

UNIT – IV ERP MODELS /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 system 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.

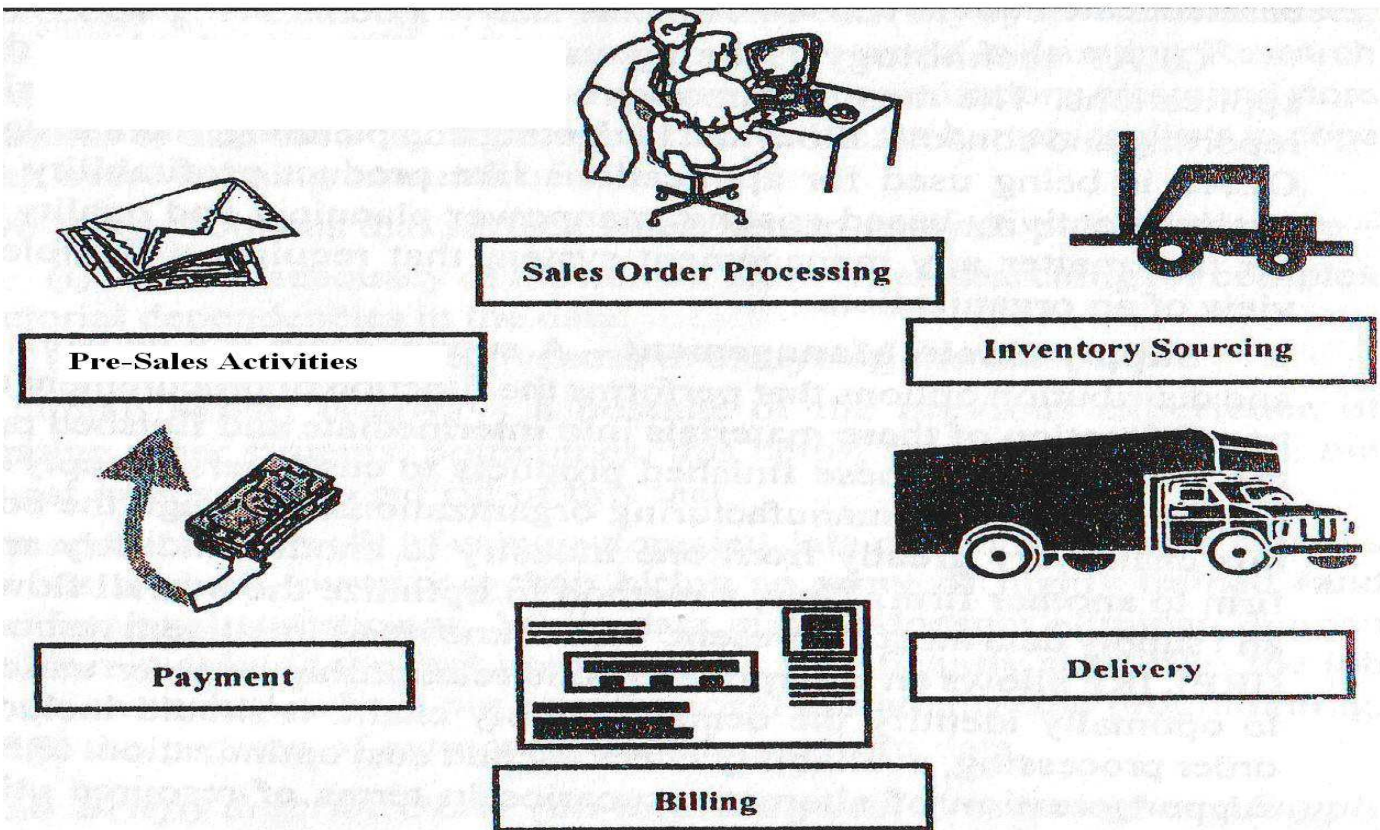


Figure 4.1 The sales and Distribution Process

- 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. It uses the four data files in preparing the master production schedule. the input data include
 - o Customer order file
 - o Sales forecast file
 - o Finished-goods inventory file
 - o Production capacity file
- 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. Raw material inventory file is used to determine which of the materials are already

on the hand. Then net requirement can be calculated from the gross material and the material on the hand. (net requirement = gross - materials on hand)

- iii. **Capacity requirements planning:** this system works with MRP system to ensure that the scheduled production will fit within the plant capacity. After that determination has been made, the material requirements planning system produces several outputs. The main output is planned order schedule, which lists the needed quantities of each material by the time period.
- iv. **Order release system:** it uses the planned order schedule for input and prints an order release report. One copy is sent to buyers in the purchasing department for use in negotiating with suppliers and the other copy is sent to shop floor managers for use in controlling the production process.

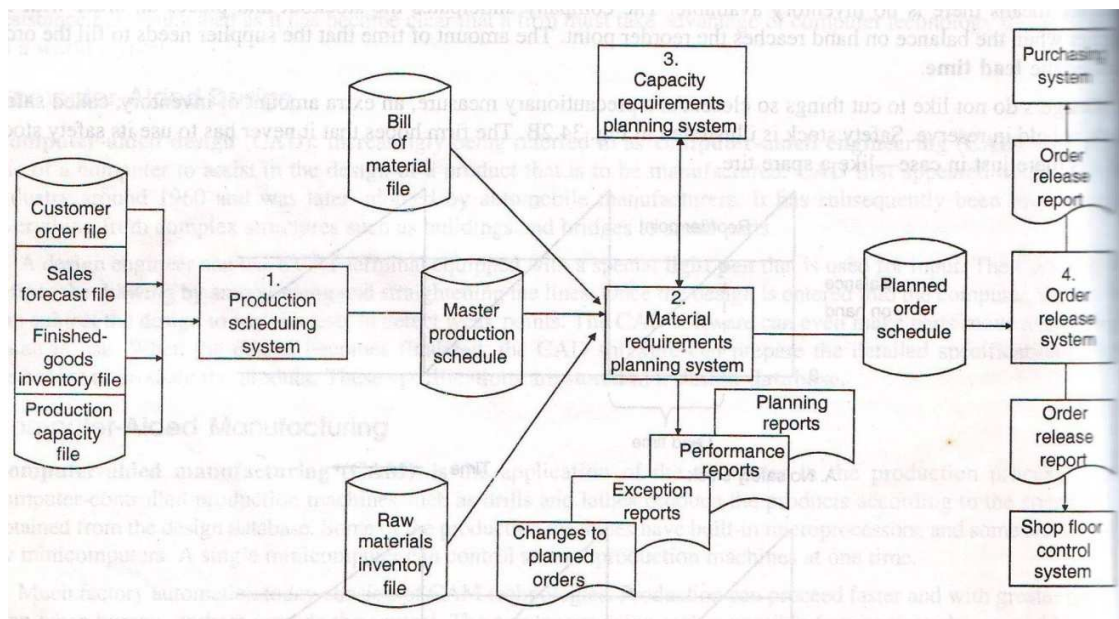


Figure 4.2 An MRP System

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
 - Less idle time
 - Fewer bottlenecks
- Better priority planning
 - Quicker production starts
 - Schedule flexibility

- Improved customer service
 - Meet delivery dates
 - Improved quality
 - Lower price possibility
- Improved employee moral
- Better management information

