Bachelor of Computer Application

(B.C.A.)

Enterprise Resource Planning

Semester-iv

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Syllabus

Enterprise Resource Planning

Learning Objective

- Demonstrate a good understanding of the basic issues in ERP systems
- Analyze the strategic options for ERP identification and adoption
- Design the ERP implementation strategies
- Understand the need of Business Systems and Processes through strategic analysis of ERP systems

Unit 1

Process view of organization Make to stock and Make to order cycles ERP Introduction: Origin, Evolution and Structure and Benefits: o Conceptual Model of ERP, Scenario and Justification of ERP in India, Various Modules of ERP, Advantage of ERP.

Unit 2

Advancement of IT and Impact on organizations data management: Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM).

Unit 3

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, and The changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software Integration of ERP, Supply chain and Customer Relationship Applications.

Unit 4

ERP Implementation: Business Process mapping and re-engineering, ERP Implementation Life Cycle Role of Consultants, Vendors and Employees. Critical Success Factors: Guiding Selection and Evaluation of ERP, Strategies and CSF for Successful ERP Implementation, Causes of ERP Failure.

Unit 5

Practical Module: ERP & E-Commerce, Future Directives- in ERP, Integrating ERP into organizational culture. Using an open source ERP toolfor orienting students to ERP.

References

- Manufacturing Resource Planning (MRP II) with Introduction to ERP; SCM; an CRM by Khalid Sheikh, Publisher: McGraw-Hill
- The Impact of Enterprise Systems on Corporate Performance: A study of ERP, SCM, and CRM System Implementations [An article from: Journal of Operations Management] by K.B. Hendricks; V.R. Singhal; and J.K. Stratman, Publisher: Elsevier
- ERP and Supply Chain Management by Christian N. Madu, Publisher: CHI

Contents

5. ERP Case Studies 2

* * *

1 Enterprise Resource Planning

1. Introduction

There are various processes that are essential to running a business, including inventory and order management, accounting, human resources, Customer Relationship Management (CRM). ERP software integrates these various functions into one complete system to stream line processes and information across the entire organization. So, an ERP or Enterprises resource planning is an important enterprise application running on network that integrates all the individual department / functions in a single software application.

An enterprise is the group of people with a common goal, which has certain resources at its disposal to achieve this goal. The group has some key functions to perform in order to achieve the goal. Resources include money, manpower, materials and all the other things that are required to run the enterprise. Planning is done to ensure that nothing goes wrong. Planning is putting necessary functions in place and more importantly, putting them together.

Therefore, enterprise-wide resource planning or ERP is a method of effective planning of all the resources in an organization.

The central feature of all ERP systems is a shared database that supports multiple functions used by different business units.

Enterprise Resource Planning (ERP) systems integrate internal and external management information across an entire organization. It automates this activity with an integrated software application. The purpose of ERP is to facilitate the flow of information between all business functions inside the boundaries of the organization and manage the connections to outside stakeholders.

2. What is ERP?

ERP is an abbreviation for Enterprise Resource Planning. It is the technique and concepts for integrated management of business as a whole. It is used for the effective use of management resources to improve the efficiency of enterprise management.

ERP is a way to integrate the data and processes of an organization into one single system. Usually ERP systems will have many components including hardware and software, in order to achieve integration, most ERP systems use a unified database to store data for various functions found throughout the organization. Enterprise resource planning (ERP) is a company-wide computer software system used to manage and coordinate all the resources, information, and functions of a business from shared data stores. An ERP system has a service-oriented architecture with modular hardware and software units or "services" that communicate on a local area network. The modular design allows a business to add or reconfigure modules (perhaps from different vendors) while preserving data integrity in one shared database that may be centralized or distributed. The central feature of all ERP systems is a shared database that supports multiple functions used by different business units.

Enterprise Resource Planning (ERP) systems integrate internal and external management information across an entire organization. It automates this activity with an integrated software application. The purpose of ERP is to facilitate the flow of information between all business functions inside the boundaries of the organization and manage the connections to outside stakeholders.

Today's ERP systems can cover a wide range of functions and integrate them into one unified database. For instance, functions such as Human Resources, Supply Chain Management, Customer Relations Management, Financials, Manufacturing functions and Warehouse Management functions were all once stand alone software applications, usually housed with their own database and network, today, they can all fit under one umbrella - the ERP system

2.1 Definition of ERP

i. *"ERP is an integrated multidimensional system for all functions, based on a business model for planning, control and global (resource) optimization of the entire supply chain".*

OR

ii. *"ERP is an integrated suit of application software modules, providing operational, managerial and strategic information for an enterprise to improve productivity, quality and competitiveness".*

OR

iii. *"ERP is an integrated system that allows information to enter at a single point in the process and updates a single shared database for all functions that directly or indirectly depend on this information".*

ERP software is designed to model and automate many of the basic processes of a company.

ERP enables an enterprise to balance its resources, such as manpower, machines, materials, money, methods and marketing to stay competitive in a globalised economy. ERP combines all departments/functions together into a single, integrated, software program that runs off a single database so that the various departments can more easily share information and communicate with each other as shown in *fig. 1.1.*

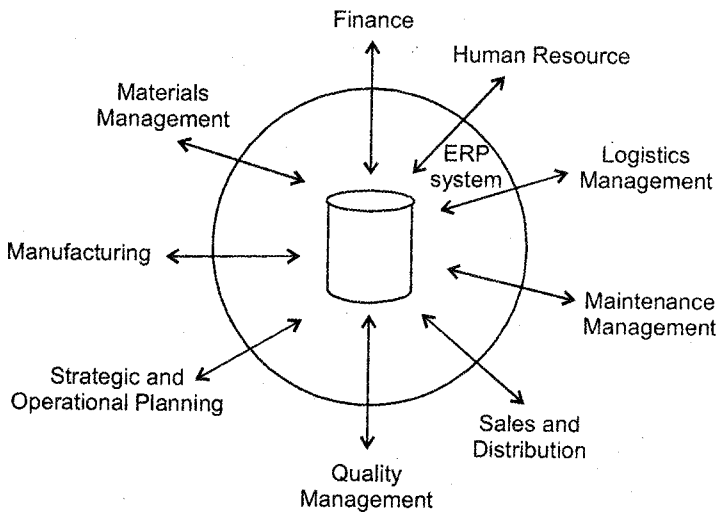


Figure 1.1: Information integration through ERP system

ERP provides real-time, online information for decision making or analysis. It means, whenever data is entered into the system, it is processed and stored immediately. Since, the transactions are simultaneous, the information based on these transactions is also up-to-date and readily available at any given time.

It is basically a software suit that integrates the whole enterprise, covering the entire internal supply chain from vendors and suppliers to customers.

For example, When a warehouse in Dubai enters a customer order, that data should automatically flow to others in the company who need to see it to the finance department at headquarters in Mumbai and to manufacturing department in Pune.

ERP is business tool rather than a system tool as it establishes business process engineering as well as reengineering and can bring radical changes in an organization. It is easy to use and address all software requirements of the enterprise. It is also flexible enough to accommodate future changes.

ERP System Improves the Efficiency and Productivity

ERP's true power and potential is its movement from traditional business model to the enterprise business model. ERP packages attempt to integrate all departments and functions across a company onto a single computer system that can serve all those different departments particular needs.

Actually, this kind of integration is a very difficult task. Building a single software program that serves the needs of people in finance as well as it does the people in human resources and in the warehouse. Each of those departments typically has its own computer system optimized for the particular ways that the department does its work.

But, ERP combines these all together to share information and communicate with each other. *Example,* A customer places an order. That order begins a mostly paper-based journey from one in-tray to another in-tray around the company's different departments. So moving the order from one department to another department causes delay and lost orders. It may also invite errors, because it is operating into different computer system in different departments.

And one more problem is, meanwhile the process no one in the company truly knows what the status of the order is, at any given point because there is no way to see the status of order if it is another department. And to know the status from different departments is also very tedious and frustrating experience as well as wasting time to follow-up this.

So ERP replaces the old standalone computer systems from all departments (like finance, HR, manufacturing, warehouse, purchasing marketing, etc) with a single unified software which provides different software modules for different departments, as shown in *fig. 1.1.* So anyone from one department can look into the other department to know the status of order. People in these different departments all see the same information and can update it.

When one department finishes the order it is automatically routed via the ERP system to the next department. To find out where the order is at any point, we need only log into the ERP system and track it down.

ERP systems integrate internal and external management information across an entire organization with the help of an integrated software application. The purpose of ERP is to facilitate the flow of information between all business functions inside the boundaries of the organization and manage the connections to outside also.

Thus ERP system improves the efficiency and productivity.

Characteristics of ERP System

ERP systems typically include the following characteristics:

i. An integrated system that operates in real time (or next to real time), without relying on periodic updates.

ii. A common database, which supports all applications.

iii. A consistent look and feel throughout each module.

iv. Installation of the system without elaborate application /data integrated by the Information Technology (IT) department.

v. Gives a global, real-time view of data that can enable companies to address concerns proactively and drive improvements.

vi. Improves financial compliance with regulatory standards and reduce risks.

vii. Automates core business operations such as lead-to-cash, order-to-fulfillment and produce-to-pay process.

viii. Enhances customer service by providing one source for billing and relationship tracking.

3. Need of ERP

Why does our company need an ERP solution?

Solution

There are various (countless) different processes, activities and systems used to run our business and we need to establish numerous workflows and procedures-some manual, some automated- that may or may not be formally documented. As a result, a variety of departmental applications and legacy databases are likely disjointed and not well-integrated. This was the approach in the past.

But today, in dynamic and highly competitive market place, it required higher productivity, profitability and growth and that is the primary reason of an ERP solution which reduces both time and money to complete numerous workflow and procedures.

There are a number of processes that a company may need to integrate together. One of these processes is called design engineering. When a company is in the process of designing a product, the process of actually creating it is just as important as the end result. ERP can be useful in helping a company find the best design process. Another area where ERP can be useful is order tracking. When a company receives orders for a product, being able to properly track the orders can allow the company to get detailed information on their customers and marketing strategies. If different software packages are being used, this data may not be consistent. So it is the reason that we use ERP because it has the ability to increase information consistency and accuracy. So this is one of the reason of need ERP because ERP has the ability to increase information consistency and accuracy.

One more reason is it operate in real-time.

Most organizations across the world have realize that in a rapidly changing environment, it is impossible to create and maintain a custom designed software package which will cater to all their requirements and also be completely up-to-date. Realizing the requirement of user, some of the software companies have designed enterprise. Resource planning software which will offer an integrated software solution to all the functions of an organization.

To sustain a business in this competitive environment the technique like ERP is good and helping companies to provide better quality and lower cost. So, the answer of 'why we need ERP solution?' is in short:

We need ERP solution

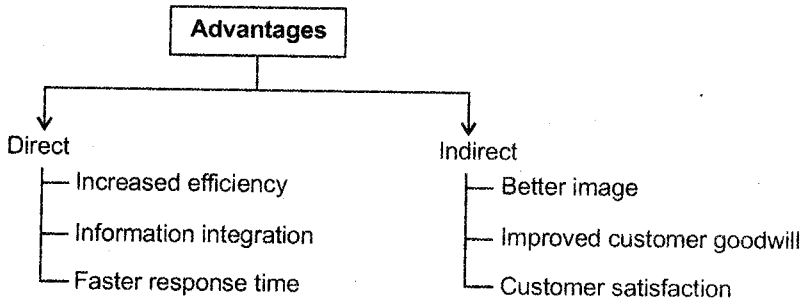
i. For higher productivity, profitability and growth of the business.
ii. To reduce time and money to complete numerous workflow and procedures.
iii. To increase information consistency and accuracy.
iv. To operate in real time.
v. For common database used to support all required applications.
vi. For business integration and improved data accuracy.
vii. For flexibility and new technology.

A company needs an ERP system, when their exact financial and operational performance is unknown inaccurate customer expectations and job costs are predicated or even unknown and promised delivery dates are regularly missed. It also needs when company do not meet or for exceed production requirements on a consistent basis.

Implementing ERP allows a company to overcome problems and issues, which leads to failure and it is able to replace the system currently in place which grows the organization.

4. Advantages of ERP

Installing an ERP system has many advantages both direct and indirect.



1. The fundamental advantage of ERP is that integrating the processes by which businesses operate saves time and expense. Tasks that benefit from this integration include
   a. Business operation saves time and expenses.
   b. Decisions can be made more quickly and with fewer errors.
   c. Data becomes visible across the organization.
   d. Sales forecasting, which allows inventory optimization.
   e. Chronological history of every transaction through relevant data compilation in every area of operation.
   f. Order tracking, from acceptance through fulfillment.
   g. Revenue tracking, from invoice through cash receipt.
   h. Matching purchase orders (what was ordered), inventory receipts (what arrived), and costing (what the vendor invoiced).
2. ERP systems centralize business data, bringing the following benefits
   a. They eliminate the need to synchronize changes between multiple systems-consolidation of finance, marketing and sales, human resource, and manufacturing applications
   b. They bring legitimacy and transparency in each bit of statistical data.
   c. They enable standard product naming/coding.
   d. They provide a comprehensive enterprise view (no "islands of information"). They make real–time information available to management anywhere, any time to make proper decisions.
   e. They protect sensitive data by consolidating multiple security systems into a single structure.

3. Complete visibility into all the important processes across various departments of an organization (especially for senior management personnel).
4. Automatic and coherent work-flow from one department / function to another to ensure smooth transition/ completion of processes.
5. A unified and single reporting system to analyze the statistics/ numbers/ status etc in real-time, across all the functions / departments.
6. Since same software is used across all departments – this can avoid individual departments having to buy and maintain their own software systems.
7. Certain ERP vendors can extend their ERP systems to provide Business Intelligence functionalities as well.
8. Advanced e-commerce integration is possible with ERP systems that can handle web-based order tracking/ processing.
9. There are various modules in an ERP system like Finance/ Accounts, Human Resource Management, Manufacturing, Marketing / Sales, Supply Chain / Warehouse Management, CRM, Project Management, etc.
10. Since ERP is a modular software system, it is possible to implement either a few modules (or) many modules based on the requirements of an organization. If more modules implemented, the integration between various departments might be better.
11. Single Database is implemented on the back-end to store all the information required by the ERP system and that enables centralized storage / back-up of all enterprise data.
12. ERP systems are more secure as centralized security policies can be applied to them and all the transactions happening via the ERP systems can be tracked.
13. ERP systems provide visibility and hence enable better/ faster collaboration across all the departments.
14. It is possible to integrate other systems (like bar-code reader, *for example*) to the ERP system through an API (Application Programming Interface).
15. ERP systems make it easier for order tracking, inventory tracking, revenue tracking, sales forecasting and related activities.
16. ERP systems are a boon for managing globally dispersed enterprise companies.

5. Disadvantages of ERP

1. ERP can **cost** more than less integrated and/or less comprehensive solutions. The cost of ERP Software, planning, customization, configuration, testing, implementation, etc is too high.
2. ERP deployments take **1-3 years** to get completed and fully functional.
3. **Customization** is problematic. Too little customization may not integrate the ERP system with the business process & too much customization may slow down the project and make it difficult to upgrade.
4. The **cost savings / payback** may not be realized immediately after the ERP implementation & it is quite difficult to measure the same.
5. The **participation** of users is very important for successful implementation of ERP projects – So, exhaustive user training and simple user interface might be critical. But ERP systems are generally difficult to use (and learn).
6. There may be additional **indirect costs** like new IT infrastructure, upgrading the WAN links, etc.
7. **Migration** of existing data to the new ERP systems is always difficult to achieve as with integrating ERP systems with other stand alone software systems.
8. ERP implementations are difficult to achieve in **decentralized organizations** with disparate business processes and systems.
9. Once an ERP systems is implemented it becomes a **single vendor lock-in** for further upgrades, customizations etc.
10. **Re–engineering** business processes to fit the ERP system may damage competitiveness and / or divert focus from other critical activities.
11. **High switching costs** associated with ERP can increase the ERP vendor's negotiating power which can result in higher support, maintenance, and upgrade expenses.
12. **Overcoming resistance** to sharing sensitive information between departments can divert management attention.
13. Integration of truly independent businesses can create **unnecessary dependencies**.
14. **Extensive training** requirements take resources from daily operations.
15. **Due to ERP's architecture** (OLTP, On-Line Transaction Processing) ERP systems are not well suited for production planning and supply chain management (SCM).
16. Requires a **lot of time, planning and money**.
17. Inadequate investment in **ongoing training** for involved personnel including those implementing and testing changes.

6. Benefit of ERP

Some of the benefits are quantitative (tangible) while others are non-quantitative (intangible)

Tangible benefits are those measured in monetary terms and intangible benefits can not be measured in monetary terms but they do have a very significant because of business impact.

The following are some of the direct benefits of the ERP:

i. Business integration.
ii. Flexibility/improved international operations.
iii. Better analysis and planning capabilities.
iv. Use of latest technology.

i. **Business integration:** The main reason of the ERP package implementation is integration. It is the automatic data updation (automatic data exchange among departmental applications) that is possible among the related business components.

In traditional way, company's information was isolated in departmental functions, and almost all were weak for communication and integration of information. So ERP packages, integrates all the departments data and it makes enable to automatically update at the time of transactions occur. For this reason, we are able to grasp business details in real time, carry out the various types of management decisions in a timely manner, based on that information. It also eliminates the problem of synchronizing the changes made by different departments. It also reduces the risk of loss of confidential data.

ii. **Flexibility/Improved international operations:** The second advantages of ERP packages is their flexibility. Different languages, currencies, accounting standards and so on can be covered in one system.

Different languages: ERP supports different languages so that the company can work in the language they want.

Multi currency: ERP also supports different currencies so that if the company is globalize (multinational) then it could have branches in many countries and for this it should support different currencies.

Multiple accounting standards: ERP provides different accounting standards for calculation of profits, wages, general ledger and so on.

This flexibility is essential for the globalization of the business and for the system unification.

iii. **Better analysis and planning capabilities:** Another advantage of the ERP is the planning functions (the appropriate or assigned duties, responsibilities, missions or tasks of an individual office or organization). By using ERP, it becomes possible to carry out, flexibility

and in real time, filling and analysis of data from a variety of dimensions, so one is able to give the decision makers the information they want, thus enabling them to make better informed decisions.

iv. **Use of latest Technology:** The fourth advantage is the utilization of the latest developments in Information Technology (IT). ERP quickly adapted their systems to take advantage of the latest technologies like open systems, client/server technology, Internet/intranet CALS (Computer Aided Acquisition and Logistics Support) electronic-commerce, etc. so it makes the flexible adaptation to change in future business environment possible.

6.1 Tangible Benefits

Tangible benefits are those measured in monetary terms (quantitative benefits). These are as follows:

i. Improves the productivity of process and personnel.

ii. Lowering the cost of products and services purchased.

iii. Paper and postage cost reduction.

iv. Inventory reduction

v. Lead time reduction

vi. Reduced stock obsolescene.

vii. Faster product/service look-up and ordering saving time and money.

viii. Automated ordering and payment, lowering payment processing and paper cost.

ix. Availability of timely, accurate information with detailed content and better presentation.

x. Quicker response and follow-up with customers.

xi. Better monitoring and quicker resolution of queries from within and outside.

xii. Quick response to change in business operations and market consumption.

xiii. Improved business processes providing a competitive advantages.

xiv. Single write/validate, multi-read for data.

xv. Speeding up the whole manufacturing process.

xvi. Better and systematic handling of process.

xvii. Fasten the creation of reports.

xviii. Reduce paper works and repeated entry.

xix. Quick processing of information.

xx. Serving the customer efficiently in time.

xxi. Solves the customer problem quickly.

xxii. Information based decision.

xxiii. Reduce process cycle time.

6.2 Intangible Benefits

Intangible benefits can not be measured in monetary terms but they do have a very significant business impact. These are as follows:

i. Increases organizational transparency and responsibility.

ii. Accurate and faster access to data for timely decisions.

iii. Can reach more vendors, producing more competitive bids.

iv. Improved customer response.

v. Saves enormous time and effort in data entry.

vi. More controls there by lowering the risk by mis-utilization of resources.

vii. Facilitates strategic planning.

viii. Uniform reporting according to global standards.

ix. Improved customer service and satisfaction.

x. Increased flexibility in operations.

xi. Improved resource utility, reduced quality cost and information accuracy.

xii. Improved decision-making processes.

6.3 Other Significant Benefits of ERP

1. **Reduced operating costs:** One of the most immediate benefits from implementing an ERP is reduced operating costs such as lower inventory control costs, lower production costs and lower marketing costs. By avoiding duplication of information, an ERP provides opportunities for cost reduction and value-added tasks, leading to increased margins.

2. **Facilitate day-to-day management:** The other benefit is facilitation of day-to-day management. ERP systems offer better accessibility to data so that management can have up-to-the-minute access to information for decision making and managerial control.

3. **Enhanced work efficiency:** ERP systems enhance the efficiency of the whole organization by smoothly integrating its various divisions. It also helps in reduction of paper document and provides an online format for quick storage and retrieval of information.

   ERP ensures a quick response to changes in market conditions and also improves the productivity of the organization by providing each department with their own computer system and database.

4. **Integration of business functions/business integration:** It is the main reason of ERP implementation, in which automatic data updation is possible among the related business components. It eliminates the problem of synchronizing the changes made by different departments. It also reduces the risk of loss of confidential data.

5. **Improved international operations/flexibility:** ERP package provides flexibility in different languages, currencies and accounting standards. This flexibility is essential for the globalization of the business and for the system unification.

6. **Improved visibility:** Due to centralized nature of ERP system, it provides visibility which enables organizations to run their enterprise in accordance with their strategy, while empowering them to make quick decisions to pursue opportunities.

7. **Real time capabilities** and the ability to see what is going on with our organization as it happens.

8. It is **handy** when we deal with high volume of business process.

9. **Better analysis and planning capabilities:** By using ERP, it becomes possible to analyse data from a variety of dimensions, so one is able to give the decision makers the information they want, thus enabling them to make better informed decisions.

10. **Use of latest technology:** ERP quickly adapted their systems to take advantage of latest technologies. So it makes the flexible adaptation to change in future environment possible.

11. With an ERP system, our company **will never have inventory shortage or wasted time spent transferring files.**

12. Improved customer satisfaction based on improved on time delivery, increased quality, shortened delivery times.

13. ERP can greatly improve the quality and efficiency of a business. By keeping a company's internal business process running smoothly, ERP can lead to better outputs that will benefit the company such as customer service, and manufacturing.

14. ERP provides support to upper level management to provide them with critical decision making information. This decision support will allow the upper level management to make managerial choices that will enhance the business down the road.

15. ERP also creates a more agile company that can better adapt to situations and changes. ERP makes the company more flexible and less rigidly structured in an effort to allow the different parts of an organization to become more cohesive, in turn, enhancing the business both internally and externally.

16. ERP provides our company with the right system and performance that we need. ERP can also help our company to reduce operating cost and it is a benefit when running company analytics. It improves the coordination of our company's process into one streamlined process where everything can be accessed through one enterprise wide information network.

17. The immediate benefit from implementing ERP systems we can expect is reduced operating costs, such as lower inventory control cost, lower production costs, lower marketing costs and lower help desk support costs.

18. Facilitate Day-to-Day Management : ERP programs are being developed and updated all the time. With so many different types on the market, companies should make sure they do due diligence and try out different packages before choosing one to use. Some of the programs even offer mobile capabilities so that you can always have a finger on the pulse of your business activities from your pads.

19. With real time capabilities and the ability to be able to see what is going on with your company as it happens, ERP systems are handy when you deal with high volume. With an ERP system, your company will never have inventory shortages or wasted time spent transferring files. You can test out an ERP system before buying it and see how it will work with your business.

7. Limitation

1. Personnel turnover; companies can employ new managers lacking education in the company's ERP system, proposing changes in business practices that are out of synchronization with the best utilization of the company's selected ERP.

2. Customization of the ERP software is limited. Some customization may involve changing of the ERP software structure which is usually not allowed.

3. Re-engineering of business processes to fit the "industry standard" prescribed by the ERP system may lead to a loss of competitive advantage.

4. ERP systems can be very expensive to install often ranging from 30,000 to 500,000,000 for multinational companies.

5. ERP vendors can charge sums of money for annual license renewal that is unrelated to the size of the company using the ERP or its profitability.

6. ERPs are often seen as too rigid and too difficult to adapt to the specific workflow and business process of some companies—this is cited as one of the main causes of their failure.
7. Systems can be difficult to use.
8. Systems are too restrictive and do not allow much flexibility in implementation and usage.
9. The system can suffer from the "weakest link" problem—an inefficiency in one department or at one of the partners may affect other participants.
10. Many of the integrated links need high accuracy in other applications to work effectively. A company can achieve minimum standards, then over time "dirty data" will reduce the reliability of some applications.
11. Once a system is established, switching costs are very high for any one of the partners (reducing flexibility and strategic control at the corporate level).
12. The blurring of company boundaries can cause problems in accountability, lines of responsibility, and employee morale.
13. Resistance in sharing sensitive internal information between departments can reduce the effectiveness of the software.
14. There are frequent compatibility problems with the various legacy systems of the partners.
15. The system may be over-engineered relative to the actual needs of the customer.

In short, the success of the system is fully dependent on how the workers utilize it. This means they must be properly trained, and a number of companies have attempted to save money by reducing the cost of training. Even if a company has enough money to implement ERP, they may not be able to successfully use it if they do not have enough money to train their workers on the process of using it. One of the biggest problems with ERP is that it is hard to customize. It must be modified to suit their needs, and this process can be both expensive and tedious. Even when a company does begin changing the system, they are limited in what they can do.

8. Growth of ERP

ERP systems bring all business operations into one uniform and builds a centralized database. So, ERP system is steadily growing and main reason of this enormous growth is improved business performance, easy and faster implementation and good cost. It reduces cycle time helps to deliver an order in time. This computerized system compresses the time and taken for such a process from many days to few seconds and with better accuracy than manual system.

Different companies replace their key business functions or they shift their business from traditional to computerized because of some of the following reasons:

i. Enable improved business performance

a. Cycle time reduction (The act or process of reducing): The time required to contact other department is reduced. So cycle time reduction work fast by ERP.

b. Increase business agility in ERP (the state or quality of being agile, nimbleness).

c. Inventory reduction (the state or quality of being agile, nimbleness): As the data is integrated there is no need to reenter the data and the paperless transaction is done using EDI (Electronic Data Interchange).

d. Order fulfilment (to bring into actuality) improvement: There is no conflict between the departments like sales and production so order can be made on time.

ii. To support business growth requirements

a. New products/product lines, new customer updates packages: We can grow our organization by implementing new products in the market and get the new customers for that product.

b. Globalize the product: Global requirement including multiple languages and currencies.

iii. To provide flexible (capable of being bent or flexed) integrated, real-time decision support

a. Improve responsiveness across the organization every person takes works as.

b. Managers get the integrated data of different departments at any time to analyse and to take important decisions at the right time.

c. To eliminate limitations in the legacy system.

d. Integration of the isolated departments.

e. Decision support system.

f. Availability of the right data at right time.

g. Flexibility to change.

iv. To eliminate limitations in legacy systems

a. Century dating issues.

b. Fragmentation (the act or process of breaking into fragments) of data and processing.

c. Inflexibility (Not easily bent, stiff or rigid) to change.

d. Insupportable (Not endurable, intolerate) technologies.

v. **To take advantage of the untapped mid-market (medium size organizations)**

a. Increased functionality at a reasonable cost.

b. Client server/open system technology.

c. Vertical (being or suited at right analyse to the horizon, upright) market solutions.

