how the supplier has configured R/3 system.

iii. **Inventory Sourcing:** when recording an order, the SAP R/3 system will check the inventory records and the production planning records to see whether the requested material can be delivered on the date the customer desires. This estimate includes the expected shipping time, taking into account weekends and holidays. Fitter snacker's current systems do not have a good method for checking inventory availability. In the R/3 system, availability is automatically checked and the R/3 system can be configured to increase planned production in case of shortage.

iv. **Delivery:** in the R/3 system, the word delivery means releasing the documents that the warehouse will use of pick, pack and ship orders. The deliver process allows deliveries to be created so that the warehouse and the shipping activities are carried out efficiently. When the documents are created for picking, packing and shipping, the documents are transferred to the materials management module, where the warehouse activities of picking, packing and shipping are carried out.

v. **Billing:** the R/3 system uses the sales order data to create an invoice by copying the data into the invoice document. This document can be printed and mailed, faxed, or transmitted electronically to the customer. At this point, accounting records are also updated. To record the sale, Fitter snacker's accounts receivable is debited (increased) and sales is created. Thus, R/3 updates the accounting records automatically.

vi. **Payment:** when the customer sends a payment, it is again processed by the R/3 system. Cash is debited and the customer's account is credited. The timely recording of this transaction have a great effect on the timeliness and accuracy of any subsequent credit checks for the customer.

Fitter snacker has a problem with getting the credit check done correctly, and this is the subject of a credit management problem.

2. MRP (Material Requirements Planning)

In 1960, a new approach to materials management was devised, called MRP. Rather than wait until it is time to order, MRP looks into the future and identifies the materials that will be needed, their quantities, and the dates on which they will be needed.

2.1 Components:

i. **Production scheduling system** -- produces a master production schedule that encompasses the longest lead time plus the longest production time.
ii. **MRP system**: determines how much material will be needed to produce the desired number of units. The bill of material file is used to explode the bill of material for each item scheduled for production.
iii. **Capacity requirements planning**: this system works with MRP system to keep production within plant capacity. Produces outputs reports and planned order schedule.
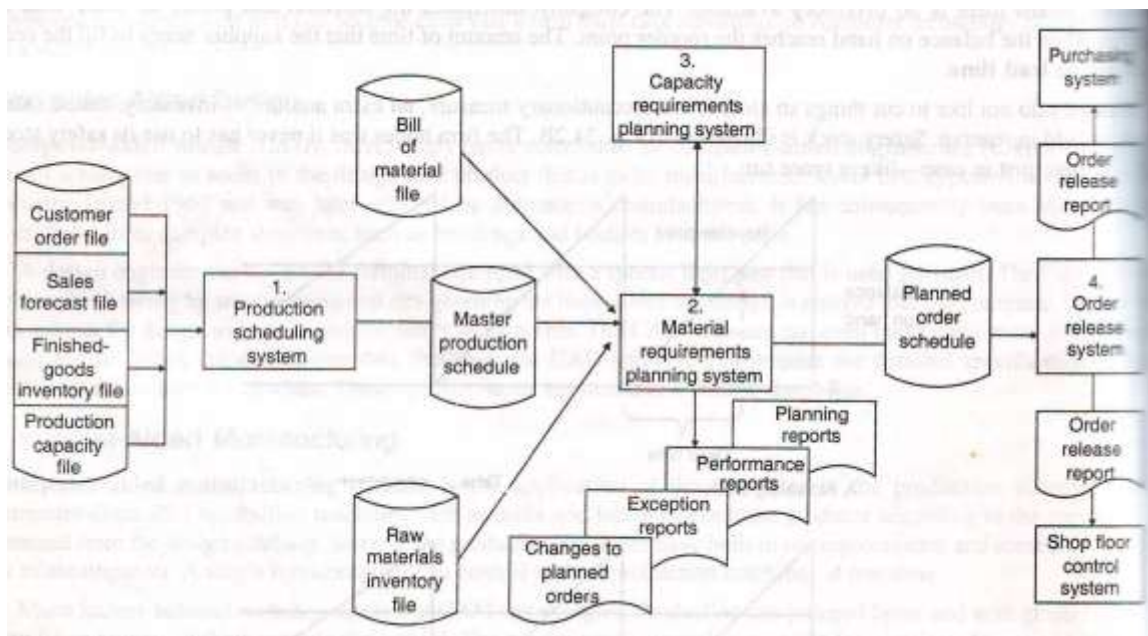iv. **Order release system**: produces reports for shop floor and purchasing.

Figure 4.2 An MRP System

2.3 Manufacturing Resource Planning (MRP-II)

The purpose is to integrate MRP with all systems that affect materials management. MRP II supports financial planning by converting materials schedules into capital requirements. Information in the MRP II system is used to provide accounting with information on material receipts to determine accounts payable. MRP II increases a company's efficiency by providing a central source of management information.

2.4 MRP-II Benefits

- More efficient use of resources
  - Reduced inventories

- o Less idle time
  - o Fewer bottlenecks
- Better priority planning
  - o Quicker production starts
  - o Schedule flexibility
- Improved customer service
  - o Meet delivery dates
  - o Improved quality
  - o Lower price possibility
- Improved employee moral
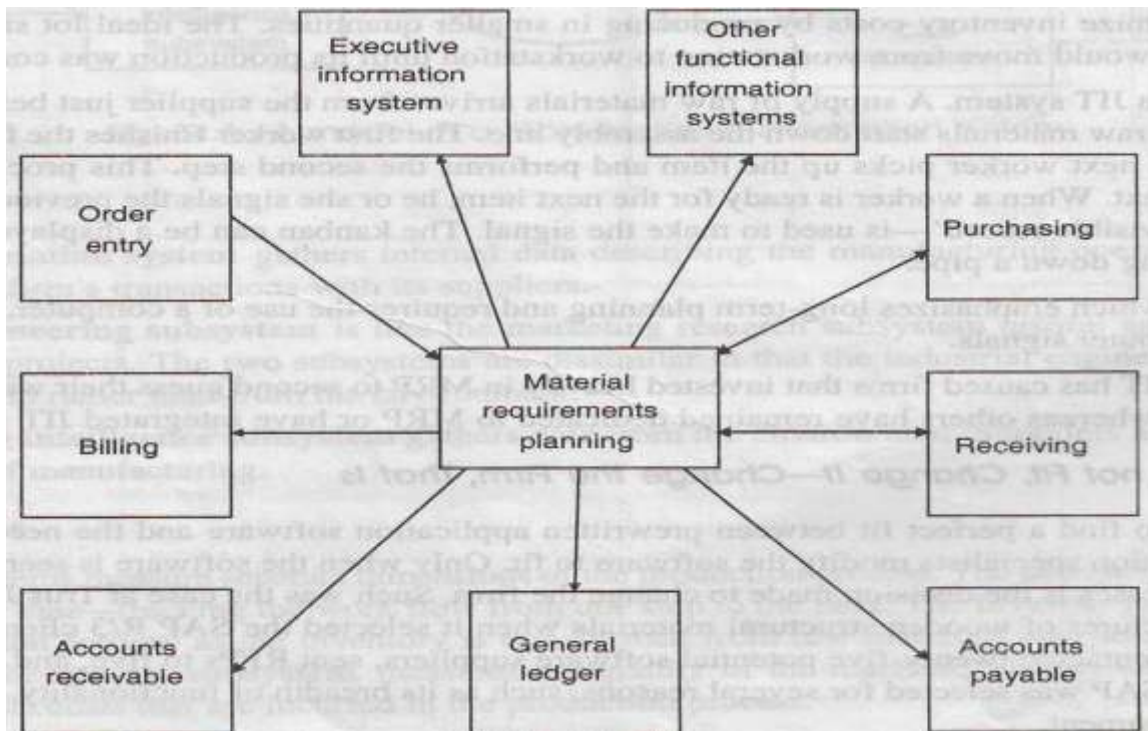- Better management information