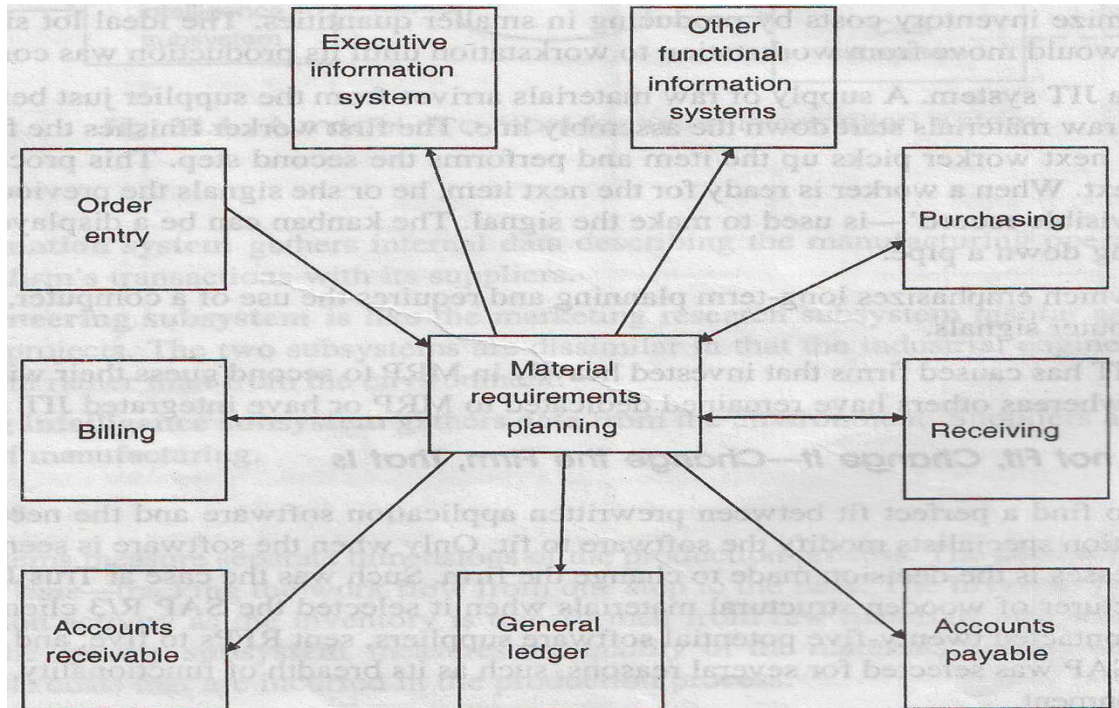


Figure 4.3 An MRP II System

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 rules 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.

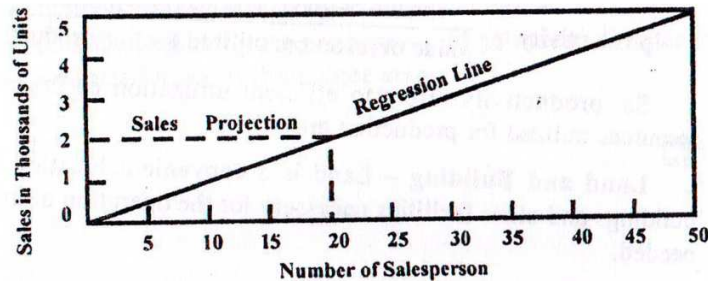


Figure 4.4 Using the number of salespersons to project sales

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

The entire system is represented by the upright rectangle in the centre. The environmental elements of the distribution system include:

- Customers
- Suppliers
- Materials stockroom
- Management

The environmental elements are represented by horizontal rectangle. The environmental elements are connected to the system by arrows called data flows. The data flows that connect the firm with its customers are quite similar to the flows that connect the firm with its suppliers. That is because the firm is a customer of its supplier.

The distribution system consists of

Sales order: the order that the firm receives from its customers.

Purchase order: the orders that the firm places to its suppliers are called purchase orders.

Verbal commitments: in some cases the firm will first obtain verbal commitments from its suppliers before the purchase orders are prepared.

Rejected sales orders: very often the firm will have to send rejected sales order notices to customers- perhaps their credit rating is bad. Suppliers also send rejected sales order notices to firm.

Invoices: both the firm and its suppliers use invoices to advice customers how much money they owe, and statements to collect unpaid bills.

Payments: both the firm and its customers must make payments for their purchases.

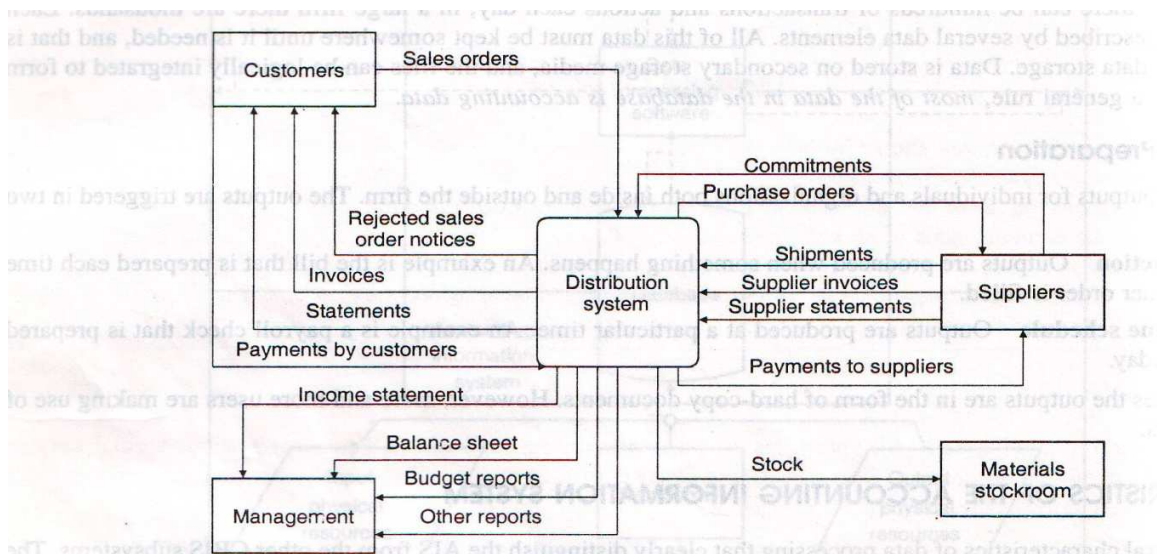


Figure 4.5 The distribution system

6.2 Major subsystem of the distribution system

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

Processes are:

- Fill orders
- Order replenishment stock
- Maintain general ledger

The first subsystem is concerned with filling customer orders

The second with ordering replenishment stock from suppliers

The third subsystem is concerned with maintaining the firm's general ledger.

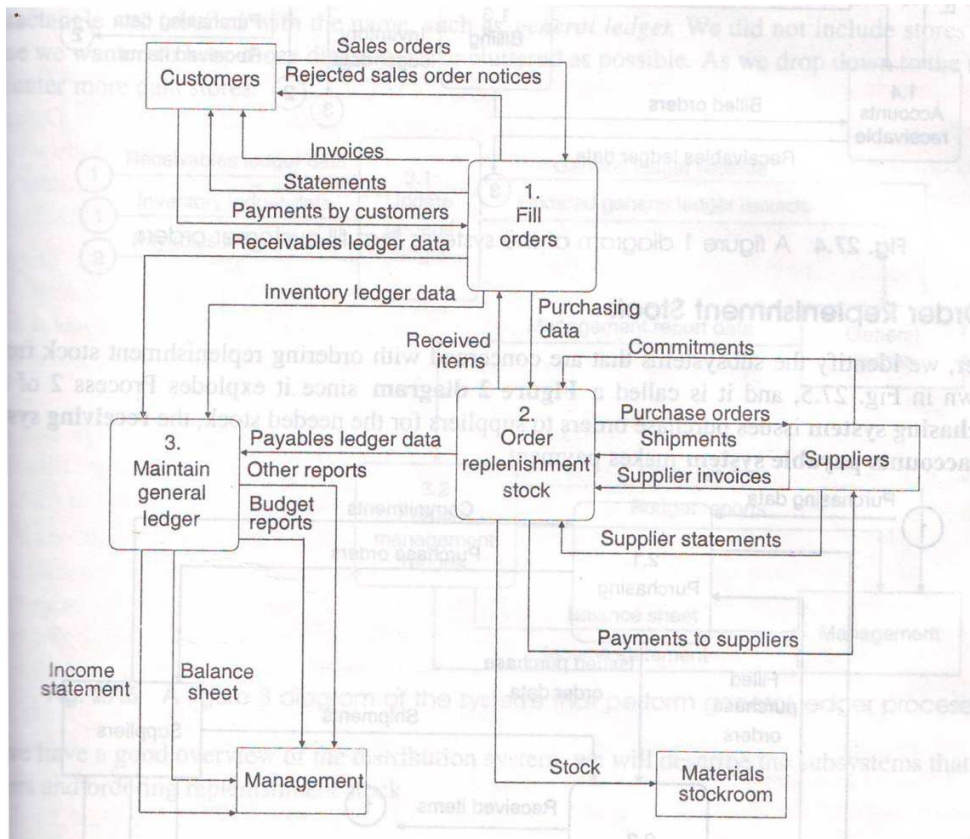


Figure 4.6 The distribution system with processes

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. The financial accounting is concerned with the collection, filling and storage of financial data. The financial accounting is concerned with the recording of business transactions in the books of account. For example when raw materials move from inventory to manufacturing, the system reduces quantity values in inventory and simultaneously, subtracts values for inventory accounts in the balance sheet.
- **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.