SUMMARY

- ERP is an abbreviation for Enterprise Resource Planning.
- Enterprise Resource Planning (ERP) systems integrate internal and external management information across an entire organization.
- The purpose of ERP is to facilitate the flow of information between all business functions inside the boundaries of the organization and manage the connections to outside stakeholders.
- ERP enables an enterprise to balance its resources, such as manpower, machines, materials, money, methods and marketing to stay competitive in a globalised economy.
- ERP combines all departments/functions together into a single, integrated, software program that runs off a single database so that the various departments can more easily share information and communicate with each other.
- ERP provides real-time, online information for decision making or analysis.
- It is basically a software suit that integrates the whole enterprise, covering the entire internal supply chain from vendors and suppliers to customers.
- ERP System Improves the Efficiency and Productivity of the organization.
- ERP has tangible and intangible benefits.
- Tangible benefits are those measured in monetary terms. *e.g.,* Business integration, Flexibility / improved international operations, Better analysis and planning capabilities, Use of latest technology.
- Intangible benefits cannot be measured in monetary terms but they do have a very significant because of business impact.

EXERCISE

1. Explain what do you mean by ERP?
2. Discuss the various reasons for the growth of ERP.
3. Discuss how ERP systems improve the efficiency and productivity of organizations.
4. Discuss the order processing in an organization with traditional information systems and one with ERP. Discuss how the ERP system improves productivity, reduces errors and enable inter departmental information access.
5. Explain the advantages of ERP.
6. Explain what are the tangible and intangible benefits of ERP.
7. Why is it important to have integrated management information? Explain with examples.
8. Discuss how ERP helps in better decision-making.
9. What is the need of ERP system?
10. What are disadvantages of ERP system?
11. What are the limitations of the ERP?

2 ERP and Related Technologies

Introduction

ERP used to improve the efficiency and productivity of the enterprise. ERP system serve an important function by integrating separate business functions – materials management, product planning, sales distribution, financials and others into a single application. However, ERP system have three significant limitations

i. Managers can not generate custom reports or queries without help from a programmer and this inhibits them from obtaining information quickly so that they can act on it for 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 division systems and does not include external intelligence.

There are various technologies that help to overcome these limitations. These technologies when used in conjunction with the ERP package will help in overcoming the limitations of a standalone ERP system and thus help the employees in making better decisions. Some of these technologies are

Data Warehousing and Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management (SCM), Customer Relationship Management (CRM), Geographical Information Systems (GIS), Decision Support System (DSS), Management Information System (MIS), Business Process Re-Engineering (BPR), Executive Support System (ESS) etc.

1. Business Process Re-Engineering (BPR)

To stay in today's competitive marketplace, organizations have been forced to improve their business processes because customers are demanding better products and services. Organizations reengineer when the management feels that a significant gap is existing between the actual and desired results, creating a business problem. At times, senior management translates this business problem into process performance problems and opportunities. This allows the company to focus on fundamentally transforming the target process (es), thus improving business results and solving the problem. At this early stage of identifying the need for radical change, senior management commitment and sponsorship is essential in taking the decision to reengineer.

Re-engineering is 'radical change, fast'. Reengineering involves fundamental rethinking and transformation of an integrated set of business processes. Reengineering requires not only a redesign of business processes but also concurrent examination and redesign of the information technologies and the organization that supports these processes.

▶The Evolution of BPR

During the period 1990-1993, management experts like *Dr. Michael Hammer, James Chmapy* and *Thomas Davenport* research and studies of successful industries created the concept BPR.

They gathered information by asking questions such as, "what worked and why?" along with "what didn't work and why not?' They discovered that most of the companies that had succeeded in changing their processes have used a similar set of tools and tactics. They called this set of procedures, 'Business Reengineering'. *Thomas Davenport* also performed research in this area and gathered information on methods and practices, which led to the successful implementation of what he called, 'process Innovation'. Both business reengineering and process innovation address the concept of redesigning how business performs strategic processes.

▶Definition of BPR

Business reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary modern measures of performance, such as cost, quality, service and speed." ***Dr. Michael Hammer***

Business Process Reengineering is also known as, "Business Process Redesign", "Business Transformation" or "Business Process Change Management".

It means, BPR is a process of examining current processes and redesigning those processes to increase the efficiency and effectiveness of an organization. In simple, BPR means the rapid and radical redesign of strategic, value-added business processes and systems, policies and organizational structure that support them to optimize workflow and productivity in an organization. BPR pursues improvements in quality, speed, service and cost by using information technology.

BPR means not just change but dramatic change and dramatic improvements. This is achieved by organizational structures, management systems, job descriptions, performance measurements, skill development, training and most important the use of information technology.

BPR impacts every aspect of how the organization runs its business. Change on this scale can cause results ranging from enviable success to complete breakdown and failure.

A successful BPR can result in dramatic performance improvements, increases in profits, better business practices, enormous cost reductions, dramatic improvements in productivity and so on.

It can also create substantial improvements in quality, customer service, employee satisfaction, profitability and other business goals.

Business Process Reengineering (BPR) is the analysis and redesign of workflow within and between enterprises. BPR has the ability to produce dramatic improvements. It involves the radical redesign of core business processes to achieve dramatic improvement in productivity, cycle times and quality.

In BPR, companies start with a blank sheet of paper and rethink existing processes to deliver more value to the customer. They typically adopt a new value system that places increased emphasis on customer needs. Companies reduce organizational layers and eliminate unproductive activities in two key areas. First, they redesign functional organizations into cross-functional teams.

Second, they use technology to improve data dissemination and decision making.

BPR aimed to help organizations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs and become world class competitors. BPR seeks to help companies radically restructure their organizations by focusing on the ground-up design of their business processes.

Four major areas can be identified as being subjected to change in BPR organization technology, strategy and people where a process view is used as common framework for considering these dimensions. Business strategy is the primary driver of BPR initiatives and the other dimensions are governed by strategy's encompassing role. The organization dimensions reflect the structural elements of the company, such as hierarchical levels, the composition of organizational units and the distribution of work between them. Technology is concerned with the use of computer systems and

other forms of communication technology in the business. In BPR, information technology is generally considered as playing a role as enabler of new forms of organizing and collaborating, rather than supporting existing business functions. The people/human resources dimension deals with aspects such as education, training, motivation and reward systems. The concept of business processes interrelated activities aiming at creating a value added output to a customer is the basic underlying idea of a BPR. The processes are characterized by a number of attributes: process ownership, customer focus, value adding and cross-functionality.

2. Management Information System (MIS)

Information is the basis for every decision taken in an organization. The efficiency of management depends upon the availability of regular and relevant information. Thus, it is essential that an effective and efficient reporting system be developed as part of accounting system. The main object of management information is to obtain the required about the operating results of an organization regularly in order to use them for future planning and control.

The old techniques are now considered useless in the process of decision taking. Modern management is constantly on look out for such quantitative and such information, which can help in analyzing the proposed alternative actions and choosing one as its decision. Thus, modern management functions are information-oriented more popularly known as, "management by information". And the system through which information is communicated to the management is known as, "Management Information System (MIS)". The management needs full information before taking any decision. Good decisions can minimize costs and optimize results. Management information system can be helpful to the management in under taking management decision smoothly and effectively.

In early business, computers were used for simple operations such as tracking inventory, billing, sales or payroll data, with little detail or structure. Over time, these computer applications became more complex, hardware storage capacities grew, and technologies improved for connecting previously isolated applications. As more and more data was stored and linked, managers sought greater detail as well as greater abstraction with the aim of creating entire management reports from the raw, stored data. The term 'MIS' arose to describe such applications providing managers with information about sales, inventories and other data that would help in managing the enterprise.

Today the term is used broadly in a number of contexts and includes: decision support systems resource and people management applications, Enterprise Resource Planning (ERP), Enterprise Performance Management (EPM), Supply Chain Management (SCM), Customer Relationship Management (CRM), Project management and database retrieval applications.

Management Information System can be analyzed by

Management: Management covers the planning control and administration of the operations of a concern. The top management handles planning, the middle management concentrates on controlling and the lower management is concerned with actual administration.

Information: Information in MIS, means the processed data that helps the management in planning, controlling and operations. Data means all the facts arising out of the operations of the concern. Data is processed, i.e., recorded, summarized, compared and finally presented to the management in the form of MIS report.

System: Data is processed into information with the help of a system, a system is made up of inputs, processing, output and feedback or control.

Thus, MIS means a system for processing data in order to give proper information to the management for performing its functions.

A Management Information System (MIS) provides information that is needed to manage organizations efficiently and effectively. MIS encompass **three primary components**: Technology, people (individuals, groups or organizations) and data/information for decision making.

MIS are designed to be used to analyze and facilitate strategic and operational activities in the organization.

Academically the term MIS is used to the study of how individuals, groups and organizations evaluate, design, implement, manage and utilize systems to generate information to improve efficiency and effectiveness of decision making, including systems as Decision Support Systems (DSS), Expert System (ES), and Executive Information System (EIS).

An MIS includes a group of information management methods related to the automation or support of decision making. Some common examples of MIS output are reports on sales, stock inventory, payroll, orders and budgets. A range of different types of reports are generated by an MIS including scheduled reports, forecasting reports, on-demand reports and exception reports.

MIS produces fixed, regularly scheduled reports based on data extracted and summarized from the firms underlying transaction processing systems to middle and operational level managers to identify and inform structured and semi-structured decision problems.

MIS is any system that provides people with either data or information relating to an organization's operation. It supports the activities of organizational people by processing data to assist with transaction workload (in an effective manner), supplying information to authorized people in a timely manner. It also supports a business's long range plans, providing reports based upon performance analysis in areas critical to those plans, with feedback loops, including recruitment and training regimens. MIS not only indicates how things are going, but also why and where performance is failing to meet the plan. These reports include near-real-time performance of cost centers and projects with detail sufficient for individual accountability.

▶Advantages of Management Information System

These are some of the benefits that can be attained for different types of management information systems.

i. Companies are able to highlight their strengths and weaknesses due to the presence of revenue reports, employee's performance record, etc. The identification of these aspects can help the company to improve their business processes and operations.

ii. Giving an overall picture of the company and acting as a communication and planning tool.

iii. The availability of the customer data and feedback can help the company to align their business processes according to the needs of the customers. The effective management of customer data can help the company to perform direct marketing and promotion activities.

iv. Information is considered to be an important asset for any company in the modern competitive world. The consumer buying trends and behaviour can be predicted by the analysis of sales and revenue reports from each operating region of the company.

v. Improve efficiency and effectiveness of decision making.

vi. Supports business for long range plans, providing reports based upon performance analysis in areas critical to those plans, with feedback loops, including recruitment and training.

vii. It includes near-real-time performance of cost centers and projects with detail sufficient for individual accountability.

3. Decision Support System (DSS)

A Decision Support System (DSS) is a computer based information system that supports business or organizational decision-making activities. DSSs serve the management, operations and planning levels of an organization and help to make decisions, which may be rapidly changing and not easily specified in advance. Decision support systems can be either fully computerized, human or a combination of both.

A DSS can be any system that supports decision-making. We can say that a DSS is a system for helping people makes decisions using a computer. A DSS is a computerized system that assists in corporate decision making, with a decision being a choice between alternatives based on the estimated values of those alternatives. Supporting a decision means to assist people working alone, or in a group to gather intelligence, generate alternative and make choices.

Generally, decision support systems are interactive, flexible and adaptable information systems, developed to support the solution of non-structured management problems for improved decision

making. *For example*, In medical decision making, it often involves making a diagnosis and selecting an appropriate treatment.

DSS even extends into the Justice system and is therefore mistakes simply cannot be made.

Decision support systems often use business intelligence and data mining technology to provide aggregations of timely data as well as additional valuable insight. Data mining and predictive analytics often provide helpful, information for decision support.

Typical information that a decision support application might gather and present includes:

i. Inventories of information (including legacy and relational data sources, cubes, data warehouses and data marts).
ii. Comparative sales figures between one period and the next.
iii. Project revenue figures based on product sales assumptions.

▶DSS Characteristics and Capabilities

i. Supports decision makers in semi structured and unstructured problems.
ii. Supports mangers at all levels.
iii. Supports individuals and groups.
iv. Supports interdependent or sequential decisions.
v. Supports intelligence, design, choice and implementation.
vi. Supports a verify of decision process and styles.
vii. Should be adaptable and flexible.
viii. Should be interactive and easy to use.
ix. Benefits exceed cost.
x. Complete control by decision-makers.
xi. Easy modification to suit needs and changing environment.

DSS includes knowledge-based systems. A properly designed DSS is an interactive software based system intended to help decision makers compile useful information from a combination of raw data, documents and personal knowledge, or business models to identify and solve problem and make decisions.

▶DSS Components may be classified As

i. Inputs: Factors, numbers and characteristics to analyze.
ii. User knowledge and expertise: Inputs requiring manual analysis by the user.
iii. Outputs: Transformed data from which DSS "decisions" are generated.
iv. Decisions: Results generated by the DSS based on user criteria.

DSSs which perform selected cognitive decision-making functions and are based on artificial intelligence or intelligent agents technologies are called, 'Intelligent Decision Support System' (IDSS).

One example is the clinical decision support system for medical diagnosis. Other example include a bank loan officer verifying the credit of a loan applicant or an engineering firm that has bids on several projects and wants to know if they can be competitive with their costs.

DSS is extensively used in business and management. Executive dashboard and other business performance software allow faster decision making, identification of negative trends and better allocation of business resources. Due to DSS all the information from any organization is represented in the form of charts, graphs, i.e., in a summarized way, which helps the management to take strategic decision.

3.1 Benefits of DSS

i. Improves personal efficiency.

ii. Speeds up the process of decision making.

iii. Increases organizational control.

iv. Encourages exploration and discovery on the part of the decision maker.

v. Speeds up problem solving in an organization.

vi. Facilitates interpersonal communication.

vii. Promotes learning or training.

viii. Generates new evidence in support of a decision.

ix. Creates a competitive advantage over competition.

x. Reveals new approaches to thinking about the problem space.

xi. Helps automate managerial processes.

4. Executive Support System (ESS)

An executive support system is a class of information systems that supports business and organizational decision-making activities. It is an interactive software-based system made to help decision makers, compile useful information from a combination of raw data to identify and solve problems and make decisions.

Executive Support System (ESS) is a reporting tool (software) that allows you to turn your organization's data into useful summarized reports. These reports are generally used by executive level managers for quick access to reports coming from all company levels and departments such as billing, cost accounting, staffing, scheduling and more.

In addition to providing quick access to organized data from departments, some ESS tools also provide analysis tools that predict a series of performance outcomes over time using the input data. This type of ESS is useful to executive as it provide possible outcomes and quick reference to statistics and numbers needed for decision-making.

ESS supplies the necessary tools to senior management. The problems and situations senior executives face are very fluid, always changing, so the system must be flexible and easy to manipulate.

4.1 The Role of ESS in the Organization

Executives often face information overload and must be able to separate it in order to make the right decision. On the other hand, if the information they have, is not detailed enough, they may not be able to make the best decision. An ESS can supply the summarized information that the executives need and yet provide the opportunity to drill down to more detail if necessary.

As technology advances, ESS are able to link data from various sources both internal and external to provide the amount and kind of information executives find result. As common software programs include more options and executives gain experience using these programs they are turning to them as an easy way to manipulate information. Many executives are also turning to the web to provide the flexibility they need.

As more executives come up through the ranks, they are more familiar with and rely more on technology to assist them with their jobs. ESS don't provide executives with readymade decisions. They provide the information that helps them make their decisions. Executives use that information, along with their experience, knowledge, education and understanding of the corporation and the business environment as a whole, to make their decision.

Executives are more inclined to want summarized data rather than detailed data (even through the details must be available).

ESS rely on graphic presentation of information because it is a much quicker way for busy executives to grasp summarized information.

ESS meet the needs of corporate executives by providing them with vast amounts of information quickly and in graphical form to help them make effective, decisions.

ESS must be flexible, easy to use, and contain both internal and external sources of information. ESS focuses more in the end-user requirements of maximum interactivity and user-friendliness. An

ESS can be understood as a friendly, fully customized and interactive DSS to be mostly used by top executives and policy-makers to get permanent and updated assessment in relation to key questions (information and knowledge).

ESS focuses only on interactive and executive assessment tools, those which can be used personally by end-users. An ESS requires a previous expert work filtering information and knowledge into meaningful indicators and tools.

As ESS's definition, its design and implementation must integrate future users as much as feasible, since an ESS represents both a challenge and an opportunity to improve their working processes. An ESS will induce organizational changes which can not be successful in complex institutions unless they are clearly perceived and desired since the beginning.

▶ Advantages

i. Filters data for management.

ii. Improves to tracking information.

iii. Offers efficiency to decision makers.

▶ Disadvantages

i. Difficult to keep current data.

ii. May lead to less reliable and increase data.

iii. Small companies may encounter executive costs for implementation.

iv. Too detailed oriented.

5. Data Warehouse

Data warehouse is a collection of data designed to support management decision making. Data warehouse contains a wide variety of data that presents a 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.

The primary goals of a data warehouse are the following:

i. Provide access to the data of an organization.

ii. Data consistency.

iii. Capacity to separate and combine data.

iv. Inclusion of tools setup to query, analyze and present information.

v. Publish used data.

vi. Drive business reengineering.

The collection of data used by a data warehouses may be characterized as- subject-oriented, integrated, non-volatile and time variant.

In computing, a data warehouse (DW or DWH) is a database used for reporting and data analysis. The data stored in the warehouse are uploaded from the operational systems (such as marketing, sales, etc). The data may pass through an operational data store for additional operations before they are used in the dataware for reporting.

Data warehouse focuses on data storage. To retrieve and analyze data, to extract, transform and load data, and to manage the data dictionary are also considered essential components of a data warehousing system.

A data warehouse is a relational database that is designed for query and analysis rather than for transaction processing. It usually contains historical data derived from transaction data, but it can include data from other sources. It separate analysis workload from transaction workload and enables an organization to consolidate data from several sources. In addition to a relational database, a data warehouse environment includes an Extraction, Transportation, Transformation and Loading (ETL) solution, an Online Analytical Processing (OLAP) engine, client analysis tools, and other applications that manage the process of gathering data and delivering it to business users.

5.1 Data in the Data Warehouse

The collection of data used by a data warehouse may be characterized as subject-oriented, integrated, non-volatile and time variant.

i. **Subject–Oriented:** Data warehouses are designed to help you analyze data. The data warehouse is oriented towards those major subject areas of the organization, which have been defined in the data model. *For example*, to learn more about your company's sales data, you can build a warehouse that concentrates on sales. Using this warehouse, you can answer questions like, "who was our best customer for this item last year?" This ability to define a data warehouse by subject matter, sales in this case, makes the data warehouse subject-oriented.

The data in the data warehouse is organized so that all the data elements relating to the same real-world event or object are linked together.

ii. **Integrated:** The data warehouse can receive data from a number of sources. Each of these sources had an application designer (s), each freely encoding, naming conventions, physical attributes and measurement of attributes. The filtering and translation necessary to transform the many sources into one consistent database is known as, "integration".

Integration is closely related to subject orientation. Data warehouses must put data from disparate sources into a consistent format. They may resolve such problems as naming conflicts and inconsistencies among units of measure. When they achieve this, they are said to be integrated.

The data warehouse contains data from most or all of organizations operational systems and these data are made consistent.

iii. **Non-Volatile:** Non-volatile means, once data entered into the warehouses, it should not change. This is logical because the purpose of a warehouse is to enable you to analyze what was occurred. Data in the data warehouse are never over-written or deleted-once committed, the data are static, read-only and retained for future reporting. Data is loaded and accessed, but not changed.

iv. **Time Variant:** In order to discover trends in business, analysts need large amounts of data. This is very much in contrast to online transaction processing (OLTP) systems, where performance requirements demand that historical data be moved to an archieve. A data warehouse's focus on change over time is what is meant by the term time variant.

For an operational system, the stored data contains the current value.

▶ Benefits of a Data Warehouse

A data warehouse maintains a copy of information from the source transaction system. This architectural complexity provides the opportunity to:

i. Maintain data history, even if the source transaction system do not.

ii. Integrate data from multiple source systems, enabling a central view across the enterprise. This benefit is always valuable, but particularly so when the organization has grown by merger.

iii. Improve data quality, by providing consistent codes and descriptions, flagging or even fixing bad data.

iv. Present the organizations information consistently.

v. Provide a single common data model for all data of interest regardless of the data's source.

vi. Restructure the data so that it makes sense to the business users.

vii. Restructure the data so that it delivers excellent query performance, even for complex analytic queries, without impacting the operational systems.

viii. Add value to operational business applications, notably Customer Relationship Management (CRM) systems.

▶ Advantages of a Data Warehouse

Implementing a data warehouse provides significant benefits many tangible, some intangible.

The benefits include the following:

i. **More cost effective decision-making:** A data warehouse allows reduction of staff and computer resources required to support queries and reports against operational and production databases. This typically offers significant saving. It also eliminates the resource drain on production systems when executing long running, complex queries and reports.

ii. **Better enterprise intelligence:** Guaranteed data accuracy and reliability result from ensuring that a data warehouse contains only 'trusted' data.

iii. **Enhanced customer service:** An enterprise can maintain better customer relationships by correlating all customer data via a single, data warehouse architecture.

iv. **Business reengineering:** By allowing unlimited analysis of an enterprise and knowing what information is important to an enterprise, it will provide direction and priority for reengineering efforts.

v. **Information system reengineering:** Data warehouses can be subdivided into data marts. Data marts store subsets of data from a warehouse. Data marts contain primarily dimensions and facts. Facts can contain either atomic data and if necessary, summarized data. The single data mart often models a specific business area such as "sales" or "production". These data marts can eventually be integrated to create a comprehensive data warehouse.

▶Use of a Data Warehouse

Uses of a data warehouse are as shown in following:

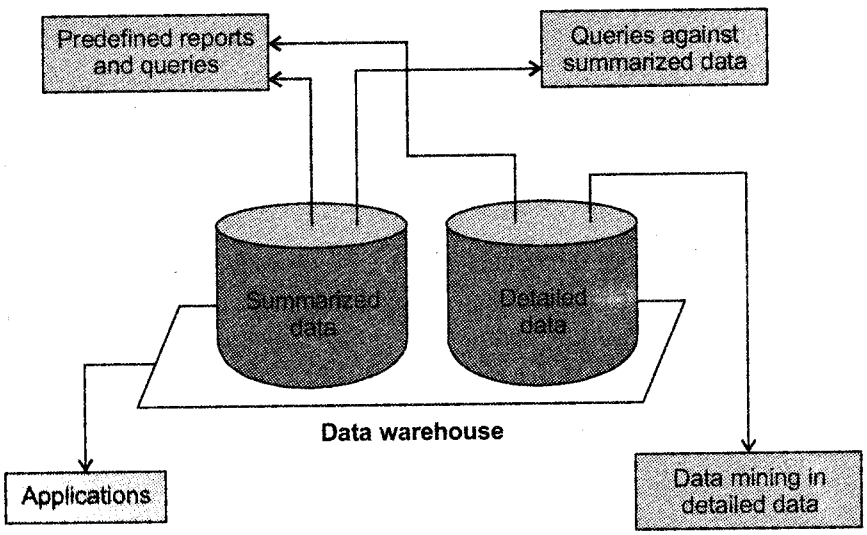


Figure 2.1

i. **Standard reports and queries:** Many users of the data warehouse need to access a set of standard reports and queries. It is desirable to periodically, automatically produce a set of standard reports that are required by many different users. When these users need a particular report, they can just view the report that has already run by the data warehouse system rather, than running it themselves. This facility can be particularly useful for reports that take a long time to run.

ii. **Queries against summarized data:** The summary views in the data warehouse can be the object of a large majority of analysis in a data warehouse. Simple filtering and summation from the summary views account for most of the analysis activity against many data warehouses. These summary views contain predefined standard business analysis.

iii. **Data mining:** The reports and queries of the summary tables are adequate to answer many "what" questions in the business. The drill-down into the detail data provides answer to "why" and "how" questions. Data mining is an evolving science. A data mining user starts with summary data and drills down into the detail data looking for arguments to prove or disprove a hypothesis. The tools for data mining are evolving rapidly to satisfy the need to understand the behavior of business units such as customers and products.

iv. **Interface with other data warehouse:** The data warehouse system is likely to be interfaced with other applications that use it as the source of operational system data. It may feed data to other data warehouse or smaller data warehouses called, 'data marts'. Data warehouse can be a better single and consistent source for data instead of the operational systems.

6. Data Mining

Data mining or knowledge discovery is the extraction of hidden predictive information from large databases. Data mining tools predict behavior and future trends, allowing business to make proactive, knowledge-driven decisions. Data mining tools can answer business questions that traditionally were too time consuming to resolve. They scour (search) databases for hidden patterns, finding predictive information that experts may miss because it lies outside their expectations.

6.1 The Evolution of Data Mining

Data mining is a natural development of the increased use of computerized database to store data and provide answers to business analyst. In the evolution from business data to business information, each new step has built open the previous one as shown below:

Evolution step	Business question	Enabling technology
Data collection (1960s)	"What was my total revenue in the last five years?"	Computer, tapes, disks
Data access (1980s)	"What were unit sales in Maharashtra" last march?	RDBMS, SQL, ODBC
Data warehousing and decision support (1990s)	"What were unit sales in Maharashtra last march?" Drill down to Mumbai?	OLAP (Online Analytical Processing), multidimensional databases, data warehouses.
Data mining	"What is likely to happen to southern region unit sales next month? Why?"	Advanced computer algorithms, multiprocessor computers, massive databases, etc.

"Data mining" or "Knowledge Discovery in Databases" process or "KDD" is a field at the intersection of computer science and statistics, is the process that attempts to discover patterns in large data sets.

The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use. The actual data mining task is the automatic or semi-automatic analysis of large quantities of data extract previously unknown interesting patterns such as groups of data records (cluster analysis) unusual records (anomaly detection) and dependencies (association rule mining).

▶How Data Mining Works?

How is data mining able to tell you important things that you didn't know or what is going to happen next? The technique that is used to perform these feats is called, "modeling". Data mining uses a different model for the creation of information about data. We call this the "discovery model". Modeling is simply the act of building a model (a set of examples or a mathematical relationship) based on data from situations where the answer is known and then applying the model to other situations where the answer are not known.

E.g., build a model which considers the director of marketing for a telecommunications company. He would like to focus his marketing and sales efforts on segments of the population most likely to become big users of long distance services or calls. From the existing database of customers, which contain information such as age, sex, credit, history, income, zip code, occupation etc, they can use data mining tools, such as neural networks, to identify the characteristics of those customers who make lots of long distance calls. For instance, they know, their best customers are unmarried females and males between the age of 20 and 30. Then the model for high value customers and they would budget their marketing efforts to accordingly.

While large-scale information technology has been evolving separate transaction and analytical systems, data mining provides the link between the two. Data mining software analyzes relationships and patterns in stored transaction data based on open-ended user queries.

Several types of analytical software are available: statistical, machine learning and neural networks. Generally, any of four types of relationships are sought:

i. **Classes:** Stored data is used to locate data in predetermined groups. e.g., A restaurant chain could mine customer purchase data to determine when customers visit and what they typically order. This information could be used to increase traffic by having daily specials.

ii. **Clusters:** Data items are grouped according to logical relationships or consumer preferences. e.g., data can be mined to identify market segments or consumer affinities.

iii. **Associates:** Data can be mined to identify associations. e.g., shampoo-conditioner is an example of associative mining, shoes socks is also the example.

iv. **Sequential patterns:** Data is mined to anticipate behavior patterns and trends.

Data mining consists of five major elements:

i. Extract, transform and load transaction data onto the data warehouse system.

ii. Store and manage the data in a multidimensional database system.

iii. Provide data access to business analysts and information technology professionals.

iv. Analyze the data by application software.

v. Present the data in a useful format, such as a graph or table.

▶ Technologies used in Data Mining/Data Mining Techniques/Tools/Levels of Data Mining

Some tools/techniques that are used in data mining are:

i. **Artificial neural networks:** Non-linear predictive models that learn through training and resemble biological neural networks in structure.

ii. **Genetic algorithms:** Optimization techniques that use process such as genetic combination, mutation and natural selection in a design based on the concepts of natural evolution.

iii. **Decision trees:** Tree shaped structures that represent sets of decisions. These decisions generate rules for the classification of a dataset.

iv. **Nearest neighbor method:** (Case-Base Reasoning (CBR)): A technique that classifies each record in a dataset based on a combination of the classes of k record (s) most similar to it in a historical dataset (where K-1). Sometimes, called 'k-nearest neighbor technique'.

