



P. R. ENGINEERING COLLEGE

(An ISO 9001-2000 Certified Institution)



Vallam, Thanjavur – 613 403

Subject code : IT 1003

Subject Name : Enterprise Resource Planning

Department : Information Technology

Year / Semester : IV /VIII

SYLLABUS

IT1003 – ENTERPRISE RESOURCE PLANNING

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UNIT 1 FUNDAMENTALS

9

ERP – Enterprise – Benefits of ERP – ERP and related technologies – Business Process Reengineering (BPR) – Data warehousing and data mining – OLAP – SCM

UNIT II ERP IMPLEMENTATION

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ERP Implementation lifecycle – Implementation methodology – Hidden costs – Organizing the implementation – Vendors– Consultants and users – Contracts with vendors – Consultants and employees – Project management and monitoring.

UNIT III BUSINESS MODULES 9

Business modules in an ERP package – Finance – Manufacturing – Human resources – Plant maintenance – Materials management – Quality management – Sales and distribution.

UNIT IV ERP MARKET

9

ERP market place – SAP AG – Peoplesoft – Baan – JD Edwards – Oracle – QAD – SSA

UNIT V ERP – PRESENT AND FUTURE

9

Turbo charge the ERP system – EIA – ERP and e - Commerce – ERP and internet – Future directions

Total: 45

TEXT BOOK

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 2000.

REFERENCES

1. Joseph A Brady, Ellen F Monk and Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology, 2001.
2. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning Concepts and Practice”, Prentice Hall of India, 2003.

UNIT 1

What is an Enterprise

- An enterprise is a group of people with a common goal, which has certain resources (people, money, energy, materials, space, time) at its disposal to achieve this goal.
- Examples: IBM, Ford, Tata Motors, Accenture, Microsoft, Indian Railways, Ramu's Teashop, etc.
- The enterprise acts as a single entity.
- The resources are considered the inputs, and the attainment of the goals the output of the process.
- The degree of success of the enterprise is often measured by the ratio between the outputs and inputs. This ratio is called productivity.

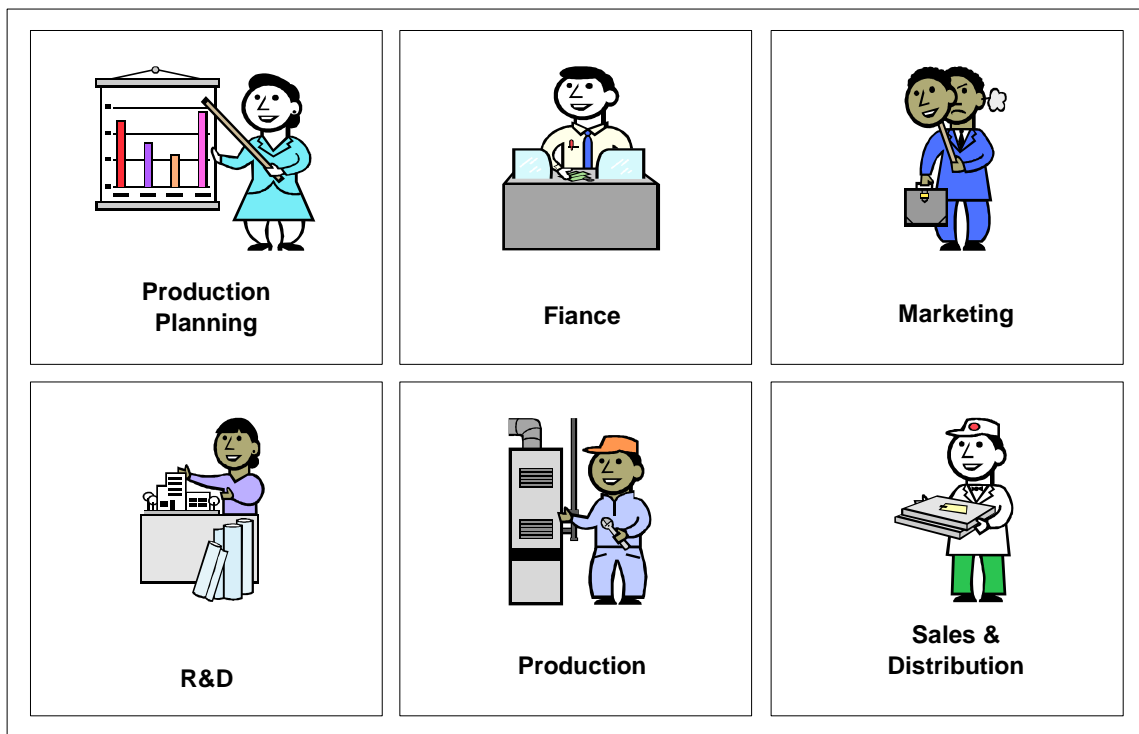
Enterprise



Traditional Organization

- The organization is divided into different units based on the functions they perform— finance, manufacturing, production planning, purchasing, sales and distribution, R&D, HR, etc.
- The various departments have their own goals.
- The different departments function in isolation and have their own data collection & analysis systems.
- The result is that, instead of taking the organization towards the common goal the various departments end up pulling it in different directions as one department does not know what the other does and for what purpose.
- So unless all the departments know what the others are doing and for what purpose, the inter-departmental conflicts will arise thus disrupting the normal functioning of the organization.
- The solution is to have a centralized information storage and management facility.

Traditional Organization

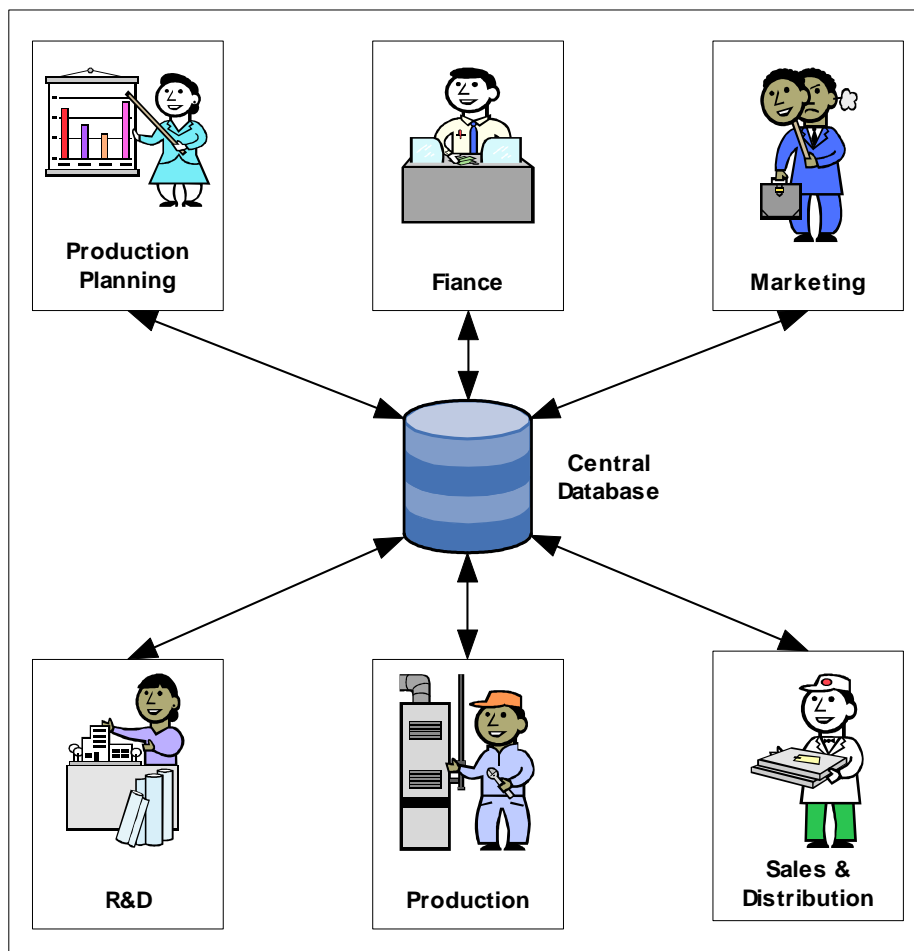


Organization where there is no or little Communication between Departments

Enterprise Way...

- In the enterprise way, the entire organization is considered as a single system.
- Information about all the aspects of the organization is stored centrally and is available to all departments, thus avoiding conflicts.
- ERP systems help to make this task easier by integrating the information systems, enabling smooth and seamless flow of information across departmental barriers, and automating business process and functions.
- ERP systems help the organization to work and move forward as a single entity.

Enterprise Way...



An Enterprise where all Departments Know what others are Doing

Business Function...

- Organizations that make products to sell have the following functional areas of operation—purchasing, production and materials management, marketing and sales, accounting and finance, human resources, etc.
- Each functional area comprises a variety of business functions and business activities within that functional area of operation.
- Earlier business systems functioned in isolation. What happens in one functional area was not communicated with other functions.
- The information system of one function had no impact other functional areas.
- This mode of functioning caused many problems including disruption of the functioning of the organization.

Function vs. Process

- Recently organizations have started focusing on business processes rather than business functions.
- A business process is a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer.
- The difference between a BF and a BP is that a process cuts across more than one business function to get a task done.
- Organizations are now trying to view their business operations from the perspective of a satisfied customer.
- Sharing data effectively and efficiently between and within functional areas leads to more efficient business processes.
- Information systems can be designed so that accurate and timely data are shared between functional areas. These systems are called integrated information systems.

Function vs. Process (contd)

- For a company to provide customer satisfaction, it must make sure that its functional areas of operation are integrated—one department should know what the other departments are doing.
- For example the people in sales and marketing should know the up-to-date details of the latest products, their prices, their features and so on so that they can provide this information to the customers.