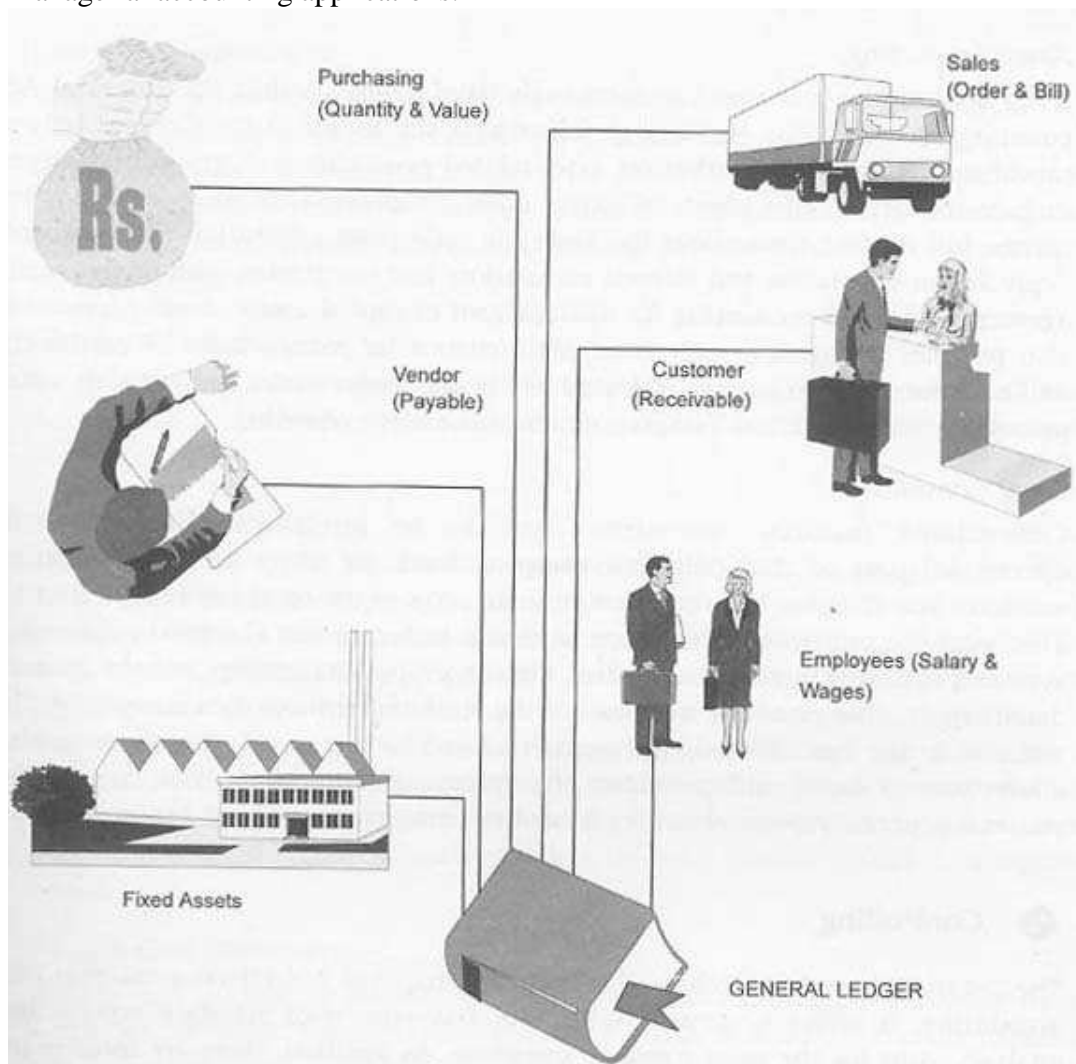


Figure 4.7 Typical General Ledger

- **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 is a sacrifice in the present in the expectation of a future gain.

Investment management is the art of administering the employment of money in financial instruments (are bonds, loans and deposits) in the present, with the expectation of a positive return in the future.

- 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 is the risk that the value of an instrument will decrease due to moves in market factors. The five standard Market risk factors are:
 - Equity risk (stock prices will change)
 - Interest rate risk (interest rate will change)
 - Currency risk (foreign exchange rate will change)
 - Commodity risk (commodity prices will change)
 - Credit risk (credit prices will change)

Market risk management plays 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.