Figure 4.3 An MRP II System

3. SCHEDULING

Scheduling is committing resources to the realization of an event at a defined time. Scheduling is committing resources to a plan. This module assists in simplifying the administration and evaluation of time data. Time management or scheduling is a powerful tool which helps in administer and evaluate data related to the time employees spend working. This component can simplify efforts irrespective of whether the organization uses centralized or decentralized data to determine employee working hours. Time management manages work schedules efficiently and effectively by automating schedule generation and allowing flexible definition of time models and schedules per location and organization level. With time management, can set flexible working hours and process work notices as times are recorded. Individual and group piecework calculation for employee's incentive wages is also available through the incentive wages feature. The time evaluation component allows daily processing of employee time data. It is a flexible tool designed to handle complicated evaluation rules to fulfill regulatory requirements and determine overtime and other time-related data. The time evaluation component stores organization's business rues and automatically validates hours worked and wage

types. The results of time evaluation can be depicted on a time sheet which provides a detailed overview of daily balances and time wage types. Most packages provide a review of feature which will provide all necessary information and tools to review and maintain employee time data.

4. FORECASTING

Forecasting is the process of estimation in unknown situations. It is one of the oldest mathematical activities in business. It was done years before the computer, using desk calculators. The computer enabled the forecasters to make the calculations much more quick and easy. In considering the contribution that forecasting can make to the firm, should keep three basic facts in mind:

I. **All forecast are projections of the past**: The best basis for predicting what will happen in the future is to look at the past. All types of forecasting follow this approach. This is the reason why accounting data is so important in forecasting; it provides the historical base.
II. **All forecasts consist of semi-structured decisions:** Forecasting decisions are a good example of the semi-structured type of decisions that are supported by the DSS. The decisions are based on some variables that can be easily measured and some that cannot.
III. **No forecasting is perfect:** Not even the most sophisticated main frame forecasting package can be expected to predict the future with 100 percent accuracy.

Since managers are aware of these facts, they apply much judgment in using the forecasts as a basis for future planning.

4.1 Short Term and Longer Term Forecasting

Short term forecasting is performed by the functional areas. The marketing function projects sales for the near future- say the next one to three years. All of the functional areas use the sales forecast as the basis for determining the resources that they will need to support the project level of activity. For example, the sales forecast is a basis for the MRP projections made by manufacturing.

Long term forecasting is usually done by an area other than marketing- by the financial function or by a special group that has planning as its only responsibility. Some larger corporations have a strategic planning group that reports to the executive level.

4.2 Forecasting Methods

Although it is natural to think of forecasting as involving only quantitative methods, an increasing amount of attention is being directed at non- quantitative methods.

Non- quantitative Methods: A non- quantitative forecasting method does not involve computations of data but is based on subjective estimates. The manager applies such reasoning as-"We sold two thousands units last year, and we should be able to improve on that. So I think we will sell twenty-five hundred next year."

Forecast such as these may make it seem as if the manager is flying by the seat of the pants, but they can result from an insight into the business that comes from years of experience. Many managers are very good at the non- quantitative approach.

Some firms have established a formal system that encompasses non- quantitative methods. Three such formal systems are:

a. **Panel Consensus:** This technique consists of a group of experts who openly discuss the factors bearing on the future and arrive at a single projection based on the combined inputs. The experts can meet on a regularly scheduled basis, follow a prescribed agenda, and have the discussion recorded in a written form. Such sessions rely on face-to –face dialogue in a conference room setting.

b. **Delphi method:** It involves a group of experts who do not meet in person but instead submit responses to a series of questionnaires that are prepared by a coordinator. Each round of questionnaires incorporates inputs from previous rounds, thus gradually refining the content.

c. **Electronic meeting system:** An electronic meeting system (EMS) is a type of computer software that facilitates group decision-making within an organization. To work with such a system, networked computers, a projection screen, and EMS software are required. The term was coined by Jay Nunamaker et al. in 1991. The term is synonymous with Group Support Systems (GSS) and essentially synonymous with Group Decision Support Systems (GDSS). An electronic meeting system is a suite of configurable collaborative software tools that can be used to create predictable, repeatable patterns of collaboration among people working toward a goal. With an electronic meeting system, each user typically has own computer, and each user can contribute to the same shared object at the same time. Thus, nobody needs to wait for a turn to speak; so people don't forget what they want to say while they are waiting for the floor. When a group or a group leader deems it appropriate, people can contribute anonymously to most electronic meeting systems tool, so the group can focus on the content and meaning of ideas, rather than on their sources. Anonymous contributions are particularly useful when a team is generating or evaluating ideas. It is less useful when a team is establishing the agreed meaning of ideas, or building consensus.

Quantitative Methods: Many forecasting techniques have been developed over the years. One that has retained a large following is regression analysis to be forecast, called the dependent variable. And another activity called the independent variable. The activity to be forecast depends on the other activity.
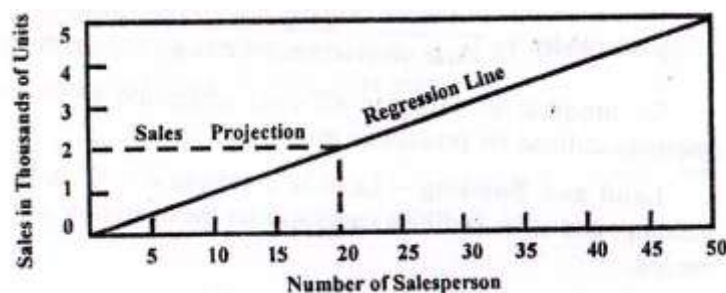
Figure 4.4 Using the number of salespersons to project sales

Figure 1.5 illustrates the relationship between the dependent and the independent variables. In this example, the firm's sales are the dependent variable and the number of salespersons is the independent variable. The sales depend on the number of sales representatives.