- Similarly, the people in the manufacturing plants should know which models are being ordered in large quantities so that they can buy the necessary materials and start manufacturing those items to deliver to the customers.
- This type of inter-departmental information sharing through the use of integrated information systems will help the organizations in achieving customer satisfaction while improving their productivity and efficiency.

Business Process...

- **Business Process** is a collection of interrelated tasks, which solve a particular issue.
- There are three types of business processes—Management, Operational, and Supporting
- Management processes govern the operation of a system. Typical management processes include “corporate governance” and “strategic management”.
- Operational processes create the primary value stream and are part of the core business. Typical operational processes are purchasing, manufacturing, marketing, and sales.
- Supporting processes support the core processes. Examples include accounting, recruitment, IT-support.

Business Process... (contd)

- A business process can be decomposed into several sub-processes, which have their own attributes, but also contribute to achieving the goal of the super-process.
- The analysis of business processes typically includes the mapping of processes and sub-processes down to activity level.
- Activities are parts of the business process that do not include any decision making and thus are not worth decomposing such as “answer the phone”, “prepare the invoice“, “send the fax”, etc.

Information Systems

- Information is refined data. An information system consists of three elements—people, procedures, and data.
- Information activities are find, create, receive, acquire, monitor, classify, safeguard, organize, use, publish, collaborate, disseminate, archive, dispose, transfer, etc.
- Management information system (MIS) produce information products that support many of the day-to-day decision making needs of the management.

- The problem with traditional MIS is that they operate at a departmental level and they give only information that has been pre-defined.
- Traditional information systems fail to capture the information needs of the entire organization as they concentrate on capturing department level information—isolated information gathering.
- No decision-maker can take good decisions with the isolated information that they can get from the information produced by individual departments.

Information Islands

- No organization can function as islands of different departments.
- All the departments should have access to the organization's information.
- In today's competitive business environment, the key resource of every organization is information.
- If all the information islands, which are functioning in isolation, are integrated into a single system, the impact of that would be dramatic.
- If the organization does not have an efficient and effective mechanism then the chances of that organization succeeding are very remote.

Integrated Management Information

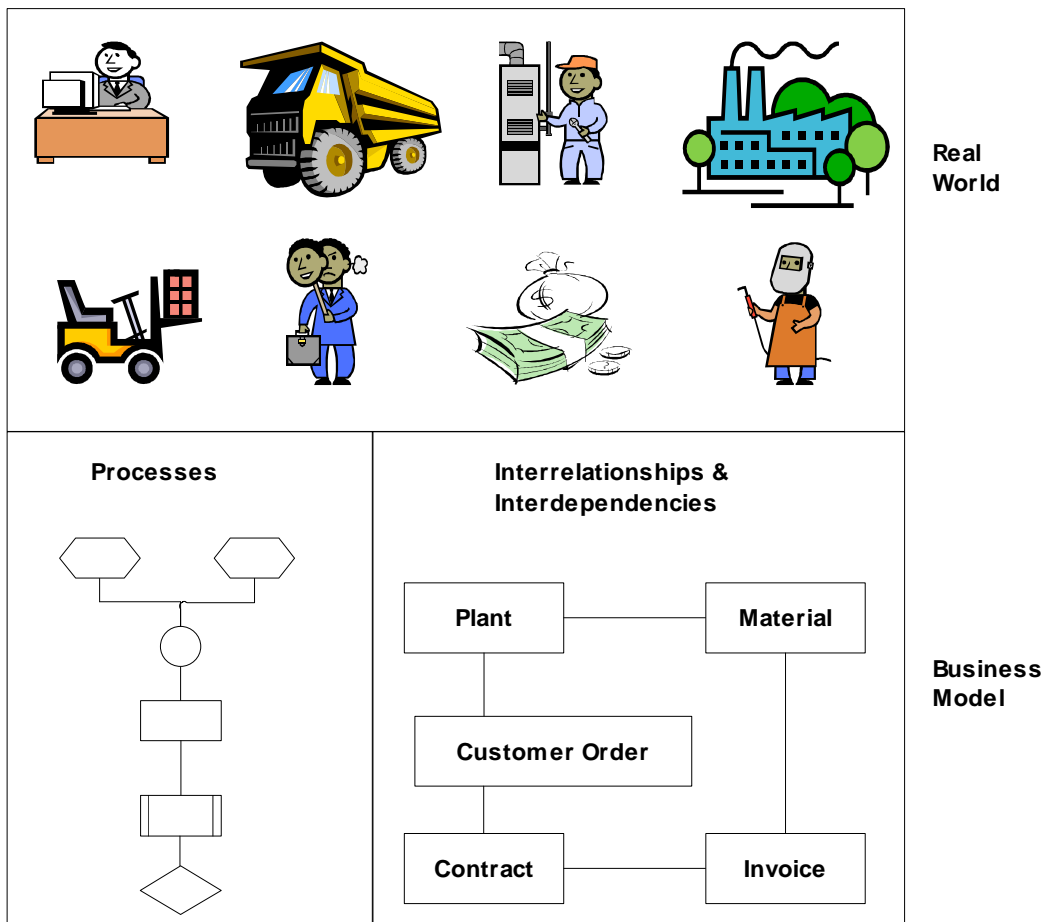
- The three fundamental characteristics of information are accuracy, relevancy, and timeliness.
- To survive, the organization must always be on its toes, gathering and analyzing the data—both internal and external. Any mechanism that will automate the information gathering and analysis process will enhance the chances of the organization to beat the competition.
- What is needed is a system that treats the organization as a single entity and caters to the information needs of the whole organization.
- If this is possible, and if the information that is generated is accurate, timely and relevant, then these systems will go a long way in helping the organization to realize its goals.
- Integrated management information provides the decision makers with accurate, relevant, timely, and up-to-the minute information so that they can make better and informed decisions much faster.

- Integrated management information will enable the organization to become more competitive, agile and respond quickly to the changes in the business environment, customer interests and trends.

Role of Enterprise in ERP Implementation

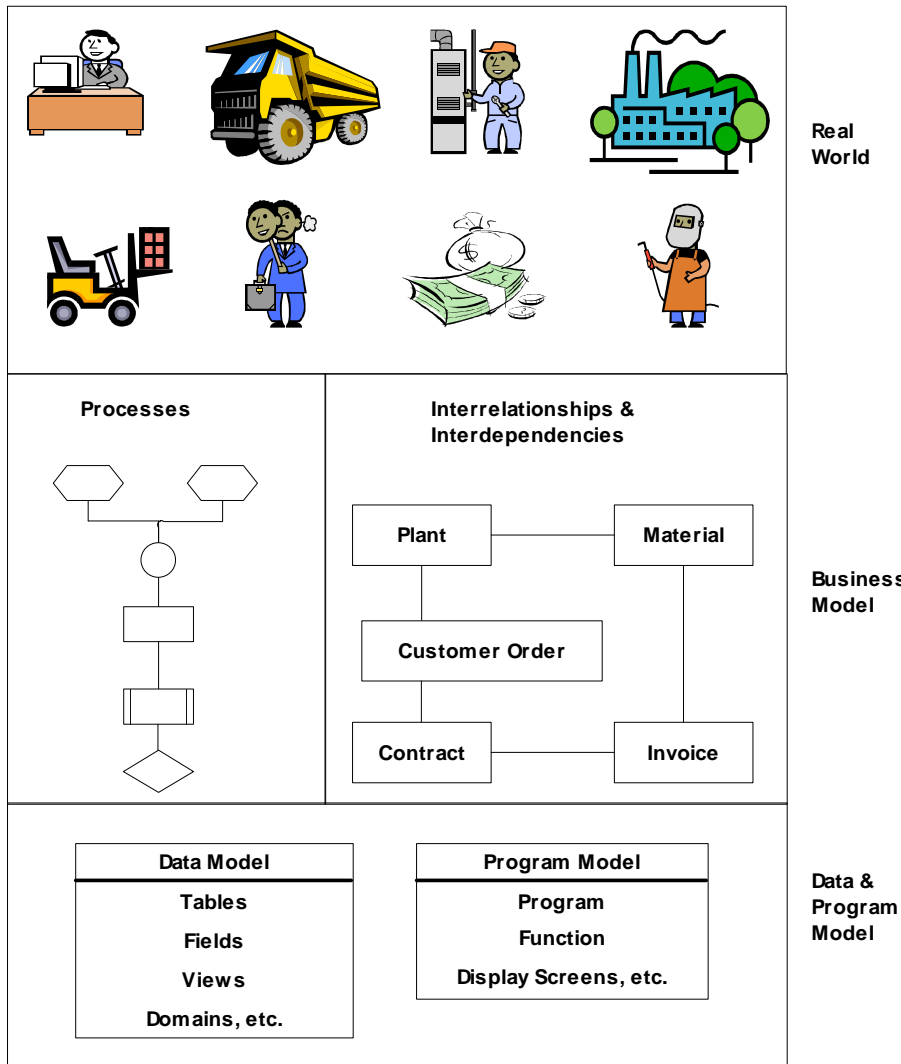
- ERP implementation project an enterprise in its own right.
 - Common goal: successful implementation of the project
 - Resources: ERP package, hardware, money, people, etc.
 - People: Employees, management, consultants, ERP vendors, etc.
- Organization's Responsibilities:
 - Own and sponsor the ERP implementation project (usually done by the CEO, CIO, COO, or someone senior)
 - Designate the right people to lead the project.
 - Select and assign the right people to the implementation team
 - Select the ERP package best suited for the organization
 - Make available the necessary infrastructure (resources)
 - Ensure top management support and participation
 - Manage package vendors and external consultants
 - Manage and deal with employee resistance
 - Motivate the employees to change and to learn new technologies
 - Re-train and re-locate employees and ensure the complete participation
 - Operate the ERP system in the best possible manner
 - Maintain the ERP system at its peak efficiency
- **Business Modeling**
- **Business modeling or creating a business model is one of the first activities in any ERP project. ERP systems should mirror the business processes.**

- A business model is a representation of the business as one large system, showing the interconnections and interdependencies of the various sub-systems and business processes.
- Based on the organization's goals, objectives and strategic plans, a business model consisting of the business processes is developed.
- Based on the business model, the ERP system is developed with the aim of providing the required information and necessary assistance to the various individuals to perform their business processes more effectively and efficiently.
- The business is modeled as an integrated system.
- Information is a very important resource and is very critical in managing all the other resources.
- The business model is usually represented in the graphical form using flowcharts and flow diagrams.