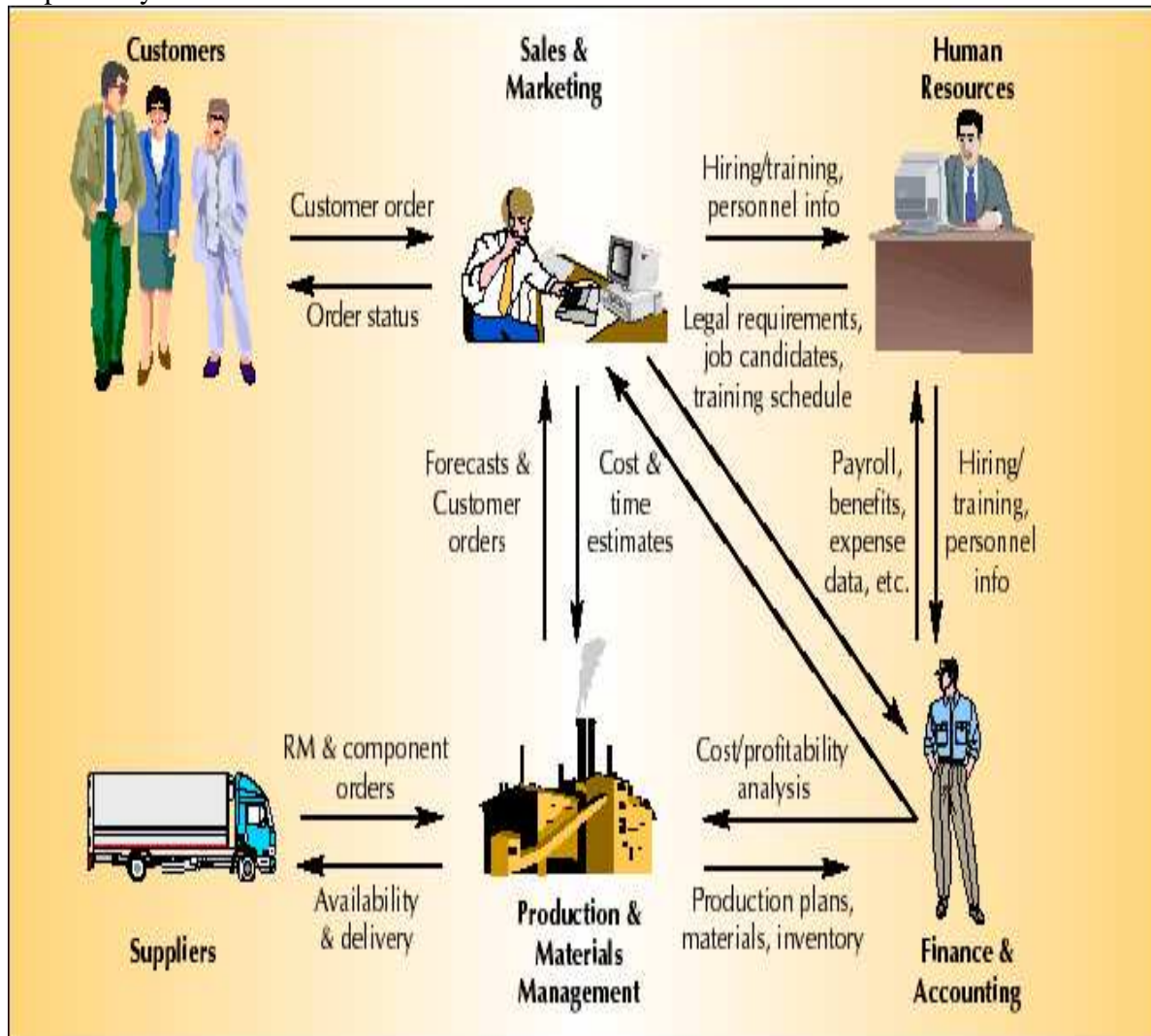


Figure 4.8 ERP Modules

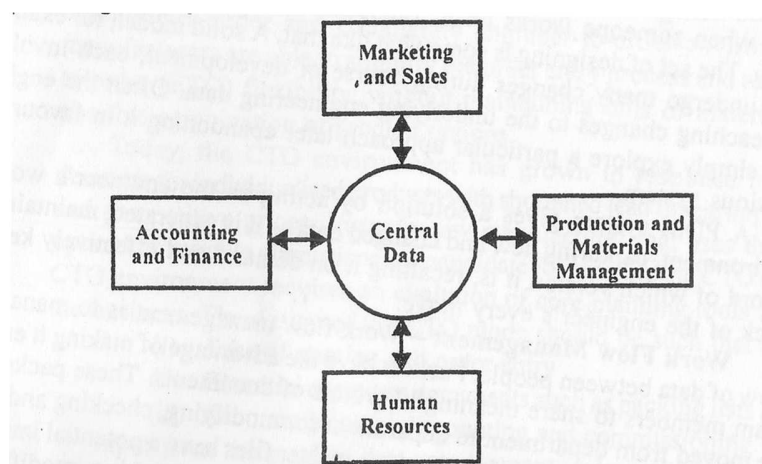


Figure 4.9 Data flow within an integrated information system

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 from 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.

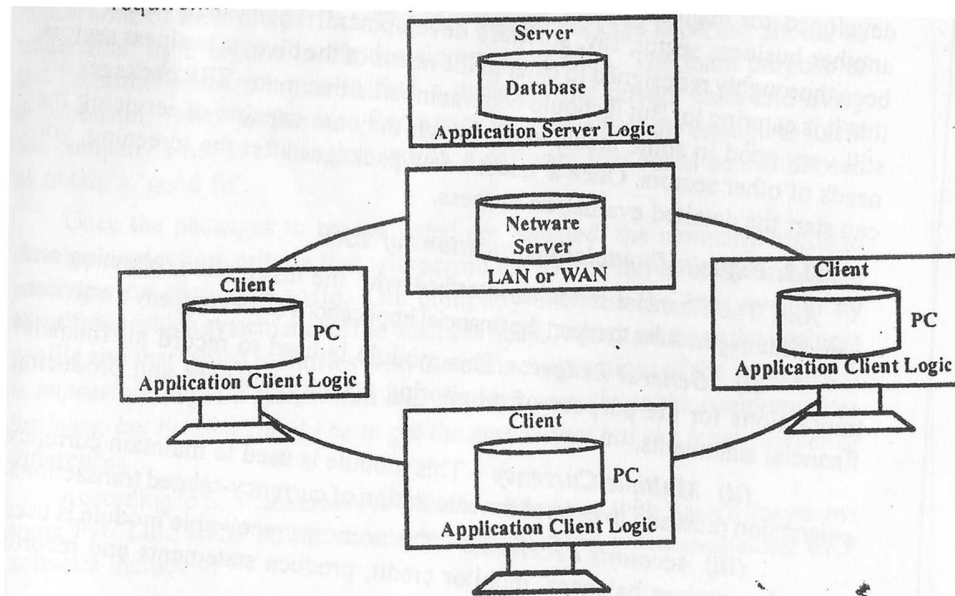


Figure 4.10 Client-Server Architecture Model

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

ERP systems have three significant limitations:

- I. Managers cannot generate custom reports or queries without help from a programmers and this inhibits them from obtaining information quickly, which is essential for maintaining a competitive advantage.
- II. ERP systems provide current status only, such as open orders. Managers often need to look past the current status to find trends and patterns that aid better decision making.
- III. The data in the ERP application is not integrated with other enterprise or decision systems and does not include external intelligence.

There are many technologies that help to overcome these limitations. Some of these technologies which when integrated with the ERP system will enable the companies to do business at Internet speed.

- i. Business Process Reengineering (BPR)
- ii. Data warehousing
- iii. Data mining
- iv. On-line analytical processing (OLAP)
- v. Product life cycle management (PLM)
- vi. Supply chain management (SCM)
- vii. Customer relationship management (CRM)
- viii. Geographical information systems (GIS)
- ix. Intranets and extranets
- x. Electronic data interchange (EDI)
- xi. Electronic Funds Transfer (EFT)
- xii. Cryptography

10.1 Business Process Reengineering (BPR)

- The replacement of outdated processes with newer ones is called as business process redesign or business process re-engineering.
- Just automating the existing business practices will not help ERP to achieve the anticipated results because,

- $OO + NT = EOO$

Where,

OO- old office

NT – new technology

EOO- economically weaker old office

- Business Process Re-engineering [BPR] brings out the deficiencies of the existing setup.
- BPR and ERP will give way to implement new systems and the long pending improvements in the existing systems.
- BPR may be time consuming but the scope can be restricted & controlled by the Management.

10.1.1 BPR Steps:

Step 1	Step 2	Step 3
Understand	Simplify/Improve	Automate
Understand the existing systems associated with all the functionalities	Draft & frame the possibilities & ways to simplify or Improve or eliminate the processes	Implement with the help of ERP

Three types of BPR:

- Reverse engineering
- Re-structuring
- Re-engineering

10.1.2 Reverse engineering

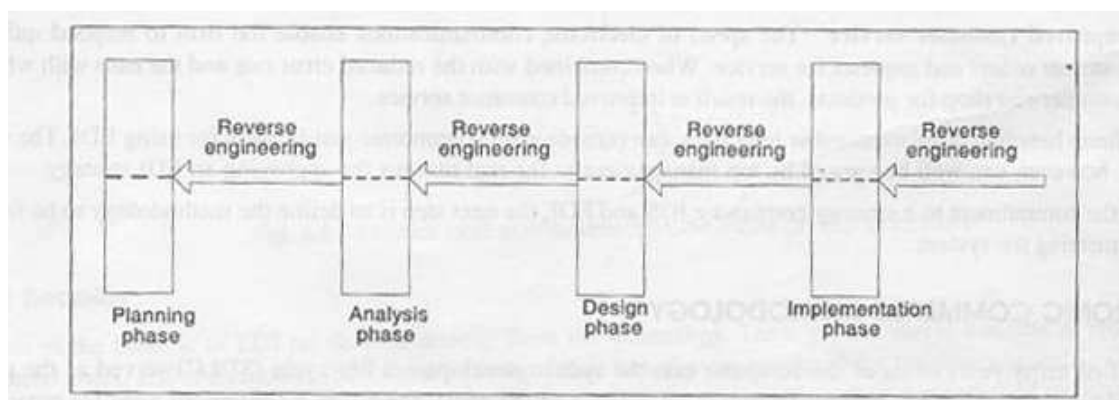


Figure 4.11 Reverse engineering

- It is the process of analyzing a system to identify its elements and their interrelationships, as well as to create documentation in a higher level of abstraction than currently exists.
- Reverse engineering does not change the functionality of a system.
- The starting point in reverse engineering system is the program code which is transferred into documentation which is further transformed into more abstract descriptions.

10.1.3 Re-structuring

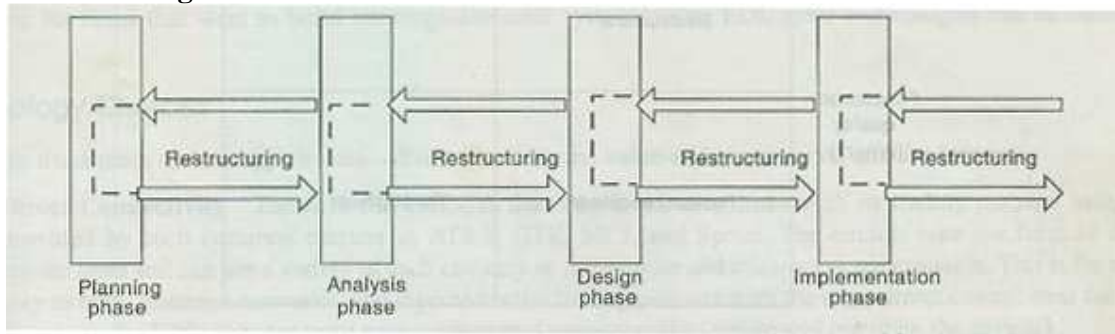


Figure 4.12 Re-structuring

It is the transformation of a system into another form without changing its functionality. A good example is the transformation of a program written during the early years of computing when there were few programming standards into one in a structured format.