In CBR, to forecast a future situation, find the closest past and choose the solution that was right one in those past situations.

v. **Rule induction:** The extraction of useful if-then rules from data based on statistical significance.

vi. **Data visualization:** The visual interpretation of complex relationships in multidimensional data. Graphics tools are used to illustrate data relationships.

6.2 Task Solved by Data Mining

i. **Predicting:** A task of learning a pattern from examples and using the developed model to predict future values of the target variable.

ii. **Classification:** A task of finding a function that maps an example into one of several discrete classes.

iii. **Detection of relations:** A task of searching for the most influential independent variables for a selected target variable.

iv. **Explicit modeling:** A task of finding explicit formulae describing dependencies between various variables.

v. **Clustering:** A task of identifying a finite set of categories or clusters that describe data.

vi. **Deviation detection:** A task of determining the most significant changes in some key measures of data from previous or expected values.

▶ Advantages of Data Mining/Uses of Data Mining/What can Data Mining do?

Data mining helps analysts to recognize significant facts, relationships, trends, patterns, exceptions and anomalies that might otherwise go unnoticed. For business, data mining is used to discover patterns and relationships in the data in order to help make better business decisions. Data mining can help spot sales trends, develop smarter marketing campaigns and accurately predict customer loyalty, specific uses of data mining include:

i. **Market segmentation:** Identify the common characteristics of customers who buy the same products from your company.

ii. **Customer churn:** Predict which customers are likely to leave your company and go to a competitor.

iii. **Fraud detection:** Identify which transactions are most likely to be fraudulent.

iv. **Direct marketing:** Identify which prospectus should be included in a mailing list to obtain the highest response rate.

v. **Interactive marketing:** Predict what each individual accessing a website is most likely interested in seeing.

vi. **Market basket analysis:** Understand what products or services are commonly purchased together. e.g., shampoo-hair conditioner.

vii. **Trend analysis:** Reveal the difference between a typical customer this month and last.

Data mining technology can generate new business opportunities by

i. **Automated prediction of trends and behaviours:** Data mining automates the process of finding predictive information in a large database. Questions that traditionally require extensive analysis can now be directly answered from the data. It uses data on past promotional mailings to identify the targets most likely to maximize return on investment in future mailings.

ii. **Automated discovery of previously unknown patterns:** Data mining tools sweep through databases and identify previously hidden patterns. e.g., The analysis of retail sales data to identify seemingly unrelated products that are often purchased together.

iii. Using massively parallel computers companies dig through volumes of data to discover patterns about their customers and products. e.g., A grocery chains have found that when women go to a supermarket to buy shampoo, they sometimes walk out with a hair-conditioner as well. Using this information, it is possible to layout a store so that these items are closer.

iv. **Databases can be larger in both depth and breadth:** The databases can have more columns and rows. Usually, analysts must often limit the number of variables they examine when doing analysis due to time constraints. The data mining databases contains larger samples (more rows) when data mining tools are implemented on high-performance parallel processing systems, they can analyze massive databases in minutes. Faster processing means that users can automatically experiment with more models to understand complex data. The high-speed makes it practical for users to analyze huge quantities of data and large databases yield improved predictions.

7. On-Line Analytical Processing (OLAP)

The term Online Analytical Processing (OLAP) was introduced by *E.F.Codd* in 1993 to refer to a type of application that allows a user in interactively analyze data. An OLAP system is often contrasted to an Online Transaction Processing (OLTP) system that focuses on processing transaction such as orders, invoices or general ledger transactions.

OLAP can be defined as, 'the process of converting raw data into business information through multi-dimensional analysis'. This enables analysts to identify business strengths and weaknesses, business trends and the underlying causes of these trends. It provides an insight into the business through the interactive analysis of different views of business information that have been built up from raw operating data which reflect the business users understanding of the business.

"Online Analytical Processing (OLAP) is a method of analyzing data in a multidimensional format, often across multiple time periods, with the aim of uncovering the business information concealed within the data." OLAP enables business users to gain an insight into the business through interactive analysis of different views of the business data that have been built up from the operational systems. This approach facilitates a more initiative and meaningful analysis of business information and assists in identifying important business trends.

It describes a class of applications that require multi-dimensional analysis of business data. OLAP systems enable managers and analysts to rapidly and easily examine key performance data and perform powerful comparison and trend analyses, even on very large data volumes. They 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 is often confused with data warehousing. It is not a data warehousing, but it is an integral part of data warehousing solution. OLAP comes in many different shades, depending upon the underlying database structure and the location of the majority of the analytical processing. Thus, the term OLAP has different meanings depending upon the specific combination of these variable.

OLAP provides the facility to analyze the data held within the data warehouse in a flexible manner. It is an integral component of a successful data warehouse solution, it is not in itself a data warehousing methodology or system. However, the term OLAP has different meanings for different people, as there are many variants of OLAP.

The OLAP approach enables a more intuitive interactive analysis of business information. It allows business users to understand the current business position and the factors contributing to that position, through detailed analysis of the underlying information. It also helps business users to identify important business trends and opportunities through the analysis of historical data and future projections in various "what-if" scenarios.

Online analytical processing or OLAP is an approach to swiftly answer Multi-Dimensional analytical (MDA) queries. The term OLAP was created as a slight modification of the traditional database term OLTP (Online Transaction Processing). OLAP 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 database facilitate business-intelligence queries. OLAP is a database technology that has been optimized for querying and reporting, instead of processing transactions. The source of OLAP is OLTP databases that are commonly stored in data warehouses. OLAP data is derived from this historical data and aggregated into structures that permit sophisticated analysis. OLAP data is organized hierarchically and stored in cubes instead of tables. It is a sophisticated technology that uses multidimensional structures to provide rapid access to data for analysis. It makes it easy to display high-level summarizes, such as sales totals across an entire country or region, and also display the details for sites where sales are particularly strong or weak. OLAP databases are designed to speed up the retrieval of data.

OLAP is a function of business intelligence software that enables a user to easily and selectively extract and view data from different points of view. Designed for managers looking to make sense of their information, OLAP tools structure data hierarchically- the way managers think of their enterprises, but also allows business analysts to rotate that data, changing the relationships to get more detailed insight into corporate information.

OLAP can be used for data mining or the discovery of previously undiscerned relationships between data items. An OLAP database does not need to be as large as a data warehouse, since not all transactional data is needed for trend analysis. Using Open Database Connectivity (ODBC), data can be imported from existing relational databases to create a multidimensional database for OLAP.

7.1 Basic Analytical Operations of OLAP

OLAP tools enable users to interactively analyze multidimensional data from multiple perspectives. OLAP consists of three basic analytical operations- consolidation (roll-up), drill-down and slicing and dicing.

i. **Consolidation:** It involves the aggregation of data that can be accumulated and computed in one or more dimensions. These can be simple roll-ups or complex expressions involving inter-related data *for example*, sales offices can be rolled up to districts and districts rolled-up to regions.

ii. **Drill-down:** Drill-down is a technique that allows users to navigate through the details. OLAP data servers can also go in the reverse direction and display detailed data which comprises consolidated data, which is called, "drill-down". For instance, user can view the sales by individual products that make up a region's sales.

iii. **Slicing and dicing:** Slicing and dicing refers to the ability to look at the database from different viewpoints. One slice of the sales database might show all sales of product type within regions. Another slice might show all sales by sales channel within each product type. Slicing and dicing is often performed along the time axis in order to analyze trends and find patterns.

Slicing and dicing is a feature where by users can take out (slicing) a specific set of data of the OLAP cube and view (dicing) the slices from different viewpoints.

Powerful integrated OLAP tools allow users to quickly slice and dice data to conduct in depth analysis.

Databases configured for OLAP use a multidimensional data model, allowing for complex analytical and ad-hoc queries with a rapid execution time. They borrow aspects of navigational databases, hierarchical databases and relational databases.

7.2 Types/Different Styles of OLAP

The four major alternatives for implementing OLAP applications are:

i. Multidimensional OLAP (MOLAP)

ii. Hybrid OLAP (HOLAP)

iii. Desktop OLAP (DOLAP)

iv. Relational OLAP (ROLAP)

All four OLAP styles should implement all the data security requirements for confidentiality, possibly down to individual data item level. This is a major area of weakness in many current OLAP products, which implement only basic security models. Each of the four OLAP alternatives has its related strengths and weaknesses.

i. **Multi-dimensional OLAP (MOLAP):** Multi-dimensional OLAP (MOLAP) is based on a multi-dimensional database architecture. This stores data in a three dimensional data cube. It stores data in optimized multi-dimensional array storage, rather than in a relational database. Therefore, it requires the pre-computation and storage of information in the cube-the operation known as, 'processing'. It provides performance benefits where the data retrieval paths follow the pre-defined structure of the data cubes.

MOLAP is suitable for applications requiring only pre-defined analysis on multiple dimensions (e.g., sales by customer type by geographic area over time). The MOLAP is not suitable for ad-hoc analysis, (for e.g., when attempting to discover why customers are being lost to competitors).

ii. **Hybrid OLAP (HOLAP):** Hybrid OLAP (HOLAP) integrates specialized multi-dimensional data storage with relational database management technology. This allows business to link multi-dimensional data to the underlying source data in a relational database. HOLAP database will divide data between relational and specialized storage e.g., for some vendors, a HOLAP database will use relational tables to hold the larger quantities of detailed data and use specialized storage for at least some aspects of the smaller quantities of more aggregate or less-detailed data.

HOLAP products seem to combine the better points of both multi-dimensional and relational databases.

HOLAP is best suited to applications that require heavy analysis, must provide predictable response times to resource intensive queries, will have a small number of concurrent users (i.e., fewer than 20), etc. HOLAP is not suitable for ad-hoc analysis. e.g., when attempting to discover why customers are being lost to competitors.

iii. **Desktop OLAP (DOLAP):** Desktop OLAP (DOLAP) allows users to perform limited analysis, directly against data held within a relational database, while avoiding many of the problems that affect the hybrid and relational OLAP styles.

The desktop OLAP is suitable for an enterprise that wants to provide pre-defined analysis capabilities to business users without incurring the higher purchase and maintenance cost of more functional products. Thus, type of HOLAP is not suitable where there is a requirement for flexible analysis or where users require access to a common view of the business data.

iv. **Relational OLAP (ROLAP):** Relational OLAP (ROLAP) is the fastest growing area of OLAP technology, with new vendors entering the market at an accelerating pace. ROLAP

products are designed to operate directly on a data warehouse built on relational databases, through a comprehensive metadata layer. This eliminates any need to create static multi-dimensional data cubes.

ROLAP is suitable for situations where users require unrestricted analysis of a large volume of data, different business areas require different multi-dimensional views over the same source data, where there is a requirement to drill-down to a low level of detail without impacting on the operational system, etc. ROLAP is not suitable where data storage is a limiting factor due to the data redundancy.

▶ Uses of OLAP

i. In finance department, OLAP is used for budgeting, activity based costing (allocations), financial performance analysis and financial modeling.

ii. In sales department, OLAP is used for sales analysis and forecasting.

iii. In marketing department, OLAP is used for market research analysis, sales forecasting, promotion analysis customer analysis and market/customer segmentation.

iv. OLAP is used in production planning and defect analysis.

v. Just-in-time information: OLAP has the ability to provide managers with the information they need to make effective decisions about an organizations strategic directions. OLAP has the ability to provide information as needed, i.e., its ability to provide 'just-in-time' information for effective decision-making.

vi. A truly flexible data model ensures that OLAP systems can respond to changing business requirements as needed for effective decision making.

vii. 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.

viii. OLAP transforms raw data so that it reflects the real dimensionality of the enterprise as understood by the user.

ix. OLAP enables decision-making about future actions.

x. OLAP plays the role of a mediator to the various types of data sources and front-end interfaces, as shown in following figure.

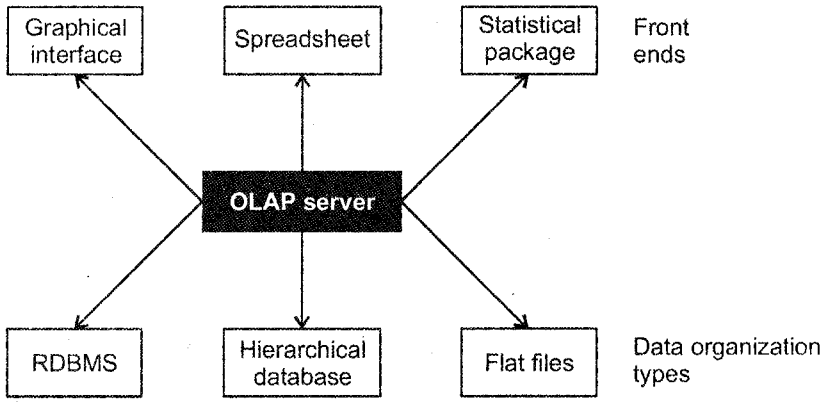


Figure 2.2: Mediating role of OLAP server

An OLAP server provides with respect to the various types of databases and files in which data may be stored and the numerous types of front-end packages that the end-users may need.

xi. OLAP enables analysts to identify business strengths and weaknesses, business trends and the underlying causes of these trends.

▶ Benefits of OLAP

i. Increases the productivity of business managers, developers and whole organizations.

ii. Business users of OLAP applications can become more self-sufficient, due to the inherent flexibility of OLAP systems.

iii. OLAP enables managers to model problems that would be impossible using less flexible systems with lengthy and inconsistent response time. More controls and timely access to strategic information are equal to more effective decision-making.

iv. Developers can deliver applications to business users faster and providing better service by using software specially designed for OLAP.

Faster delivery of applications also reduces the applications backlog.

v. OLAP applications are dependent on data warehouses and transaction-processing systems to refresh their source level data. As a result, IT gains more self-sufficient users without relinquishing control over the integrity of the data.

vi. Using OLAP, IT reduces the query drag and network traffic on transaction systems or the data warehouse.

vii. By providing the ability to model real business problems and a more efficient use of people resources, OLAP enables the organization as a whole to respond more quickly to market demands. Market responsiveness, often yields improves revenue and profitability.

viii. OLAP analyzing data in a multi-dimensional format, often across multiple time periods, with the aim of uncovering the business information concealed within the data.

ix. OLAP enables business users to gain an insight into the business through interactive analysis of different views of the business data that have been built up from the operational systems.

8. Supply Chain Management (SCM)

Supply Chain Management (SCM) is a systems approach to managing the entire flow of information, materials and services from raw materials suppliers through factories and warehouses to the end customer. A supply chain is a network of supplier, manufacturing, assembly, distribution and logistics facilities that perform the functions of procurement of materials, transformation of these materials into intermediate and finished products and the distribution of these products to customers. Supply chain arises in both manufacturing and service organizations. All ERP companies are now offering supply chain solutions as a major extended feature of their ERP packages.

Supply chain management is a major application area of Internet Technologies and Electronic Commerce (ITEC).

SCM is the management of a network of interconnected business involved in the provision of product and service packages required by the end customers in a supply chain. SCM spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to consumption.

SCM is a combination of art and science that goes into improving the way your company finds the raw components it need to make a product or service and deliver it to customers. It is an active management of supply chain activities to maximize customer value and achieve a sustainable competitive advantage. It represents a conscious effort by the supply chain firms to develop and run supply chains in the most effective and efficient ways possible. Supply chain activities cover everything from product development, sourcing, production and logistics, as well as the information systems needed to coordinate these activities.

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. It involves coordinating and integrating these flows both within and among companies. It is said that the ultimate goal of any effective supply chain management system is to reduce inventory (with the assumption that products are available when needed).

Supply Chain Management (SCM) flows can be divided into three main flows:

i. The product flow

ii. The information flow

iii. The financial flow

The product flow includes the movement of goods from a supplier to a customer, as well as any customer returns or service needs. It involves the transformation, movement and storage of goods and materials. They are the most visible piece of the supply chain.

The information flow involves transmitting orders and updating the status of delivery. It allows the various supply chain partners to coordinate their long-term plans, and to control the day-to-day flows of goods and material up and down the supply chain.

The **financial flow** consists of credit terms, payment schedulers and consignment and title ownership arrangements.

The concept of supply chain management encompasses all activities relating to the supply chain. This includes vendor selection, negotiation, relations and performance. It accommodates the planning, procurement and delivery processes and personnel recruitment and training. It deals with the vendor owned buffer stocks, on-site inventory levels, off-site warehouse management, the efficient use of transportation and the tracking of in-transit items. Other issues include duty, import documentation and foreign currency management. A true supply chain application package will support all these activities.

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. The 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 predicable life cycles.

There are two main types of SCM software planning applications and execution applications.

Planning applications use advanced algorithms to determine the best way to fill an order. Execution applications track the physical status of goods, the management of materials and financial information involving all parties.

Some SCM applications are based on open data models that support the sharing of data both inside and outside the enterprise (this is called the extended enterprise, and includes key suppliers, manufacturers and end customers of a specific company). This shared data may reside in diverse database systems, or data warehouses, at several different sites and companies.

By sharing this data, 'upstream' (with a company suppliers) and 'downstream' (with a company's clients), SCM applications have the potential to improve the time-to-market of products, reduce costs, and allow all parties in the supply chain to better manage current resources and plan for future needs. Increasing number of companies are turning to web sites and web-based applications as part of the SCM solution.

8.1 Basic Components of SCM

The following are five basic components of SCM

i. **Plan:** This is the strategic portion of SCM. Companies need a strategy for managing all the resources that go towards meeting customer demand for their product or service. A big piece of SCM planning is developing a set of metrics to monitor the supply chain so that it is efficient, costs less and delivers high quality and value to customers.

ii. **Source:** Companies must choose suppliers to deliver the goods and services they need to create their product. Therefore, supply chain managers must develop a set of pricing, delivery and payment processes with suppliers and create metrics for monitoring and improving the relationships. And then, SCM managers can put together processes for managing their goods and services inventory, including receiving and verifying shipments, transferring them to the manufacturing facilities and authorizing supplier payments.

iii. **Make:** This is the manufacturing step supply chain managers schedule the activities necessary for production, testing, packaging and preparation for delivery. This is the most metric-intensive portion of the supply chain one where companies are able to measure quality levels, production output and worker productivity.

iv. **Deliver:** This is the part that many SCM insiders refer to as logistics, where companies coordinate the receipt of order from customers, develop a network of warehouses, pick carriers to get products to customers and set up an invoicing system to receive payments.

v. **Return:** This can be problematic part of the supply chain for many companies. Supply chain planners have to create a responsive and flexible network for receiving defective and excess products back from their customers and supporting customers who have problems with delivered products.

▶Advantages of Supply Chain Management (SCM)

Supply chain management enables:

i. Supply chain planning and collaboration.
ii. Supply chain execution.
iii. Supply chain visibility design and analytics.
iv. Business benefits.

i. **Supply chain planning and collaboration:** With SCM, we can model our existing supply chain, set goals, and forecast, optimize and schedule time, materials and other resources. Supply chain planning functionality enables us to maximize return on assets and ensures a profitable match of supply and demand.

ii. **Supply chain execution:** SCM enables us to carry out supply chain planning and generate high efficiency at the lowest possible cost. We can sense and respond to demand through an adaptive supply chain network in which distribution, transportation, and logistics are integrated into real-time planning processes.

iii. **Supply chain visibility design and analytics:** SCM gives us network-wide visibility across our extended supply chain to perform strategic as well as day-to-day planning. The application also enables collaboration and analytics, so we can monitor and analyze the performance of our extended supply chain using pre-defined Key Performance Indicators (KPIs).

iv. **Business benefits:** SCM can help you transform a traditional linear supply chain into an adaptive network with the following benefits.

   a. *Faster response to changes in supply and demand:* With increased visibility into the supply chain and adaptive supply chain networks, we can be more responsive. We can sense and respond quickly to changes and quickly capitalize on new opportunities.

   b. *Increased customer satisfaction:* By offering a common information framework that supports communication and collaboration, SCM enables us to better adapt to and meet customer demands.

   c. *Compliance with regulatory requirements:* We can track and monitor compliance in areas such as environment, health and safety.

   d. *Improved cash flow:* Information transparency and real-time business intelligence can lead to shorter cash to cash cycle times. Reduced inventory levels and increased inventory turns across the network can lower overall costs.

   e. *Higher margins:* With SCM, we can lower operational expenses with timelier planning for procurement, manufacturing and transportation. Better order, product and execution tracking can lead to improvements in performance and quality and lower costs. We can also improve margins through better coordination with business partners.

   f. *Greater synchronization with business priorities:* Tight connections with trading partners keep our supply chain aligned with current business strategic and priorities, improving our organizations overall performance and achievement of goals.

9. Customer Relationship Management (CRM)

CRM stands for Customer Relationship Management. It is a strategy used to learn more about customer's needs and behaviours in order to develop stronger relationships with them. CRM is a process that will help bring together lots of pieces of information about customers, sales, marketing effectiveness, and responsiveness and market trends.

CRM or customer relationship management, is a company-wide business strategy designed to reduce costs and increase profitability by solidifying customer loyalty. True CRM brings together information from all data sources within an organization (and where appropriate, from outside the organization) to give one, holistic view of each customer in real time. This allows customer facing employees in such areas as sales, customer support and marketing to make quick yet informed decisions on everything from cross-selling and up selling opportunities to target marketing strategies to competitive positioning tactics.

Gartner Inc. defines CRM as follows:

"A business strategy, the outcomes of which optimize profitability, revenue and customer satisfaction by organizing around customer segments, fostering customer-satisfying behaviours and implementing customer processes. By definition then CRM technologies enable greater customer insight, increased customer access, more effective interactions and integration throughout all customer channels and back-office enterprise functions."

CRM can be described as the development and implementation of a strategy of handling interactions with past, existing or future customers. It covers all customer oriented activities from potential market identification through to customer loyalty retention. It is technology enabled and involves data capture and analysis information generation and distribution, and customer-oriented activity. CRM has a central database and integrates with an ERP system and different channels of interaction. CRM involves different participants and has the facility to manage these participants. Finally, it distinguishes different emphasis in dealing with the customer, including account management and opportunity exploitation. CRM is about acquiring and retaining customers, improving customer loyalty, gaining customer insight and implementing customer-focused strategies.

CRM helps companies to achieve its objectives. It enhances the company's "front office", focusing on sales, marketing and customer service. However, in order to be truly successful. CRM must be seen as a combination of people, processes and systems rather than a narrowly defined IT application. CRM is one piece of the new wave of ERP that focuses on outward facing processes, typing them together with the inside the enterprise transaction processing engine of the original ERP systems.

There are three key elements to a successful CRM initiative: **people, process and technology.**

The **people throughout** a company from the CEO to each and every customer service representative to need buy into and support CRM. A company's business process must be

reengineered to bolster its CRM initiative, often from the view of how can these processes better serve the customer?

Firms must select the right technology to drive these improved **processes**, provide the best data to the employees, and be easy enough to operate that users won't balk. If one of these three foundations is not sound, the entire CRM structure will crumble (fall down).

As such, CRM is best suited to help businesses use people, processes and **technology** to gain insight into the behavior and value of customers. This insight allows for improved customer service, increased call center efficiency added cross-sell and up sell opportunities, improved close rates, streamlined sales and marketing processes, improved customer profiling and targeting, reduced costs and increased share of customer and overall profitability.

It is a strategy used to learn more about customer's need and behaviours in order to develop stronger relationship with them. After all, good customer relationships are at the heart of business success. CRM is a process that will help bring together lots of pieces of information about customers, sales, marketing effectiveness, and responsiveness and market trends.

CRM is a widely implemented model for managing a company's interaction with customers, clients and sales prospects. It involves using technology to organize, automate and synchronize business processes-principally sales activities but also those for marketing, customer service and technical support. The overall goals are to find, attract, and win new clients, service and retain those the company already has, entice former clients to return, and reduce the cost of marketing and client service. CRM describes a company wide business strategy including customer interface departments as well as other departments. Measuring and valuing customer relationships is critical to implementing this strategy.

▶ Goal of CRM

The idea of CRM is that it helps business 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. Help sales staff close deals faster.
v. Simplify marketing and sales processes.
vi. Discover new customers.
vii. Increase customer revenues.

▶ Functions of CRM

CRM is a corporate level strategy, focusing on creating and maintaining relationships with customers. CRM governs an organization's philosophy at all levels, including policies and processes, front of house customer service, employee training, marketing, systems and information management.

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 customer's sales and services information.

▶ Use of CRM

CRM covers all interaction and business with customers. 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 customer's value and devising appropriate service strategies for each customer.
iii. Providing mechanisms for managing and scheduled follow-up sales calls.
iv. Tracking all contact 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 scheduled maintenance, repair and ongoing support.

▶ Benefits of CRM

i. CRM systems enable companies to communicate with customers on a personal level.

ii. A company performing CRM provides a single corporate face to the customer wherever the customer may encounter the company: through different business units, regional offices or operational organizations within the company. Customers expect integrated, seamless, multichannel customer service that is transparent whether the service is being provided by the company or by a third-party service provider.

iii. CRM enables selling, call centers, e-business and data warehousing/data mining.

iv. Quality and efficiency.

v. Decrease in overall costs.

vi. Increase profitability.

SUMMARY

- There are various technologies used in ERP system to improve the efficiency of the organization and to streamline operations of the organization.
- These various technologies are used to overcome the limitations of the ERP system if we are integrating it with ERP system.
- It is important that the ERP packages should integrate these technologies into their ERP system in order to remain competitive and responsive to customers.
- Some of these technologies are Data Warehousing and Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management (SCM), Customer Relationship Management (CRM), Geographical Information Systems (GIS), Decision Support System(DSS), Management Information System (MIS), Business Process Re-Engineering (BPR) etc.
- **Business Process Re-Engineering(BPR):** BPR is a process of examining current processes and redesigning those processes to increase the efficiency and effectiveness of an organization.
- **Management Information System(MIS)**: MIS is a system for processing data in order to give proper information to the management for performing its functions. It provides information that is needed to manage organizations efficiently and effectively.
- **Decision Support System(DSS)**: DSS is a computer based information system that supports business or organizational decision-making activities. DSSs serve the management, operations and planning levels of an organization and help to make decisions, which may be rapidly changing and not easily specified in advance. Decision support systems can be either fully computerized, human or a combination of both
- **Executive Support System(ESS)**: An ESS is a class of information systems that supports business and organizational decision-making activities. It is an interactive software-based system made to help decision makers, compile useful information from a combination of raw data to identify and solve problems and make decisions.

- **Data Warehousing**: Data warehouse is a collection of data designed to support management decision making. 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. The collection of data used by a data warehouses may be characterized as- subject-oriented, integrated, non-volatile and time variant.
- **Data Mining**: Data mining or knowledge discovery is the extraction of hidden predictive information from large databases. Data mining tools predict behavior and future trends, allowing business to make proactive, knowledge-driven decisions. Data mining tools can answer business questions that traditionally were too time consuming to resolve. They scour (search) databases for hidden patterns, finding predictive information that experts may miss because it lies outside their expectations.
- **On-line Analytical Processing (OLAP)**: OLAP is the process of converting raw data into business information through multi-dimensional analysis. OLAP enables business users to gain an insight into the business through interactive analysis of different views of the business data that have been built up from the operational systems. The four major alternatives for implementing OLAP applications are: Multidimensional OLAP (MOLAP), Hybrid OLAP (HOLAP), Desktop OLAP (DOLAP), Relational OLAP (ROLAP).
- **Supply Chain Management (SCM)**: SCM is a systems approach to managing the entire flow of information, materials and services from raw materials suppliers through factories and warehouses to the end customer. SCM is the management of a network of interconnected business involved in the provision of product and service packages required by the end customers in a supply chain.
- **Customer Relationship Management (CRM)**: CRM is a strategy used to learn more about customer's needs and behaviors in order to develop stronger relationships with them.