Integrated Data Model

- The most critical step in the ERP implementation is the creation of an integrated data model as all the employees from the different departments get access to the integrated data and this will help in better decision-making.
- With the implementation of ERP systems all the data will be from the integrated database.
- Maintaining and managing the integrated data constantly updated and up-to-date is one of the biggest challenges of ERP implementation and operation.
- The integrated database will reduce data redundancy and give all employees access to the updated and up-to-the minute information about the entire organization.
- When designing the data model for the ERP system, the most important thing that should be kept in mind is the information integration and the process/ procedure automation.
- The data model should reflect the entire organization and should successfully depict and integrate the data structures of the entire organization.



Data Model and its Relationship with the Real World

Review Questions

1. What is an enterprise? What is the role of the enterprise? Discuss with examples.
2. Discuss the disadvantages of information islands, where each department has its own data collection and analysis system?
3. Why is the availability of timely, relevant and accurate information necessary for business success? Discuss with examples.
4. Why is it important to have integrated management information? Explain with examples.

5. **What is business modeling? Discuss its purpose.**
6. **What do you mean by integrated data model? How is it created?**
7. **Discuss how ERP helps in better decision-making?**
8. **Discuss the working of a typical manufacturing organization? Is it fundamentally different from a service organization? Compare and contrast.**

Benefits of ERP

- Installing an ERP system has many advantages—both direct and indirect.
- The direct advantages include improved efficiency, information integration for better decision- making, faster response time to customer queries, etc.
- The indirect benefits include better corporate image, improved customer goodwill, customer satisfaction and so on.
- Some of the benefits are quantitative (tangible) while many others are qualitative (intangible).

Tangible Benefits of ERP

1. Inventory reduction
2. Inventory carrying cost reduction
3. Reduction of lead-time
4. Personnel reduction
5. Cycle time reduction
6. Productivity improvements
7. Other management improvements
8. Financial close cycle reduction
9. IT cost reduction
10. Procurement cost reduction
11. Cash management improvements
12. Revenue/profit improvements
13. Reduced quality costs

14. Improved resource utilization
15. Transportation/logistics cost reduction
16. Maintenance reduction
17. On-time delivery improvements

Intangible Benefits of ERP

1. Information visibility
2. New and improved business processes
3. Customer responsiveness
4. Improved supplier performance
5. Better customer satisfaction
6. Cost reduction
7. Integration of business functions
8. Information integration
9. Better analysis and planning capabilities
10. Improved information accuracy
11. Improved decision-making capability
12. Standardization of business processes
13. Flexibility and business agility
14. Globalization of the organization
15. Better business performance
16. Supply chain integration
17. Use of latest technology

Question Review

1. Discuss the tangible and intangible benefits of ERP systems.

2. Sometimes, the intangible benefits are more important than the tangible benefits. Discuss the above statement.
3. Explain the various benefits of ERP implementation in detail.

ERP and Related Technologies

Limitations of ERP

- ERP systems serve an important function by integrating separate business functions— materials management, product planning, sales, distribution, financials and others—into a single application.
- **But ERP systems have three significant limitations:**
 1. Managers cannot generate custom reports or queries without help from a programmer and this inhibits managers from obtaining information quickly so that they can act on it for competitive advantage.
 2. 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.
 3. The data in the ERP application is not integrated with other enterprises or division systems and does not include external intelligence.

Overcoming the Limitations

- There are many technologies that help ERP systems to overcome the limitations, that reduces its usefulness.
- 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.
- Organizations are constantly innovating methods to improve operational efficiency, reduce costs, provide high-quality and personalized customer service, improve customer satisfaction and increase profit margins.
- Companies that use technology, integrate it into the core of their business planning and are ready to face the challenge of conducting business in this Internet age are called e-businesses.
- ERP is the central or the core component around which the various technologies are integrated to build an organization that works at the speed and efficiencies of the Internet

age (e-business) and where most processes are automated and things happen at Internet speed.

Enabling Technologies

- Some of these technologies which when integrated with the ERP system, will enable the companies to do business at Internet speed. These technologies used are:
 1. Business Process Reengineering (BPR)
 2. Data warehousing & data marts
 3. Data mining
 4. On-line analytical processing (OLAP)
 5. Product life cycle management (PLM)
 6. Supply chain management (SCM)
 7. Customer relationship management (CRM)
 8. Geographical information systems (GIS)
 9. Intranets and extranets
 10. Electronic data interchange (EDI)
 11. Electronic Funds Transfer (EFT)
 12. Cryptography

Business Process Reengineering (BPR)

- BPR is the analysis and redesign of workflow within and between enterprises. BPR promotes the idea that sometimes radical redesign and reorganization of an enterprise (wiping the slate clean) was necessary to lower costs and increase quality of service and that information technology was the key enabler for that radical change.
- Hammer and Champy, the founders of this concept, felt that the design of workflow in most large corporations was based on assumptions about technology, people, and organizational goals that were no longer valid. They suggested seven principles of reengineering to streamline the work process and thereby achieve significant levels of improvement in quality, time management, and cost:
 1. Organize around outcomes, not tasks.

2. Identify all the processes in an organization and prioritize them in order of redesign urgency.
 3. Integrate information processing work into the real work that produces the information.
 4. Treat geographically dispersed resources as though they were centralized.
 5. Link parallel activities in the workflow instead of just integrating their results.
 6. Put the decision point where the work is performed, and build control into the process.
 7. Capture information once and at the source.
- By the mid-1990's, BPR gained the reputation of being a nice way of saying "downsizing." According to Hammer, lack of sustained management commitment and leadership, unrealistic scope and expectations, and resistance to change prompted management to abandon the concept of BPR and embrace the next new methodology, **Enterprise Resource Planning (ERP)**.

Data Warehousing & Data Marts

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

Data Mining

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

On-line Analytical Processing (OLAP)

- OLAP is a decision support software that allows the user to quickly analyze information that has been summarized into multidimensional views and hierarchies.
- OLAP is a category of software tools that provides analysis of data stored in a database.

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

Product Life Cycle Management (PLM)

- The conditions a product is sold under will change over time. The product life cycle refers to the succession of stages a product goes through.
- Product life cycle management is the succession of strategies used by management as a product goes through its life cycle.
- PLM is the process of managing the entire lifecycle of a product from its conception, through design and manufacture, to service and disposal.
- PLM gives companies the power to plan, manage and schedule product life cycles by accelerating the introduction of new products, and optimizing life cycle phases of all products.
- Organizations need an integrated product life cycle management (PLM) software solution for collaborative engineering, product development, and management of projects, product structures, documents and quality.
- PLM software should provide an information backbone to help you access relevant information anywhere, anytime.

Supply Chain Management (SCM)

- Supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain as efficiently as possible.
- SCM spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption.
- SCM is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer.

- SCM involves coordinating and integrating these flows both within and among companies.
- The ultimate goal of any effective supply chain management system is to reduce inventory (with the assumption that products are available when needed).
- A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products and the distribution of these finished products to customers.
- Supply chains exist in both service and manufacturing organizations, although the complexity of the chain may vary greatly from industry to industry and firm to firm.

Customer Relationship Management (CRM)

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

- CRM tools include software and browser-based applications that collect and organize information about customers.

Geographical information systems (GIS)

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

Intranets

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

Extranets

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

Electronic data interchange (EDI)

- **Electronic Data Interchange is the transfer of data between different companies using networks, such as VANs or the Internet. As more and more companies get connected to the Internet, EDI is becoming increasingly important as an easy mechanism for companies to buy, sell, and trade information.**
- **EDI is the electronic communication of business transactions, such as orders, confirmations and invoices, between organizations. Third parties provide EDI services that enable organizations with different equipment to connect. Although interactive access may be a part of it, EDI implies direct computer-to-computer transactions into vendors' databases and ordering systems.**

- **The Internet gave EDI quite a boost. However, rather than using privately owned networks and the traditional EDI data formats (X12, EDIFACT and TRADACOMS), many business transactions are formatted in XML and transported over the Internet using the HTTP Web protocol.**

Electronic Funds Transfer (EFT)

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

Cryptography

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

- It has been said that any encryption code can be broken given enough time to compute all permutations.
- However, if it takes months to break a code, then most of the break-ins can be prevented or avoided.
- As computers get faster, to stay ahead of the game, encryption algorithms have to become stronger by using longer keys and more clever techniques.