When there is only a single independent variable, the technique is called simple regression, or bivariate regression. When there is more than one independent variable, the terms are multiple regression or multivariate regression.

A line has been plotted through the data points in the figure so that the total distance from each of the points to the line is at a minimum. This line is called the regression line, and it is the best fit to the points. Management can use the regression line to forecast sales based on a particular number of sales persons. For example, if the firm employs twenty salespersons, management can assume the sales will approximate two thousand units.

Prewritten programs called statistics packages or simply stat packages are used to perform regression analysis and other statistical routines on the computer. Some of the more popular stat packages are Minitab, IDA, SAS, and SPSS. Some are available for microcomputers and are good examples of organizational productivity software.

5. MAINTENANCE

The plant maintenance module provides an integrated solution for supporting the operational needs of an enterprise –wide system. Plant maintenance module includes an entire family of products covering all aspects of plant/equipment maintenance and becomes integral to the achievement of process improvement. Plant maintenance supports various options for structuring technical systems with its object, type and function-related views, and enables flexible navigation. Data concerning the planning, processing and history of maintenance tasks is documented in the system and complies with business verification requirements. All maintenance tasks, such as inspection, servicing and repair activities, are saved in a historical database. In addition to standard indicators, diverse analysis options are also available in many systems for evaluating this data.

Plant maintenance provides you with technical and business reports and various presentation options, according to the criteria used: for example, organizational unit, location, execution period for the tasks, or system manufacturer. This information helps you to reduce the duration and costs of plant downtimes as a result of damage, and to recognize possible weak points within your technical system in good time. It also forms the basis for defining an optimum maintenance strategy in the sense of "Total Productive Maintenance" (TPM) or risk optimized maintenance.

The major subsystems of a plant maintenance module are:

i. **Preventive Maintenance Control:** Preventive Maintenance Control provides planning, scheduling and control of facilities and equipment. Equipment lubrication, component replacement and safety inspection can be planned scheduled, and monitored. Maintenance tasks can be tracked for each machine, or piece of equipment, by two user-defined modes, as well as calendar day frequency. These modes could include tracking by hours of operation, units of production produced, gallons of fuel consumed, or the number of days in operation since the last service interval. Preventive Maintenance Control enables organizations to lower repair costs by avoiding downtime, machine breakage and process variability. Companies achieve higher machine utilization and improved machine reliability and tolerance control, along with higher production yields.

ii. **Equipment Tracking:** Equipment is an asset that needs to be monitored and protected. In many situations, equipment maintenance costs constitute the single largest controllable expenditure of an organization. All facets of plant location history and utilization history are described and tracked. This history includes acquisition and disposition information and associations between different pieces of equipment to pinpoint operational dependencies. Running totals for operation units to date are also provided. Each piece of equipment is defined by a model and serial number. User-defined data sheets can be developed which allow for the grouping of user data

into formats that can be linked to equipment records. All of this information can be used to create equipment specifications, which provide detailed information for technical specialists working in equipment operations, maintenance and transportation control.

iii. **Component Tracking:** Components are, typically subsets of larger equipment and deserves the same amount of cost controlling scrutiny. Component tracking enables equipment managers to identify components with chronic repair problems. They can determine whether a repair or replacement should be covered by warranty. Planning component replacements, rather than waiting for component failures to occur, reduces unscheduled equipment downtime. Component tracking includes repair/exchange history and component service life.

iv. **Plant Maintenance Calibration Tracking:** Plant Maintenance Calibration Tracking allows organizations to leverage their investment in the Plant Maintenance module by providing for the tracking of equipment calibration in support of ISO9000 Requirements.

v. **Plant Maintenance Warranty Claims Tracking:** Plant Maintenance Warranty Claims Tracking is an administrative system designed to provide control of all items covered by manufacturer and vendor warranties. It enables plant management to recover all of the warranty; reimbursements to which they are entitled but have not been able to recover in the past. Features include the ability to establish the type and length of warranty, for example, elapsed day, months, mileage stipulation, or operating units. A complete history is performed for each item covered by the warranty, and complete information regarding the warranty service provider is generated.

6. DISTRIBUTION

A distribution firm is the firm that distributes products or services to their customers. We call the system the distribution system.

6.1 System overview

DFD's are used to document the system. DFD's, document a system in a hierarchical manner shown in figure 4.5. The diagram is called a context diagram because it processes the system in the context of its environment.

The environmental elements of the distribution system include
- Customers
- Suppliers
- Materials stockroom
- Management

The data flows that connect the firm with its customers are quite similar to the flows that connect the firm with its suppliers. The data flow from the distribution system to management consists of the standard accounting reports.
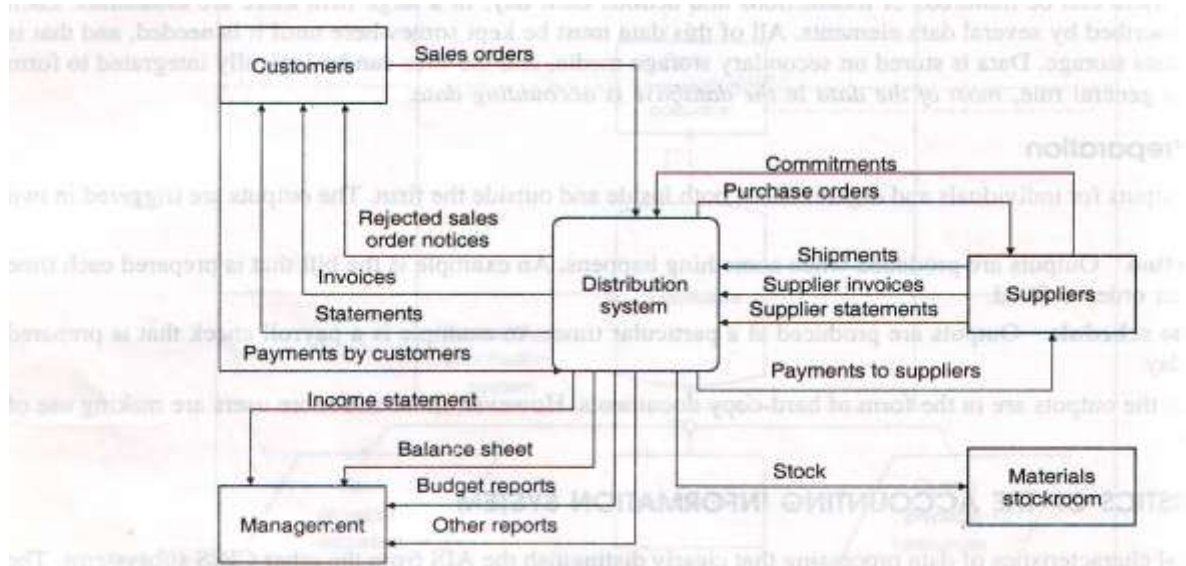
Figure 4.5 A context diagram of the distribution system

6.2 Major subsystem of the distribution system

The context diagram is fine for defining the boundary of the system-the environmental elements and the interfaces.