EXERCISES

1. What do you mean by business process reengineering?
2. Discuss the evolution of BPR.
3. Explain the term: Management Information System (MIS) in detail.
4. What are the advantages of MIS?
5. Explain Decision Support System (DSS) with its characteristics.
6. What are the benefits of DSS?
7. Explain Executive Support System (ESS).
8. Explain what is the role of ESS in the organization.
9. What are the advantages and disadvantages of ESS?
10. What is data warehousing?

11. Which type of data is in data warehouse? Explain it.
12. What are the benefits of data warehouse?
13. Explain advantages of data warehouse.
14. Explain uses of data warehouse in detail.
15. What is data mining? Explain it with its evolution.
16. How does data mining works?
17. Which technologies are used in data mining?
18. Which tasks are performed by data mining?
19. Explain advantages of data mining.
20. Explain Online Analytical Processing (OLAP) in detail.
21. Which basic analytical operations are performed by OLAP?
22. Explain different types of OLAP.
23. What are the uses of OLAP?
24. Explain benefits of OLAP.
25. Explain the term: Supply Chain Management (SCM)
26. Explain SCM flow.
27. Explain basic components of SCM.
28. What are the advantages of SCM?
29. What do you mean by Customer Relationship Management (CRM).
30. What are the goals of CRM?
31. Explain functions of CRM.
32. State the uses of CRM.
33. Explain the benefits of CRM.

3 ERP Modules and Vendors

1. ERP Modules

All ERP packages contain many modules. The number and features of the modules varies with the ERP package. Each module of ERP software corresponds to a major functional area of an organization. An ERP software is designed to include modules so that it is easy to access a particular option, it is easy to train staff and easy to understand. Generally it includes modules for material purchasing, inventory control, product planning, product distribution, tracking the order, financial ERP module, accounting, marketing, sales and distribution and human resource etc. Organizations implement the modules in ERP that are both economically and technically feasible and profitable.

Interrelation between Different ERP Modules

There are different modules in ERP like Sales and Marketing module, Human Resource module, Finance and Accounting module, Production and Material Management, etc. All these modules are interrelated.

Following *fig. 3.1* shows the interrelation between different ERP modules:

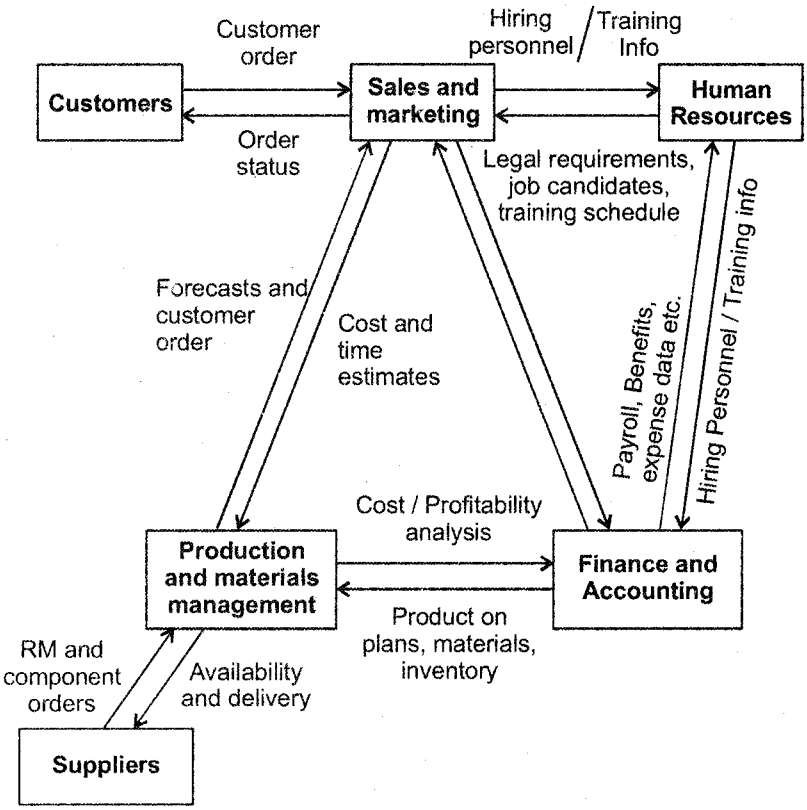


Figure 3.1: Interrelation between different ERP modules

i. **Sales and Marketing Module:** When customer gives an order, it will come in Sales and Marketing module. From this module, the information passes in different modules like Human Resource module, Finance and Accounting module, and Production and Material Management module.

Sales and Marketing module passes data to the Human Resource module about requirement of personnel. It may be about hiring personnel or training information.

This module also gives data to Finance and Accounting module about payment schedule from the customer.

It also gives the data to the Production and Material Management module about time limit and cost estimation regarding customer order.

ii. **Human Resource Module:** Human resource module receives data from sales and marketing module about the requirement of personnel and training. It may be about hiring personnel or training information. According to the sales and marketing data, human resource module pass

information about hiring personnel (if any) and training information to the Finance and Accounting module for budget preparation.

This module also receives data from Finance and Accounting module about payroll benefits and expenses.

According to the received data, it plans for the legal requirements, job candidates and prepare training schedule and pass the details of it to the Sales and Marketing module.

iii. **Finance and Accounting Module:** Finance and accounting module receives data from Human Resource module about hiring personnel (if any) and training information for the budget preparation. By receiving such data, this module prepares budget.

After preparing a budget, the information about payroll and expenses for hiring and training of the personnel provides to the Human Resource module. Then human resource module prepares training schedule and job requirement (if any) to the sales and marketing.

Similar information will be passes to the Production and Material management module regarding budget for material, to prepare production plan as per the payment schedule of customer.

iv. **Production and Material Management Module:** By receiving data from Sales and Marketing module and Finance and Accounting module, this module will manufacture material on order it to suppliers as per the plan. Meanwhile the information will be passes to the sales and marketing module regarding readiness of the material or production or order (i.e., forecasting). After readiness of material, material will be delivered to the material department form supplier.

After receipt of the material, material management module will inform to the finance module regarding the cost for profit analysis.

Same information regarding availability and delivery will be passed to the suppliers also.

2. ERP Module for Finance

The financial activities of the finance department are recorded using various user interfaces and these interface screens related to the finance department are grouped into a single menu option and these set of options are called, "the finance module".

Both types of organizations i.e. Profit organizations and non-profit organizations take benefit from the implementation of ERP financial module. The financial module is the core of many ERP software systems. It can gather financial data from various functional departments and generates valuable financial reports such as balance sheet, general ledger, trial balance and quarterly financial

statements. It performs financial operations of a company. Charts of groups and chart of accounts are defined here. All vouchers related to journal entries, sales, purchase, receipt and payment are recorded. Using finance module, a company can generate balance sheet, general ledger, trial balance, profit and loss statement and daybooks besides many other transactional reports. It is integrated with Sales, Purchase, Inventory, Costing and Equipment Maintenance.

The finance modules of most ERP systems will have the following sub-systems:

i. Financial Accounting (General ledger, Accounts Receivable/Payable, Special ledgers, Fixed asset accounting, Legal consolidation).

ii. Investment Management (Investment Planning/Budgeting/Controlling, Depreciation Forecast/Simulation/Calculation).

iii. Controlling (Overhead Cost Controlling, Activity Based Costing, Product Cost Accounting, and Profitability Analysis).

iv. Treasury (Cash Management, Treasury Management, Market Risk Management, Funds Management)

v. Enterprise Controlling (Executive Information System, Business Planning and Budgeting, Profit Center Accounting).

▶ Features and Highlights

1. Caters to both national and international markets: user-defined formats for number, currency and date.
2. Consolidated reports for any level of the company hierarchy.
3. Drill down reports to reach up to the voucher level.
4. Entering pending voucher details at the time of accounts creation.
5. Definition of subsidiary ledgers.
6. User definable precision for amounts (no. of digits after decimal).
7. Flexibility of Indian/ American number system.
8. Printing of amount in words in any language.
9. Multibranch accounting
10. Allocation of income and expenses to cost centers.
11. Department wise budget allocation for all accounts.
12. Online and batch posting of vouchers by authorized users.
13. Defining narration for vouchers for ease of data entry.

14. Flexible voucher numbering-daily, weekly, monthly, yearly and carry forward.
15. Transaction limit for vouchers.
16. Upto 999 entries per voucher.
17. Transactions in multiple currencies.
18. Conversion rates on selling/buying price.
19. Adjustments of exchange fluctuations.
20. Fiscal year definition.
21. Enterable sales/purchase voucher till sales/purchase modules are live.
22. Recurrent JV (Joint venture) entries.
23. Replication of JV.
24. Receipt/payment voucher
    - i. against invoice/bill
    - ii. on account
    - iii. new reference-against orders
    - iv. advance adjustments
25. Complete TDS functionality.
26. TDS monitoring through integrated inputs from purchase and payments.
27. Debit notes/credit notes
    - i. on account
    - ii. new reference-against order
    - iii. against invoice/bills
    - iv. book closing
    - v. period closing
    - vi. financial year closing
28. All accounts closing
29. Bank and cash closing
30. Transfer without closing-ability to work in two (2) financial years simultaneously.

3. ERP Module for Production Planning, Control and Management

The term production or operations is often used interchangeably with manufacturing, because modern production methods were first developed and applied in manufacturing industries. In the process of evolution of manufacturing requirement planning (MRP) II into ERP, while vendors have

developed more robust software for production planning, consulting firms have accumulated vast knowledge of implementing production planning module. Production planning optimizes the utilization of manufacturing capacity, parts, components and material resources using historical production data and sales forecasting. It must provide the information base upon which the entire operation should be run. It should contain the necessary business rules to manage the entire supply chain process whether within a facility, between facilities, or across the entire supply chain.

Production planning helps an organization plan production with the optimum utilization of all available resources. Material requirement planning is done based on the production advice generated by the sales department. Feasibility of production is evaluated using details like raw material availability and procurement time, machine availability and capacity. A production schedule is generated for all machines where the scheduling is done in an optimize fashion based on the priorities of production.

Production planning is integrated with sales, inventory, purchase and production.

Some of the major sub-systems of the module are:

i. Material and capacity planning

ii. Shop floor control

iii. Quality management

iv. JIT/Repetitive manufacturing

v. Cost management

vi. Engineering data management

vii. Engineering change control

viii. Configuration management

ix. Serialization/lot control

x. Tooling

This module is used to record data related to the manufacturing department of the organization. Data is recorded in this module when bill of materials have to be created, work orders have to be created and WIP (Work in Progress) receipts are to be created for recording completed work orders.

Production planning module enables us to plan production, execute production, evaluate the quality of production, meet production goals and make our overall production planning process more efficient.

▶ Features and Highlights

1. Process definition with inputs, outputs, by-products and overheads.
2. Definition of bill of material for all products up to any number of levels.
3. Planning based on customer wise production advice and sales forecast.
4. Material requirement planning (MRP) – MRP based on machine capacity and availability, machine efficiency, raw material availability, lead time-giving feasible quantity for production.
5. Production plan for machines with optimum utilization of all available resources like raw materials and machines.
6. Option to revoke production plan to change input parameters/ production priority/quantity using fresh production advice.
7. Generation of production schedule for machines detailing inputs and outputs.
8. Analysis of machine efficiency and utilization.
9. Automatic generation of MRS and purchase requisitions on finalization of plan.
10. Generation of process requisition for processes that have to be subcontracted.
11. Reserving quantity for production.
12. Automatic generation of job orders for production.
13. Option to make daily plans for production.

4. ERP Module for Sales and Distribution

Sales is the most important and essential function for the existence of an organization. Sales handle all the activities for domestic and export sales of an organization. The customer and product database is maintained. Capturing enquiries, order placement, order scheduling and then dispatching and invoicing from the broad steps of the sales cycle. Stock transfer between warehouses is also covered. Besides all this, important analysis reports are provided to guide decision making and strategy planning. Export documents are also generated.

Sales module implements functions of order placement, order scheduling, shipping and invoicing. Sales module is closely integrated with organizations e-commerce websites. Many ERP vendors offer online storefront as part of the sales module.

ERP marketing (distribution) module supports lead generation, direct mailing campaign and more.

Sales are integrated with inventory, production planning and finance. Typically, a sales and distribution module will contain the following sub-systems:

i. Master data management

ii. Order management

iii. Warehouse management

iv. Shipping

v. Billing

vi. Pricing

vii. Sales support

viii. Transportation

ix. Foreign trade

The sales and distribution module very actively interacts with the material management and financial accounting modules for delivery and billing. Following figure shows the sales and distribution and associated processes.

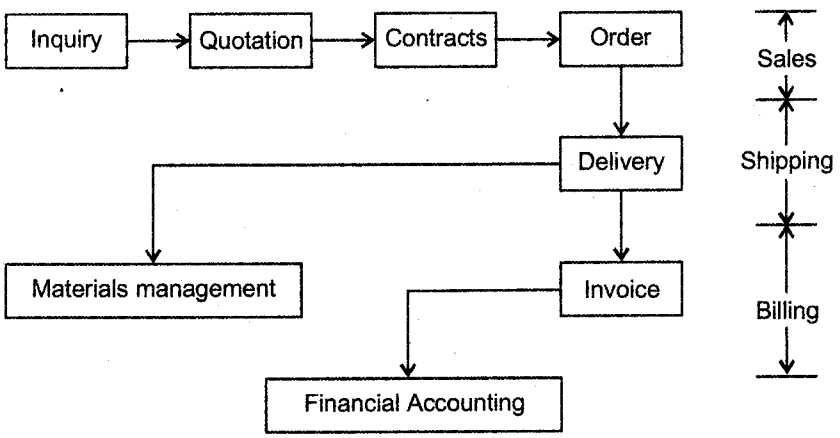


Figure 3.2: Sales and distribution

During sales order-processing the following basic functions are carried out

i. Inquiry handling.

ii. Quotation preparation and processing.

iii. Contracts and contract management (order management).

iv. Monitoring the sales transactions.

v. Checking for availability.

vi. Transferring requirements to materials planning (MRP).

vii. Scheduling the delivery.

viii. Calculating pricing and taxes.

ix. Checking credit limits.

x. Invoicing/billing.

xi. Creating printed or electronically transmitted documents (confirmations and so on).

The increased efficiency in sales and distribution is a key factor to ensure that companies retain a competitive edge and improve both profit margins and customer service.

The sales, distribution and service module offer the automation of the business transactions like sales queries, inquiries and quotations, sales orders, outline agreements such as contracts and scheduling agreements, delivery/shipment, invoicing/billing, after sales support, etc.

▶ Features and Highlights

1. Handles pre-sales and sales activities of the organization.
2. Complete stock-to-stock tracking of sales order processing cycle.
3. Marketing surveys for estimating demand for various products to prepare an effective marketing strategy.
4. Detailed customers/business partners/dealers database including bank details, TDS details, contact details and credit limit.
5. Target setting for executives.
6. Flexibility to define customer-specific prices for products and reference to customer part no.
7. Multiple dispatch location for customers/dealers.
8. Product definition: Upto 30 character user-defined product code, product category, group and subgroup for classification of product.
9. Complete export documentation for export oriented companies.
10. Excise details.
11. Quotations and amendments to quotations with complete history.
12. Analyzing lost jobs.

13. Different types of orders can be generated to suit varied needs of customers.
14. Order entry for direct/scheduled/open/sample order with details for dealers, incentives and competition.
15. Order calculation based on price offered, discounts, excise, taxes, freight, etc.
16. Letter of credit details for association with sales orders.
17. Order amendment history.
18. Authorization of orders and invoices.
19. Order scheduling over a period of time and tracking delivery schedule.
20. Order tracking through status and transaction reports.
21. Order processing.
22. Preparation of dispatch advice.
23. Multiple dispatches against single sales order.
24. Invoice generation with advance adjustments. Sales voucher automatically generated in finance.
25. Tracking sales returns.
26. Rejection invoice for rejections made against purchases with excise consideration.
27. Stock transfer between warehouses for multi-location companies.
28. Service invoice for services given to customers.
29. Variance reports.
30. Enables top view-consolidation of sales data for all child companies.
31. CRM integration through internet-posting enquiries and sales orders on web by customers. Importing the same into ERP after validations.

5. ERP Module for Human Resource Management

Human Resource (HR) is another widely implemented ERP module. HR module steam lines the management of human resources and human capitals. HR modules routinely maintain a complete employee database including contact information, salary details, attendance, performance evaluation and promotion of all employees. Advanced HR module is integrated with knowledge management systems to optimally utilize the expertise of all employees.

The various sub-systems under the HR module are:

i. Personnel management (HR master-data, personnel administration, information systems, recruitment, travel management, benefits administration, salary administration).

ii. Organizational management (organizational structure, staffing schedules, job descriptions planning scenarios, personnel cost planning).

iii. Payroll accounting (gross/net accounting, history function, dialog capability, multi-currency capability, international solutions)

iv. Time management (shift planning, work schedules, time recording, and absence determination).

v. Personnel development (career and succession planning, profile comparisons, qualifications, assessments, additional training determination, training and event management).

▶ Features and Highlights

1. Highly parameterized, suitable for any organization, reduction in data entry.
2. Automation of recruitment procedure and maintenance of candidate databank.
3. Track of employee history of appraisals, promotions, transfer and separation.
4. Uploading of attendance from various attendance recording machines.
5. Complete income tax functionality.
6. Generation of statutory PF, ESI and Income Tax reports.
7. Manpower planning and recruitment (pre and post interview action plan for scheduling, selection and evaluation).
8. Consultant databank.
9. Candidate databank.
10. Generation of call letters and appointment letters.
11. Training details-training program and analysis.
12. Drill down organization chart with complete reporting structures.
13. Maintaining record of employees details including, job related details, qualification, work experience, etc.
14. User definable salary components for earnings, deductions, allowances and reimbursements (no limitation on number of salary components per employee).

15. Formula based gradewise/designation wise/ location wise/employee wise salary structure.
16. Defining statutory parameters for PF, ESI, superannuation and gratuity.
17. Payroll calendar based on working days/payment days.
18. Professional tax according to locations.
19. Leave entitlement details for each employee.
20. Shift roster to generate employees working calendar.
21. Facility of full attendance transfer to mark 'present' for entire month and update leaves later to reduce data entry effort.
22. Uploading attendance from swipe machine.
23. Recording advance compensating off department employee wise.
24. Arrears calculation.
25. Loan structure, application and sanction of loan and updating in finance based on installation plan.
26. Bonus processing.
27. Category/employee wise salary processing taking into account attendance, salary components, PF, ESI, arrears, tax and reimbursements.
28. Leave encashment.
29. Posting of salary details in finance.
30. Performance rating against various user defined performance factors at time of confirmation, appraisal and promotion.
31. Employee history –promotions, transfers and salary increments.
32. Complete separation procedure settlement and exit interview, full and final salary processing, gratuity and superannuation.
33. Income tax functionality
    - Tax slabs/surcharge
    - Investment details
    - TDS plan generation on basis of LTA, perks, investments, HRA and CLA details.
    - Statutory reports.

6. ERP Module for Inventory Control System

Inventory covers all stock related functions of an organization. Stock management and valuation activities, which form the backbone of any organization generally, take a lot of time and resources. Inventory handles all the store activities of issues, dispatches, receipts and quality control. The lot wise stock of each item is maintained and various MIS are provided for tracking stock movement.

Inventory module facilitates processes of maintaining the appropriate level of stock in a warehouse. The activities of inventory control involves in identifying inventory requirements, setting targets, providing replenishment techniques and options, monitoring item usages, reconciling the inventory balances and reporting inventory status. Integration of inventory control module with sales, purchase, finance modules allows ERP systems to generate vigilant executive level reports.

ERP inventory management module facilitates recording of data in the inventory department.

Activities of the inventory department such as receipt of goods, delivery of goods, maintenance of material in the stock sections, classifying all the materials, issuing of materials to the manufacturing department, rejections from the suppliers are recorded with full details.

▶ Features and Highlights

1. Online status of item quantity in terms of on-hand, on-hand available, reserved, ordered, to order, rejected, defective and reworkable quantities.
2. Complete excise functionality and generation of excise registers.
3. Upto 30 character alphanumeric stock code.
4. Multiple levels of classification of items.
5. Excisable items-definition and chapter allocation.
6. Multiple units of measurement.
7. Alternate items for production planning.
8. Handling of non-stock low value items like stationary.
9. Lotwise tracking of inventory at shop floor and main stores.
10. Stock valuation –LIFO/FIFO/weighted average.
11. Material requisition from different requirement areas.
12. Purchasing and subcontracting.
13. Receiving material against sales order processing, material requirement, subcontracting, gate pass and production requisition.

14. Landed rate of items.
15. Quality control based on QC parameters.
16. Handling material rejections.
17. Rejected material dispatch to subcontractors.
18. Gate pass-returnable/non-returnable.
19. Cenvat claim for capital goods.
20. Analysis which help in maintaining optimum stock levels.
21. Physical verification of stock.
22. Reallocation of reworkable stock.
23. Multiple warehouses/branches/regional offices.
24. Stock transfer-receipts from other warehouse.
25. Consolidation of all warehouses.
26. Consolidation at any level of company hierarchy.

Inventory management module allows us to manage our stocks on a quantity and value basis, plan enter and check any goods movements and carry out physical inventory. In this, the user can easily obtain an overview of the current stocks of any given material.

7. ERP Module for Quality Management

The ISO 9000 series and a host of other international standards define the functions of quality management and the elements of a quality management system. The functions in the quality management module support the essential elements of such a system. It penetrates all processes within an organization. The task priorities according to the quality loop shift from production (implementation phase) to production planning and product development (planning phase), to procurement and sales and distribution, as well as into the entire usage phase.

The quality management module handles the traditional tasks of quality planning, quality inspection and quality control. *e.g.*, it supports quality management in procurement, product verification, documentation and in the processing of problems.

The quality management modules internal functions do not directly interact with the data or processes of other modules.

7.1 Quality Management Module – Functions

The quality management module fulfils the following functions:

i. **Quality planning** (management of basic data for quality planning and inspection planning, material specifications, inspection planning).

ii. **Quality inspection** (trigger inspections, inspection processing with inspection plan selection and sample calculation, print shop paper for sampling and inspections, record results and defects, make the usage decision and trigger follow-up actions).

iii. **Quality control** (dynamic sample determination on the basis of the quality level history, application of statistical process control techniques using quality control charts, quality scores for inspection lots, quality notifications for processing internal or external problems and initiating corrective action to correct the problems, inspection lot processing and problem processing, quality management information system for inspection, results and quality notifications).

The quality management module uses the systems integration to link the tasks of quality management with those of the other applications, such as materials management, production, sales/distribution and cost accounting. An inspection that is triggered automatically upon goods receipt is an example of this. The quality management module is integrated with the master-data and processes of the following applications:

i. **Material management** (purchasing, inventory management, warehouse management, material requirements planning).

ii. **Production** (work scheduling, shop floor control)

iii. **Sales and distribution** (delivery, creation of quality certificates)

The quality management module supports the exchange of data with other applications in order to prevent related data from being recorded and stored redundantly. e.g, the information provided by a goods receipt posting relating to the material, vendor and lot size is automatically transferred to the inspection lot data record when an inspection is triggered.

This module is related with each department and quality control test are performed at various levels starting from raw materials till finished goods. It allows a wide variety of characteristics and parameters to be specified in the stand inspection operations and maintain an extensive history to improve product quality and identify recurring problems.

ERP quality management allows the quality department to define its own quality test cases required at different juncture of production, beginning from quality check required during the inward of raw materials. Further quality characteristics, parameters and expected results, under each quality process check can be configured without any programming assistance.

This module enables you to build test cases to ensure quality. With this module you may identify product issues and test for them. If we create a product that is strictly regulated by the government, the quality management module will ensure us to meet regulations or compliances.

8. ERP Market

The ERP market is a very competitive and fast growing market. The ERP market has grown tremendously during the last few years, both in India and abroad. The ERP market continues to benefit from a widespread acceptance of the idea that business must have integrated information systems to be competitive. The main reason for this enormous growth worldwide can, in particular, be attributed to the inability of older systems to manage the conversion to year 2000, and other factors such as, industry best practices, easy and faster implementation and good cost predictions. Another factor behind the growth is that already existing clients acquire more licenses and modules. The number of employees using the ERP system is increasing and the ERP clients who have started with the basic modules will purchase subsequent applications. There is also a trend to replace customized systems with standard application packages, like an ERP system.

The ERP market is concentrated towards the western countries, where 88 percent of the market is located, according to the Gartner Group.

Therefore, it will have great potential in other parts of the world in the coming years. One of the largest problems in the market today is the lack of competent people and so on, it is difficult for companies to employ people with ERP experience.

ERP clients are most affected by this problem. Their employees who work with the system become so called 'super users' and are very attractive in the job market. The consulting firms can offer them better conditions and salaries, which make it difficult for clients to keep their employees.

The ERP market is now dominated by SAP. The others have more or less given up the first place and are fighting for subsequent positions. The German vendor, SAP, occupies approximately 30 percent of the world market.

8.1 SAP

In 1972, five former IBM employees – *Dietmar Hopp, Hans-Werner Hector, Hasso Plattner, Klaus Tschira and Claus Wellenreuther* – launched a company called **'Systems Applications and Products in Data Processing (SAP)'** in Mannheim, Germany with a vision to develop standard application software for real-time business processing. This company is now the recognized leader in providing collaborative business solutions for all types of industries and for every major market. Today, SAP has installations in more than 107 countries and is the world's largest business software company and the world's third largest independent software provider overall.

By using SAP solutions, organizations of all sizes-including small and mid-size enterprises-can reduce costs, improve performance and gain the agility to respond to changing business needs. SAP has also developed the SAP Netweaver platform, which allows customers to achieve more value from their IT investments.

The SAP system operates on the multiple OS platforms-UNIX, NT and OS/400 and can use most of the established databases. SAP's clients are mainly big international companies with revenue of at least 300 million. The system SAP has more than 7500 clients in over 90 countries.

SAP was the first to enter the market and thereby, gained early market shares, which is probably the most important reason for their success. In terms of revenue, profit, earnings per share, research and development spending and market share, SAP is far ahead of its competitors. Today, SAP has a customer base that includes more than 32,000 organizations in 120 countries around the worlds. SAP is the No.1 vendor of standard business applications software and is the fourth largest independent software supplier in the world.

SAP has 27 major industry verticals and is continuously being upgraded. Some of them are follows:

Aerospace and defence, Automotives, Chemicals, Consumer Products, Engineering, Construction and Operation, Hightech, Healthcare, Industrial machinery and components, Mill projects, Mining, oil and natural gas, Pharmaceuticals, Retail, Professional services, Utilities, Wholesale distribution.

▸Strengths of SAP

1. Long-term partnership with customers.
2. In-depth knowledge of business.
3. Experience of integrating business processes within and across enterprise.
4. Commanding market position.
5. Brand recognition.
6. Sound financial situation.
7. Functionality covering a wide range of 27 industry-specific solutions.
8. Attractiveness of mySAP.com portal for its existing large customer base.
9. Sustained investment in R & D.
10. Very strong and qualified consultants.
11. Strong technology, very broad and hard core ERP solution (R/3).

▸Weaknesses of SAP

A problem for SAP is that the growth of the market for large companies, SAP's primary clients, tends to slow down.

Some analysts say that SAP R/3 is too big and complex for smaller clients. SAP must develop smaller and cheaper systems for this group.

SAP's commitment to product development is unrivalled.

The most significant problem with the R/3 system is its implementation complexity.

According to certain analysis, the 'typical' SAP implementation takes somewhere between eighteen months and five years. However, SAP does not make money on long implementation time, since their partners perform the implementation of SAP R/3. Therefore, they make large efforts in reducing the implementation time.

8.2 Oracle

Oracle Corporation (founded in 1977) is the world's second largest software company and the leading supplier of software for enterprise information management.

SAP's nearest challenger, oracle came with its product oracle E-Business suite, 11i. Oracle established itself as the largest database vendor before moving into the ERP segment in 1989.

Oracle keeps all of the information and manages the business processes in one single well- organized database. Whether from oracle E-business suite or any other vendor-custom or legacy-business applications can be managed and operated more simply and at less cost because all the data is kept in one place. Its applications were developed without the constraints of legacy systems and were among the first to use the advanced capabilities of relational database design.