Review Questions

1. What are the limitations of ERP?
2. What are the technologies that are used to improve the capabilities of ERP systems?
3. Discuss the advantages of the following enabling technologies:
 1. Business Process Reengineering (BPR)
 2. Data warehousing & data marts
 3. Data mining
 4. On-line analytical processing (OLAP)
 5. Product life cycle management (PLM)
 6. Supply chain management (SCM)
 7. Customer relationship management (CRM)
 8. Geographical information systems (GIS)
 9. Intranets and extranets
 10. Electronic data interchange (EDI)
 11. Electronic Funds Transfer (EFT)
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Business Process Reengineering (BPR)

- Business Process Reengineering (BPR) means not just change—but dramatic change and dramatic improvements.
- BPR involves the overhaul of organizational structures, management systems, job descriptions, performance measurements, skill development, training and most

importantly, 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, increase in profits, better business practices, enormous cost reductions, dramatic improvements in productivity and so on.
- The stories of BPR failures are due to improper implementation or other factors. BPR can help a successful company to stay on top or transform one that may be on the verge of bankruptcy, into a successful one.
- Even though there are many cases where BPR has resulted in catastrophic results, the fact still remains that a properly implemented BPR has the ability to produce dramatic improvements.

Different Phases of BPR

- The tasks that experts agree upon to successfully perform BPR, can be grouped into seven steps, or phases.
- The different phases of BPR are:
 1. Begin organizational change
 2. Building the reengineering organization
 3. Identifying BPR opportunities
 4. Understanding the existing process
 5. Reengineering the process
 6. Blueprint the new business system
 7. Perform the transformation

All successful BPR projects begin with the most critical requirement—communication throughout the organization.

Challenges of BPR

- Unfortunately, all BPR projects are not as successful as those described.
- Most of the BPR projects will fall short of expectations.

- Companies that begin BPR projects face many of the following challenges:
 1. Resistance from employees
 2. Changing the traditional ways of doing things
 3. Time requirements (BPR is a lengthy process, almost always taking two or more years to complete.)
 4. High cost of BPR
 5. Skepticism about BPR and its success
 6. Manpower reduction (BPR often results in employees being laid off)

Maximizing Chances for BPR Success

- The guidelines that will help in maximizing chances for success in a BPR effort are:
 1. Realize that not every company needs to re-invent itself.
 2. Expect strenuous resistance and manage it properly.
 3. Surround the project with a sense of urgency.
 4. Get top management support.
 5. Communicate with employees to prevent rumors and misunderstandings.
 6. Create an atmosphere of trust and co-operation.
 7. Make sure the people who are affected by or are going to use the new system are involved in the change process.
 8. Change the way employees are evaluated and rewarded to motivate them to support the system.
 9. Staff the project with the best people and provide them with resources they need.
 10. Make sure employees are adequately trained on how to use the new system.
 11. Be prepared to change the company's culture and its organizational structure, and to re-organize the information systems function.
 12. Go for small successes at first. Go for more dramatic projects once you have gained some experience in BPR.

Review Questions

1. What does business process reengineering mean?
2. Discuss the benefits of BPR.
3. Discuss the evolution of BPR.
4. What are the different phases of BPR?
5. Discuss the activities to be performed in the different phases.
6. What are the challenges faced by BPR efforts?
7. How do you maximize your chances for BPR success?

Data Warehousing

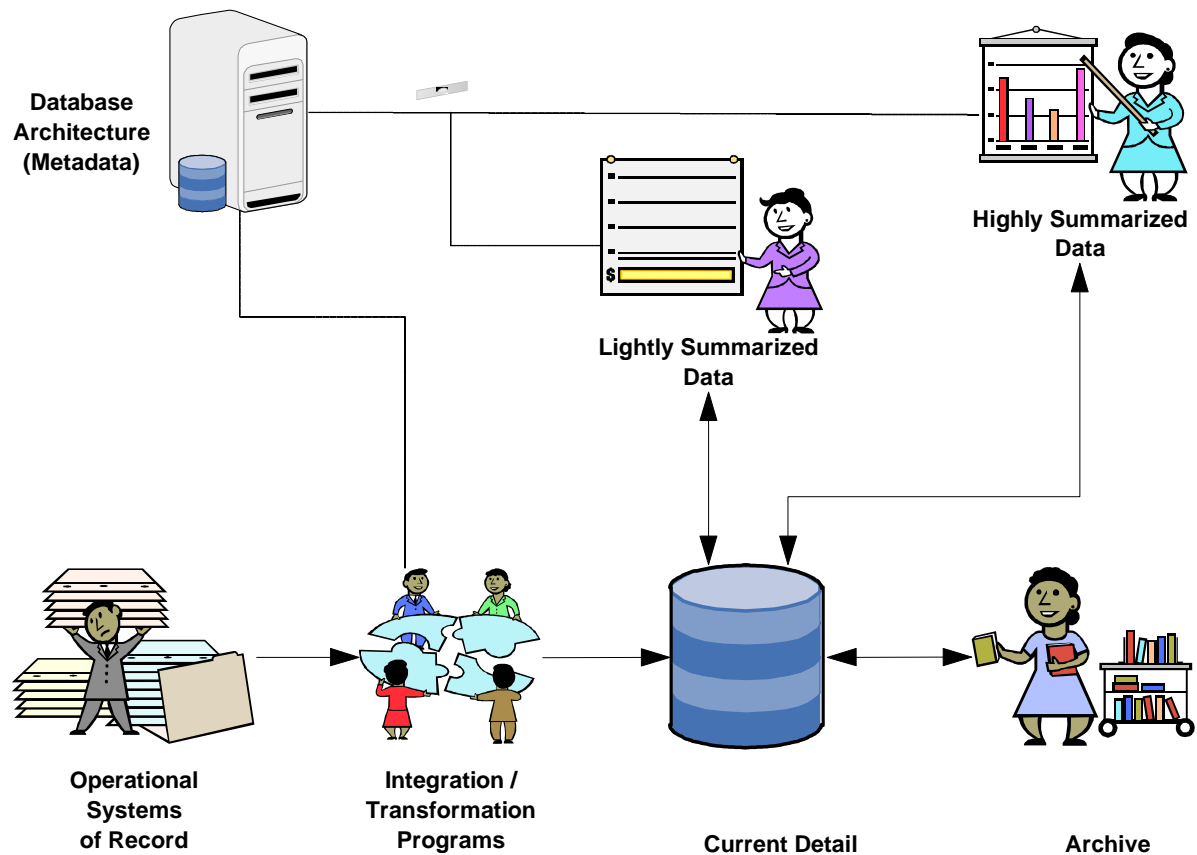
Data Warehouse

- A data warehouse is a database designed to support decision making in an organization. Data from the production databases are copied to the data warehouse so that queries can be performed without disturbing the performance or the stability of the production systems.
- The term Data Warehouse was coined by Bill Inmon in 1990, which he defined in the following way: “A warehouse is a subject-oriented, integrated, time-variant and non-volatile collection of data in support of management’s decision making process”. He defined the terms in the sentence as follows:
 1. Subject Oriented – Data that gives information about a particular subject instead of about a company’s ongoing operations.
 2. Integrated – Data that is gathered into the data warehouse from a variety of sources and merged into a coherent whole.
 3. Time-variant – All data in the data warehouse is identified with a particular time period.
 4. Non-volatile – Data is stable in a data warehouse. More data is added but data is never removed. This enables management to gain a consistent picture of the business.
- Data warehousing emphasizes the capture of data from diverse sources for useful analysis and access, but does not generally start from the point-of-view of the end user or knowledge worker who may need access to specialized, sometimes local databases. The latter idea is known as the data mart.

Data Warehouse—Concepts & Goals

- 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.
- This separation allows business analysis and queries to be performed without disturbing the performance or the stability of the production systems.
- The primary goals of a data warehouse are the following:
 1. Provide access to the data of an organization
 2. Data consistency
 3. Capacity to separate and combine data
 4. Inclusion of tools set up to query, analyze and present information
 5. Publish used data
 6. Drive business re-engineering
- Typically, a data warehouse is housed on an enterprise mainframe server.
- Data from various online transaction processing (OLTP) applications and other sources is selectively extracted and organized on the data warehouse database for use by analytical applications and user queries.

Components of a Data Warehouse



Data Warehouse Architecture

- The major components of a data warehouse are given below:
 1. Summarized data – Summarized data is classified into two—lightly summarized and highly summarized.
 2. Operational systems of record – A system of record is the source of the data that feed the data warehouse.
 3. Integration/ transformation programs – The programs that clean, edit, re-format, merge and review the operational data before loading them into the data warehouse.
 4. Current detail – The heart of a data warehouse is its current detail, where the bulk of data resides. Current detail comes directly from operational systems and may be stored as raw data or as aggregations of raw data.
 5. Data warehouse architecture or metadata – Metadata is the data about data and is used by data warehouse developers to manage and control data warehouse

creation and maintenance. To a data warehouse user, metadata is like a “card catalog” of the subjects available.

6. Archives – Data warehouse archives contain old data (normally over two years old) of significant, continuing interest and value to the enterprise.

Benefits of a Data Warehouse

- Implementing a data warehouse provides significant benefits—many tangible, some intangible.
- The benefits include the following.
 1. More cost-effective decision-making – A data warehouse allows reduction of staff and computer resources required to support queries and reports.
 2. Better enterprise intelligence – Increased quality and flexibility of enterprise analysis arises from high quality data in the warehouse
 3. Enhanced customer service – Better customer relationships by correlating all customer data via a single data warehouse architecture.
 4. Business reengineering – Allowing unlimited analysis of enterprise information provides an insight into enterprise processes that yields breakthrough ideas for reengineering those processes.
 5. Information system reengineering – Data warehouse development can be an effective first step in re-engineering the enterprise’s legacy systems.