Distribution system consists of three subsystems. The subsystems are identified by the numbered upright rectangles.

- The first subsystem is concerned with filling customer orders
- The second with ordering replenishment stock from suppliers
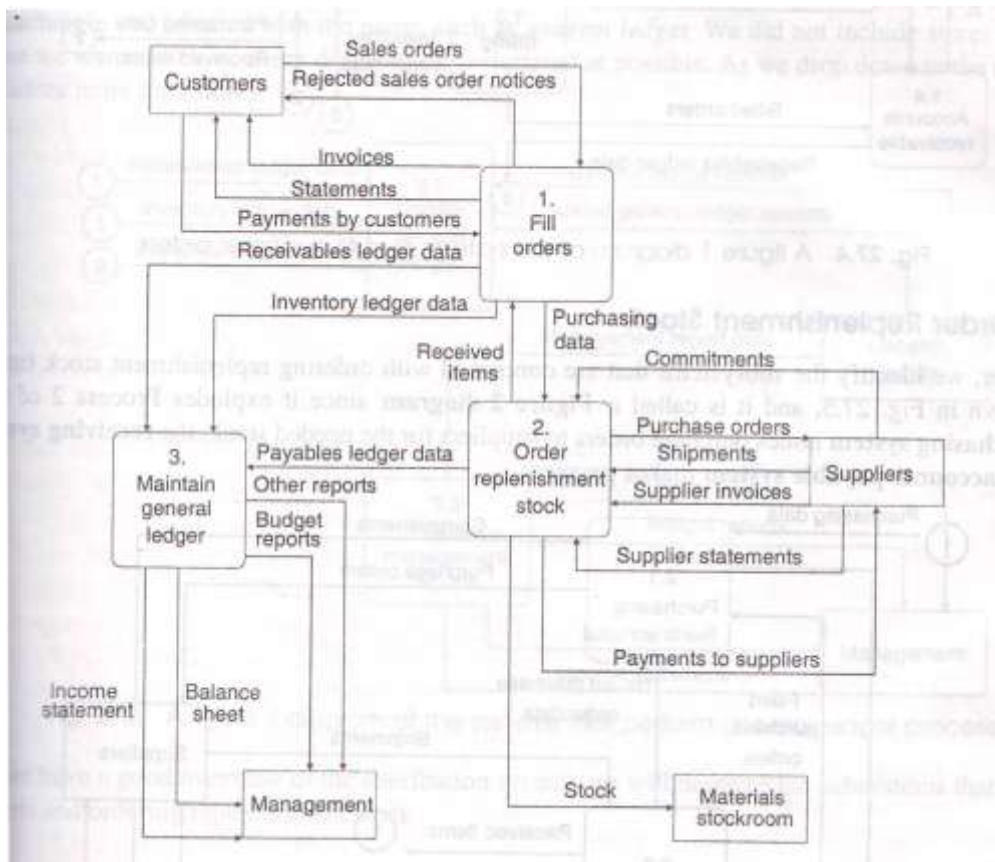- Third with maintaining the firm's general ledger.

Figure 4.6 A figure 0 diagram of the distribution system

7. FINANCE

The financial modules provide financial functionality and analysis support to thousands of businesses. The finance modules will have the following subsystem:

I. **Financial accounting**: the objective of a good financial accounting system is to provide company-wide control and integration of financial information that is essential to strategic decision making.

- **General ledger**: the General Ledger (GL) is essential both to the financial accounting system and to strategic decision making. The General Ledger supports all the functions needed in a financial accounting system. This includes flexible structuring of the chart of accounts at the group and the company level, distributed application scenarios, real-time simultaneous update of sub-ledgers and the general ledger, elimination of time-consuming reconciliation, and parallel views of data, in both the general ledger and the managerial accounting applications.

- **Accounts Receivable and Payable:** Accounts Receivable and payable transactions are performed automatically, when related processes take place in other modules. This module uses standard business rules for procedures ranging from data entry and reporting, to processing payments and bank transactions. Accounts Receivable and payable functions include Internet integration, document management, and full support for EDI processing, including automatic integration with cash management and flexible reporting using customer and vendor information systems.

- **Asset Accounting:** asset accounting manages the company's fixed assets. Within the Financial Accounting system, Asset Accounting serves as a sub-ledger to the General Ledger, providing detailed information on asset-related transactions. Asset Accounting also provides integration with Plant Maintenance for management of machinery and equipment, management of leased assets and assets under construction, mass processing with workflow integration, and interactive reporting.

- **Legal Consolidation:** consolidated financial statements need to be integrated effectively with operational data at the individual company level. By using different valuation methods, we can plan balance sheet strategies to suit the company's requirements. The Legal Consolidation sub-system is closely linked to the Financial Accounting system, permitting direct data transfer, from individual statements into the consolidated report.

II. **Investment management**: Investment management is the professional management of various securities (shares, bonds etc) assets (e.g. real estate), to meet specified investment goals for the benefit of the investors. Investors may be institutions (insurance companies, pension funds, corporations etc.) or private investors (both directly via investment contracts and more commonly via collective investment schemes e.g. mutual funds). The term asset management is often used to refer to the investment management of collective investments, whilst the more generic fund management may refer to all forms of institutional investment as well as investment management for private investors. Investment managers who specialize in advisory or discretionary management on behalf of (normally wealthy) private investors may often refer to their services as wealth management or portfolio management often within the context of so-called "private banking".

The provision of investment management services includes elements of financial analysis, asset selection, stock selection, plan implementation and ongoing monitoring of investments. Investment management is a large and important global industry in its own right responsible for caretaking of trillions of dollars, euro, pounds and yen. Coming under the remit of financial services many of the world's largest companies are at least in part investment managers and employ millions of staff and create billions in revenue. It provides extensive support for investment processes right from planning through settlement. Investment management facilitates investment planning and budgeting at a level higher than that needed for specific orders or projects. Investment management provides tools, enabling you to plan and manage your capital spending projects right from the earliest stage.

III. **Controlling:** the controlling system gathers the functions required for effective internal cost accounting. It offers a versatile information system, with standard reports and analysis paths for the most common questions. In addition, there are features for creating custom reports to supplement standard reports.