10.1.4 Re-engineering

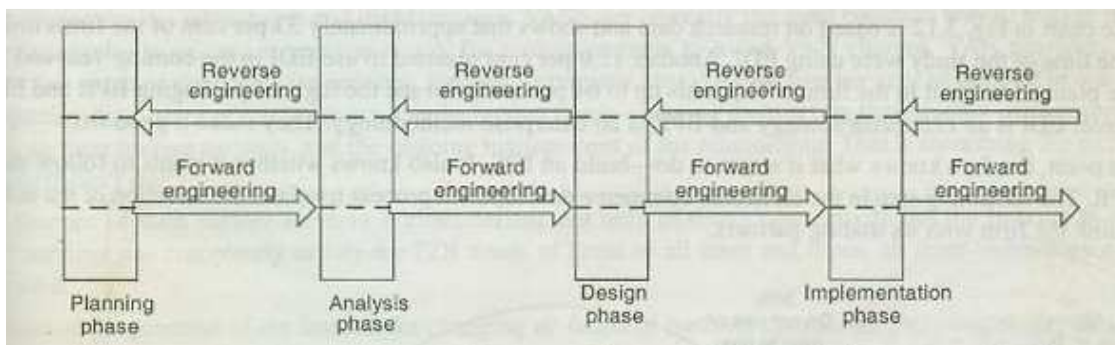


Figure 4.13 Re-engineering

It is the complete redesign of a system with the objective of changing its functionality.

10.2 Data Warehousing

DWH technology comprises a set of new concepts and tools which support the knowledge worker (executive, manager, and analyst) with information material for decision making.

The fundamental reason for building a DWH is to improve the quality of information in the organization.

Data coming from external and internal sources, existing in a variety of forms from traditional structural data to unstructured data like text files or multimedia is cleaned and integrated into a single repository.

A DWH is the consistent store of this data which is made available to end users in a way they can understand and use in a business context.

10.2.1 DWH features

Subject-Oriented: Information is presented according to specific subjects or areas of interest, not simply as computer files. Data is manipulated to provide information about a particular subject. For example, the SRDB is not simply made accessible to end-users, but is provided structure and organized according to the specific needs.

Integrated: A single source of information to understand multiple areas of interest. The data warehouse provides one-stop shopping and contains information about a variety of subjects. Thus the OIRAP data warehouse has information on students, faculty and staff, instructional workload, and student outcomes.

Non-Volatile: Stable information that doesn't change each time an operational process is executed. Information is consistent regardless of when the warehouse is accessed.

Time-Variant: Containing a history of the subject, as well as current information. Historical information is an important component of a data warehouse.

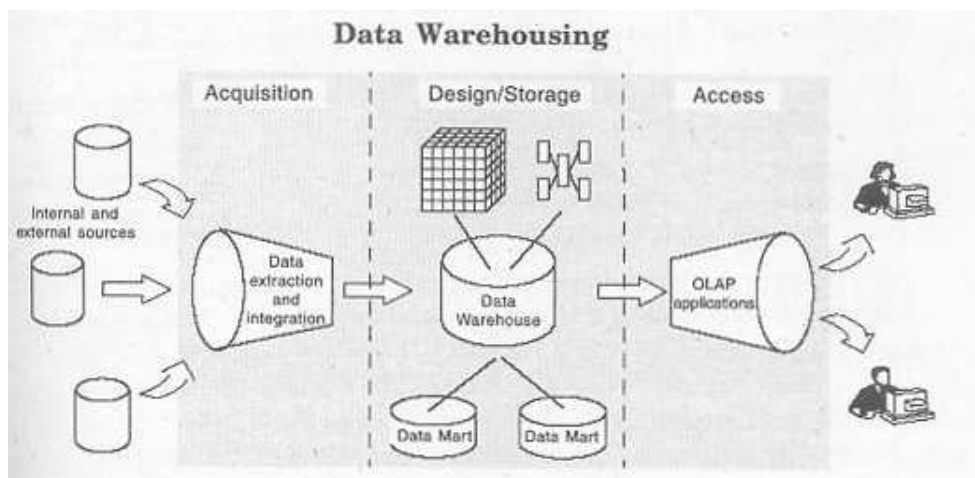


Figure 4.14 Data Warehouse Architecture

In the diagram,

- The center of a DWH system is the DWH itself.
- The data import and preparation component is responsible for data acquisition. It includes all programs, applications that are responsible for extracting data from operational sources, preparing and loading it into the warehouse.
- The access component includes all different applications that makes use of the information stored in the warehouse.

10.3 Data Mining

- It is the process of identifying valid, novel, potentially useful and ultimately comprehensible information from databases that is used to make crucial business decisions.
- For example, one Midwest grocery chain used the data mining capacity. They discovered that when men bought bread on Monday and Saturday they also tended to buy butter.
- Further analysis showed that these shoppers typically did there their weekly grocery shopping on Saturday.
- The retailer concluded that they purchased the bread and butter to have it available for the upcoming weekend.
- The grocery chain could use this newly discovered information in various ways to increase revenue.

- For example, they could move the butter display closer to the bread display.

10.3.1 Data mining consists of five major elements:

- Extract, transform and load transaction data onto the data warehouse system.
- Store and manage the data in a multidimensional database system.
- Provide data access to business analysts and information technology professionals.
- Analyze the data by application software.
- Present the data in a useful format such as a graph or table.

10.3.2 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.

10.4 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.
- OLAP tools can be used in a wide variety of business areas, including sales and marketing analysis, financial reporting, quality tracking, profitability analysis, manpower and pricing applications, and many others.
- OLAP enables analysts, managers and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information.
- OLAP transforms raw data so that it reflects the real dimensionality of the enterprise as understood by the user.
- A typical OLAP calculation is more complex than simply summing data, for example:” what would be the effect on production cost of ‘G110’ fasteners to distributors if metal prices went up by Rs 100/ton and transportation costs went down by Rs 0.50/kilometer?”
- OLAP transforms Data Warehouse data into strategic information.
- 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.

10.4.1 Uses of OLAP

Although OLAP applications are found in widely divergent functional areas, they all require the following key features:

- **Multidimensional views of data:** a multidimensional view of data provides more than the ability to “slice and dice”. It provides the foundation for analytical processing through flexible access to information. Whether the request is for the weekly sales of a product across all geographical areas or the year-to date sales in a city across all products, an OLAP system must have consistent response times.
- **Calculation-intensive capabilities:** the real test of an OLAP database is its ability to perform complex calculations. OLAP databases must be able to do more than simple aggregation.
- **Time intelligence:** time is an integral component of almost any analytical application. Time is a unique dimension because it is sequential in character. True OLAP systems understand the sequential nature of time. Business performance is almost always judged over time, for example, this month vs. last month.

10.4.2 OLAP benefits

- Successful OLAP applications increase the productivity of business managers, developers, and whole organizations.
- Managers are no longer dependent on IT to make schema changes, to create joins and so on.
- More control and timely access to strategic information equals more effective decision-making.
- OLAP enables the organization as a whole to respond more quickly to market demands. Market responsiveness, in turn, often yields improved revenue and profitability.

10.5 Product Life Cycle Management (PLM)

- Product lifecycle management is the process of managing product-related design, production and maintenance information. The core of PLM is in the creation and central management of all product data and the technology used to access this information and knowledge.
- PLM as a discipline emerged from tools such as CAD, CAM and PDM, but can be viewed as the integration of these tools with methods, people and the processes through all stages of a product's life. It is not just about software technology but is also a business strategy.
- PLM also serves as the central repository for secondary information, such as vendor application notes, catalogs, customer feedback, marketing plans, archived project schedules, and other information acquired over the product's life.