Obstacles to Data Warehouse Projects

- Rushing to data warehouse development, information systems personnel often discover obstacles “on the fly”, causing timelines and expense budgets to grow exponentially.
- Data warehouse developers should become familiar with the potential challenges to a successful data warehouse deployment.
- When left unchecked, these challenges can become full-fledged barriers, bringing developers to their knees and halting large-scale data warehouse production.
- Some challenges facing data warehouse developers are:
 1. Complex Extract, Transformation and Load Characteristics
 2. Immense Volumes of Daily Data
 3. Load Methodology (Load Control and Auditing)

4. Data Warehouse Recovery (Load Recovery)
5. Data Warehouse Validation
6. Data Warehouse Read Performance
7. Metadata Management

Activities supported by the Data Warehouse

- Some of the activities supported by today's data warehouses are pre-defined and not much different from traditional analysis activity.
- Other processes such as multi-dimensional analysis and information visualization were not available with traditional analysis tools and methods.
- The main activities supported by data warehouses are:
 1. Standard Reports and Queries
 2. Queries against Summarized Data
 3. Data Mining
 4. Interface with other Data Warehouses

Review Questions

1. What is a data warehouse?
2. What are the goals of a data warehouse?
3. What are the characteristics of the data in a data warehouse?
4. Discuss the data warehouse architecture.
5. Explain the data warehousing system.
6. What are the advantages of a data warehouse?
7. Explain the structure of a data warehouse.
8. Discuss the obstacles to successful data warehouse projects.
9. What are the uses of a data warehouse?
10. Discuss why data warehouses are important and how they can be integrated with ERP systems.

Data Mining

- Data mining has been defined as “the nontrivial extraction of implicit, previously unknown, and potentially useful information from data” and “the science of extracting useful information from large data sets or databases”
- Data mining, the extraction of hidden predictive information from large databases, is a powerful new technology with great potential to help companies focus on the most important information in their data warehouses.
- Data mining tools predict future trends and behaviors, allowing businesses to make proactive, knowledge-driven decisions.
- The automated, prospective analyses offered by data mining move beyond the analyses of past events provided by retrospective tools typical of decision support systems.
- Data mining tools can answer business questions that traditionally were too time consuming to resolve. They scour databases for hidden patterns, finding predictive information that experts may miss because it lies outside their expectations.
- Modern data mining systems self learn from the previous history of the investigated system, formulating and testing hypotheses about the rules, which the system obeys.

Evolution of Data Mining

- Data mining techniques are the result of a long process of research and product development.
- This evolution began when business data was first stored on computers, continued with improvements in data access, and more recently, generated technologies that allow users to navigate through their data in real time.
- Data mining takes this evolutionary process beyond retrospective data access and navigation to prospective and proactive information delivery.
- Data mining is ready for application in the business community because it is supported by three technologies that are now sufficiently mature:
 1. Massive data collection
 2. Powerful multiprocessor computers
 3. Data mining algorithms

- The evolution of data mining has the following phases:
 1. Data collection (1960s)
 2. Data access (1980s)
 3. Data warehousing & decision support (1990s)
 4. Data mining (1990s onwards)

Knowledge Verification and Discovery

- Traditional decision support systems (DSS) and executive information systems (EIS) use tools like queries, multidimensional analysis and visualization to gather information.
- In the above tools, the user is guiding the information gathering and is basically trying to find out the causes of problems. This kind of information processing is known as knowledge verification.
- In the above cases, the amount of new information created is very little: the user's hypothesis is either verified, or it is negated. The user processes the information by successive iterations upon examining the results of query after query and linking the verified and refined hypotheses. This is the essence of a verification model.
- Data mining uses a different model for the creation of information about data. We call this the discovery model.
- Data mining uses methodologies that can sift through the data in search of frequently occurring patterns, detect trends, produce generalizations about the data, etc. These tools can discover these types of information with very little (or no) guidance from the user.

Advantages of Data Mining

- Data mining techniques can yield the benefits of automation on existing software and hardware platforms, and can be implemented on new systems, as existing platforms are upgraded and new products developed.
- When data mining tools are implemented on high performance parallel processing systems, they can analyze massive databases in minutes. The high speed makes it practical for users to analyze huge quantities of data.
- Given databases of sufficient size and quality, data mining technology can generate new business opportunities by providing the following capabilities:
 1. Automated prediction of trends and behaviors—Data mining automates the process of finding predictive information in large databases.

2. Automated discovery of previously unknown patterns—Data mining tools sweep through databases and identify previously hidden patterns in one step.
3. Databases can be larger in both depth and breadth—High performance data mining allows users to explore the full depth of a database, without pre-selecting a sub-set of variables. The data mining databases contains larger samples (more rows) as they yield lower estimation errors and variance, and allow users to make inferences about small but important segments of a population.

Technologies used in Data Mining

- The most commonly used techniques in data mining are:
 1. Statistics and Regression
 2. Neural networks
 3. Clustering
 4. Rule induction
 5. Evolutionary programming
 6. Case-based reasoning (CBR)
 7. Memory-based reasoning (MBR)
 8. Decision trees
 9. Link analysis
 10. Genetic algorithms
 11. Association rules
 12. Non-linear regression methods

Review Questions

1. What is data mining?
2. Discuss the evolution of data mining.
3. Discuss the difference between knowledge verification and discovery.
4. Explain the data mining process.
5. What are the advantages of data mining?

6. What are the tasks solved by data mining?
7. What are the technologies used in data mining?

On-line Analytical Processing (OLAP)

- The term OLAP was coined by E.F. Codd in 1993, to refer to a type of application that allows a user to interactively analyze data.
- OLAP is a class of applications that require multi-dimensional analysis of business data. OLAP is a method of analyzing data in a multi-dimensional format, often across multiple time periods, with the aim of uncovering the business information concealed within the 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.
- OLAP is 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. 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.
- OLAP uses a multi-dimensional view of aggregate data to provide quick access to strategic information for further analysis.

Uses of OLAP

- OLAP applications span a variety of organizational functions:
 1. Finance departments use OLAP for applications such as budgeting, activity-based costing (allocations), financial performance analysis and financial modeling.
 2. Sales analysis and forecasting are two of the OLAP applications found in sales departments.
 3. Marketing departments use OLAP for market research analysis, sales forecasting, promotions analysis, customer analysis and market/ customer segmentation.

4. Manufacturing OLAP applications include production planning and defect analysis.
- OLAP transforms raw data so that it reflects the real dimensionality of the enterprise as understood by the user. While OLAP systems have the ability to answer “who?” and “what?” questions, it is their ability to answer “what if?” and “why?” that sets them apart from data warehouses.
 - A truly flexible data model ensures that OLAP systems can respond to changing business requirements as needed for effective decision-making.

Key Features of OLAP

- OLAP enables managers to model problems that would be impossible using less flexible systems with lengthy and inconsistent response times. More controls and timely access to strategic information are equal to more effective decision-making.
- OLAP enables the organization as a whole to respond more quickly to market demands. Market responsiveness, in turn, often yields improved revenue and profitability.
- Although OLAP applications are found in widely divergent functional areas, they all require the following key features:
 1. Multi-dimensional views of data – A multi-dimensional view of data provides more than the ability to “slice and dice”; it provides the foundation for analytical processing through flexible access to information.
 2. Calculation-intensive capabilities – Analytical processing systems are judged on their ability to create information from data. To perform complex analysis like trend analysis, sales forecasting, etc. OLAP applications should have calculation-intensive capabilities.
 3. Time intelligence – True OLAP systems understand the sequential nature of time. Concepts such as year-to-date and period over period comparisons can be easily defined in an OLAP system.

Different Styles of OLAP

The four major alternatives for implementing OLAP applications are:

1. **Multi-dimensional OLAP** – Multi-dimensional OLAP (MOLAP) is based on a multi-dimensional data base architecture. MOLAP is suitable for applications requiring only pre-defined analysis on multiple dimensions.

2. **Hybrid OLAP** – Hybrid OLAP products primarily integrate specialized multi-dimensional data storage with relational database management technology. 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.
3. **Desktop OLAP** – The desktop style of OLAP 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.
4. **Relational OLAP** – Relational OLAP (ROLAP) is the fastest growing area of OLAP technology, with new vendors entering the market at an accelerating pace. The ROLAP is suitable for situations where users require unrestricted analysis of a large volume of data.

Review Questions

1. What is OLAP?
2. Explain the connection between data warehouse and OLAP.
3. What are the uses of OLAP?
4. Discuss the key features of OLAP.
5. What are the different styles of OLAP?
6. How does one choose an OLAP style?
7. What are the benefits of OLAP?

Supply Chain Management (SCM)

- Supply chain management (SCM) is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer.
- SCM involves coordinating and integrating these flows both within and among companies.
- SCM enables collaboration, planning, execution and coordination of the entire supply chain, empowering companies to adapt their supply chain processes to an ever-changing competitive environment.

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

Advantages of SCM

- Supply chain management enables:

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

Review Questions

1. What do you mean by supply chain management?
2. Discuss the evolution of SCM.
3. Discuss the transformation of SCM from battlefield to business.
4. Discuss the improvements that happened in the SCM.
5. What are the advantages of SCM?

UNIT 2

ERP Implementation Lifecycle

Objectives of ERP Implementation

- Objectives are the major high-level characteristics that can have a great impact upon the success of an ERP project.

- The objectives include characteristics such as:
 1. Speed - The speed of the project is how much time the company would like to take in implementing the system.
 2. Scope - The scope of the project includes all of the functional and technical characteristics that the company wants to implement.
 3. Resources - Resources are everything that is needed to support the project including people, hardware systems, software systems, technical support and consultants.
 4. Risk - The risk of a project is a factor that impacts the overall success of the ERP implementation.
 5. Complexity - Complexity is the degree of difficulty of implementing, operating and maintaining the ERP system.
 6. Benefits - Benefits are the extent to which the company will utilize functionality of the ERP system for software development, maintenance and other support activities.