- **Overhead Cost Controlling:** many organizations experience a significant increase in the percentage of indirect costs, which cannot be directly assigned to either the products manufactured, or to the services rendered. While cost monitoring and optimization may be quite advanced in production areas, transparency is often lacking in overhead cost areas. The overhead cost controlling subsystem focuses on the monitoring and allocation of overheads.

- **Cost Center Accounting:** cost center accounting analyses where overheads occur within the organization. Costs are assigned to the sub-areas of the organization where they originated. The system offers a wide variety of methods for allocating posted amounts and quantities.

- **Overhead Orders:** overhead Orders sub-system collects and analyses costs, based on individual internal measures. This system can monitor and automatically check budgets assigned to each measure.

- **Activity-Based Costing:** the goals of the entire organization should come before the goals of individual departments, when it comes to business process reengineering. The Activity-Based Costing module is a response to the growing need for monitoring and controlling cross-departmental business processes, in addition to functions and products.

- **Product Cost Controlling:** Product cost controlling module determines, the costs arising from manufacturing a product, or providing a service. Plan and standard values, serve in valuating warehouse stock and for contrasting revenues received with costs. In addition, the values in Product Cost Controlling are crucial for determining the lowest price limit for which a product is profitable.

- **Cost Object Controlling:** Cost Object Controlling helps you monitor manufacturing orders. Integration with the logistics components results in a logistical quantity flow that provides instant information on actual cost object costs, allowing ongoing costing calculations at any time. Follow-up calculations determine and analyze the variances between actual manufacturing costs, and the plan costs resulting from product cost planning.

- **Profitability Analysis:** Profitability analysis subsystem examines the source of returns. As part of sales controlling, profitability analysis is the last step in cost-based settlement, where revenues are assigned to costs according to the market segment. Information from Profitability analysis, frame important decisions in areas such as determining prices, selecting customers, developing conditions and choosing distribution channels.

IV. **Treasury:** A treasury is any place where the currency or items of high monetary value are kept. The head of a Treasury is typically known as a Treasurer. The treasury component provides you with a basis for effective liquidity, portfolio and risk management.

- **Cash Management:** the cash management subsystem, allows you to analyze financial transactions for a given period. Cash management also identified, and records future developments for the purposes of financial budgeting. The company's payment transactions are grouped into cash holdings, cash inflows and cash outflows. Cash management provides information on the sources and uses of funds to secure liquidity in order to meet payment obligations when they become due. Cash management also monitors and controls incoming and outgoing payment flows, and supplies the data required for managing short-term money market investments and borrowing.

- **Treasury Management:** the treasury management component offers functions for managing financial deals and positions, from trading to transferring data to Financial Accounting. Treasury management also supports flexible reporting and evaluation structures for analyzing financial deals, positions and portfolios. For short-term liquidity and risk management, we can use the money market, or foreign exchange transactions, to smooth out liquidity squeezes and gluts, or to eliminate currency risks. Securities and loans come into play in the medium and long-term.

- **Market Risk Management:** Market risk management playa a vital role within Treasury, in ensuring your company's competitiveness. The process involves a complex feedback loop encompassing data collection, risk management, analysis and simulation as well as active planning of financial instruments. This process dovetails-closely with other treasury and corporate functions. Market risk management acts as an integrated, central risk control station with monitoring and management functions.

- **Funds Management:** Funds management subsystem supports your funds management process from budgeting all the way through to payments, including monitoring expenditures, activities, resources and revenues. Budgets are entered for areas of responsibility that can cover as many management levels.

V. **Enterprise Controlling:** Enterprise controlling comprises of those functions that will optimize shareholder value, while meeting internal objectives for growth and investment. This module usually includes executive Information system, Business Planning and Budgeting, Consolidation, and Profit Centre Accounting.

- **Executive Information System:** the executive information system provides an overview of the critical information necessary to manage the organization. This component integrates data from other ERP components, and non-ERP data sources both inside and outside the enterprise. Drill-down reporting and report portfolio are available to evaluate and present the data. In drill-down reporting, you can analyze the data interactively. Exception can be defined in order to highlight areas of concern.

- **Business Planning and Budgeting:** Business planning and budgeting supports the management teams of business units and groups in the calculation of business targets, such as return on investment. This module also supports central investment planning, budget release and tracking. This module automatically transfers data about investment requirements from transaction applications, and provides extensive analysis functions for budget monitoring.

- **Profit Centre Accounting:** Profit centre accounting analyses the profitability of internal responsibility centre. A company's organizational structure is represented in the form of a profit centre hierarchy, with the profit centre as the smallest unit of responsibility.

8. FEATURES OF EACH OF THE MODULES AND DESCRIPTION OF DATA FLOWS ACROSS MODULE

Integrated information system allows all business area to access the same database, eliminating redundant data and communications lags for example, when a sales person enters a sales order into the database, those data are immediately available to production, so manufacturing the order can begin and