Oracle is the second largest software company in the world, only beaten by Microsoft. Oracle was the first to provide business intelligence solutions and the first to begin to integrate the internet into their products.

Oracle employs more than 55,000 people in more than 145 countries around the world. Headquartered in Redwood shores, California, oracle is the first software company to implement the Internet computing model for developing and deploying enterprise software across its entire product line: databases and relational servers, application development and decision support tools and enterprise business applications.

The different verticals identified by oracle are:

Aerospace and defence, Automotives, Chemicals, Communications, Consumer packaged goods, energy, Engineering and Construction, Financial services, Government, Healthcare, High technology, higher education, Industrial manufacturing, Life sciences, Professional services, Retail, Travel and transportation, Utilities.

Designed to support both discrete and process manufacturing environments, oracle manufacturing drives continuous process improvement, lowers operating costs and ensures regulatory compliance. The manufacturing products of oracle can be divided into four major categories, which are:

i. Discrete manufacturing

ii. Process manufacturing

iii. Flow manufacturing

iv. Shop floor management

▶Strengths of Oracle

i. Oracle's core product is database applications which forms the basic foundation of an ERP package.

ii. Good reputation of horizontal applications for functionality and scalability.

iii. Strong international professional services.

iv. Early Internet architecture adoption and entry to CRM market.

v. One of the top leaders in the ERP market position.

vi. Financially sound global organization.

vii. Sustained investment in R & D.

viii. Very competitive in ERP functionality and in price/performance ratio, its vary broad product portfolio has been attained both through strategic acquisitions and internal product development.

▶Weaknesses of Oracle

i. Regarded as a late entrant in the ERP system.

ii. Product integration issues.

iii. Insufficient sales execution.

8.3 PeopleSoft

Peoplesoft was established in 1987 to provide innovative software solutions that meet the changing business demands of enterprise worldwide. In June 2005, peoplesoft merged with oracle corporation. While the peoplesoft enterprise solutions are being marketed under Oracle Peoplesoft Enterprises Applications, the peoplesoft support, consulting, education, hosting and financing are now integrated with oracle service.

Oracle's Peoplesoft Enterprise applications are designed for the most complex business requirements. They provide web services integration with multi-vendor and homegrown applications and can be easily configured and adapted to meet the most unique customer requirements. In addition, Peoplesoft Enterprise supports a very broad choice of technology infrastructure. The enterprise applications include: campus solutions, customer relationship management, enterprise performance management, financial management, human capital management, service automation (project management), supplier relationship management (procurement), and supply chain management.

The benefits of the peoplesoft enterprise applications include:

i. Accelerate the path to fusion.
ii. Deliver best-in-class business processes.
iii. Drive superior ownership experience.

Peoplesoft's business solutions are built with the flexibility to fit today's business. The company is a leading provider of enterprise software that ties together back-office applications and databases. Peoplesoft has got three products-peoplesoft enterprise, peoplesoft enterpriseone, and peoplesoftworld.

▶ Peoplesoft Enterprise

It is based on pure Internet Architecture designed for flexible configuration and open, multi-vendor integration. It is ideally suited for functionalities like-human resources, finance, IT, procurement, marketing, services and sales across all industries.

▶ People EnterpriseOne

It is a complete suite of modular, pre-integrated industry specific business applications designed for rapid deployment and case of administration on a pure Internet architecture.

It is ideally suited for organizations that manufacture, construct, distribute, service or manage products or physical assets.

▶ PeopleSoft World

It is an application suite for the IBM iseries platform. The applications are tightly integrated and pre-bundled on a single database with a web-enabled architecture.

The industrial segments that peoplesoft caters to are:

Automotive, Banking and capital markets, Chemicals and lubricants, Communications, Construction, Consumer products, Energy, Government, Field service organizations, Health care, High-tech electronics, Higher education, Home builder, Industrial manufacturing, Insurance, Life sciences, Paper and packaging, Professional services organization, Real estate, Retail, Staffing, Utilities.

8.4 BANN/SSA Glob

SSA was founded in December 1981 and has its headquarters in Chicago, USA. In August 2006, SSA Global underwent an identity change adopting the name of its new owner Infor.

ERP should support the way you want to work, not lock you into one way of operating. SSA ERP is what you need to automate, plan, collaborate and execute according to your specific business requirements. It is designed for a wide range of manufacturing industries and used by more companies to actually manufacturing products than any other ERP system. Its modern, flexible architecture and web-based user interfaces deliver competitive advantage, while its superior functionality enables you to automate key business processes, meet changing demands and collaborate internally between departments, and externally across your supply chain. Integration with SSA Leanware facilitates the transition from traditional to lean manufacturing.

BAAN'S (SSA Global) strategy concentrates on manufacturing and logistic systems and operates on UNIX and NT.

To minimize the time to market, BAAN has acquired several software companies with corporate financials specialists which is the most notable of fifteen acquisitions in eighteen months. Acquisition certainly reduces time to market, but it also necessitates the development of interfaces with BAAN and its integration. BANN's acquisition has been costly and it showed weak results for the third and fourth quarter of 1998.

BAAN maintains that although the componentization of its products is a lengthy process, it is considerably less difficult than the task faced by SAP.

SSA Global targets the following verticals:

Aerospace and defence, Automotives, Business services, Chemicals, Consumer packaged goods, Industrial machinery and equipment, Financial services, General process manufacturing, Government and education, Healthcare, High-tech electronics, Hospitality and gaming, Medical products, Devices and equipments, Pharmaceuticals and biological, Retail.

SSA ERP (BAAN) helps companies to:

i. Reduce operational costs and improve efficiency.
ii. Enjoy better visibility of transactions across the enterprise.
iii. Make better business decisions.
iv. Deliver the right product at the right time.
v. Keep customer promises.
vi. Adopt manufacturing best practices.

8.5 Comparison of Current ERP Vendors

	Criteria	Oracle	SAP	BANN	PeopleSoft
1.	Completeness of functionality with in-core package.	Yes, but maintenance module is available through maximo. Project scheduling and advanced scheduling and add-ons.	Yes, except advanced production scheduling.	Yes, except advanced production scheduling.	Complete solution is not internal.
2.	Project scheduling	Primavera	Internal	Internal	Primavera link
3.	Advanced planning and scheduling	I1 rhythm	Limited internal and I 2 Rhythm	No link	Available
4.	Multi-plant maintenance	Maximo link	Available	Not complete	Available
5.	Localization	Available	Available	Available	Available
6.	Architecture	3-Tier web	3-Tier web	3 – Tier	3-Tier
7.	Choice in OS	UNIX,NT	UNIX,NT,OS 400	UNIX, NT	UNIX, NT
8.	Database	Oracle	Multiple	Multiple	DB2/400,SQL server and oracle.
9.	Development tools-proprietory -P open -O	Oracle designer and oracle developer, oracle (o)	ABAP	BAAN 4 GL Tools (P)	-

8.6 Comparison of Current ERP Packages

The ERP packages available in the market come with different functionalities and features. Some of the basic functional and technical features are as follows:

	Functionality	BAAN	SAP	ORACLE	PeopleSoft
1.	Plant maintenance module	Not available and provided a very primitive support through their service management module which cannot be compared with the functionality by SAP R/3.	Full fledged plant maintenance module tightly integrated with other SAP module is available.	Available	Available
2.	HR module	Currently not available	HR module to handle personnel planning and development and personnel administration and is integrated with other modules of SAP R/3. Indianised payroll also available.	HR module available but not localized. No localized payroll.	Peoplesoft HR module has been designed to handle HRD issues and has come up with impressive local favour to suit Indian payroll and other conditions.

3.	Activity based costing	Not available in BAAN but is interfaced with a third party package 'Hyperion'	Full fledged ABC functionality available as part of SAP R/3.	ABM module available and has similar functionalities.	PS can create budget on activity-based costing.
4.	Supply chain optimization	Integration with a product called 'APS' from Berclain.	Offers a full fledged supply chain solution that caters to demand forecasting, supply network, planning, and scheduling.	Limited functionalities available in supply chain, advanced planning and scheduling activities.	Supply chain not available. Available on NT.
5.	Treasury	Not available	Available	Available	Available
6.	Profitability analysis	Available	Available	Available	Available
7.	Profit centre accounting	Available configured as dimensions. No intelligence built into cater to profit centre requirements like transfer pricing.	Fully supported	Available. Transfer pricing not supported.	Available
8.	Capital investment planning and budgeting with links to fixed assets	Not Available	Available	Not Available	not Available
9.	CRM solution	Available through 'Aurum'.	Full fledged CRM solution covering field sales, marketing, service and Internet sales available.	Available	Available
10.	Project planning and scheduling	Available	Available	Only project costing and billing supported within the package. MS projects or primavera to be interfaced for planning and scheduling complex.	Available
11.	Ease of Use/Navigation	Average	Complex	Complex	Easy and simple
12.	Indian localization cater to all Indirect taxation requirements like excise, MODVAT, TDS, Octral, etc.	Available	Available	Available	Available

13.	Reporting: Data warehousing Tool	Not Available	Business intelligence solution (BW/SEM) available as part of my SAP.com with excel front end.	BIS available through a group of existing products.	OLAP-based business intelligence solution.
14.	Early warning system	Not Available	Inbuilt email system is used to generate reports/mails based on user defined rules.	Available	Available
15.	Technology: Workflow	Not Available	Full-fledged workflow functionality available and supports multistage workflow.	Workflow is limited to a few areas only.	Available
16.	System and network administration Tools	Not Available. Need CA Unicenter or Tivoli.	Computing centre management system available.	Need separate tools.	Not available
17.	Transport request for transfer of configurations	Not available	Available	Not available	Not available
18.	Performance over a WAN	About 7-8 KBPS per user	About 3.5 to 4 kbps per user	About 7-8 kbps/user	About 7-8 kbps/user
19.	Internet Technology and E-business	Not available	Available	Available	Available
20.	Integration with MS-office	Not available	Available	Not available	Available
21.	Implementation: upgrade	BAAN IVc-the current product being offered in India has been largely rewritten in BAAN ERP-the new release being offered globally. Upgrade to BAAN ERP from BAAN IVc is like a new implementation.	Clear upgrade path between releases.	Available	Available
22.	Support services	No equivalent of OSS-only 24*6 hour support for critical incidents.	OSS (Online Support System) is available that provides 24*7 support across the globe.	3 different service levels exist. All customers are not automatically eligible for 24*7 support.	OSS is available that provides 24*7 support across the globe.

23.	Methodology	DEM is positioned as a modeling tool integration between DEM and BAAN system.	A SAP methodology-proven and adopted by partners.	-	-
24.	Ease of implementation	Average	Complex	Complex	Easy

9. Disadvantages of Non-ERP System

1. People in one department cannot access easily an information about what is happening in the other departments. May be at the top management level, the summary reports are being circulated to other departments also, but these summary reports often final in capturing the real picture.
2. Able to give only that information which is designed for that department.
3. Most of tasks were done manually, so a task that involved the coordination of two or three departments would take number of days in a non-ERP environment.
4. Numerous workflows and procedures are required to run the business which may not be documented.
5. Non-availability of real-time information.
6. Possibility of manual errors in manually operated financial and operational data.
7. Due to non-collaboration of departments, their response time gradually increases.
8. Also sometimes, the departmental objectives can be conflicting.
9. Different softwares are used for different departments so individual departments have to buy and maintain their own software systems.
10. Different departments must have their separate backup system, which also increases memory cost.
11. Separate security systems needs to be applied at different departments.

9.1 Importance of ERP

1. ERP systems makes it easier to track the workflow across various departments and reduce the operational costs involved in manually tracking and perhaps duplicating data using individual and disparate system.
2. A unified and single reporting system to analyze the statistics/numbers/status, etc. in real-time, across all the function/departments.
3. Saves time and expenses.

4. It protects sensitive data by consolidating multiple security systems into a single structure.
5. ERP can greatly improve the quality and efficiency of business. By keeping a company's internal business process running smoothly, ERP can lead to better outputs that will benefit the company such as customer service and manufacturing.
6. ERP provides support to upper-level management to provide them with critical decision making information.
7. ERP makes the company more flexible and less rigidly structure in an effort to allow the different part of organization to become more cohesive, in turn, enhancing the business both internally and externally.
8. ERP systems are more secure as centralized security polices can be applied to them and all the transactions happening via ERP systems can be tracked.
9. It is possible to integrate other systems (e.g., bar code reader), to the ERP system through an API (Application Programming Interface).
10. Automation and module integration.

10. Benefits of Integration

1. Different modules in the ERP system are integrated. So they are able to send and receive data across departmental barriers.
2. Improves productivity and reduces response and reaction time.
3. Automation and time reduction/fast response: Tasks are completed within minutes while it were take few hours or days before ERP module integration. Tasks are completed within minutes just by an action intiated by a single person (which triggers a lot of other processes in many different modules).
4. Stores all the data in a central database and all the modules update the database on a real-time basis, the information available in the database is current up-to the minute.
5. Complete visibility of all departments of an organization is possible.
6. Automatic and coherent workflow from one department/function to another to ensure that smooth transaction/completion of processes.
7. Single database is implemented on the back end to store all the information required by ERP system and that enables centralized storage/backup of all enterprise data.
8. Chronological history of every transaction through relevant data compilation in every area of operation.
9. Order tracking from acceptance through fulfillment.

10. Revenue tracking from invoice through cash receipt.
11. Matching purchase orders (what is ordered), inventory receipts (what arrived) and costing (what the vendor invoiced).
12. Eliminate the need to synchronize the changes between multiple systems: consolidation of finance, marketing and sales, human resource and manufacturing applications.
13. It brings legitimacy and transparency in each bit of statistical data.
14. It enables standard product naming/coding.

11. Standardization of Data Code

Before to see what is standardization and why it is required, we will see an example of Data Non-Standardization: Suppose an organization has three plants at 3 different locations- 001, 0002 and 0003. All these plants use same bearing:

Material: Ball Bearing ID: 25 mm OD: 47mm, Width: 12 mm Catalog # 6005

However, in each plant it has different material code and description. Even the same bearing is having two different material codes and descriptions in one plant. This example may sound too exaggerating in the first look. However, reality may not be too different. If analyzed closely the master data team can filter out many such examples. This is an example of Data Non-Standardization. No unique material code number. No unique or standard way of description.

This kind of situation leads to issues like lack of visibility of a material or product across the enterprise, higher inventory – same material purchased under different codes and /or descriptions, etc.

As a broad variety of standards have developed in the field of information technology. Standards are available at various levels and originate from different standardization bodies. Although it would be desirable from a technological standpoint to have a single accepted standard over the enterprise, standardization is necessary.

Data standardization refers to the use of the same set of codes to encode data throughout a system. Standardization is the process of developing and implementing technical standards. To achieve the unique enterprise database, data standardization is essential. Data standardization gives unique identity to the every data entry all over the enterprise. So it is easy to understand and analyze the data. Standardizing data helps you make the source data internally consistent; that is, each data type has the same kind of content and format.

Data standardization first step to ensure that your data is able to be shared across the enterprise. It establishes trustworthy data for used by others applications in the organization. Ideally, such

standardization should be performed during data entry. If, for some reason it is not possible, a comprehensive backend process is necessary to eliminate any inconsistencies in the data.

The standardize stage builds on the interpretation of the data during the investigate stage. The standardize stage reformats data and creates a consistent data presentation with fixed and discrete columns, according to company requirements. To correctly parse and identify each element and place them in the appropriate column in the output file, the standardize stage uses rule sets that are designed to comply with standards or conventions. The standardize rule sets can assimilate the data and append additional information from the input data.

The standardize stage parses free-form and fixed-format columns into single-domain columns to create a consistent representation of the input data.

i. Free-form columns contain alphanumeric information of any length as long as it is less than or equal to the maximum column length defined for that column.

ii. Fixed-format columns contain only one specific type of information, such as only numeric, character, or alphanumeric, and have a specific format.

Standardized data is important for the following reasons:

i. Effectively matches data.

ii. Facilitates a consistent format for the output data.

▶Goals of the Standardization

i. To provide common definitions for information in records, which will facilitate the effective use, understanding, and automation of records.

ii. To standardize attribute values, which will enhance data sharing.

iii. To resolve discrepancies related to the use of homonyms and synonyms in record systems, which will minimize duplication within and among those systems.

▶The Benefits of Standardizing Data

i. **Data sharing/Communications:** Standardized data is more easily understood; standardization allows agencies to exchange data freely when based upon a common set of definitions and understandings about the data and its features.

ii. **Elimination of redundancy:** Standardization contributes directly to the reduction and in some cases the elimination of duplication and redundant gathering of similar data and database construction.

iii. **Maintainability:** Standardized data formatting and rules for data entry can mean that new information can be entered more easily.

iv. **Direct Costs:** Standardized data allows for minimal post processing requirements and leads directly to more efficient use of data and technical resources; plus it adds to the effectiveness of computer operations by providing predictable data. That is, if, because of standardization, a programmer knows the range of values and the types of information to expect in various fields, then few conditional checks are required and the code will execute more rapidly.

v. **Correlating disparate data:** By translating disparate databases to the same standard, databases which at first appear to be incompatible may in fact be compatible and complementary.

vi. **Effective computer operations:** Effective computer operations means that automated systems work best when data is predictably located in a data set, as in a data set which conforms to certain standards. This increases retrieval times, can reduce storage requirements, and enhances program code requirements.

vii. **Reduced need for data translation:** With the advent of standardized data available for view and analysis over the web, the need for translation software diminishes.

viii. **Cost benefits:** Data sharing and partnerships, allowing for reduction of data duplication, and for best use of capabilities, leads directly to more efficient use of data and technical and human resources, thus enabling the reduction of overall costs.

▶When to Standardize, and When Not to Standardize

In general, standardize when any of the following circumstances arise:

i. You have an existing database that will be combined, joined or coordinated with another database that is standardized or will be standardized, or

ii. You are designing a new database for the first time, or

iii. Analog data is being automated, or

iv. Automated data is to be exchanged, or

v. Substantial amounts of analog (hard copy) data will be exchanged with an agency using automated data.

In general, do not standardize when both of the following conditions are met:

i. Your data will never be shared or exchanged, and

ii. Your data set is so small that there is no practical reason to automate it.

The full benefits of data standardization will only be achieved if organizations use the same data element definitions and if those definitions are available for all business partners to search, retrieve and use for message specification development.

SUMMARY

- ERP software is made up of many software modules.
- Each ERP software module has a major functional area of an organization.
- The number and the features of the modules may be different according to the ERP package and vendor.
- Modules are to permit automating of some functions but not others.
- Some common modules, such as finance and accounting, are adopted by nearly all users; others such as human resource management are not.
- Organizations implement modules that are both economically and technically feasible and profitable.
- It includes, modules for material purchasing, inventory control, product planning, product distribution, tracking the order, financial ERP module, accounting, marketing, and human resource.
- Different modules of the ERP have interrelation between their different modules.
- Every module in the ERP package corresponds to a major functionality and plays an important role in the ERP package to smooth the workflow.
- Module makes ERP package easy to understand and also helpful to train the staff.

EXERCISES

1. Which are the modules present in ERP? Explain interrelation between different ERP modules.
2. Explain Finance module in detail.
3. Which are the sub-systems of Finance module? Explain its features and highlights.
4. Explain ERP module for Production Planning, control and management.
5. Explain ERP module of Sales and Distribution (Marketing).
6. Which functions are carried out during Sales and Distribution (Marketing) module?
7. Explain features and highlights of Sales and Marketing module.
8. Explain ERP module for Human Resource management.
9. Explain features and highlights of Human Resource module.
10. Explain quality management module in detail.
11. Short note on – ERP Market.
12. Explain SAP in detail with strengths and weaknesses of it.
13. Explain Oracle in detail with strengths and weaknesses of it.
14. Explain Peoplesoft in detail with strengths and weaknesses of it.
15. Explain BAAN / SSA in detail with strengths and weaknesses of it.
16. Compare different ERP vendors.

i.	Oracle vs. SAP	ii.	Oracle vs. BAAN
iii.	Oracle vs. PeopleSoft	iv.	SAP vs. BAAN
v.	SAP vs. PeopleSoft	vi.	BAAN vs. PeopleSoft

17. Compare different ERP packages:

    i. Oracle vs. SAP
    ii. Oracle vs. BAAN
    iii. Oracle vs. PeopleSoft
    iv. SAP vs. BAAN
    v. SAP vs. PeopleSoft
    vi. BAAN vs. PeopleSoft

18. Explain disadvantages of non-ERP system.

19. Explain importance of ERP.

20. Explain benefits of integration.

Innovation Throughout
VISION

4 ERP Implementation Life Cycle

1. ERP Implementation Life Cycle

The process of ERP implementation is referred to as, "ERP Implementation Life Cycle".

When we are thinking about ERP implementation life cycle, we must keep one thing in our mind that, the organizational culture and the nature of projects will be different from company to company. So, two ERP implementations can never be identical. They will vary depending on the size, nature of projects, complexity of projects, development methodology, organizational culture, etc. The objectives, the different phases, the sequence of these phases and other details of the ERP implementation will vary from organization to organization.

ERP implementation life cycle focus on the ERP project which is carried out to make ERP up and running. ERP project is gone through different phases. Most often these phases do not necessarily depend on one another in a sequence, i.e., one phase might start before previous phase has finished. So there are no clear separating lines between these phases. But, logical order of phases is followed.

All the phases of ERP implementation life cycle may not be applicable in all cases. e.g., If the organization have already identified a particular package, then first phase of life cycle, i.e., pre-selection screening and package evaluation is skipped.

There are different phases of ERP implementation life cycle, as described below.

1.1 Different phases of ERP Implementation

Different phases of ERP implementation

i. Pre-evaluation screening
ii. Package evaluation
iii. Project planning phase
iv. Gap Analysis
v. Reengineering
vi. Customization/configuration
vii. Implementation team training
viii. Testing
ix. End-user training
x. Going live
xi. Post implementation phase

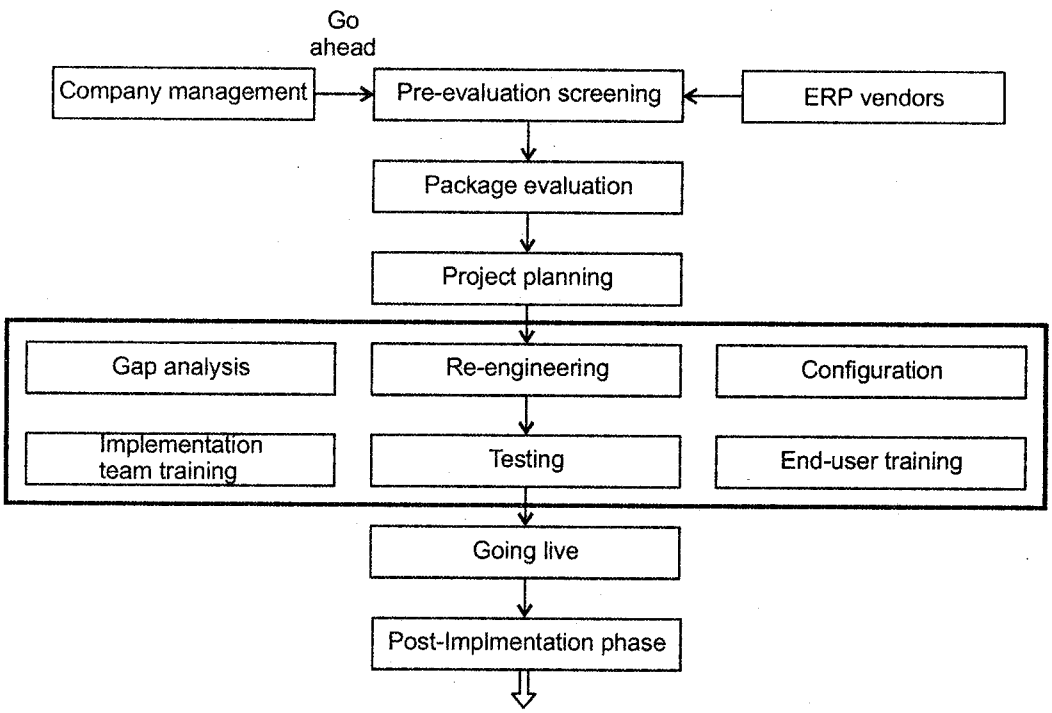


Figure 4.1

▶ Pre-evaluation Screening

It is the first phase of ERP implementation life cycle. It begins when the company decides to implement ERP package. So, in pre-evaluation screening, it starts to search for the perfect package. But, there are various ERP packages in the market. Not all packages are same, each has its own weakness and strength. From them, to find out the package which is flexible enough to meet the company's need and customized to obtain 'good fit'. And it is very time-consuming process. So it is better to shortlist the packages and not be more than 5.

After shortlisting of package do superficial or detail study of packages, by considering strong points and weak points of each package and then shortlist them according to the requirement of organization and appropriate suit for different departments. And eliminate those packages that are not suitable for company's business processes.

While selecting a perfect package for a company, we are comparing (following) points:

i. History (origin) of package that few determines the type of business it is suited for.

ii. Cost-license, training, customization, maintenance etc.

iii. Years of existence

iv. Past experience

v. Time required (for implementation, training, etc)

vi. Functional fit with the company's business.

vii. Degree of integration between the various components of ERP system.

viii. Flexibility and scalability

ix. Complexity

x. Feedback from customers

xi. Effectiveness

xii. Transparency

xiii. User friendliness

xiv. Quick implementation

xv. Availability of regular upgrades

For this pre-evaluation screening, selection committee will be assigned. By considering the above criteria, it will decide the appropriate package. Once a package is selected, detail evaluation process starts.

▶ Package Evaluation

Package evaluation/selection is one of the most important phase of the ERP implementation because, selection of our package will decide success or failure of the project. Because once we have purchased a package and invested in it, it is not easy task to switch it into another one if any failure or problem, occurs in it. So it is very important phase of ERP implementation so 'Do it right first time'.

Selected package of ERP should be flexible enough to customize as per company's need or 'good fit' to company. Selection committee will perform this task of evaluating a package. Selection committee keeps in mind the reality that none of the package is perfect. So we do not find the perfect one but to find a package that is flexible enough to meet the need of company and good fit to it. It is impossible to get a system that will perform exactly as the company does business but the aim is to get the system that has least number of differences.

Our selected package should fit to the different departments needs, so we consider all the departments in the selection of package. And so it is a team decision not a one-man decision.

Thus, it should have department wise as well as company acceptance.

Selection committee considers the same points, as discussed above for ERP package selection/evaluation i.e.,

i. History of package
ii. Cost
iii. Years of existence
iv. Past experience
v. Time required
vi. Functional fitness with company needs
vii. Degree of integration
viii. Flexibility and scalability
ix. Complexity
x. Feedback from customers
xi. Effectiveness
xii. Transparency
xiii. User friendliness
xiv. Quick implementation
xv. Availability of regular upgrades
xvi. Local support infrastructure
xvii. Database and their independency, security.

Selection committee should be entrusted with the task of choosing a package for company.

Committee involves people from various departments, top management and consultants (package experts), playing different roles.

People from different departments describes their needs. Package expert or consultant acts as mediator to explain pros and cons of each package and top management to decide best-fit for company's business.

▶ Project Planning Phase

This is the phase that designs the implementation process.

In this phase details of "how to go about implementation, time schedules and deadlines etc" are decided.

Roles are identified and responsibilities are assigned in this phase.

The organizational resources are decided and people who are supposed to head are identified.

Everyone's scope of work is defined.

The implementation team members are selected and task allocation is done.

The phase will decide "when to begin the project", "how to do it" and "**when the project is supposed to be completed".**

The phase will also plan what to do in case of contingencies, how to monitor the progress of implementation.

The phase will plan what control measures should be installed and what corrective actions should be taken when things get out of control.

The phase is controlled by committee and meets periodically to review the progress and future actions and normally committee headed by CEO or COO.

[CEO: Chief Executive Officer]
[COO: Chief Operating Officer]

▶ Gap Analysis

This is the most crucial phase for the success of the ERP implementation.