Phases of ERP Implementation

- Like any other project the ERP implementation project also has to go through different phases.
- The different phases of the ERP implementation are given below:
 1. Pre-evaluation screening – The purpose of this phase is to eliminate those packages that are not at all suitable for the company’s business processes.
 2. Package evaluation – In this phase the ERP package that is best suited for the organization is selected.
 3. Project planning phase – In this phase the details of how to go about the implementation are decided. In this phase the time schedules, deadlines, etc. for the project, are arrived at.
 4. Gap analysis - This is the process through which companies create a complete model of where they are now and where they want to be headed.
 5. Reengineering - It is in this phase that human factors are taken into account.
 6. Customization – In this phase, the ERP package is modified to suit the business processes of the organization.

7. Implementation team training - This is the phase where the company trains its employees to implement and later run the system.
1. Testing – This is the phase where the system that is being implemented is tested for any problems, bugs, errors, etc.
2. Going live - This is the phase where ERP is made available to the entire organization.
3. End-user training - This is the phase where the actual users of the system will be given training on how to use the system.
4. Post implementation – This is the phase where the ERP system is used for conducting the business.

Why do many ERP implementations fail?

- Some of the most common reasons for failed implementations are:
 1. Lack of top management buy-in, commitment and support
 2. Improper planning and budgeting
 3. Use of wrong ERP tool
 4. Lack of training
 5. Work culture of the organization

Review Questions

1. Discuss the main objectives of ERP implementation.
2. What are the different phases of ERP implementation?
3. Discuss each ERP implementation phase and list out the activities to be performed in each phase.
4. Discuss the reasons for the failure of ERP implementations.

Implementation Methodologies

Critical Phases of ERP Lifecycle

- The important phases of the ERP lifecycle are:

1. Adoption decision — This phase includes the definition of system requirements, its goals and benefits and an analysis of the impact of adoption at a business and organizational level.
2. Acquisition — This phase involves selecting the product that best fits the requirements of the organization to minimize the need for customization.
3. Implementation — This phase deals with the customization or parameterization and adaptation of the ERP package acquired, to meet the needs of the organization.
4. Use and maintenance — This phase consists of the use of the product in a way that returns expected benefits and minimizes disruption.
5. Evolution — In this phase, additional capabilities are integrated into the ERP system to obtain additional benefits.
6. Retirement — When new technologies appear or the ERP system or approach becomes inadequate to the needs of the business, managers decide if they will substitute another information system approach that is more adequate to the organizational needs of the moment.

ERP Implementation

- The nature of the ERP implementation is such that it is best handled within a project management context.
- The organization of the project team that is best for managing the implementation takes the following format:
 1. The CEO leads the steering committee and sponsors the project.
 2. The person who manages the implementation is the project manager
 3. The project manager reports to a steering committee, who reviews progress and resolves any territorial, resource or policy disputes.
 4. The project managers has the implementation teams reporting to him
- Implementation strategy should be decided based on the following:
 1. Speed of implementation
 2. Availability of people for carrying out the implementation tasks
 3. Availability of time for training all users

4. Cost
5. Confidence in the new system
6. Disruption to operations
7. Total timescale

Implementation Plan

- Before implementing an ERP system in an organization or project, it is very crucial that the implementation process be planned.
- The implementation plan documents the who, what, why, where, when and how of the project. It is the outcome of discussions with affected people and involves negotiations over resources, timescales and costs and their agreement.
- The most basic plan will identify all the activities, those doing them and the time frame.
- A project plan will enumerate the major tasks, the estimated duration (usually specified in months), resources required and people who will be doing the tasks.
- The project plan can be handwritten, prepared using a spreadsheet or using specialized project management software.
- There are two types of plans—high-level plan and detailed plan.
 1. The high-level plan will give an overview of the project and can be used by the top management for monitoring the project.
 2. The project manager will develop a detailed project plan, where the high-level plan is broken down into a lot more detail with the time windows being weeks or days rather than months.

Risk, Budget, Cost

- Even the most detailed of project plans can go astray for events that could have been anticipated and prevented and hence it is prudent to carry out a risk analysis.
- The aim of risk analysis is to anticipate possible problems, assess their likelihood of occurrence and their intensity of impact and finally, to establish how they can be prevented or best handled if prevention is not possible.
- Risk assessment should be carried out at the outset of the project and should be regularly reviewed, revised and updated. Process developments and changes in project conditions may raise the profile of risks that were previously viewed as insignificant.

- After the costs of the ERP implementation are identified (during the planning stage), a budget is established. The budget should have provisions for unanticipated problems and unforeseen issues that are likely to result in additional expenditure.
- The total cost of ERP ownership includes the costs of packaged software, hardware, professional services (for ongoing maintenance, upgrades and optimization) and internal costs (training cost, re-location costs, cost of temporary employees, etc.)
- The costs of the ERP implementation, operation and maintenance should be budgeted and all budget should be reviewed and revised periodically.

Performance Measurement

- Performance measurements are carried out to measure the success of the ERP implementation and the effectiveness of its operation. Three performance related measures are costs, time and benefits.
- The project plan have detailed list of the tasks, the people responsible for each tasks and the timeframe for the completion of the tasks. The project plan can be used to measure the progress of an ERP implementation.
- For each step or series of steps of the implementation, objectives can be defined which, if achieved, represent progress. By achieving these deliverables there is less likelihood of problems arising at a later date as a result of an earlier event.
- The four measurables — cost, time, benefits and deliverables — present different dimensions for measuring the performance of an implementation.
- It is important to remember that while measurables provide a means to assess progress and attainment, they in themselves do not determine success.
- Performance measurement only provide reference points for further action.
- Performance measurements are not a substitute for managing people in such a way that they give their best and more.

Problems and System Issues

- During the implementation there will be many issues which are raised and which will require resolution. The danger is that some of these issues, having been identified are forgotten, only to surface at a later date, perhaps after the system is live. Thus, it is desirable that there is an agreed procedure for recording issues and their resolution.
- The technical issues include the installation and commissioning of both hardware and software.

- Some of the technical issues are:
 1. How does the system perform when the ERP application is under heavy use?
 2. How quickly will storage space be consumed when the system is live?
 3. What is the back-up procedure?
 4. Does the system lock and if so how is it unlocked?
 5. Do the locations of PCs and printers require to be changed?
 6. How are passwords managed?
 7. What user menus need to be generated and how will this be handled?
 8. What is the disaster recovery procedure?
- The technical issues should be detected earlier and should be resolved as a small problem like lack of pre-printed stationary can prevent the system from operating smoothly.

ERP Implementation Methodologies by Vendors and Consultants

- A methodology is a roadmap to an implementation. The purpose of a methodology is to deliver an implementation on time, according to specifications and within budget.
- Most vendors, especially in the software industry, have developed their own methodologies. Consulting companies also developed their own methodologies in relation to a product.
- Some of the ERP implementation methodologies by vendors and consultants are:
 1. Accelerated SAP (ASAP) from SAP
 2. The Total Solution from Ernst & Young LLP
 3. Fast Track Workplan from Deloitte & Touché
- Methodologies are expensive and even though methodologies are customized, they are still roadmaps.
- An experienced project manager must manage the projects so that he can use the methodology to implement the ERP system in the best possible way and in the best interests of the organization.

ERP Implementation—Hidden costs

- Although different companies find different hurdles and traps in the budgeting process, those who have implemented ERP packages agree that some costs are more commonly overlooked or underestimated than others.
- The hidden costs of ERP implementation are:
 1. Training
 2. Customization
 3. Integration and testing
 4. Data conversion
 5. Data analysis
 6. Consultants
 7. Brain drain (employee turnover)
 8. Continuing maintenance
- To avoid getting blindsided by unexpected expenses, veterans recommend assembling cross-functional teams to identify the costs up-front.

Review Questions

1. What are the most important phases of the ERP life cycle?
2. Why is it difficult to manage an ERP implementation?
3. How will you organize the ERP implementation team?
4. Discuss the ERP implementation strategy?
5. What is the importance of the ERP implementation plan?
6. How do you assess the risk of an ERP implementation?
7. How is budget allocated to the various implementation activities?
8. What are the costs involved in an ERP implementation?
9. Why is cost benefit analysis performed?
10. How is performance measurement done?
11. Why is performance measurement done?

12. What are the system issues of an ERP implementation?
13. Explain the ERP implementation methodologies by SAP, Ernst & Young and Deloitte & Touché.
14. What are the hidden costs of an ERP implementation?

Vendors and Consultants

ERP Vendors

- Vendors are the 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.
- Choosing the right vendor and the right ERP package is one of the most critical tasks of ERP implementation.
- Vendor selection is not a popularity contest and bigger does not always mean better. While selecting a vendor the factors like track record, quality of the product, the financial stability, longevity, after sales service, contribution in implementation, training, and maintenance should be considered.
- The vendor should supply the product and its documentation as soon as the contract is signed. Once the contract has been exchanged the vendor will guide the company through a series of events culminating in the use of the tool.
- The vendor is responsible for fixing any problems that the implementation team encounters in the software.
- Another role the vendor has 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
- 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 cannot, what can be customized and what should not, the limitations, the strengths and weaknesses, and so on.
- The objective of vendor training is to show how the system works, not how it should be implemented.
- The trainees should use these training sessions to question the vendor on all aspects of the system.

- The project manager should monitor and control the costs incurred by the vendor.
- Problems and bugs should be brought to the vendor's attention for resolution, for which there should be a provision within the contract regarding the withholding of payment.
- The vendor should supply the product and its documentation as soon as the contract is signed.
- The vendor is responsible for fixing any problems in the software that the implementation team encounters.
- The ERP software might have to be customized to suit the company's needs. Customizing means altering the product so that it is suited for the company's purposes. It is the vendor who is responsible for the customization.