raw materials can be restocked. The data are also then available to accounting so an invoice can be prepared. Figure 4.8 explains how data flows within an integrated information system. The diagrams central diamond represents the company wide computing environment, including centralized database, the heart of the R/3 system.
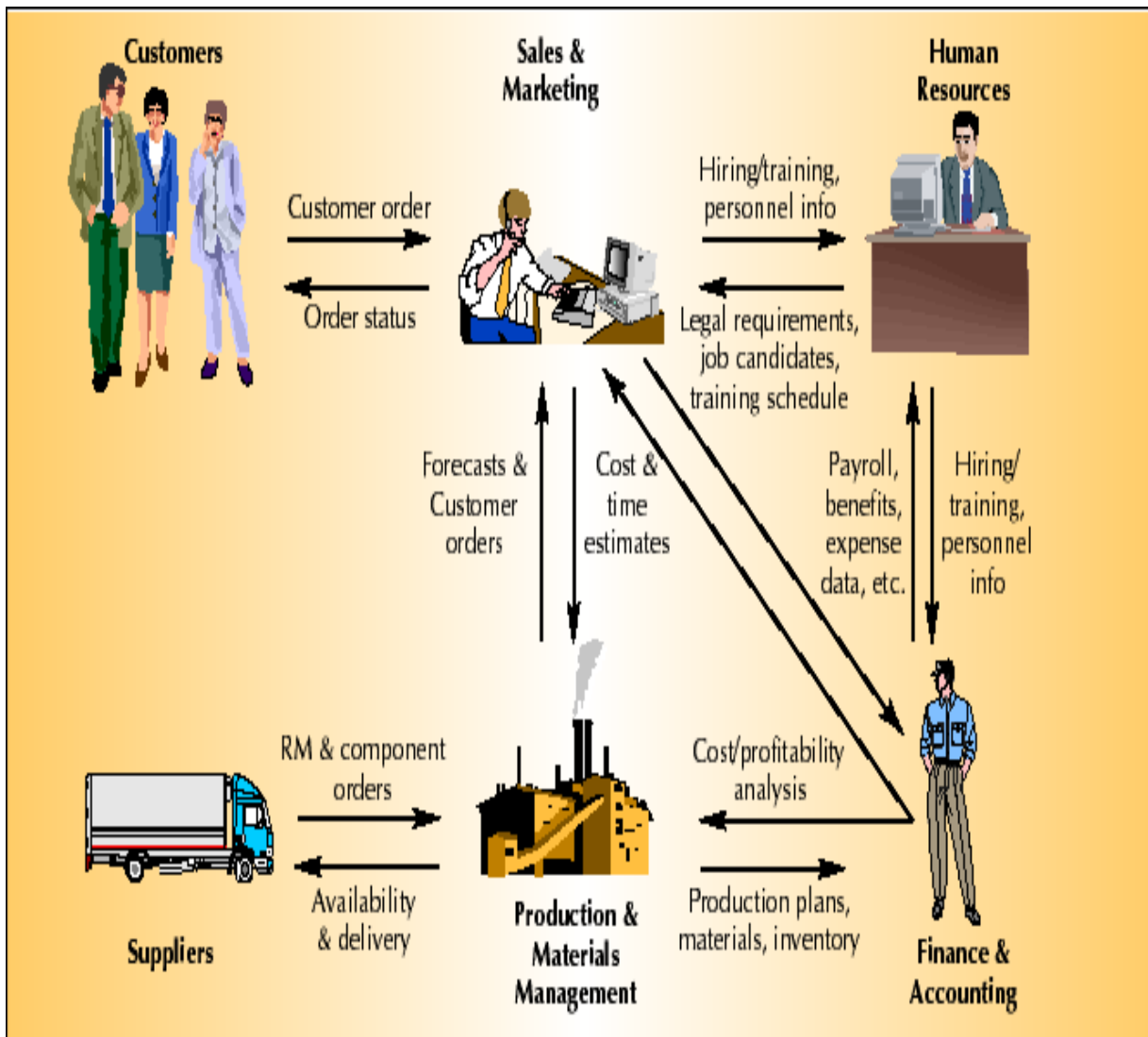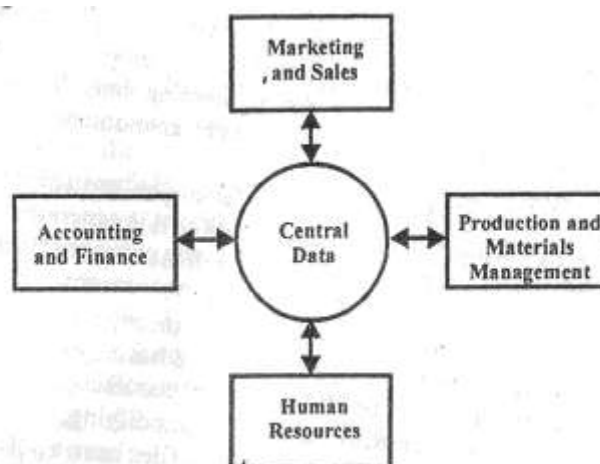

Figure 4.7 ERP Modules

Figure 4.8 Data flow within an integrated information system

The various modules can be described as:

Sales and Distribution (SD): this module record sales order and schedules deliveries. Information about the customer is maintained and accessed from this module.

Materials Management (MM): module manages the acquisition of raw materials from suppliers and the subsequent handling of raw materials from storage to work-in-progress goods to finished goods inventory.

Production Planning (PP): module maintains production information. The production here is planned and scheduled, and actual production activities are recorded.

Quality Management (QM): module helps to plan and record quality control activities like product inspections and material certifications.

Plant Maintenance (PM): module allows planning for preventive maintenance of plant machinery and managing maintenance resources.

Human Resource (HR): module facilities employee recruiting, hiring and training. This module also includes payroll and benefits.

Financial Accounting (FA): module records transaction in the general ledger accounts. It also generates financial statements for external reporting purposes.

ERP integrates business functional areas. Before ERP, each functional area works independently, using its own information system and ways of recording transactions. ERP software also makes management reporting and decision making faster and more uniform throughout an organization. In addition, ERP promotes thinking about corporate goals, as opposed to thinking only about the goals of a single department or functional area.

9. OVERVIEW OF THE SUPPORTING DATABASES

The development of modern information system is a complex process. It needs knowledge, skills and technology in almost all the disciplines. The developer, the designers and the user must be knowledgeable in their respective area of functions and responsibilities. As information systems are being demanded for online real time usage in business management, its development requires thorough understanding of the business and the manner in which it is executed. Further, different technologies other than the Information Technology, are used in the business which are used for providing input to the information systems.

In any information system application, the method generally followed is to design modular and hierarchical steps of processing leading to an output in a report form or information having certain value specific or perceived as seen by the user. The steps involved are data processing, transaction processing, application processing and system processing.

Data processing is handling raw data in a systematic manner to confirm to the data quality standards as determined by the designer of the information system.

A transaction is processed with reference to business rules, i.e., a transaction are scrutinized for conformance to the rules, policy or guidelines before it is taken up for further processing. The rules may be directly related to the transaction or it may have some relation and association with other transactions.

Application processing is designed to process more than one type of transactions to bring out the specific business results in one or more business functions.

The system processing is at a higher level, over the application processing. The system processing addresses the management issues of the business. In the information system processing, the underlying design and architecture would vary giving due regard to the specifics and specialties of that business. The entire work of ascertaining the information needs to determination of the system design and architecture is called system engineering.

The DBMS is software designed to manage and maintain the database of an organization. The main steps are data structuring, defining, interrogating, updating and creating. Through these steps, it manipulates the data and provides an environment which is appropriate to use in retrieving and storing the database information. The DBMS is a collection of the interrelated files and a set of programs through which the users can access and modify these files.

The technology side of the ERP solution is managed through the database management technology fro data acquisition to database creation, update and maintenance. The application development is done through the client/server technology, where the servers handle the specific or the general functions as the case may be and the client play the role of processing interactively and locally for meeting the information needs. The client/server implementation could be two tiers or three tiers, based on the design and the implementation strategy.