It is a phase or process in which companies create a complete model of where they are now, and in which direction they want to head in future.

Even the best ERP package can only cover 80% of the companies functional requirement.

The remaining 20% of these requirements present a problematic issues for company.

So, Gap analysis is a phase in the ERP implementation, where the organization tries to find out the gaps between the company's existing business practices and those supported by the ERP package.

The trick is to design a model which both anticipates and covers any functional gaps.

Some companies decide to live without a particular function.

Other solutions include (Different ways of finding gaps)

i. Upgrade or update the ERP software (at low cost).
ii. Identify the third party product that might fill the gap.
iii. Design a custom program.
iv. Altering ERP source code (most expensive), used only for mission critical.

▶ Reengineering

It is the phase that involves human factors. In ERP implementation settings, reengineering has two different connotations:

i. **Controversial:** Involving the use of ERP to aid in downsizing efforts- reduce significant number of employees.

   Every implementation will involve some change in job responsibilities as processes become more automated and efficient. However it is best to regard ERP as investment and cost cutting measure rather than a downsizing tool. ERP should endanger business change but not endanger the jobs of thousands of employee.

ii. **Business process Re-engineering (BPR):** The BPR approach to an ERP implementation implies that there are two separate, but closely linked implementations on an ERP site

   a. Technical implementation
   b. Business process implementation

The BPR approach emphasises the human element of necessary changes within organizations. This approach is more time consuming and has received a lot of criticism for creating a big budget and extended projects. But, those who support it argue that you cannot ignore human element.

▶ Configuration/ Customization

This is the main functional area of ERP implementation.

Business should be mapped according to goal of company.

Prototype is created before implementation it live.

Testing is done on prototype.

Configuring not only reveals strength but also weakness of the company business processes. Explain what won't fit and where the gap is.

ERP vendors constantly make efforts to lower configuration costs. Strategies that are currently being done include automation and pre-configuration.

▶ Implementation Team Training

When the configuration is taking place, the implementation team is being trained.

It is not for how to use the system, but for how to implement it.

In this phase, employees are also trained to implement and later to run the system.

Vendors and consultants will leave after the implementation is over.

Now, company is self-sufficient in running the ERP system, and company's good in house team can handle the various situations.

So the company knows the importance of selecting right employees with good attitude- i.e., willing to change, learn new things and are not afraid of technology and good functional knowledge.

▶ Testing

This is the phase, where we try to break the system.

We try to break the system until we reach a point where we are testing real case scenarios.

In this way, the system is configured and we have extreme case scenarios- system overloads, multiple users lagging on at the same time with the same query, users entering invalid data, hackers trying to access restricted areas and so on.

This test case must be designed specifically to find the weak points or links in the system and these bags should be fixed before going live.

▶ Going Live

This is the phase where all technical sides are over, and the system is officially declared operational.

In this phase, ERP is made available to the entire organization.

From technical side, the work is almost complete data conversion is done, databases are up and running on functional side, the prototype is fully configured and tested and ready to go operational.

The implementation team must have tested and run the system successfully for some time.

Once the system is 'live' the old system is removed and the new system is used for doing business.

▶ End-User Training

This is the phase where the actual users of the system will be trained on how to use the system.

This phase starts much before system goes live.

The success or failure of an ERP system depends on how the actual users use the system.

The most successful implemented ERP packages fail due to lack of end user training.

The employees who are going to use the new system are identified and their skills are noted.

Based on their skill levels are divided into groups.

Each group is then given training on the new system.

The training is very useful as the success of the ERP system is in hands of end-users.

The training section gives the overall view of the system and how the individual actions will be affecting the entire system.

Every employee is also provided with the training of the job profile while he/she is going to perform.

The training section should address about the new technologies and how people will be successful in making change over.

Atleast the end-user training is important because the success of an ERP system spends upon it and this phase is equally difficult than the implementation team training.

▶ Post-Implementation Phase (Operation and Maintenance) (Maintenance Mode)

It is very critical phase because once the implementation is over, the vendors and consultants will go.

So the employees must be trained thoroughly to handle problems in the system at any point.

Company should have people with them, who have the technical powers to make the necessary enhancements to the system as and when required in future.

The system must be upgraded as and when new versions or new technologies are introduced.

Everyone who uses these systems needs to be trained on how they work, how they relate to the business process and how a transaction ripples through the entire company whenever they press a key.

The training will never end, it is an ongoing process, new people will always be coming in and new functionality will always be entering the organization.

2. Role of Organization Management and Vendor

Successful ERP implementation is the obvious goal of any organization. ERP brings together different functionality, people, procedures and ideologies and leads to sweeping changes through out the organization. An ERP package is expected to improve the flow of information and formalize all the business processes and workflow that exist in an organization.

The ERP implementation project is a joint effort of many groups of people-the in-house implementation team, package vendor's team, outside consultants, end-users and company management.

The participation of people in an implementation can fall into several different position project sponsor, executive steering committee, project manager, functional manager team leader, team member, functional participant, consultant, vendor representative and end-user. Basic skills sets that are important to any ERP team position include communication skills, computer literacy, maturity, conceptual skills and organizational knowledge.

People who have participated in ERP implantation at different positions, have their different roles in it.

1. Management
2. CEO (Chief Executive Officer)/ Project Sponsor
3. Executive Committee
4. Project Management Team
5. Project Manager
6. Implementation Team / Work Team
7. Technical Support Team
8. Administrative Support Team
9. Consultant
10. Vendors
11. End Users

2.1 Management

Management representatives will monitor the progress of the project and make decisions and take corrective actions to keep the project on schedule and within budget. Other members will participate part-time during workshops and training.

It is the responsibility of the top management to see to it that the people who are designated to the implementation team on a full-time basis are not interrupted in any other way or with any other work.

2.2 CEO (Chief Executive Officer)/ Project Sponsor

Every ERP implementation project needs a sponsor. Ideally, the project sponsor will be the CEO. The role of the project sponsor is to ensure that the ERP implementation gets all the assistance it needs from resources to management backing. It provides the full company backing for the ERP implementation project.

CEO has **two key responsibilities**. The **first** is to promote the vision of what can be achieved using the implementation as the opportunistic catalyst for change. How radical this vision is depends upon the individual and also senior colleagues, for these colleagues will share and make their own contribution towards this vision.

The **other** responsibility of sponsorship of the project. This means that support is given to the project in such a way that promotes its importance, supports the position of the project manager, brings into line dissenting middle/senior managers, acts as arbitrator and carrier out any other activities that ensures that the project does not flag, including replacing the project manager, if necessary. The CEO needs to ensure that the gap is bridged between speech making and action if cynicism is to be avoided.

It is the CEO's role to assess the capability and lead accordingly. He serves as a source of motivational, inspirational and sometimes financial support for the overall ERP project. The project sponsors communicate with each other, coordinating and creating consistent uniform messages to the executive committee and others in the organization. He also make sure that everybody knows the ERP has strong management backing and support.

2.3 Executive Committee

The executive committee is a group of senior managers who represent the interest of the company management and is headed by the person who is in charge of the ERP implementation (sponsor)

The executive committee usually consists of the senior managers of the organization. The committee should also include the external consultant's representative. A consultant from the package vendor should also be part of the committee. Their purpose is to establish the overall high-level strategy of the ERP system in relationship to their company and to establish visions and missions for the ERP system. The visions are perceptual while missions have a specific objective tied to a due data.

The executive committee formulates the long term goals, objectives and strategies regarding the implementation of the ERP system in the company.

The executive committee defines the objectives, monitors progress and quickly resolves the issues that are brought to their attention. They ensure that the conditions are right for the

implementation. This means that they eliminate any possible conflicts of interest, which the project team members may experience.

The executive committee also ensures that corners are not cut for the sake of convenience and are committed to removing any barriers that may hinder both progress and the realization of benefits.

The executive committee is responsible for the monitoring and evaluation of the project and its progress. The committee is the body that approves budgets and initiates corrective action when things are not going according to plan. So the committee should establish a reporting and monitoring mechanism by which it will be kept abreast of progress.

2.4 Project Management Team

The project management team is headed by the project manager. The project manager will report the project progress, problems and other issues to the executive committee.

The project management team is responsible for conducting the scheduled work, administering the project, communicating with the in-house team and the consultants. The team members should monitor the implementation teams progress, assess the amount and quality of the contribution of the team members both in-house and consultants and resolve the issues that exist.

The project management team should also ensure that the company personnel and the consultants are working together as a team and that there is full co-operation between the two groups. They are also responsible for ensuring that the consultants are transferring their knowledge to the in-house team and all the documentation is done properly. The project management team should make sure that even after the external consultants and vendor representatives leave, the system will run smoothly.

2.5 Project Manager

The person who manages the implementation is the project manager. He is the person responsible for translating the vision and goals into reality. He reports to the executive committee and heads the project management team.

The project manager heads the project management team. This team includes the head of the vendor representatives, the chief consultant and the work team leaders. The work teams carry out the various tasks for implementing the system. They are the people who setup the infrastructure, produce documentation and train the employees.

The package vendor will appoint one or more of its consultants to provide support to the project manager, manage the client account and coordinate other vendor resources. Vendor consultants advise about best working practices, software functionality and assist with technical issues. Training

is provided in the first instance by the vendor to the work teams through either the consultants or specialists trainers. Once the work teams have developed and proven the new way of doing things, they produce the procedural documentation and train other employees.

The implementation of the ERP system demands that the managers and operational staff understand how the new information environment is going to work. They should be given a clear picture about what is to be changed in the current setup and what additional facilities the new technology will give the end-user. This is important because the new technology and the additional responsibilities that arise when the new system is in place can overwhelm many people. So it is important to give everybody involved an idea of what to expect before the project starts.

The project manager is also an administrator, keeping records about project progress, maintaining the project plan, handling correspondence and checking invoices.

The responsibility of the project manager is to promote business changes, builds support systems, establishes project direction, motivates ERP team, protects the team from external pressures, maintains clear view of goals and objectives, design and execute schedules, encourage clear communication, develop individuals and team also.

2.6 Implementation Team/Work Team

The implementation team/work team consists of selected employees from the company in addition to vendor representatives and consultants. These employees will perform the various tasks in implementing the ERP system form installing the hardware, software, customizing, documenting, training and so on.

The work team will perform all the day-to-day tasks of the ERP implementation from installing the hardware, software, performing customizations if required, documenting the procedures, conduct end-user training, etc.

The work teams will do the testing of the system once the system is installed. The work teams will also participate in the training of the end-user of the system. The in-house team will contain people from the company's various functions/departments.

The work team leaders should hold regular meetings with their team members in order to bring the team together so that they are all aware of what is happening. This is an opportunity for progress to be reviewed, for issues to be highlighted and for problems to be shared. They will also have regular meetings with the project manager to review the progress, resolve the problems and decide how to proceed.

2.7 Technical Support Team

The function of the technical support team is to create an environment that is suitable for the implementation of the software. They are very close with the work team and takes care of issues like data migration, data backup and recovery, hardware infrastructure and performance tuning of the database.

Technical support team is responsible for ensuring that the machines will be up and running, the network is functional and the hardware infrastructure is in good shape for the work team to implement the software package.

2.8 Administrative Support Team

The job of the administrative support team is to make the life of all others on the implementation team easier, so that they can concentrate on their tasks and be more productive and efficient.

The responsibility of the support teams include making available the workspace, tables, conference rooms, telephones, stationery, filling cabinets and any other resources required by the project team. Other duties include arranging the meetings and conferences, making photocopies of documents, circulating them to the right people and any other administrative tasks that could make the life of the team easier.

2.9 Consultant

It is the users who will be driving the implementation, and their active involvement at all levels and across all business functions is absolutely critical.

It is the responsibility of the consultant to help users appreciate the fact that it is they who are ultimately benefited by implementing the standard package. This can serve to motivate and reinforce confidence among the users, who are the driving force behind any successful implementation. The success of an information system should be measured in terms of how completely it is accepted by its users. Many positive changes come about as a result of user acceptance and this becomes visible over a period of time. However, some of the benefits are instantaneous.

The consultant has to drive home this fact so that the users appreciate this reality and continue to contribute positively. Ultimately, the users are certain to get a feeling that ERP is an integrator and not an intruder and as a result of this, the entire business is catapulated to newer heights and results in enhanced performance.

External consultants advise the project manager and the implementation team in all areas where there are no in-house experts.

Consultants provide a wide variety of functions in the gaps. Positions that consultants can fill include project manager, team leader, team member, service representative and end-user. A consultant's success depends upon a number of factors including computer literacy, conceptual skills, software knowledge, industry knowledge, maturity, problem-solving capability, communication skills, and organizational skills.

Consultants provide **three general categories of services** management, application and technical.

i. **Management consultants:** Focus primarily on the function of management as it relates to the organization of resources and business process flows. Management consultants often participate in project management and will provide high level direction for the overall successful implementation and use of the ERP system.

ii. **Application consultants:** Focus on the process of communicating, teaching, demonstrating and configuring software for the business process flows.

iii. **Technical consultants:** Deal with technical issues such as database conversions, source code modifications, communication protocols, operating systems, software installation, hardware systems and integration programs.

The role of the consultants is that they should guarantee the success of the project and should be able to show results (quantifiable results like reduction in cycle time, increased response time, improved productivity and so on) to the satisfaction of the company management.

Consultants are responsible for administering each of the phases of the implementation so that the required activities occur at the scheduled time and at the desired level of quality and with effective participation of all those who must participate.

Consultants are also responsible for analyzing and clearly addressing the customization issues. They must be able to distinguish between the 'must have' and 'nice to have' items and decide on the level of customization.

It is the duty of the consultants to present the advantages and drawbacks of each area and reach a consensus decision, which should also be the right one.

It is also the duty of the consultants to understand the total context and scope of the envisioned work and to know when to alert the company management about actions and decisions that must be undertaken so that the job not be comprised and the implementation will not be jeopardized. They also maintain technical documentation.

2.10 Vendors

Vendors are people who have developed the ERP packages. They are the people who have invested huge amounts of time and effort in research and development, to create the packaged solutions. The vendor representatives are responsible for fixing any problems in the software that the implementation team encounters.

Another role the vendor representative's have to play is that of the trainer-to provide the initial training for the company's key users, people who will play lead roles in the implementation of the system. The vendor representatives also play an important project support function and must exercise the quality control with respect to how the product is implemented. The vendor is responsible for helping the implementation team in customizing the ERP package to suit the company's needs.

Vendors have to constantly upgrade their products to use the best and latest advancements in technology. Their role is to supply the product and its documentation as soon as the contract is signed. They are responsible for fixing any problems that the implementation team encounters in the software. So they constantly interacts with the implementation team.

Another role of the vendor is as a trainer to provide the initial training for the company's key users, people who play lead roles in the implementation of the system. Vendor training should achieve the goal of showing the key users how the package works, what the major components are, how the data and information flow across the system, what is flexible and what is not, what can be configured and what can not, what can be customized and what should not, the limitations, the strengths and weaknesses and so on. The objective of the vendor training is to show how the system works, not how it should be implemented. This means that the vendor demonstrates the product as it exists and highlights the available options.

The role of the package vendor does not end with the training. The vendor also plays an important project support function and must exercise quality control with respect to how the product is implemented. It is the vendor who understands the finer details and subtleties of the product and can make valuable suggestions and improvements that could improve the performance of the system.

2.11 End Users

End-users, who represent the largest group, are the general mass of people who will use the new ERP system. Tremendous variations in skill sets can be found among the group. They have the least control over the outcome of the ERP project. Documentation and training programs are often prepared specifically for this group of people. High-end-user acceptance of the new ERP system is required for its success.

SUMMARY

- The process of ERP implementation is referred to as, "ERP Implementation Life Cycle".
- ERP implementation life cycle focus on the ERP project which is carried out to make ERP up and running.
- ERP project is gone through different phases. Most often these phases do not necessarily depend on one another in a sequence, i.e., one phase might start before previous phase has finished. So there are no clear separating lines between these phases. But, logical order of phases is followed.
- All the phases of ERP implementation life cycle may not be applicable in all cases. e.g., If the organization have already identified a particular package, then first phase of life cycle, i.e., pre-selection screening and package evaluation is skipped.
- **Different phases of ERP implementation**:
  - i. *Pre-evaluation Screening:* It is the first phase of ERP implementation life cycle. It begins when the company decides to implement ERP package. So, in pre-evaluation screening, it starts to search for the perfect package.
  - ii. *Package Evaluation:* In this phase, we are selecting our package that will decide success or failure of the project.
  - iii. *Project Planning Phase:* This phase designs the implementation process. In this phase details of "how to go about implementation, time schedules and deadlines etc" are decided. Roles are identified and responsibilities are assigned in this phase.
  - iv. *Gap Analysis:* It is a phase or process in which companies create a complete model of where they are now, and in which direction they want to head in future. Gap analysis is a phase in the ERP implementation, where the organization tries to find out the gaps between the company's existing business practices and those supported by the ERP package.
  - v. *Configuration / Customization:* This phase reveals strength but also weakness of the company business processes. This phase explains what won't fit and where the gap is.
  - vi. *Implementation Team Training:* In this phase, employees are also trained to implement and later to run the system. Vendors and consultants will leave after the implementation is over.
  - vii. *Testing:* This is the phase, where we try to break the system. We try to break the system until we reach a point where we are testing real case scenarios. This test case must be designed specifically to find the weak points or links in the system and these bags should be fixed before going live.
  - viii. *Going Live:* This is the phase where all technical sides are over, and the system is

officially declared operational. In this phase, ERP is made available to the entire organization. The implementation team must have tested and run the system successfully for some time. Once the system is 'live' the old system is removed and the new system is used for doing business.

ix. *End-User Training:* This is the phase where the actual users of the system will be trained on how to use the system. This phase starts much before system goes live. The success or failure of an ERP system depends on how the actual users use the system.

x. *Post-Implementation Phase / Operation and Maintenance / Maintenance Mode:* In this phase, the system must be upgraded as and when new versions or new technologies are introduced. Everyone who uses these systems needs to be trained on how they work, how they relate to the business process and how a transaction ripples through the entire company whenever they press a key.

- The ERP implementation project is a joint effort of many groups of people-the in-house implementation team, package vendor's team, outside consultants, end-users and company management.

EXERCISE

1. Explain different phases used in ERP implementation.
2. Explain Pre-evaluation screening phase of ERP implementation.
3. Explain Package evaluation phase of ERP implementation in detail.
4. Explain Project planning phase of ERP implementation.
5. Write note on following ERP implementation phases
   - i. Gap Analysis Phase
   - ii. Reengineering Phase
   - iii. Customization / Configuration Phase
   - iv. Implementation Team Training Phase
   - v. Testing Phase
   - vi. End-user Training Phase
   - vii. Going Live Phase
   - viii. Post implementation Phase

6. Discuss each ERP implementation phase and list out the activities to be performed in each phase.
7. Explain role of the different people in the organization in the ERP implementation.
8. Explain role of the following persons of the organization in the ERP implementation :-
   i. CEO / Project Sponsor
   ii. Executive Committee
   iii. Project Manager Team
   iv. Project Manager
   v. Implementation Team / Work Team
   vi. Technical Support Team
   vii. Administrative Support Team
   viii. Consultant
9. Explain the role of the vendor in the ERP implementation.

5 ERP Case Studies

1. Post Implementation Review

The expectations from ERP systems were always high and organizations experimenting with it hoped for significant increase in their profit gains.

Post implementations review is related to implementation process. In post implementation review, a number of implementation factors are explored and focused and reviewed on a post-implementation basis because issues associated with (ERP) implementations become more widespread during the post-implementation stage.

Because once users understand their way around the program, they can manipulate it, triggering shockwaves that can spoil an otherwise efficient control environment. While comprehensive incorporation and acceptance testing eliminates coding mistakes and workouts pathways through the program, in post-implementation phase it is the maintenance team which gets busy in bug reviews and dealing with new demands of users for new features. Consequently, the post- implementation phase becomes continuous process of improvement and fine tuning.

Usually, the force behind ERP installation and implementation is the support of top management of the enterprise. Employees on the other hand, have always been uneasy or have a fear in their mind about ERP solution. ERP systems can atomize many jobs which mean some employees may not be

needed once system implementation is complete. In lower and management cadres fear getting declared incompetent in case of failing to understand and use the ERP system. They take time to learn the system procedures. Meanwhile they keep using their old techniques and avoiding ERP system. Some employees can be technology shy. So employees due to fear of making mistakes or due to their shyness may need some time space to accept the system. Employees in the beginning use such feature of system where chances of making mistakes are minimal like emailing or data reports. Gradually employees get experienced and get a grip on the system. At this point, an explosion takes place. Number of active and effective users increases at tremendous speed as employees learn from each other quickly. Creativity of employees emerges and demands for new features in the system increases at rocket speed.

A post-implementation review or audit can be an extremely valuable exercise that provides feedback indicating whether the plan was executed properly and key benefits were achieved efficiently and effectively. Many companies hire an independent expert to conduct the review, thereby ensuring a balanced report. The outsider may provide valuable insight into the cause of problems and corrective actions. For the purpose of reviewing software implementation, our experts can be either consultants or vendors.

The following summarizes the contents of a typical post-implementation review report.

▶The Review Document

The report's first section describes the methodology used for gathering information. Most reviews have two parts: Extensive interviews and perusal of documentation. The people interviewed should represent each stakeholder group involved in the project, including maintenance management, maintenance technicians, operations management and workers, senior management, accounting, information technology, engineering, purchasing and vendors. The report should list the people interviewed. It is useful to have a list of standard questions to guide each interview. Some sample questions include:

i. What was the purpose of the project?

ii. What did you like about the implementation process?

iii. What things would you change if you has to do it again tomorrow?

iv. Were your expectations met? Why or why not?

v. Was communication effective throughout the process?

▶Project Objectives

It is important to have a look on the original purpose behind implementing to ensure the original objectives were met.

If the objectives were clearly stated at the project start, then that material copied from a previous document is sufficient, it is surprising how often objectives were not clear, as evidenced by the range of responses to the first question above. Focusing on a few well-communicated objectives is key to ensuring a successful project.

▶Issues and Recommendations

The bulk of the review should identify issues from each stage in the project, recommendations for eliminating outstanding issues and suggestions for preventing a recurrence. Installation of software and hardware is almost always fraught with problems. The key to avoiding such struggles is to anticipate potential problems have resources and a methodology for dealing with them and establish a viable escalation procedure, if required.

▶Appendices

The final report section provides detailed documentation of related material, such as the list of people interviewed, a summary of interview questions, a log of detailed issues that arose during the project and other relevant documents.

2. ERP CASE STUDY

2.1 Colgate –Palmolive Company

▶About Company

Colgate-Palmolive is a company that operates in more than 200 countries. The company focuses on strong global brands in its core businesses – Oral Care, Personal Care, Home Care, and Pet Nutrition. This leading consumer products company is committed to using technology to create products that improve the quality of life for consumers wherever they live.

▶History of the Company

Mr. William Colgate had established "Colgate" in 1806. Its main business areas were manufacturing of starch, soap and candle. It has merged with Palmolive in 1928. Corporate name changed to Colgate-Palmolive in 1956. Colgate is now recognized as one of the leading

manufacturers of Oral Care, Dental Care, Household Surface Care, Fabric Care and Pet Nutrition Products.

▶ Need for implementation of ERP

i. Since company is operating in more than 200 countries it has divergence of operating platforms.

ii. There were dozens of operating platforms running all over the world.

iii. Also persons from developing counties were low in IT skills / knowledge in mid 80's .

iv. Hence communication, data interpretation, exchange of data, consolidation of data was tedious.

v. No one understood all of the legacy systems.

vi. There was one CIO for each country however no standards or best practices were followed.

vii. Hence company has decided to implement ERP software in 1999.

▶ Implementation of ERP

The project team was led by the international consulting group within ERP Consulting, with expert input from Colgate- Palmolive. ERP Consulting provided project management resources, solution experts joined the team from ERP Consulting's system landscape optimization team, and ERP's global account management personnel helped with the complicated language issues involved. ERP used partner resources whenever it was beneficial to drive process standardization across subsidiaries.

i. End-to-end integration complexity: both sales and marketing, as well as to enterprise

ii. After its success in Mexico, Colgate assembled a team of business analysts and IT staff to determine how the application's standard templates could best be localized for other countries and units.

iii. Implementation teams at each subsidiary with the same skill set as the global development team will roll out the functionality.

iv. When the rollout is complete, Colgate's managers will be able to ensure more successful campaigns and maximize their promotion spending. With a thorough understanding of performance metrics, Colgate will be able to analyze a promotion's performance within the context of overarching business strategies and global financial goals.

v. Target of 6 to 9 months per implementation depending on size, complexity, sophistication

Selection of ERP package and reason for selection

i. ERP Supports end-to-end planning and execution processes

ii. ERP aligns with Colgate's ERP-centric global IT strategy

iii. ERP offers industry-specific trade promotion functions

iv. Leverages significant ongoing R & D investment by ERP

v. Supports financial planning and analytical processes

vi. Leverages enterprise-wide data to make business decisions

vii. ERP provides high-quality resources at a very competitive price.

viii. Also ERP Consulting has developed work protocols, as well as communication and project management methodologies that ensure the physical location of resources is not an issue.

Challenges and opportunities

i. There were different financial targets for each area hence integration of commercial plans was a challenge.

ii. As company is operating in 200 counties on different software's, there are many planning horizons.

iii. They have to investigate the benefits of an offshore delivery model

iv. Effective trade promotions

v. External factors such as consumer, professional and retailer was having different programs hence alignment of these factors was very skillful job.

vi. Evaluation of performance and gather key insights of specific regions was difficult.\

vii. Same ERP systems that could not be integrated all over the world.

▶ Benefits of Integration of Process

i. Availability of information in real time.

ii. Decision making made easy because of availability of accurate and up-to-date data.

iii. Business process re-engineered and in some cases different departments consolidated into one

iv. Improved efficiency - about 30% for the database applications and about 50% reduction in processing time

v. ERP handles 95% of the company's annual sales.

vi. Datacenters shrinks to 1 (and one backup) from 75

vii. Inventory reduce by 10%

It means after the ERP implementation, colgate-palmolive company have various benefits of it. The company realizes tremendous changes before and after the ERP package implementation. So post-implementation review of it is shortlisted listed as follows:

Criteria	Before ERP Implementation	After ERP Implementation
Enterpricing Data	5 – 80 Days	5 Min.
Customer Credit Check	15 – 20 Min.	Automatic
Enter Customer Order	30 Min.	5 Min.
Customer billing inquiry	15-20 Min.	Real-time
Ship evaluation unit	3-30 Days	2 Days
Ship replacement part	3-44 Days	2 Days
Credit returned item	1-5 Months	5 Days
Commit date for delivery	2 Hrs - 3 Weeks	Real-time

Company Name: - Colgate-Palmolive

Location: - New York City, U.S.

Industry: Consumer products

Products and services: - Oral Care, Dental Care, Household Surface Care, Fabric Care and Pet Nutrition products

Website: - www.colgate-palmolive.com

2.2 Mahindra and Mahindra

▶About Company

Mahindra and Mahindra was incorporated on 2 October, 1945, by K.C. Mahindra and J.C. Mahindra as a steel trading company, and entered in automotive manufacturing in 1947.

It has five manufacturing sites for automobiles and exports them to Eurpoe, Australia, south Africa and Iran. In the farm equipment sector, it is the largest tractor manufacturer in the country. It has two manufacturing sites for tractors and exports them to Africa, USA and Middle East.

It has 1,44,000 employees in over 100 countries across the global. Its operations span 18 key industries that form the foundation of every modern economy; aerospace, affermarket, agribusiness, automotive, components, construction equipment, consulting services, defense, energy, form equipment, finance and insurance, industrial equipment, information technology, leisure and hospitality, logistics, real estate, retail and two wheelers.

▶Company Purpose And Values

To give the best every day comes from core purpose and challenge to the conventional thinking and innovatively use all resources to drive positive change in the lives of our stakeholders and communities across the world, to enable them to rise.

All the products and services support customer's ambitions to improve their living standards.