10.5.1 The PLM process manages:

1. Products and parts, including those which are used for tooling, inspection, calibration, training, operation and maintenance
2. Documents that define the performance, functional and physical attributes of an item.
3. Ancillary documents that are used for training, operation and maintenance of an item

4. Electronic computer files that support the product's design, development, production and subsequent post-production phases
 5. Material content, including reporting on legally-proscribed or hazardous substances and the identification of part recycling and disposal methods.
 6. Organizations that adopt PLM report that revenues increase, while per-unit product cost and administrative overhead is reduced.
- Product lifecycle management represents an all-encompassing vision for managing all data relating to the design, production, support and ultimate disposal of manufactured goods.
 - PLM concepts were first introduced where safety and control have been extremely important, notably the aerospace, medical device, military and nuclear industries. These industries originated the discipline of configuration management (CM), which evolved into electronic data management systems (EDMS), which then further evolved to product data management (PDM).
 - In recent years, manufacturers of instrumentation, industrial machinery, consumer electronics, packaged goods and other complex engineered products have discovered the benefits of PLM solutions and are adopting efficient PLM software in increasing numbers.
 - 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 can be thought of as both (1) a repository for all information that affects a product, and (2) a communication process between product stakeholders: principally marketing, engineering, manufacturing and field service.
 - The PLM system is the first place where all product information from marketing and design comes together, and where it leaves in a form suitable for production and support.

10.5.2 Benefits of PLM

- The PLM application can help your organization:
 1. Support strategic sourcing by interfacing with supplier relationship management software
 2. Provide role-specific, context-driven access for internal and external users to relevant information, tools and services
 3. Improve decision-making through insight into projects, flexible reporting, and analytics for portfolio management, occupational health, product safety and product quality
 4. Increase strategic and operative control by monitoring product and production changes affecting timelines, costs and resources
 5. Provide an open technology framework that delivers up-to-date data required by enterprise processes for demand planning, manufacturing, purchasing, and sales.

10.5.3 PLM helps the organization by:

6. Managing design and process documents
7. Constructing and controlling bill of material (product structure) records
8. Offering an electronic file repository
9. Including built-in and custom part and document metadata
10. Identifying materials content for environmental compliance
11. Permitting item-focused task assignments
12. Enabling workflow and process management for approving changes
13. Controlling multi-user secured access, including "electronic signature"
14. Exporting data for downstream ERP systems

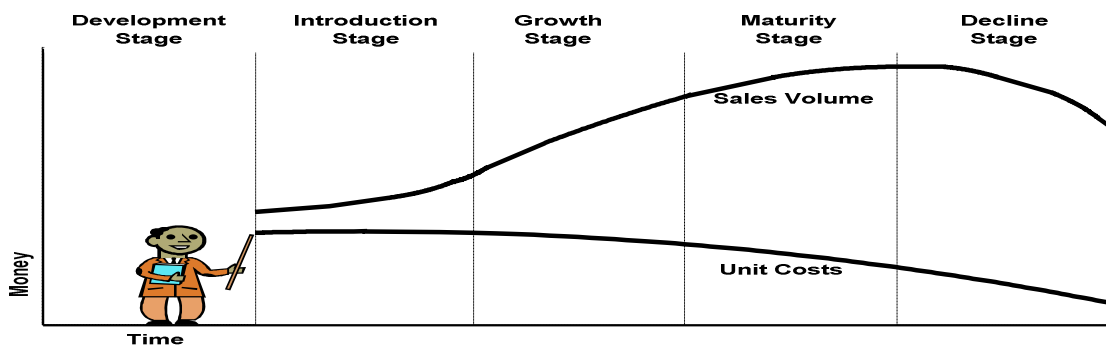


Figure 4.15 Product Lifecycle Phases

10.5.4 Features and Functions

The PLM offers all the functionality you need for integrated product and asset management. Features and functions include:

1. Life cycle data management - PLM provides an environment for managing specifications, bill of materials, routing and resource data, project structures and related technical documentation throughout the product life cycle.
2. Program and project management - Product life cycle management enables you to plan, manage and control the entire project development process, from initial idea to completion
3. Life cycle collaboration - PLM enables and accelerates collaborative processes for engineering, product development and project management by allowing all parties, both inside and outside the enterprise, to share information quickly and easily.
4. Quality management - PLM provides integrated quality management for all industries throughout the entire product life cycle.
5. Enterprise asset management - Product life cycle management enables project managers, maintenance engineers and others to manage physical assets and equipment, from first investment idea to retirement of the asset.
6. Environment, health and safety - PLM provides a solution for environment, health and safety issues by enhancing business processes to comply with government regulations.

10.5.5 PLM supports crucial product life cycle processes in the following areas:

1. Product development - PLM gives you the tools to manage all documents associated with product development—from specifications to CAD drawings, meeting minutes and test protocols.
2. Development collaboration and strategic sourcing - PLM lets you collaborate on technical documents, product structures, assets and project information during the product development process.
3. Prototyping - PLM supports the process of building prototypes based on product data and allows you to validate designs before starting production.

4. Production ramp-up - During the product introduction phase, the solution also helps you to synchronize production ramp-up to avoid lost sales, as well as to produce just the right amount of new products.
5. Sales, service and maintenance handovers - PLM integrates seamlessly with other enterprise integration applications to make handovers to sales, service and maintenance divisions easy and effective.
6. Quality engineering and improvement - PLM provides organizations with powerful tools for a broad-based approach to total quality management.
7. Product costing – PLM's enhanced estimating functions help designers to manage and influence the costs of product designs while they are still in the development phase.

10.6 Supply Chain Management (SCM)

- Supply chain management (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.
- SCM enables collaboration, planning, execution and coordination of the entire supply chain, empowering companies to adapt their supply chain processes to an ever-changing competitive environment.
- An SCM system ensures more visibility throughout the supply chain, fewer surprises and less need to stock back up raw materials or finished goods.
- With better synchronization across the entire supply chain, the business partners achieve the following major benefits:
 - I. Lower inventories and therefore, lower financing costs
 - II. Shorter receivables cycles
 - III. Optimal use of production resources, costly work forces and transportation fleets
 - IV. Faster response to market changes
 - V. Greater satisfaction and loyalty among customers
 - VI. Greater profitability
- The military was one of the first organizations to recognize supply chains and how to manage them—during World War II.
- Strategists realized that delivering the right manpower and material on schedule to just the right spot was the key to battlefield supremacy.
- Supply chain management is mainly a matter of building new communications paths and interlocking feedback loops that help business partners share information and ultimately, more fully trust each other to maximize the mutual benefits.
- The SCM systems have become more efficient and intelligent with the use of computers, artificial intelligence and other advancements in the field of information technology.
- SCM solutions transform traditional supply chains from linear, sequential steps into an adaptive supply chain network in which communities of customer-centric, demand driven companies share knowledge, intelligently adapt to changing market conditions and proactively respond to shorter, less predictable life cycles.
- Today, almost all organizations—military, manufacturing, service industries, retailers, and so on—use SCM systems to improve their efficiency and effectiveness.
- All businesses that involve complex flows of material can take advantage of the global optimization and efficient execution offered by SCM systems.

10.6.1 Advantages of SCM

- Supply chain planning and collaboration - Supply chain planning functionality enables you to maximize return on assets and ensures a profitable match of supply and demand.
- Supply chain execution - SCM enables you to carry out supply chain planning and generate high efficiency at the lowest possible cost.
- Supply chain visibility design and analytics - SCM gives you network-wide visibility across your extended supply chain to perform strategic as well as day-to-day planning.
- Business benefits - SCM can help you transform a traditional linear supply chain into an adaptive network with the following benefits:
 - Faster response to changes in supply and demand
 - Increased customer satisfaction
 - Compliance with regulatory requirements
 - Improved cash flow
 - Higher margins
 - Greater synchronization with business priorities

10.7 Customer Relationship Management (CRM)

- Customer Relationship Management (CRM), also known as relationship marketing or customer management, is an information technology industry term for the methodologies, strategies, software, and other web-based capabilities used to help an enterprise organize and manage customer relationships.
- The goal of CRM is to aid organizations in better understanding each customer's value to the company, while improving the efficiency and effectiveness of communication.
- CRM captures, analyzes, and distributes all relevant data from customer and prospect interactions to everyone in the organization. This distribution of information helps an organization better meet customer, product, and service needs.
- CRM has replaced traditional marketing techniques that focused on key marketing mix elements, such as product, price, promotion and place. Traditional marketing techniques neglected the customer in the after-sales process and failed to meet customers' desires.
- CRM emphasizes customer retention over customer acquisition and is recognized as one of the most viable tools used to further a company's success in the highly competitive business world.