Client-server architecture (CSA) is a distributed, cooperative, processing environment whereby by entire task of processing is divided in such manner that there is a demand on the system through a client and there is a server in the system to serve this demand. The architecture has two components, clients and server, where client makes a request and the server than processes the request and serves the client by offering the result. The clients and servers are connected to each other through a network component which handles communications between the two.
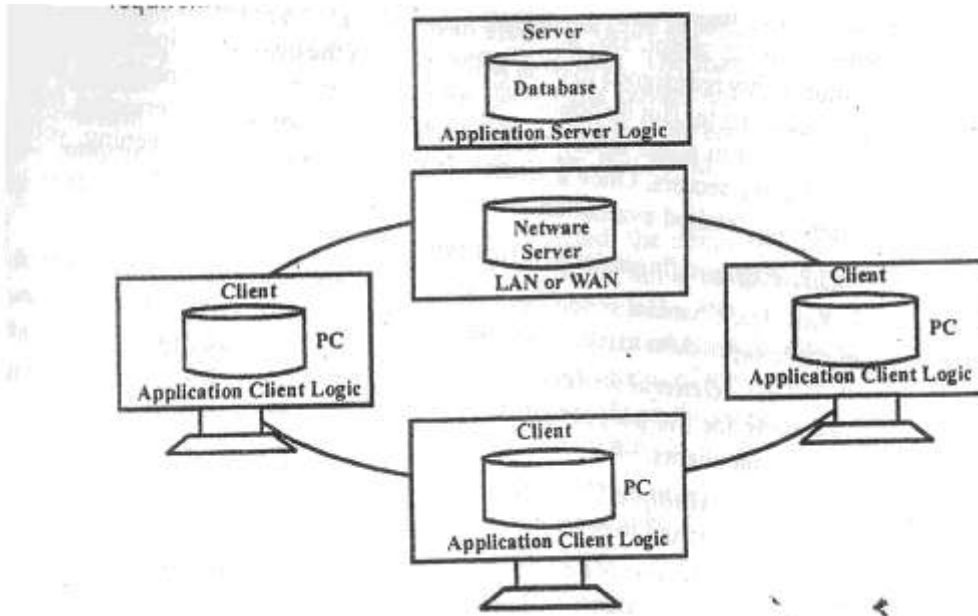
Figure 4.9 Client-Server Architecture Model

Figure 4.9 depicts a simple client-server configuration. As the diagram shows, the clients and servers are connected through either LAN or WAN network. The client has its own processing application logic and server has its own processing logic to handle data and its processing.

The client handles server independent tasks through its stored application logic and server handles clients request which are triggered after processing in the client. Hence, true client-server implementation requires, application programs split in such manner that client level processing is done by the client and communicated to server to carry out the rest and offer the feedback to the client with the processed result. Broadly, back end server has DBMS system and related application logic, and the client has front end tools to handle the requirement in terms of input, process and presentation.

10. TECHNOLOGIES REQUIRED FOR ERP

Some of these technologies which when integrated with the ERP system will enable the companies to do business at Internet speed. These technologies used are:

  i.   Business Process Reengineering (BPR)
  ii.   Data warehousing & data marts
  iii. Data mining
  iv.   On-line analytical processing (OLAP)
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Business Process Reengineering (BPR)

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BPR is the analysis and redesign of workflow within and between enterprises. BPR promotes the idea that sometimes radical redesign and reorganization of an enterprise (wiping the slate clean) was necessary to lower costs and increase quality of service and that information technology was the key enabler for that radical change.

Hammer and Champy, the founders of this concept, felt that the design of workflow in most large corporations was based on assumptions about technology, people, and organizational goals that were no longer valid. They suggested seven principles of reengineering to streamline the work process and thereby achieve significant levels of improvement in quality, time management, and cost:

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

By the mid-1990's, BPR gained the reputation of being a nice way of saying "downsizing." According to Hammer, lack of sustained management commitment and leadership, unrealistic scope and expectations, and resistance to change prompted management to abandon the concept of BPR and embrace the next new methodology, **Enterprise Resource Planning (ERP).**

Data Warehousing & Data Marts

- A **data warehouse** is database designed to support decision making in an organization.
- Data from the production databases are copied to the data warehouse so that queries can be performed without disturbing the performance or the stability of the production systems.
- **Data warehouses** contain a wide variety of data that present a coherent picture of business conditions at a single point in time.
- The term data warehousing generally refers to the combination of many different databases across an entire enterprise.
- The primary concept of data warehousing is that the data stored for business analysis can most effectively be accessed, by separating it from the data in the operational systems.
- A **data mart** is a database, or collection of databases, designed to help managers make strategic decisions about their business. Whereas a data warehouse combines databases across an entire enterprise, data marts are usually smaller and focus on a particular subject or department. Some data marts, called dependent data marts, are subsets of larger data warehouses.

Data Mining

- **Data mining** has been defined as the nontrivial extraction of implicit, previously unknown, and potentially useful information from data and the science of extracting useful information from large data sets or databases.
- Data mining is sorting through data to identify patterns and establish relationships. Data mining is a class of database applications that look for hidden patterns in a group of data that can be used to predict future behavior.

- For example, data mining software can help retail companies find customers with common interests. The term is commonly misused to describe software that presents data in new ways. True data mining software does not just change the presentation, but actually discovers previously unknown relationships among the data. Data mining is popular in the science and mathematical fields but also is utilized increasingly by marketers trying to distill useful consumer data from Web sites.
- Data mining parameters include:
    1. Association - looking for patterns where one event is connected to another event
    2. Sequence or path analysis - looking for patterns where one event leads to another later event
    3. Classification - looking for new patterns (May result in a change in the way the data is organized but that's ok)
    4. Clustering - finding and visually documenting groups of facts not previously known
    5. Forecasting - discovering patterns in data that can lead to reasonable predictions about the future (This area of data mining is known as predictive analytics.)
- Data mining techniques are used in a many research areas, including mathematics, cybernetics, and genetics. Web mining, a type of data mining used in customer relationship management (CRM), takes advantage of the huge amount of information gathered by a Web site to look for patterns in user behavior.

On-line Analytical Processing (OLAP)

- OLAP is decision support software that allows the user to quickly analyze information that has been summarized into multidimensional views and hierarchies.
- OLAP is a category of software tools that provides analysis of data stored in a database.
- OLAP tools are used to perform trend analysis on sales and financial information. They enable users to drill down into masses of sales statistics in order to isolate products that are the most volatile.
- OLAP tools enable users to analyze different dimensions of multidimensional data.
- For example, it provides time series and trend analysis views. OLAP often is used in data mining.
- The chief component of OLAP is the OLAP server, which sits between a client and database management systems (DBMS). The OLAP server understands how data is organized in the database and has special functions for analyzing the data. There are OLAP servers available for nearly all the major database systems.