Consultants

- Business consultants are professionals who specialize in developing techniques and methodologies for dealing with the implementation and the various problems that will crop up during the implementation.
- 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.
- Thus, consultants are people who have made the business of ERP implementation their business and have invested huge amounts of money and manpower for that purpose.
- Consultants provide three general categories of services—management, application and technical.
 1. Management consultants focus primarily on the function of management as it relates to the organization of resources and business process flows.
 2. Application consultants focus on the process of communicating, teaching, demonstrating and configuring software for the business process flows.
 3. Technical consultants deal with technical issues such as database conversions, source code modifications, communication protocols, operating systems, software installation, hardware systems and integration programs.
- 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 bring know-how about the package and about implementation—know-how that is not included in the standard documentation. This know-how (also known as practical knowledge) is derived from their expertise, which stems from practical experience.
- By eliminating the trial and error method of implementation and doing it right the first time the consultants help in saving huge amounts of money, time and effort.
- It is the duty of the consultant 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 will not be compromised and the implementation will not be jeopardized.
- Maintaining technical documentation on the project also falls within the duty of the consultant.
- The consultants should create a knowledge base and should train enough people so that the work they have started is continued.

Review Questions

1. Discuss why it is not a good idea to develop an ERP package in-house.
2. Discuss the various reasons for hiring business consultants.
3. Who are ERP package vendors? What are their skills and advantages?
4. Discuss the methods to manage ERP vendors.
5. What are the roles and responsibilities of ERP vendors?
6. Who are business consultants?
7. Discuss the role of business consultants in the ERP implementation.

Contracts with Vendors, Consultants and Employees

Contract with Package Vendor

- The major points that should be in the contract with the package vendor are:
 1. Value of the software and conditions of payment
 2. List of deliverables (software, documents, etc.)
 3. Mode of delivery and installation help

4. Copyright and ownership issues
5. Software license
6. Third-party software compatibility, integration or interfacing and integration support
7. Operating system
8. Hardware/ liability
9. Conditions and concessions for acquiring complementary modules
10. Cost of increasing the number of end-users
11. Cost of implementation training
12. Cost of end-user training
13. Annual maintenance fee
14. Warranty or guarantee terms
15. Terms and conditions for the receipt of new versions, upgrades, etc.
16. Details of technical support—on-site, telephonic and so on
17. Terms and conditions for customization
18. The profile of the vendors team who will be assisting the company in implementation
19. Other specific responsibilities assigned to the vendor
20. Cancellation of license

Contract with Consultants

- The following are some of the points that should be included in the contract with the consultants:
 1. Profile of the consultant's team with resume of each member
 2. Consulting fee and payment conditions
 3. The time schedule and the implementation budget
 4. The projected improvements in quantifiable terms and the time required for showing the results

5. Implementation methodology
6. Terms and conditions of knowledge transfer and employee training
7. List of deliverables (reports, manuals, knowledge bases, etc.)
8. Other specific activities the consultants are supposed to do
9. Reporting mechanism to the company management
10. Project monitoring and status reporting systems

Contract with Employees

- An employee who have undergone ERP training will have increased market value and would be able to find jobs in other companies that are will to pay more as the employee is already qualified and experienced.
- In order to avoid such situation, the company should ask the employees to sign a contract before they are put on the implementation team and given training. The main clause of the contract with the employee should be that they should not put the company in a position where the smooth running of the ERP system is interrupted.
- The contract should make it mandatory for employees who leave the company for better opportunities that they should give advance notice and should train another person to a level where he can handle the duties of the person leaving.
- The contract can also stipulate that no employee can leave the company in the middle of the implementation project, whether it be his first or fifth.
- If the company can retain the employees by other means like offering attractive salaries, stock options, challenging and comfortable work environment, etc., then adopting such a strategy is a much better way than enforcing a contract.

Review Questions

1. Why are contracts important?
2. Explain the details of the contract with the package vendor.
3. Explain the details of the contract with the package consultants.
4. Explain the details of the contract with the package employees.
5. What are automated contract management systems and what are its advantages?

Project Management & Monitoring

ERP Implementation Project

- An ERP implementation project is complex in nature, involves a lot of people, requires the coordinated effort of a number of groups, involves a lot of money and has a long completion period (typically 10–18 months).
- To successfully implement an ERP system is a very difficult task and requires huge efforts from all the stakeholders backed by efficient project management and monitoring.
- The major problem areas for the ERP implementation project are:
 1. Employee resistance and non-cooperation
 2. Project size
 3. Employee turnover
 4. Risk management
 5. Unrealistic deadlines
 6. Inadequate funding and resources
 7. Organizational politics
 8. Organizational culture
 9. Scope creep
 10. Unexpected gaps

ERP Project Manager

- The one person who shoulders the maximum responsibility in an ERP implementation project is the project manager.
- Qualities of project manager:
 1. Team player
 2. Should recognize individuals and their efforts
 3. Ability to inspire trust and communicate the vision
 4. Excellent technical expertise
 5. Computer skills

6. Good communication skills
 7. Leadership qualities
 8. Positive attitude
 9. Capability to anticipate the problems and resolve them
 10. Good listener
 11. Leads by example
 12. Excellent organizational knowledge
 13. Ready to accept blame for his mistakes
 14. Should trust his subordinates and delegate work effectively
- The project manager is the key decision-maker in the ERP implementation.
 - The project manager must be capable of making, defending and standing by every decision.

ERP Project Management

- Project management is the application of knowledge, skills, tools and techniques to a broad range of activities in order to meet the requirements of a particular project (PMBOK).
- PMBOK identifies nine knowledge areas on which project management is based. The nine knowledge areas are:
 1. Project integration management
 2. Project scope management
 3. Project time management
 4. Project cost management
 5. Project quality management
 6. Project human resource management
 7. Project communications management
 8. Project risk management
 9. Project procurement management

Project Monitoring

- One of the main roles of the members of the executive committee is project monitoring—that is to check and verify that the work that is being done is satisfactory and that the momentum, morale and enthusiasm of the work team who are performing the tasks is maintained.
- Before implementation starts the consultants and the company representatives will sit together and prepare a work plan or project plan.
- The work plan contains numerous activities, the man-hours required to complete them and the resources need perform the tasks.
- All the parties involved—the executive committee, the vendor, the consultants and the in-house team—should be in agreement with the contents of the plan.
- The work plan or the project plan forms the basis for project tracking and monitoring.
- The adherence to the plan, and constant monitoring and taking appropriate corrective actions before the project gets out of control will ensure the success of the project.
- The key players in the project tracking and monitoring are the project management team and the executive committee.

Review Questions

1. Why it is difficult to manage ERP implementation projects?
2. Explain the importance of the ERP implementation project manager.
3. Discussion the importance of decision-makers in a project.
4. Explain ERP project management with respect to the nine knowledge areas identified by PMBOK.
5. What are the golden rules for successful project management?
6. Explain project monitoring.

ERP Project Teams

- The way a company organizes its ERP project team can greatly influence the outcome of an ERP implementation.

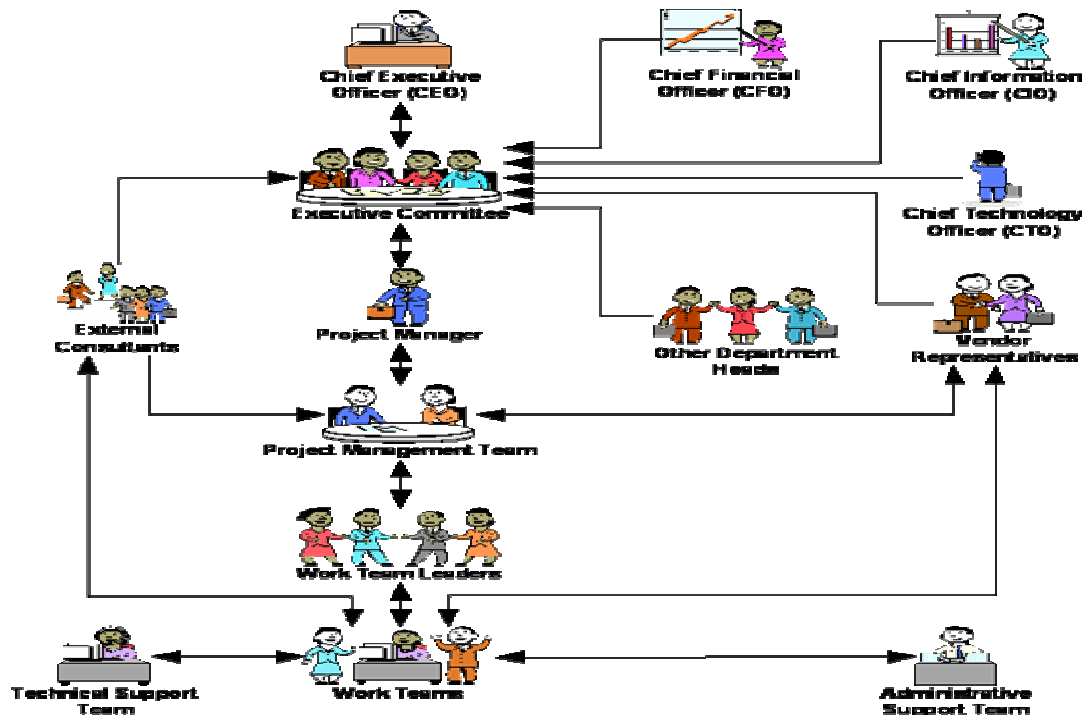
- ERP project teams are formed not just for implementing ERP software but also for the ongoing maintenance required of an ERP system.
- Team structures vary tremendously from company to company and situation to situation.
- The company management should do the ERP team formation in consultation with the consultants and vendors.
- The ERP teams should contain the consultants and vendor representatives before, during and after the implementation.
- The vendor representatives will come into the ERP team only after the selection of the ERP package, but the external consultants (the experts) should be there to help in the package selection and vendor negotiations.
- The most critical factor that decides the success of any ERP system implementation is the support of the people who use the system. So the ERP project team members and the management should do everything in their power to get the support of the end-users.