▶Earlier Problem/Situation before ERP Implementation

Earlier, whenever the need for a new test system arose, a copy of the entire production database was done. Even when they were carrying 8 years of data and the size ran into several terabytes, and using the same procedure. Obviously, this causes many challenges. Since production databases are extremely huge, this used to take a tremendous amount of time.

In the meanwhile, the production system resources used to be taxed heavily and the test system would have a downtime to around 3-4 days, leading to unnecessary project delays. Data also had to be refreshed periodically, if it had to reflect the current scenarios. Not only was this a tedious procedure, but getting concurrence from all the users regarding a common refresh data was a bigger concern. M and M was also faced with problems like sluggish sales, declining market share, low profits, dismal stock performance, lack of innovation in business and low productivity ratio.

▶The Solution and Implementation

Mahindra and Mahindra started looking around for solutions to overcome these issues. And found the best way-an ERP solution form SAP, the SAP Test Data Migration Server (TDMS).

M and M uses SAP as platform for transaction processing and business analytics. SAP platform is also extended to M and M dealers and suppliers. All these applications need to be supported by robust test environment with real time transactional data. Thus, M and M felt the need for a comprehensive test environment, which would not only be a real reflection of the current data, but also be robust enough to be refreshed quickly.

M and M thus become the first company in India to implement SAP TDMS in the manufacturing vertical.

Bristelcone India Pvt. Ltd., SAP consulting and SAP custom Development undertook the actual implementation of the TDMS software together. It was completed within a remarkable time span of just three weeks in June 2007.

Based on the company's requirement, it just copies a slice out of the production database, stores it temporarily in the production system itself. It is then copied from the temporary tables to the test server. The production processes are not affected at all. It is 'zero downtime' software. After the first successful plan, M and M decided to take another copy and test it with a live project.

The benefits that SAP TDMS has brought to the project deployment process have been enormous. The most significant feature of TDMS is that it supports a multi-client environment and even allows selective refresh of each client.

Earlier the testers had to wait for days for a data refresh. Now, we just keep the original copy as it is, so the testers can continue with their work, and create the fresh copy under a new client. Both can be accessed simultaneously.

The biggest saving have been realized in the reduction of storage and administrative costs. Since, today only a small slice of 3-4 months of data is being copied into the test system, the space required is far less than before. Thus, M and M has been able to respond to the users testing needs and manage databases more effectively. The savings show up in its entirely not only on the disk space but also from the entire resource point of view-even RAM and CPU utilization is maintained at optimum levels.

The other benefits include significant improvement in the response times from the users and zero co ordination effort during a data refresh.

The long standing and successful business relationship between M and M and SAP has only been strengthened further. And now M and M has global identity.

Company Name: Mahindra and Mahindra

Location: Mumbai, India

Industry: Manufacturing

Products and services: Automobiles, Engines, Telecom software, Engineering and steel, Rural finance and Holidays.

Website: www. Mahindra.com

▶ Challenges and Opportunities

i. Database of production system too large to do a complete copy into the test system.

ii. Sub-optimal utilization of system resources during test system copy.

iii. 3-4 days test system downtime required for every data refresh.

iv. Time for system refresh needs to be aligned between all users from multiple locations with different projects schedules and stages.

▶Objectives

i. Create authentic SAP environment to test new business scenario.

ii. Produce test environments of manageable size with real transactional data.

iii. Reduce the time required for test system refresh.

iv. Enable multi-client.

▶Why SAP/ERP

i. M and M uses SAP as platform for transaction processing and business analytics.

ii. M and M has positive experience with SAP support systems-during new implementations/ Pocs.

iii. Reliability and stability of SAP software.

iv. SAP test data migration server satisfied majority of business requirements.

▶Implementation Highlights

i. SAP TDMS implementation for non-unicode systems completed with a 3 weeks time frame.

ii. Excellent support from the SAP consulting and SAP custom development teams.

iii. Data migration scenarios tested with live projects have been very successful.

▶Benefits

i. Support of independent project schedules by selectively refreshing single clients of the test systems.

ii. Better testing of development projects through up-to date, robust and reliable data in the test system which can easily be refreshed.

iii. Ability to create test systems as required by copying only specific time-slices.

iv. Large savings on storage space and other administrative requirements.

v. Significant improvement in response times from the users.

vi. Less co-ordination effort during a data refresh.

2.3 Jalan Wires Private Ltd

▶About Company

Jalan Wires Private Limited (JWPL) an ISO 9001:2000 company is India's one of the leading manufacturer and supplier of copper and Aluminum enamel winding wires. The plant is located in DAMAN and head office in Mumbai. Jalan is the first choice of establishments like the Indian Navy, Philips, Wipro, Havells, Videocon, Crompton Greaves, Surya, Bajaj Electricals, Godrej and other known names in the business. It is established in 1997 to serve the electrical and electronic industries.

▶ERP Implementation

Jalan wires Pvt. Ltd. Implemented Eresource ERP in 2007 to enhanced control and operational efficiency.

Eresource ERP was tailored to fit the specific needs of the manufacturing industry, manufacturers in general and distributors in particular.

Eresource ERP for manufacturing industry handles right from the enquiry to delivery and dispatch of material to the customer.

▶Why e-resource ERP?

Web-based Eresource ERP solution, simplifies back-office process automation for mid-sized and growing business. It provides real-time information about finance, order management, purchase, inventory, employee management, e-commerce and much more. With web-based resource ERP solution, we can accelerate business cycles, improve productivity and reliability and provide higher levels of service to customers, suppliers and partners.

Web-based ERP solution improves business among customers, suppliers and partners through self-service portals, providing for lead management, shipment tracking, bill payment and more.

- **Company Name:** Jalan Wires Pvt. Ltd.

  Location: DAMAN, Gujarat

  Head office: Mumbai, India

  Industry: Enameled Wire Manufacturing

  Website: www.jalanwires.com

▶Key Benefits of ERP

i. Gained enterprise-wide view of operations and centralized management control.

ii. Improved information accuracy by introducing single data entry point.

iii. Cut month-end reporting time from 20 days to 12 days.

iv. Increased availability of manufacturing's for productive use.

v. Minimized equipment downtime by ensuring parts can be easily located.

vi. Strengthened cost management and quality control.

vii. Streamlined distribution and ensured customer orders are met.

3. ERP Demo Tool: ERP Next

3.1 Introduction of ERP Next Demo Tool

i. **About ERPNext:** ERPNext is a ERP demo software. ERPNext is an Open Source, web based application that helps small and medium sized business manage their accounting, inventory, sales, purchase, administration, project, customer support and website.

ii. **Open Source:** Web Based ERP in Python, Javascript and MySQL.

iii. **Architecture:** ERPNext is built on wnframework, a full-stack web app framework built primarily for ERPNext. Database back-end is MySQL.

Once you have the system wired up, you can login as Administrator and start working on the meta-data. All models in the system are called DocTypes, which also double up as views. wnframework updates your schema on the fly as you update DocTypes and views are generated on demand in your browser .

There are many built-in goodies like role based permissions on DocTypes, email integration, lists, report builder etc.

iv. **Dependencies**: ERPNext is built on MySQL and Python (cgi) and is tested to run on Linux / Unix. - MySQL-server - Python - Apache HTTPD Server.

ERPNext is Free and Open Source under the GNU General Public License. It is easily downloaded from the site:- https://demo.erpnext.com/

v. **Resources and Links**

Code

a. wnframework (Python full-stack web app framework)\

b. erpnext (ERPNext modules)

License

a. GNU/General Public License

b. Platform

▶ERPNext is built on wnframework (Version 2.0)

i. What is ERPNext?

ERPNext is an web based, open source application that helps small and medium sized business manage their accounting, inventory, sales, purchase, manufacturing, projects, customer support and website.

ii. Why ERPNext?

There are a lot of nice single module (Accounting, Invoicing, Customer Support, Projects) apps available for business but nothing that is integrated. The integrated options are usually too expensive and too complex to use. ERPNext fills this gap by providing a friendly and affordable app with all the features of a full ERP.

3.2 ERPNext Benefits

I. Keep track of every transaction, taxes, billing and budgets

i. **Multi-Company:** Create multiple companies with each company having its own flexible Chart of Accounts.

ii. **Multi-Currency:** Do your transactions in multiple currencies. Buy and sell in different currencies in the same Invoice.

iii. **Make Invoices, Journal Entries:** Maintain your book of accounts with Journal Entries, Sales and Purchase Invoices. All accounting and business entries are automatically updated in the General Ledger.

iv. **Configurable Taxes:** ERPNext has a tax template that can map taxes from any country including Value Added Taxes (VAT).

v. **Cost Centers and Budgets:** Track your business expenses and income against cost centers and maintain account-wise budgets for each. ERPNext will warn/stop you from exceeding your budget.

vi. **Trial Balance, Ledgers, AP/AR:** Get standard financial reports like Trial Balance and Accounts Payable (AP) and Accounts Receivable (AR).

2. Convert Leads, send Quotations and ensure on-time shipping

i. **Track Leads:** Create your lead database, get a view of your pipeline, get reminders from your calendar and track communication history.

ii. **Convert Opportunities:** Update your database of Opportunities and get convert more by sending timely quotes.

iii. **Send Quotations:** Prepare and send fully formatted Quotations with all Item details, including pictures, pricing and detailed terms and conditions. Track conversions into Orders

iv. **Fulfill Orders:** Track shipping / billing status across all orders to ensure on-time delivery and material planning.

v. **Calculate Taxes and Discounts:** Create multilevel item-wise tax and charges templates for easy order entry. Print Orders to include charges or taxes in item cost for simplified view to the customer.

vi. **Monitor Targets:** Set sales targets across Territories and Sales People and allocate sales to multiple sales people. Track commission and other information.

3. Run an efficient business with accurate information of stock on hand

i. **Items and Warehouses:** Maintain Items across Warehouses. Set Item Price Lists and Taxes for detailed item cost tracking.

ii. **FIFO and Moving Average:** Get your stock valued as per First-in-first-out (FIFO) or moving average. Make back-dated entries and the system will forward-calculate your valuation.

iii. **Stock Entries:** Move items from and to various warehouses and "back-flush" inventory based on Bill of Materials.

iv. **Warranty and Traceability:** Maintain a database of unique Serial Numbers for items that require traceability and to warranty and maintenance contracts.

v. **Batch inventory:** Create and manage batches of inventory for expiry and other batch related information.

vi. **Point of Sale:** Update inventory, accounting ledgers and payments all in a simple Point-of-Sales (POS) form.

4. Manage your Supply Chain and Stay on Top of your Purchases

i. **Avoid "Out-of-Stock":** Purchase Requests help you identify items you need to purchase and are created either manually, or if an item crosses its re-order level or from a Production Plan.

ii. **Track Purchase Orders:** Build and send Purchase Orders to your suppliers right from the system and track how much material is pending from which supplier.

iii. **Avoid Over Supply and Over Billing**: Set limits on Over Supply and Over Billing and get warning if the Supplier is billing at a different rate or quantity.

iv. **Sub-contract Items:** Manage scenarios where you supply the raw-material to the sub-contractor to ensure that the right amount of material is sent and consumed.

v. **Calculate Landed Costs:** Spread expenses over a number of Purchase Invoices retroactively in cases where you get bills after a period of time.

vi. **Incoming Quality:** Keep a record of sampling measurements on incoming Items from your suppliers.

5. Manage your Bill of Materials and Plan for Production

i. **Multilevel Bill of Materials (BOM):** Manage multi-level Bill of Materials and Operations for all sub-assemblies and final assemblies. Calculate manufacturing + material cost based on BoM.

ii. **Make Production Plans:** Make Production Plans by combining Sales Orders and plan for material and operations.

iii. **Material Requirements Planning (MRP):** Automatically calculate material required to complete a Production Plan based on Requested, Ordered, Actual and Reserved Stock.

iv. **Release and Close Work Orders:** Release item-wise Work Orders, build and review material consumed for production and back-flush inventory on closing.

6. Manage Administrative Processes like Payroll, Expense Claims and Leaves

i. **Maintain Employee Records:** Keep detailed records of your present and past employees including their work-history, skills, family information, health information.

ii. **Manage Payroll:** Generate Payroll from Salary Structures created for employees based on tax rules, grade, department, etc.

iii. **Attendance:** Enter or upload attendance information and generate monthly attendance reports based on leaves, holidays, etc.

iv. **Leave Management:** Create and respond to Leave Applications and keep track of leaves taken by each employee.

v. **Expense Claims:** Track and approve expense claims made by employees for travel and other reimbursement expenses.

vi. **Goals and Appraisals:** Set goals for each employee and rate and record performance against the goals.

7. Wow your customers by making sure all queries are fulfilled on time

i. **Track Support Issues:** Automatically pull support issues from your support email id and website and track status, respond and allocate.

ii. **Manage Warranty:** Create issues against Serial Numbers and identify quickly whether the item is under warranty or maintenance contract (AMC).

iii. **Schedule Visits:** Create maintenance schedules for equipment maintenance and get reminders on upcoming visits.

iv. **Record Visits:** Record information of engineer visit reports for future reference and quality analysis.

8. Manage budgets, purchases and time for long projects

i. **Allocate Tasks:** Create projects and tasks and allocate tasks to users. Get a Gantt Chart of all tasks allocated.

ii. **Set Budgets:** Track purchases, sales orders against projects and get a project-wise profitability and variance for "engineer-to-order" type of businesses.

iii. **Track Time:** Record time spent on each project / task via Time sheets for billing and reporting.

iv. **Project Reports:** Get detailed reports of all pending activities, expenses and delivery schedules for complex projects.

9. Add comments, share events and keep track of all your co-workers

i. **Calendar:** Share events with co-workers and also track scheduled appointments with leads and visits.

ii. **To do:** Create and manage your to-do and assign transactions to other user's To Do to allocate work and manage workflow.

iii. **Activity Log:** Get a log of all activities in the system from all users. See log-in log-out times and creation, updation of new records.

iv. **Knowledge Base (Wiki):** Create a simple Q and A based Knowledge system and keep track of questions and answers for various company rules, statutory info, etc.

v. **Messaging:** A simple messaging system for sending messages and documents to users from within the ERP.

vi. **Dashboard and Email Summaries:** Get an accounting dashboard with all your sales, income, expense and profit trends. Setup system to send you daily, weekly, monthly summaries by email.

10. Setup permissions to ensure each users has access to only needed information

i. **Roles:** Create custom Roles and assign roles to users and transactions.

ii. **Permissions:** Set role-based permissions on each transaction. Also create special permission rules to restrict access by user, company, department, etc.

iii. **Restrict by IP/Time of day:** Restrict users to access information within a certain IP or time of day.

iv. **Transaction Approval:** Set approval rules based on amount, etc. Setup separate roles to save transactions as "Draft" and "Submit" (release) transactions.

11. Customize to your taste and setup data quickly by importing spreadsheets

i. **Import from Spreadsheets:** Import tables such as Customer, Supplier, Item and reconcile Stock, Attendance, etc. directly from a spreadsheet (CSV) file.

ii. **Report Builder:** Build report on any table in the system and export the report to spreadsheet for further analysis.

iii. **Add Custom Fields:** Add custom fields to any transaction based on your special business requirements.

iv. **Customize Forms, Prints:** Customize sequencing of fields, for editing and make custom Print Formats for Invoices, Quotations, etc in HTML.

ERPNext - Open Source ERP for small, medium sized businesses includes Accounting, Inventory, CRM, Sales, Purchase, Projects, HRMS. Built on Python / MySQL.

v. Information you will need to fully setup your ERPNext account.

a. *Chart of Accounts:* Account heads for taxes, expense types, income types.

b. Opening balances and outstanding invoices.

c. Taxes applicable on your sales and purchases.

d. Classification (groups) of your Items, Customers and Suppliers.

e. List of Warehouses, Items, Customers and Suppliers.

f. Price Lists of your items.

g. Opening stock, for each item in each warehouse.

h. List of Address and Contacts (of Customers and Suppliers).

i. Letter Head in jpg/gif/png format.

j. Terms of contract for your Sales and Purchase Orders.

h. Numbering Series for all your transactions.

12. ERPNext Goals

i. To build an ERP system that can be used by small businesses worldwide.

ii. To make our software very easy to use, requiring no hand-holding or "implementation".

iii. To ensure that our software "Just Works".

iv. To listen to our customers and solve their "pain" points.

v. About wnframework:

Application Name: ERPNext

Version: 2

License: GNU/GPL - Usage Condition: All "erpnext" branding must be kept as it is

Source Code: https://github.com/webnotes/erpnext

Publisher: Web Notes Technologies Pvt Ltd, Mumbai

Copyright: (c) Web Notes Technologies Pvt. Ltd

4. ERPNext Demo

Click on the link below to start a full demo of ERPNext is a regular user with access to all modules (except Setup) starting from login. The demo is a shared account with data filled in by other demo viewers.

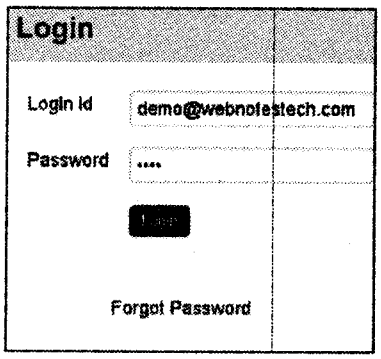
https://demo.erpnext.com/login.html

Note: ERPNext is built using features that are only supported on modern browsers. ERPNext will work well on Firefox 4+, Chrome/Safari 5+ Internet Explorer 10+.

The demo version of ERPNext have a quick start after entering the correct user name and password. On the site , user name and password have by default setting to quick start of demo.

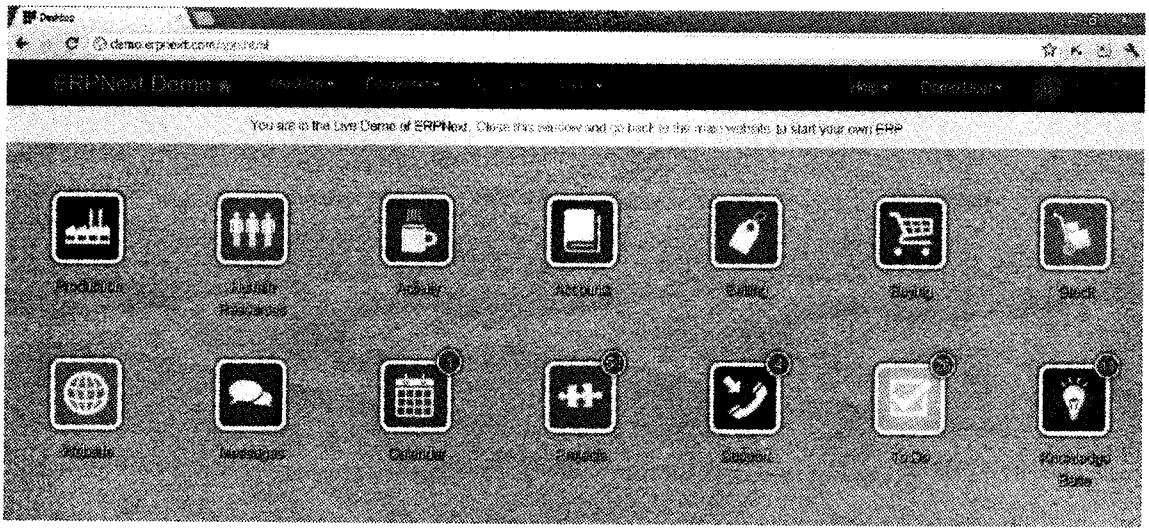
User Name: demo@webnotestech.com

Password: demo

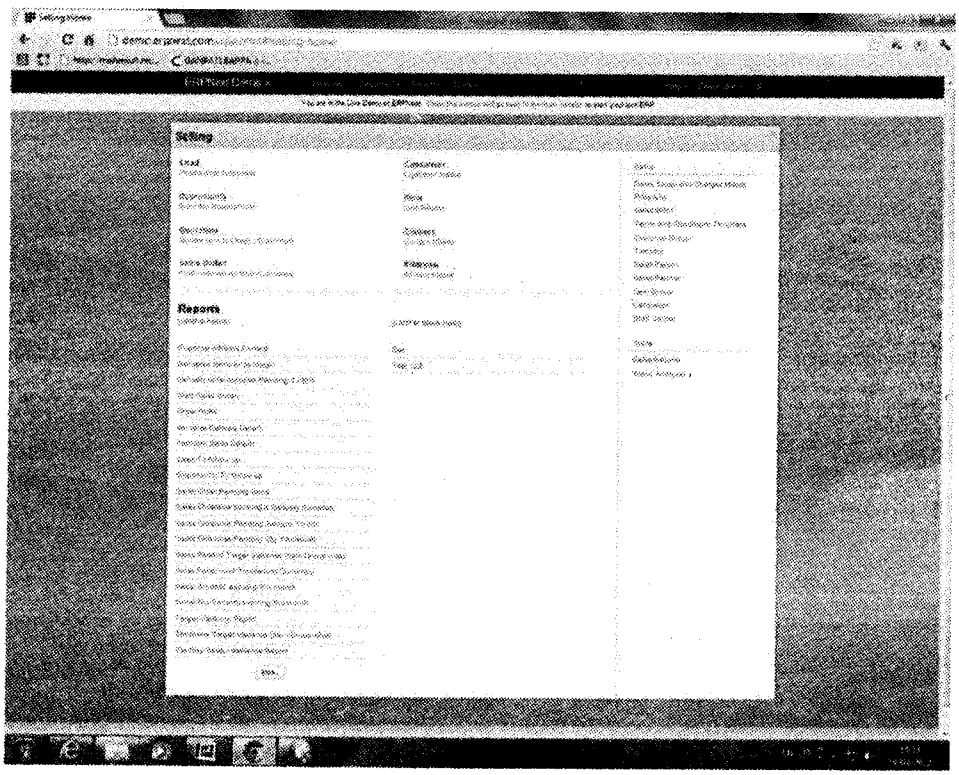


After the successful login, all operations of the organization is available on icons. So we are able to select any option / operation by just clicking on the icon. There are various operations listed below:

And the new window will be as given below: (https://demo.erpnext.com/app.html)

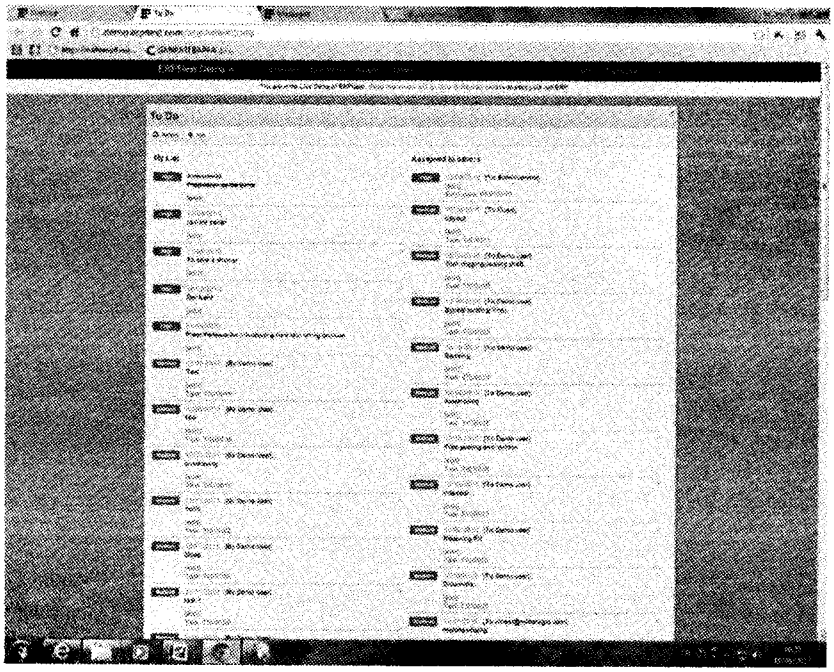


i. **Selling:** Click on the first operation, i.e., selling and the window will appear as the following:

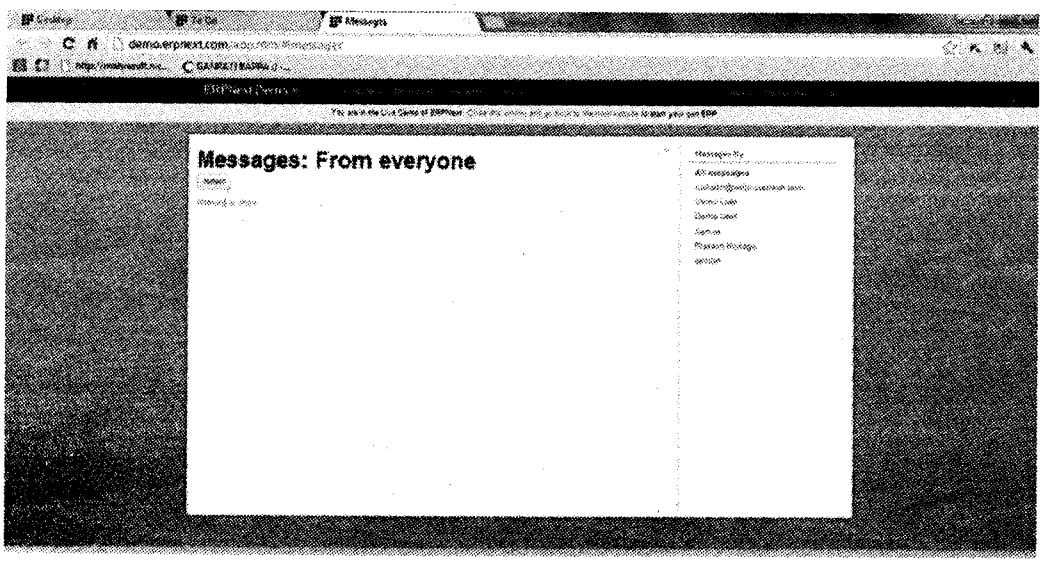


In the selling operation, we have multiple operations like Lead, Opprtunity, Quotation, Sales Order, Customer, Item, Contact, Address and various report we can generate and see in this.

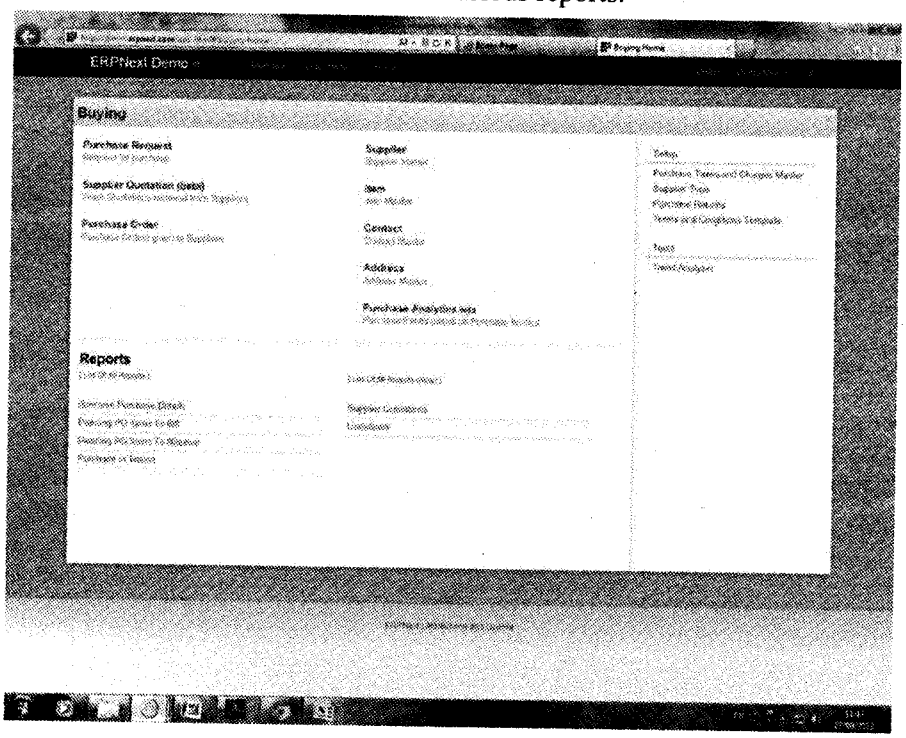
ii. **To do:** This operation helps us to create and manage your to-do and assign transactions to other user's To Do to allocate work and manage workflow.