Product Life Cycle Management (PLM)

- The conditions a product is sold under will change over time. The product life cycle refers to the succession of stages a product goes through.
- Product life cycle management is the succession of strategies used by management as a product goes through its life cycle.
- PLM is the process of managing the entire lifecycle of a product from its conception, through design and manufacture, to service and disposal.
- PLM gives companies the power to plan, manage and schedule product life cycles by accelerating the introduction of new products, and optimizing life cycle phases of all products.

- Organizations need an integrated product life cycle management (PLM) software solution for collaborative engineering, product development, and management of projects, product structures, documents and quality.
- PLM software should provide an information backbone to help you access relevant information anywhere, anytime.

Supply Chain Management (SCM)

- Supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain as efficiently as possible.
- SCM spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption.
- SCM is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer.
- SCM involves coordinating and integrating these flows both within and among companies.
- The ultimate goal of any effective supply chain management system is to reduce inventory (with the assumption that products are available when needed).
- A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products and the distribution of these finished products to customers.
- Supply chains exist in both service and manufacturing organizations, although the complexity of the chain may vary greatly from industry to industry and firm to firm.

Customer Relationship Management (CRM)

- CRM is an information industry term for methodologies, software, and usually Internet capabilities that help an enterprise manage customer relationships in an organized way.
- For example, an enterprise might build a database about its customers that described relationships in sufficient detail so that management, salespeople, people providing service, and perhaps the customer directly could access information, match customer needs with product plans and offerings, remind customers of service requirements, know what other products a customer had purchased, and so forth.
- CRM consists of:
    1. Helping an enterprise to enable its marketing departments to identify and target their best customers, manage marketing campaigns with clear goals and objectives, and generate quality leads for the sales team.
    2. Assisting the organization to improve telesales, account, and sales management by optimizing information shared by multiple employees, and streamlining existing processes (for example, taking orders using mobile devices).
    3. Allowing the formation of individualized relationships with customers, with the aim of improving customer satisfaction and maximizing profits; identifying the most profitable customers and providing them the highest level of service.
    4. Providing employees with the information and processes necessary to know their customers, understand their needs, and effectively build relationships between the company, its customer base, and distribution partners.
- CRM refers to the methodologies and tools that help businesses manage customer relationships in an organized way.
- CRM tools include software and browser-based applications that collect and organize information about customers.

Geographical information systems (GIS)

- A geographic information system (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on earth.
- A geographic information system is composed of software, hardware, and data.
- GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps.
- These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes and planning strategies.
- A geographic information system differs from other computerized information systems in two major respects. First, the information in this type of system is geographically referenced (geocoded). Second, a geographic information system has considerable capabilities for data analysis and scientific modeling, in addition to the usual data input, storage, retrieval, and output functions.

Intranets

- An intranet is a private network that is contained within an enterprise. It may consist of many interlinked local area networks and also use leased lines in the Wide Area Network.
- Typically, an intranet includes connections through one or more gateway computers to the outside Internet. The main purpose of an intranet is to share company information and computing resources among employees. An intranet can also be used to facilitate working in groups and for teleconferences.
- An intranet uses TCP/IP, HTTP, and other Internet protocols and in general looks like a private version of the Internet.
- Typically, larger enterprises allow users within their intranet to access the public Internet through firewall servers that have the ability to screen messages in both directions so that company security is maintained.
- When part of an intranet is made accessible to customers, partners, suppliers, or others outside the company, that part becomes part of an extranet.

Extranets

- An extranet is a private network that uses the Internet protocol and the public telecommunication system to securely share part of a business's information or operations with suppliers, vendors, partners, customers, or other businesses.
- An extranet can be viewed as part of a company's intranet that is extended to users outside the company. Think of an extranet as being a private portion of the Internet. If you were to remove the secure aspects of an extranet then you would in effect have just another piece of the Internet.
- An extranet requires security and privacy. These require firewall server management, the issuance and use of digital certificates or similar means of user authentication, encryption of messages, and the use of virtual private networks (VPN) that tunnel through the public network.
- Companies can use an extranet to:
  1. Exchange large volumes of data using Electronic Data Interchange (EDI) or XML
  2. Share product catalogs exclusively with wholesalers or those "in the trade"
  3. Collaborate with other companies on joint development efforts
  4. Jointly develop and use training programs with other companies

5. Provide or access services provided by one company to a group of other companies, such as an online banking application managed by one company on behalf of affiliated banks
6. Share news of common interest exclusively with partner companies

Electronic data interchange (EDI)

- Electronic Data Interchange is the transfer of data between different companies using networks, such as VANs or the Internet. As more and more companies get connected to the Internet, EDI is becoming increasingly important as an easy mechanism for companies to buy, sell, and trade information.
- EDI is the electronic communication of business transactions, such as orders, confirmations and invoices, between organizations. Third parties provide EDI services that enable organizations with different equipment to connect. Although interactive access may be a part of it, EDI implies direct computer-to-computer transactions into vendors' databases and ordering systems.
- The Internet gave EDI quite a boost. However, rather than using privately owned networks and the traditional EDI data formats (X12, EDIFACT and TRADACOMS), many business transactions are formatted in XML and transported over the Internet using the HTTP Web protocol.

Electronic Funds Transfer (EFT)

- Electronic Funds Transfer (EFT) is a system of transferring money from one bank account directly to another without any paper money changing hands.
- One of the most widely-used EFT programs is Direct Deposit, in which payroll is deposited straight into an employee's bank account, although EFT refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, Fedwire and point-of-sale (POS) transactions. It is used for both credit transfers, such as payroll payments, and for debit transfers, such as mortgage payments.
- Transactions are processed by the bank through the Automated Clearing House (ACH) network, the secure transfer system that connects the different financial institutions. For payments, funds are transferred electronically from one bank account to the billing company's bank, usually less than a day after the scheduled payment date.
- The growing popularity of EFT for online bill payment is paving the way for a paperless universe where checks, stamps, envelopes, and paper bills are obsolete.
- The benefits of EFT include reduced administrative costs, increased efficiency, simplified bookkeeping, and greater security.

Cryptography

- Cryptography is the conversion of data into a secret code for transmission over a public network. The original text, or "plaintext," is converted into a coded equivalent called "cipher text" via an encryption algorithm. The cipher text is decoded (decrypted) at the receiving end and turned back into plaintext.
- The encryption algorithm uses a "key," which is a binary number that is typically from 40 to 256 bits in length. The greater the number of bits in the key (cipher strength), the more possible key combinations and the longer it would take to break the code. The data are encrypted, or "locked," by combining the bits in the key mathematically with the data bits. At the receiving end, the key is used to "unlock" the code and restore the original data.
- It has been said that any encryption code can be broken given enough time to compute all permutations.

- However, if it takes months to break a code, then most of the break-ins can be prevented or avoided.
- As computers get faster, to stay ahead of the game, encryption algorithms have to become stronger by using longer keys and more clever techniques.