10.7.1 Goals of CRM

The idea of CRM is that it helps businesses use technology and human resources to gain insight into the behavior of customers and the value of those customers. If it works as hoped, a business can:

- I. Provide better customer service
- II. Make call centers more efficient
- III. Cross sell products more effectively
- IV. Increase sales
- V. Help sales staff close deals faster
- VI. Simplify marketing and sales processes
- VII. Discover new customers
- VIII. Increase customer revenues
- IX. Increase automation of facilitates
- X. Improve the better use of existing resources
- XI. Increase quality of information

- XII. Improve the response time
- XIII. Improve customer targeting
- XIV. Improve customer retention

10.7.2 Functions and Components of CRM

CRM systems are integrated end-to-end across marketing, sales and customer service. A CRM system should:

- I. Identify factors important to clients
- II. Promote a customer-oriented philosophy
- III. Adopt customer based measures
- IV. Develop end-to-end processes to serve customers
- V. Provide successful customer support
- VI. Handle customer complaints
- VII. Track all aspects of sales
- VIII. Create a holistic view of customers' sales and services information

There are three fundamental components in CRM:

- IX. Operational—automation of basic business processes (marketing, sales, service)
- X. Analytical—analysis of customer data and behavior using business intelligence
- XI. Collaborative—communicating with clients

10.7.3 Uses of CRM

A good CRM program allows a business to acquire customers, provide customer services and retain valued customers. Customer services can be improved by:

- I. Providing on-line access to product information and technical assistance around the clock
- II. Identifying what customers value and devising appropriate service strategies for each customer
- III. Providing mechanisms for managing and scheduling follow-up sales calls
- IV. Tracking all contacts with a customer
- V. Identifying potential problems before they occur
- VI. Providing a user-friendly mechanism for registering customer complaints
- VII. Providing a mechanism for handling problems and complaints
- VIII. Providing a mechanism for correcting service deficiencies
- IX. Storing customer interests in order to target customers selectively
- X. Providing mechanisms for managing and scheduling maintenance, repair and ongoing support

10.7.4 CRM System and Marketing Processes

CRM supports critical marketing processes, including the following.

- I. Technology-Enabled Selling
- II. Marketing Resource Management
- III. Segment and List Management
- IV. Call Center Management
- V. Campaign Management
- VI. Internet Protocol Telephony
- VII. Field Service Management
- VIII. Trade Promotion Management
- IX. Lead Management

10.8 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.

10.9 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.

10.10 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

10.11 Electronic data interchange (EDI)

Electronic data interchange (EDI) consists of direct computer-to-computer transmissions among multiple firms of data in a machine-readable, structured format.

The typical EDI linkages establish connections between the firm and its suppliers and its customers. Connections with suppliers are referred to as the supply side of the system, and connections with customers go by the name customer side.

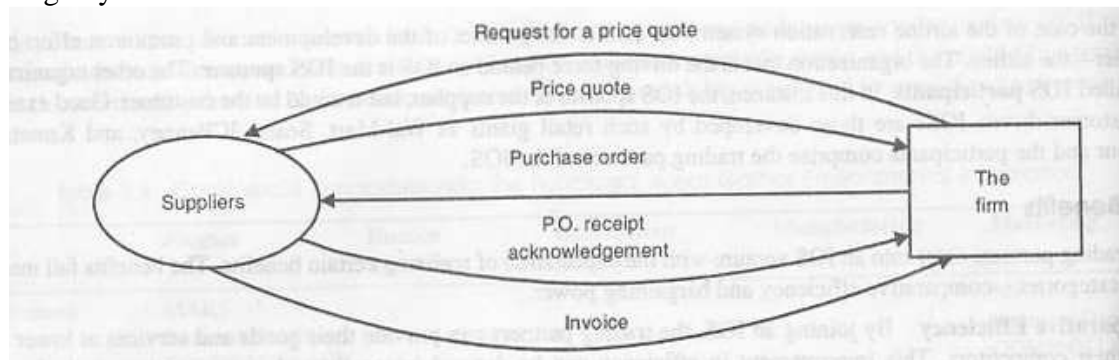


Figure 4.16 EDI transmissions

- In the figure, the firm sends a transaction set to a supplier asking for a price quote.
- The supplier responds with the quote.
- The firm decides to make the purchase and transmits a purchase order (P.O.) to the supplier. The supplier acknowledges receipt of the P.O.
- The supplier fills the order and transmits an invoice to the firm, requesting payment.

10.11.1 EDI standards

The data that flows along each path between the firm and its trading partners adheres to a standard format. The standard formats enable the trading partners to exchange data but require a translation process prior to sending and after receipt. The translation is required because the partner's computer applications typically do not handle data in the same format as the standards. Special software, called mapping software, performs the translation process.

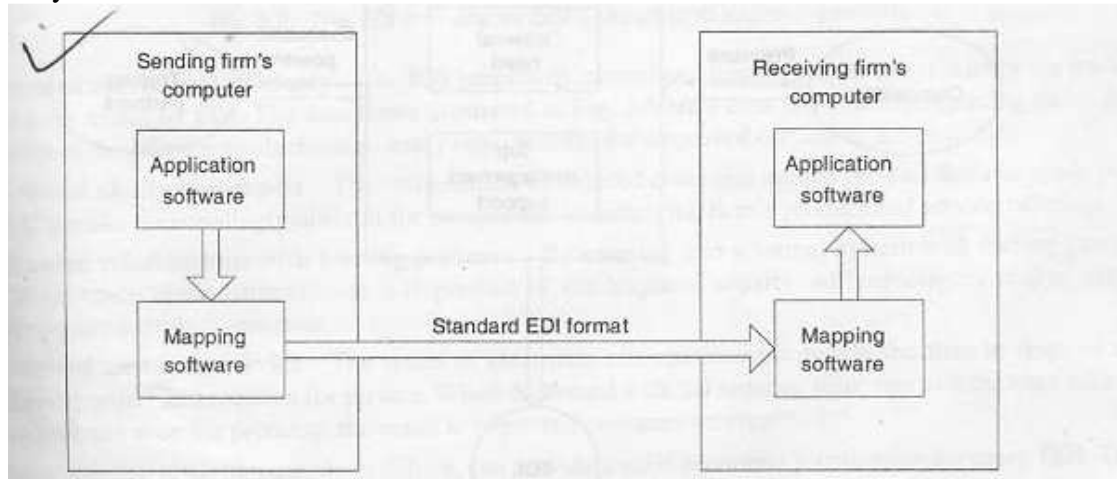


Figure 4.17 Mapping software

10.11.2 Adoption influences

The factors that can influence the EDI decision are:

Competitive pressure: when the firm is in a poor position in relation to its competitors or when industry or trade associations provide strong pressure, the firm will adopt EDI in a reactive way.

Exercised power: when a firm can exert power over other members of the IOS, it will be proactive in adopting EDI. Some firm are so powerful that they can demand that either their partners use EDI or take their business elsewhere.

Internal need: when the firm sees that participation in the IOS is a way to improve its own operations, it will approach EDI in a proactive manner.

Top management support: regardless of whether the firm acts in a proactive or reactive manner, top management support always influences the decision.