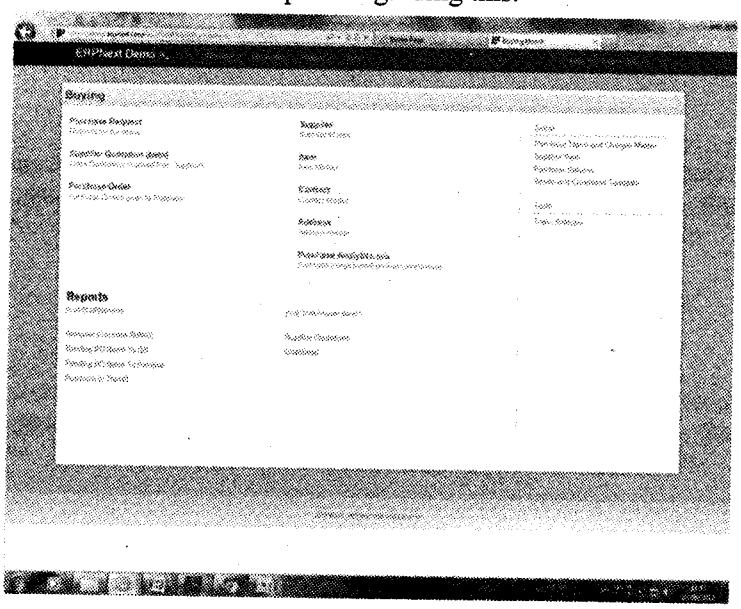
iii. **Messages:** It is a simple messaging system for sending messages and documents to users from within the ERP. Here, we can see messages from everyone and also create a new message for someone.



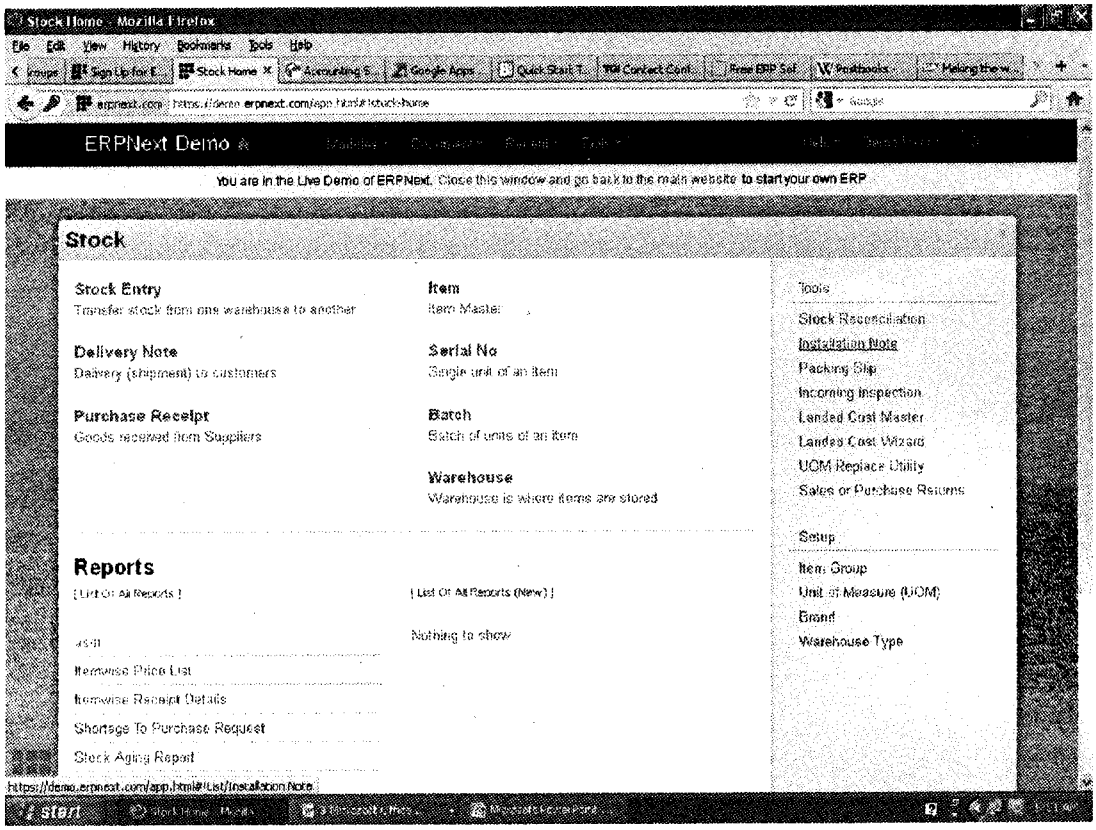
iv. **Accounts:** This helps in operations of journal voucher, sales invoice, purchase invoice, chart of accounts, chart of cost centers and their various reports.



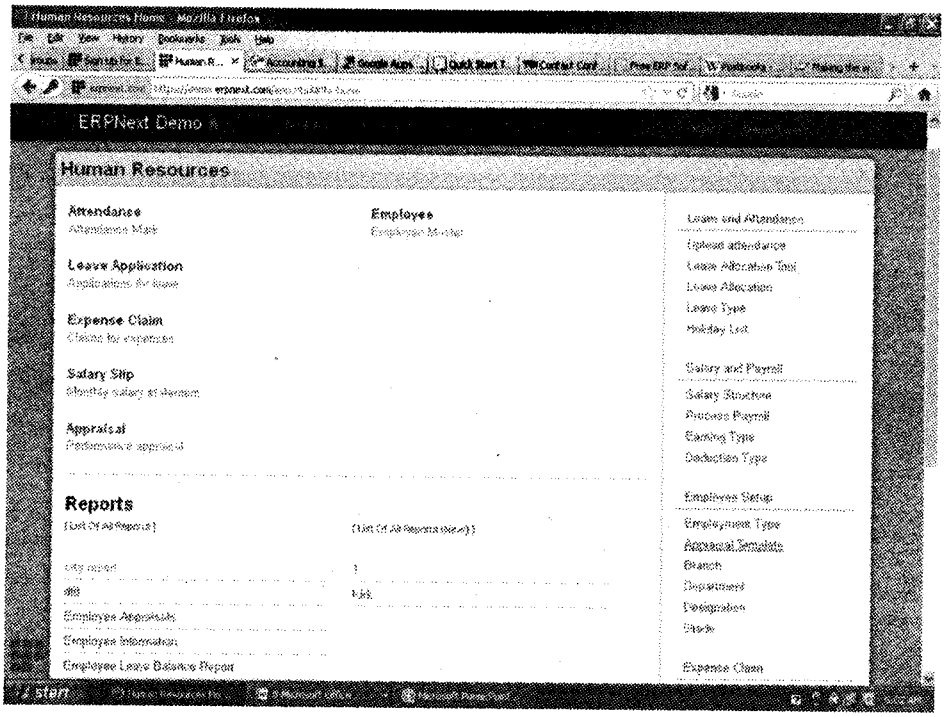
v. **Buying:** It gives details about purchase request, supplier quotation, purchase order, supplier, item, contact, address and various reports regarding this.



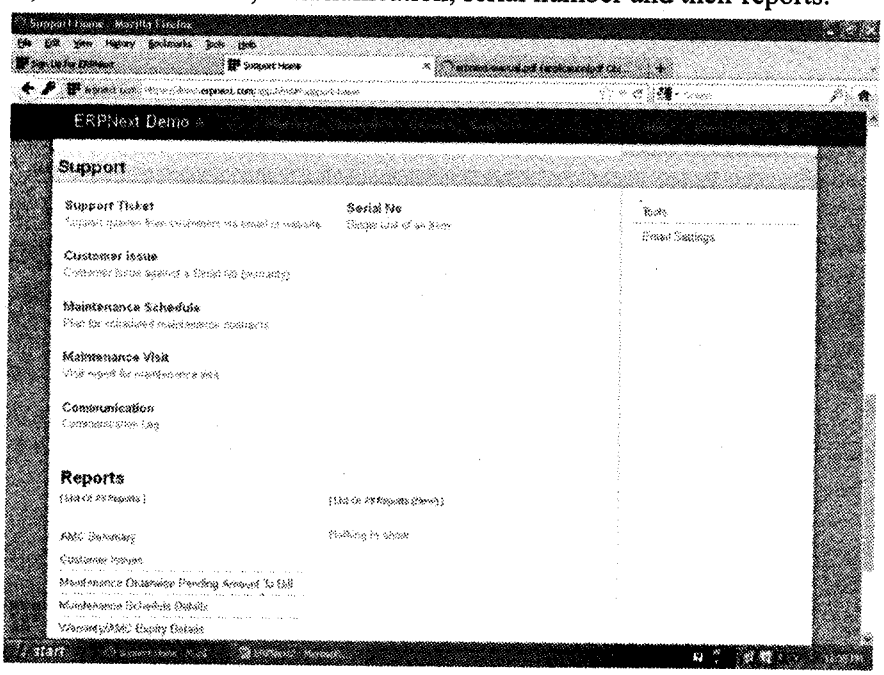
vi. **Stock:** It performs the operation of stock entry, delivery note, purchase receipt, item, serial number, batch, warehouse and detailed reports of it.



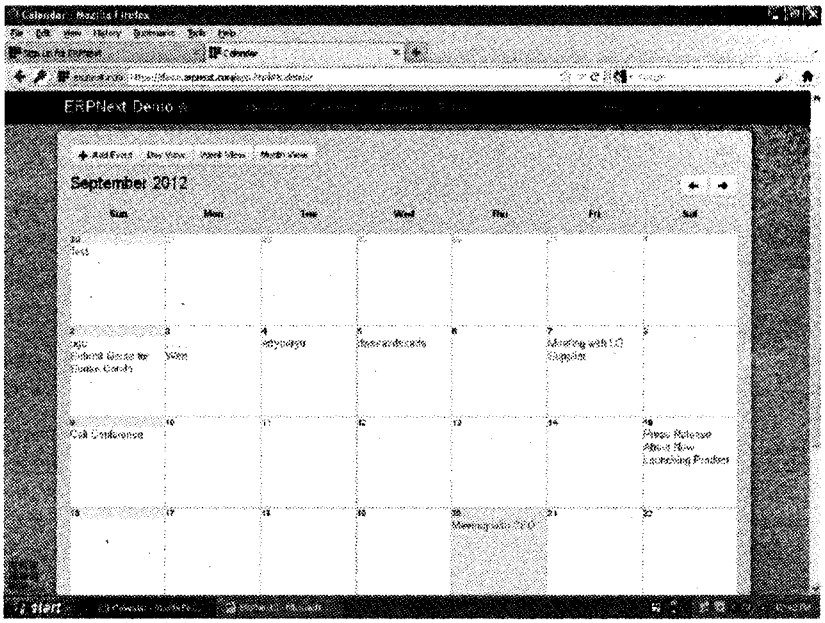
vii. **Human Resource:** It keeps the records of attendance, leave application, expense claim, salary slip, appraisal, employee and detail reports of it.



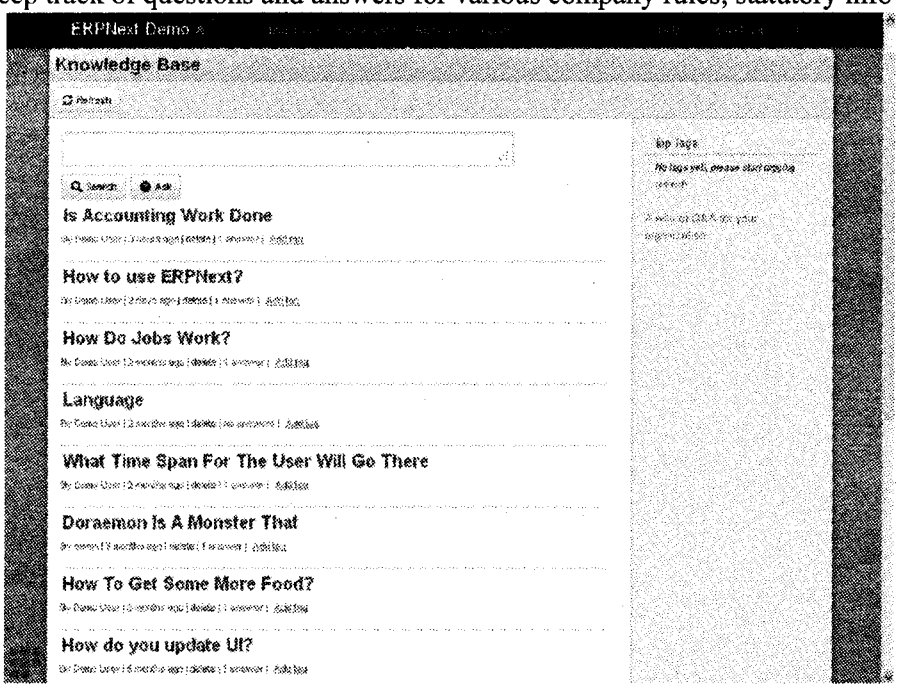
viii. **Support:** It performs operations related to support ticket, customer issue, maintenance schedule, maintenance visit, communication, serial number and their reports.



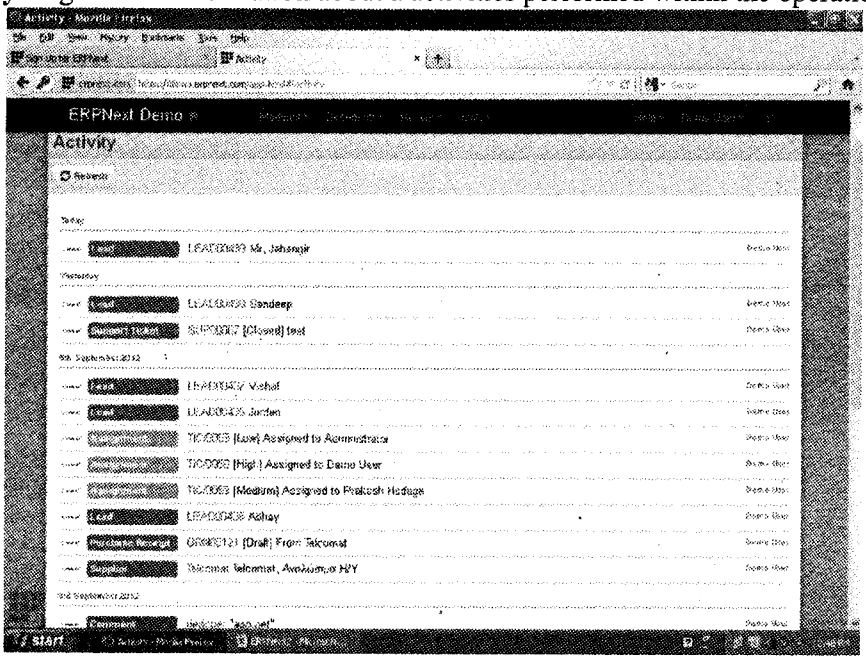
ix. **Calender:** It shares events with co-workers and also track scheduled appointments with leads and visits.



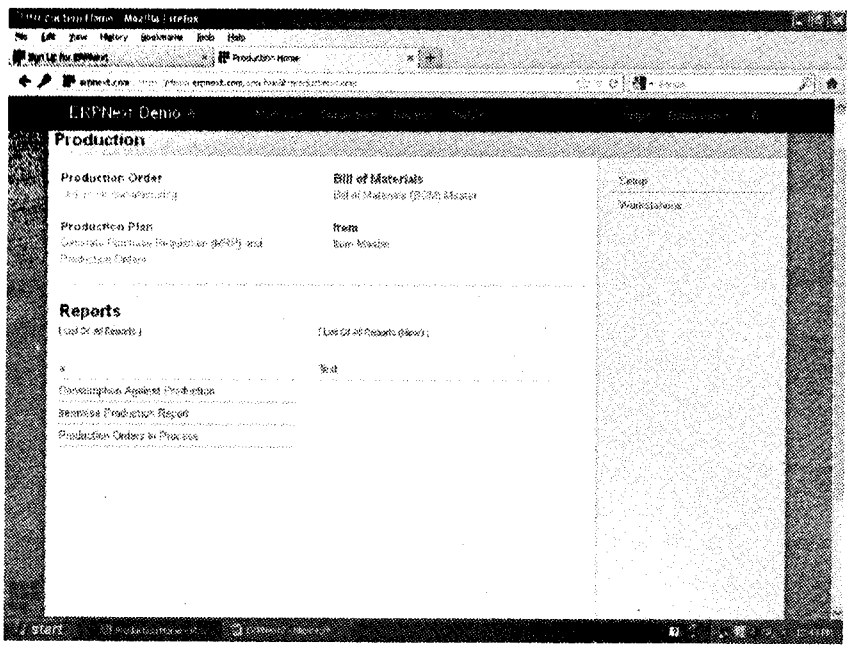
x. **Knowledge Base:** It creates a simple Q & A (question and answer) based Knowledge system and keep track of questions and answers for various company rules, statutory info etc.



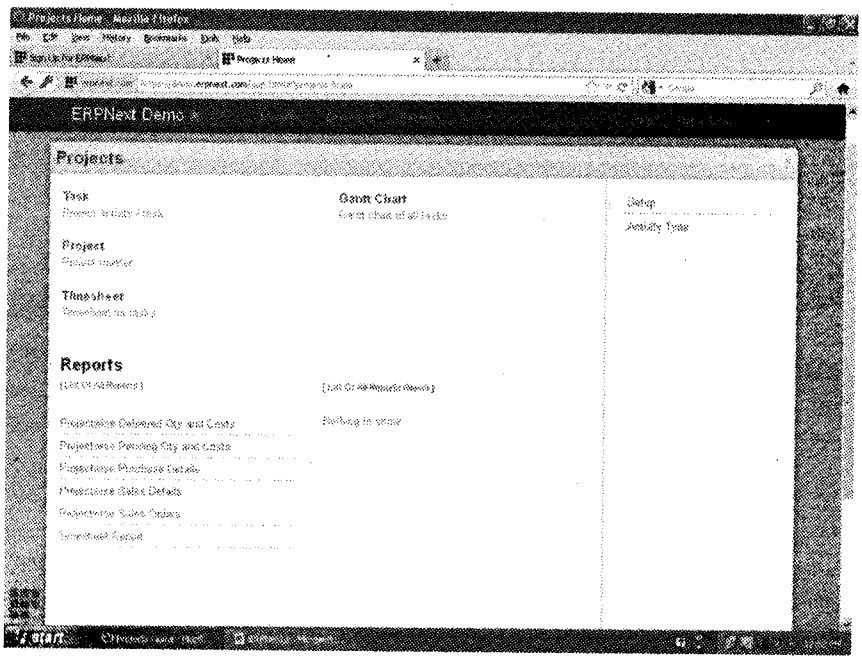
xi. **Activity:** It gives the information about a activities performed within the operation.



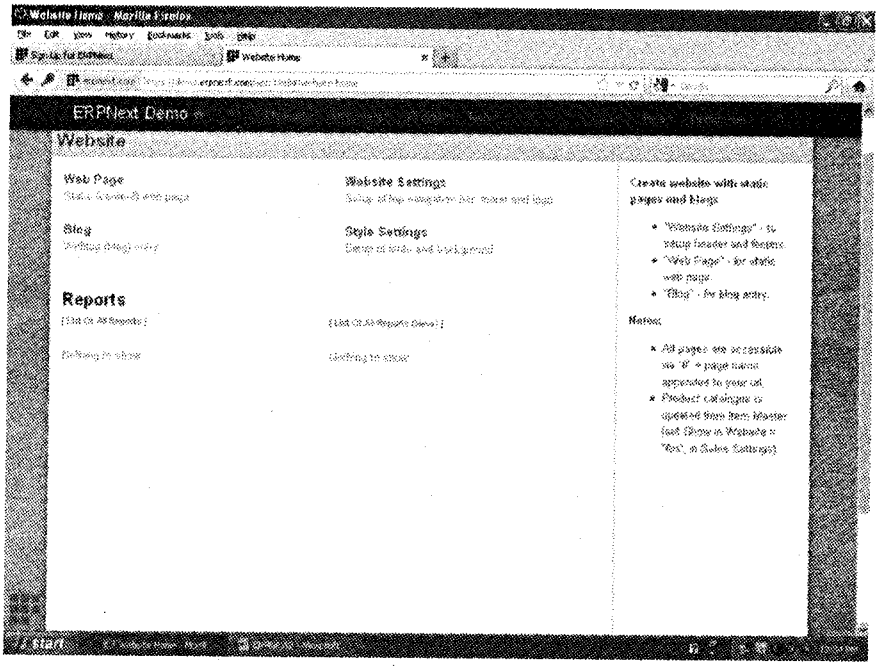
xii. **Production:** It performs the operations of production order, production plan, bill of materials, items and generating their reports.



xiii. **Projects:** In this operation performing regarding task, project, timesheet, ganttchart and their reports.



xiv. **Website:** This operation is related to the web page, blog, website settings, style settings and reports on it.



xv. **Dashboard:** It displays the dashboard.

xvi. **Setup:** In this, all operations are related to the setting of company's data, users and permissions branding, email and notification, printing and customiziation.

It is very user-friendly software and we can do various operations in it very easily. So try the demo version and work on it and enjoy with ERPNext.

5. Customization

ERP vendors do offer customers configuration options that allow organizations to incorporate their own business rules. But there are often functionality gaps remaining even after the configuration is complete. ERP customers have several options to reconcile functionality gaps, each with their own pros / cons. Technical solutions include rewriting part of the delivered functionality, writing a homegrown bolt-on/add-on module within the ERP system, or interfacing to an external system.

All three of these options are varying degrees of system customization, with the first being the most invasive and costly to maintain. Alternatively, there are non-technical options such as changing business practices and/or organizational policies to better match the delivered ERP functionality.

The primary goal of ERP system customization is to achieve a fit between an ERP system and the business processes of the organization. In other words, ERP customization serves to fill the gap between ERP functionality and organizational requirements.

A reason for ERP system customization is a functional misfit between the standard ERP system functionality and existing business processes. Besides the functional misfit, several reasons for ERP system customization rooted in the influence of diverse social groups have been proposed. For example, ERP system customization may be performed because of a consultant's lack of knowledge about a product or its context, insufficient development work from the vendor, or as an act of safeguarding a working position by internal information system personnel.

ERP system customization is affected by: ERP knowledge at the beginning of the project, experience of the implementation team, reliance on consultants, organizational project motivation, organizational culture, involvement of operational departments, ERP project acceptance, and fear of personal disadvantage from change.

Customizing an ERP package can be very expensive and complicated. ERP customization is more risky and may increase cost. ERP system customization has been applied to match organizational businesses processes.

Customization Services involves any modifications or extensions that change how the out-of-the-box ERP system works.

To be successful with ERP implementation, either organization has to adopt according to ERP with deploying best practices suggested by vendor or ERP has to be customized to meet the specific needs of organization.

Though customization is difficult decision for the organization, it is an integral part of ERP solutions. Decision of customization also plays an important role in the success of ERP. Customization requires expertise in software solution as well as business process. It is time consuming procedure and increases the expenditure. Thus management has to take the decision very carefully.

5.1 Reasons behind Customization

Q.1. Why customization of ERP is necessary / required for different industries?

Ans.

It is stated that generic ERP software often lacks key components needed in manufacturing operations. It is possible for large organization to integrate the necessary functionalities in the software, but lack of key components can cost the small organization their business competency. Though there are some vendors offering industry specific software, it lacks industry specific needs. If two businesses are different and their packages are same, customization becomes inevitable. According to it, following are some of the main reasons of ERP customization:

i. Need of different formats of reports or specific reports.
ii. Adding data field to data base.
iii. Lack of business process knowledge of Code developers.
iv. The necessary functionalities are not present in the ERP package provided by the vendor.
v. To make ERP system more user friendly and increase its acceptance by users.
vi. For increasing the efficiency of the operation of the ERP package.
vii. To embed the best practices desired by the organization in the ERP package.
viii. Lack of power of project team to prevent customization.
ix. To facilitate a smoother implementation.
x. To simplify the amount of time taken to carry out their day-to-day operations.
xi. To reduce the number of staff in organization hence reducing costs.
xii. To add value to the ERP package.
xiii. To maintain existing ways of work that was perceived of value to those at Home.

5.2 Types of Customization

It is stated that, the primary goal of customization in ERP implementation is to achieve a fit between the ERP system and the process that the system supports. Thus, both the system and the process can be changed or customized to achieve the goal. They referred two main types of customization:

i. Technical Customization
ii. Process Customization

They have developed framework for identification of customization options based on the degree of changes undertaken for both the ERP system and the business process.

i. **Technical Customization:** When the system is customized to fit the process. It has been explained that three types of technical customization options are available to organizations: module selection, table configuration and code modification.

   a. *Modules Selection:* Companies have choice of selection of ERP modules suitable for their business. Some modules are essential while others are not necessary to run the business. In this case, technical customization is achieved through the company's decision as to which modules to implement. In general, the greater the number of modules selected, the greater the integration benefits, but also the greater the costs, risks and changes involved.

   b. *Configuration Tables:* A configuration table enables a company to tailor a particular aspect of the system to the way it chooses to do business. A key requirement for table configuration is to understand the meaning and consequences of each configurable option in each table. Since there are numerous tables in a typical ERP system, this can be a very complex and time-consuming task, especially when interdependencies among options across various tables and modules need to be considered.

   c. *Code Modification:* It involves rewriting some of the ES's code, or building interfaces between existing system and the ES.

ii. **Process Customization:** When a process is customized to fit the system. Process change is classified into three categories: no change, incremental change, and radical change.

   a. *No change*, process customization involves only changes in tasks and resources, but no changes in relationships among tasks and configurations of resources. An example of such process customization is task automation in which computer technologies are substituted for manual labor. Then, the resources used to accomplish the task have been switched from manual labor to computers but the other elements of the business process remain the same.

   b. *Incremental change* in which improvements are made not only in tasks and resources, but also in relationships among tasks and relationships among tasks and resources. The nature of the process and its outcome measures, however, has not changed. The focus of the change is solving problems found in the process.

   c. *Radical change* is the third category of process customization. It involves the fundamental rethinking and radical redesign.

5.3 Customization Advantages

i. Improves user acceptance.

ii. Offers the potential to obtain competitive advantage vis-à-vis companies using only standard features.

5.4 Customization Disadvantage

i. Increases time and resources required to both implement and maintain.

ii. Inhibits seamless communication between suppliers and customers who use the same ERP system uncustomized.

iii. Over reliance on customization undermines the principles of ERP as a standardizing software platform.

iv. Developing a new code or rewriting a code requires skilled developer.

v. Rewriting a code can disturb the balance of software package and can hamper its working.

vi. Upgrade of customized software is difficult and can cost several weeks and huge money.

vii. Customization can consume the resources which are vital for other projects.

SUMMARY

- Post implementations review is related to implementation process.
- In post implementation review, a number of implementation factors are explored and focused and reviewed on a post-implementation basis because issues associated with (ERP) implementations become more widespread during the post-implementation stage.
- A post-implementation review or audit can be an extremely valuable exercise that provides feedback indicating whether the plan was executed properly and key benefits were achieved efficiently and effectively.
- The primary goal of ERP system customization is to achieve a fit between an ERP system and the business processes of the organization.
- ERP customization serves to fill the gap between ERP functionality and organizational requirements.
- A reason for ERP system customization is a functional misfit between the standard ERP system functionality and existing business processes.
- ERP system customization is affected by :- ERP knowledge at the beginning of the project, experience of the implementation team, reliance on consultants, organizational project motivation, organizational culture, involvement of operational departments, ERP project acceptance, and fear of personal disadvantage from change.

EXERCISES

1. Explain what do you mean by post implementation review. And also explain which questions should be include in review document.
2. What do you mean by customization? What are the reasons behind the customization?
3. Explain customization with its advantages and disadvantages.
4. Why customization of ERP is necessary?
5. What are the types of customization?

Suggestive Readings:

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