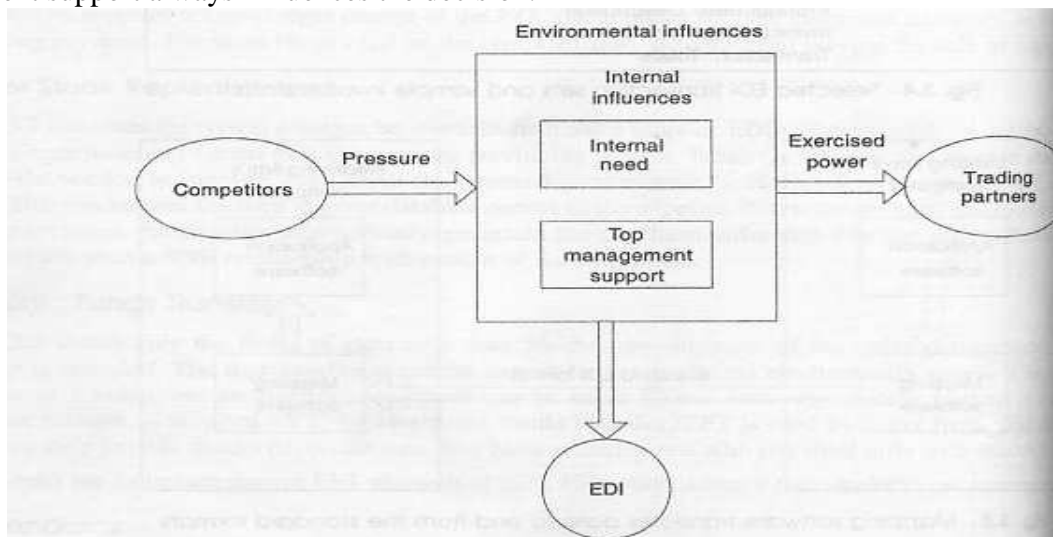


Figure 4.18 Internal and environmental influences on EDI adoption

10.11.3 EDI benefits

Reduced errors: by not having to key incoming data into the system, data entry errors can be greatly reduced.

Reduced costs: cost reductions can be realized by eliminating redundant steps, eliminating paper documents and reducing the manual labor of routing paper documents through the organization.

Increased operational efficiency: the IOS benefits of internal and inter-organizational efficiency are made possible to a large extent by EDI.

Increased ability to compete: the combination of reduced costs and unique product features made possible by the IOS make it exceedingly difficult for competitors to match the firm's product and service offerings.

Improved relationships with trading partners: by entering into a formal system with trading partners, good relations come about naturally-as a byproduct of the business activity.

Improved customer service: the speed of electronic communications enables the firm to respond quickly to customer orders and requests for service.

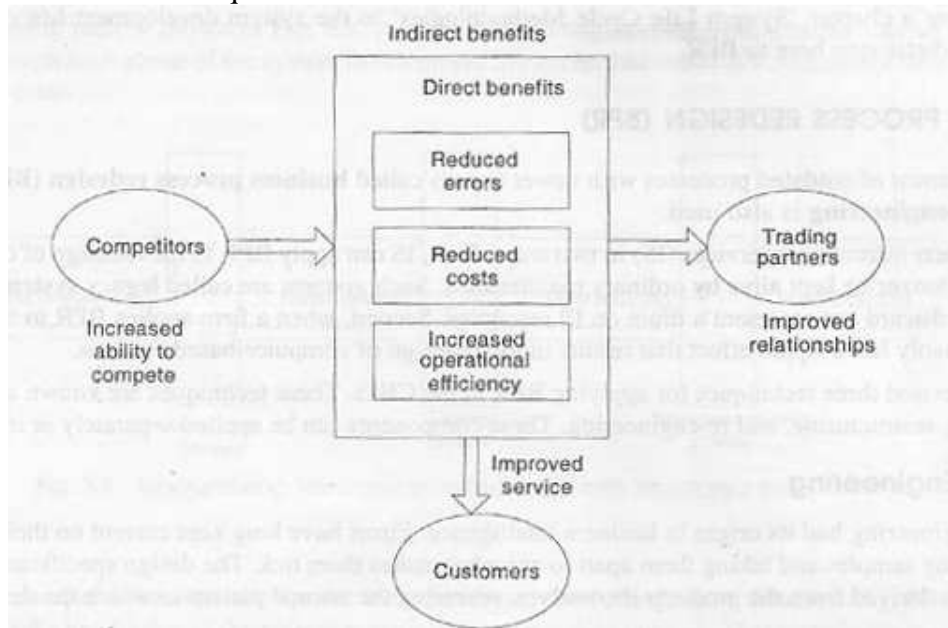


Figure 4.19 The EDI enjoys both direct and indirect benefits

10.12 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.

10.12.1 Most common EFT's

- **Direct Deposit:** It is used by employers for depositing their employees' salary in a bank account.
- **Automatic charge to your check or savings account:** For example, when you are paying a mortgage, the bank will discharge the monthly payment from a pre-accorded bank account. The benefit is that you won't have to go to the bank to do it. It's automatic.
- **Cash card:** With this type of card you can spend a prepaid amount of money until the balance is zero. So, if you wish to make a gift certificate without tying up your beneficiary with one store, you can buy a cash card from your favorite bank. **ATM's are also used for EFT's:** Since an automatic teller machine is much cheaper than a group of bank tellers, it has helped to bring costs down and benefit the customer.

10.12.2 Advantages

- **Time saving:** Since all the transaction is done automatically and electronically, the bank doesn't need to pay a person to do it, a person to drive the loans to the other bank, the cost of the transport, the cost of the maintenance of the transport, online auto insurance and the gas of the transport. EFT's have revolutionized modern banking.
- **Immediate payment:** it brings an up to date cash flow. You won't hear either about lost checks caused by the inefficiency of normal mail (nowadays known as snail mail for its velocity compared to emails) and up to date bookkeeping.

10.13 Cryptography

What happens in real life?

We have universal electronic connectivity via networks of our computers so allowing viruses (modifies our system programs and other data) and hackers to do eavesdropping (i.e. listening to a conversation without our awareness).

So both the organizations and individuals need to protect data and resources from such disclosure, to guarantee the authenticity of data and messages, and to protect systems from network based attacks.

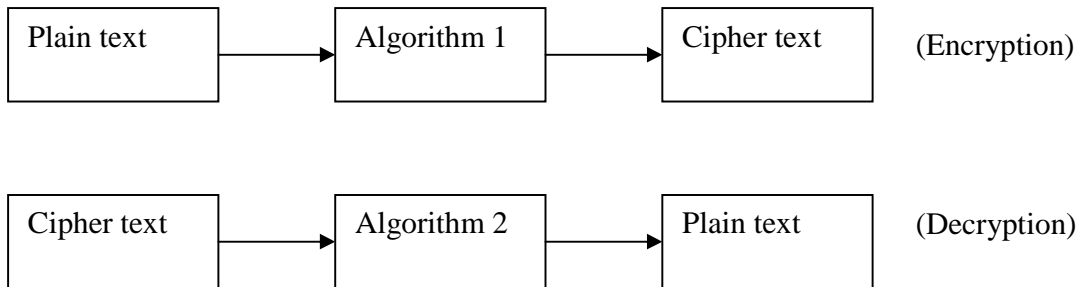
The subject Cryptography is related to the ideas and techniques to avoid such network generated problems and basically here with this subject we will focus our attention on network security.

Cryptography is the study of **secret** (crypto-) **writing** (-graphy)

Cryptography is the study of message secrecy. The noted cryptographer Ron Rivest has observed that "cryptography is about communication in the presence of adversaries". One of cryptography's primary purposes is hiding the meaning of messages, but not usually their existence. Cryptography is also used in many applications encountered in everyday life; examples include security of ATM cards, computer passwords, and electronic commerce all depend on cryptography.

Plain text: The message to be encrypted known as the plain text, are transformed by a function that is parameterized by a key.

Cipher text: The output of the encryption process, known as the cipher text.



Plain text: a b c d e f g h I j k l m n o p r s t u v w x y z
Cipher text: q w e r t y u i o p a s d f g h j k l z x c v b n m

It is not necessary that both the algorithm should be reverse. Key should be common.

Types of cryptography

1. Symmetric (secret/private key encryption)

In this scheme only one key is used for both encryption and decryption.

2. Asymmetric (public key encryption)

Two different keys, one for encryption and other for decryption are used.

Difference between MRP, MRPII and ERP

While MRP and MRPII are systems that address the requirements of a manufacturing setup, ERP addresses the information needs and requirements of the entire enterprise. The focus of ERP has not only been on addressing the current requirements of the organization, but also on providing the opportunity for continually improving and refining the business processes. Since the system is integrated, the redundant data and processes are eliminated. The ERP system is integrated as well as automated, thus automating the business procedures on an enterprise level. For example, an order entered by an order entry clerk in the purchase department will trigger a lot of actions in many other departments, like sales and distribution, finance, manufacturing and so on.