People involved in the ERP Implementation

- The participation of people in an implementation can fall into several different positions:
- Project Sponsor - The role of the project sponsor is to ensure that the ERP implementation gets all the assistance it needs from resources to management backing.
- Executive committee – This committee formulates the long terms goals, objectives and strategies regarding the implementation of the ERP system in the company.
- Project Manager - Person responsible for translating the vision and goals into reality. Reports to the executive committee and heads the project management team.
- Implementation or Work Team - This 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 from installing the hardware, software, customizing, documenting, training and so on.
- Functional Managers – They oversee the day-today operations of their respective functional areas.
- Functional Participants - Functional participants answer questions, and review the training programs and business process flows that are proposed in the new software.
- Consultants – They are experts who will assist the organization’s team in all matters related to the implementation and operation of the system.

- Package vendors - They are people who have developed the ERP packages and they also will assist the organization in the implementation, customization, training, etc.
- End-users - End-users are the general mass of people who will use the new ERP system
- The CEO, CIO or COO sponsors the project and ensures full support of the management.
- The executive committee comprising the top management team formulates guidelines and monitors the project, take corrective actions when required. The project managers report to the executive committee.
- 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 implementation teams carry out the various tasks for implementing the system. If the implementation team is comprised of people from all departments and from all levels, they can convey what they have learned about the ERP system and thus help overcome the initial resistance the system is bound to face.
- The external consultants help the project manager and the work team members in all aspects of the implementation.
- Vendor representatives advise about best working practices, software functionality and assist with technical issues.
- The implementation team with the help of the consultants and vendor representatives help the end-users on how to use the system.
- The technical and administrative support teams ensures that the implementation team has all the resources they need, when they need it.

Organization of the ERP Implementation Project



Review Questions

1. Discuss the importance of people in an ERP implementation project.
2. Discuss the ERP package implementation—the various challenges, tasks and activities, the goals and objectives.
3. Who are the people involved in the ERP implementation?
4. Explain the nature of the ERP implementation team.
5. Explain the composition of the ERP implementation team.
6. Explain the organization of the ERP implementation team.
7. Discuss the role of the CEO or project sponsor in the ERP implementation.
8. Discuss the composition, duties and responsibilities of the executive committee.
9. What is the role of external consultants in the ERP implementation?
10. Discuss the duties and responsibilities, desired characteristics and qualities of the implementation project manager.
11. What are the functions of the project management team?
12. What are work teams? Explain its organization and functions.

13. What are the duties of the technical support team?
14. Explain the duties of the administrative support team?
15. Explain how the implementation team works.

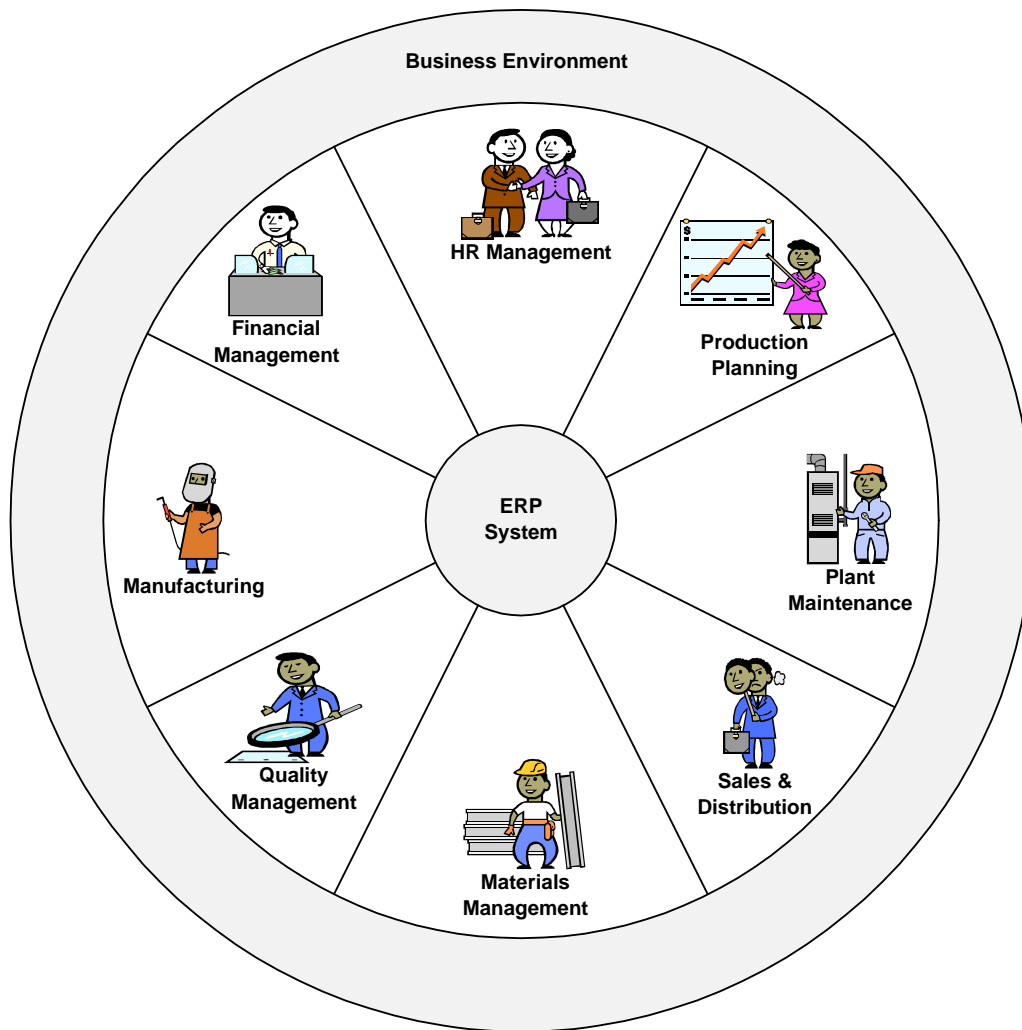
UNIT 3

Business Modules of an ERP Package

Enterprise & ERP

- Business uses resources to produce goods and services. These resources are land, labor and capital.
- These three resources become productive when combined in a rational way for some creative or gainful purpose. This is the function of the fourth resource — entrepreneurship or management.
- Entrepreneurs or managers combine resources like land, labor and capital in different ways to produce goods or services.
- So, it is the function of the management to plan effectively and efficiently the resources available to the enterprise.
- The enterprise resource planning (ERP) systems help the management by making the planning process more productive and efficient.
- All ERP packages contain many modules. The number and features of the modules varies with the ERP package.
- Some of the most common modules available in almost all packages are finance, manufacturing and production planning, sales and distribution, plant maintenance, quality management, materials management and so on.

ERP System



Financial Module

- The finance modules of most ERP systems provide financial functionality and analysis support to thousands of businesses in many countries across the globe.
- The finance modules of most ERP systems will have the following sub-systems:
 1. Financial Accounting (General Ledger, Accounts Receivable/ Payable, Special Ledgers, Fixed Asset Accounting, Legal Consolidation)
 2. Investment Management (Investment Planning/ Budgeting/ Controlling, Depreciation Forecast/ Simulation/ Calculation)
 3. Controlling (Overhead Cost Controlling, Activity-based Costing, Product Cost Accounting, Profitability Analysis)

4. Treasury (Cash Management, Treasury Management, Market Risk Management, Funds Management)
5. Enterprise Controlling (Executive Information System, Business Planning and Budgeting, Profit Center Accounting)

Manufacturing Module

- A manufacturing module enables an enterprise to marry technology with business processes to create an integrated solution.
- It provides the information base upon which the entire operation should be run.
- It contains the necessary business rules to manage the entire supply chain process, whether within a facility, between facilities or across the entire supply chain.
- It provides the freedom to change manufacturing and planning methods, as required.
- The manufacturing modules of most ERP vendors do not limit businesses to a single manufacturing method, such as make-to-stock or make-to-order. Instead, many manufacturing and planning methods can be combined within the same operation, with unlimited flexibility to choose the best method—or combination of methods—for each product at each stage throughout its life cycle.
- Some of the major sub-systems of the manufacturing module are material and capacity planning, shop floor control, quality management, JIT/ repetitive manufacturing, cost management, engineering data management, engineering change control, configuration management, serialization/ lot control, tooling, etc.

HR Module

- HR (human resources) is another widely implemented ERP module. The HR module streamlines 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 different ERP systems offer many different sub-systems under the HR umbrella. Listed below are some of the most common sub-systems:

1. Personnel management (HR master data, personnel administration, information systems, recruitment, travel management, benefits administration, salary administration)
2. Organizational management (organizational structure, staffing schedules, job descriptions, planning scenarios, personnel cost planning)
3. Payroll accounting (gross/ net accounting, history function, dialog capability, multi-currency capability, international solutions)
4. Time management (shift planning, work schedules, time recording, absence determination)
5. Personnel Development (Career and succession planning, Profile comparisons, Qualifications assessments, Additional training determination, Training and event management)

Materials Management Module

- The materials management module facilitates the processes of maintaining the appropriate level of stock in a warehouse.
- The activities of inventory control involve identifying inventory requirements, setting targets, providing replenishment techniques and options, monitoring item usages, reconciling the inventory balances and reporting inventory status.
- Integration of the inventory control module with sales, purchase and finance modules allows ERP systems to generate vigilant executive level reports.
- The materials management module optimizes all purchasing processes with workflow-driven processing functions, enables automated supplier evaluation, lowers procurement and warehousing costs with accurate inventory and warehouse management, and integrates invoice verification.
- The main modules of the materials management module are pre-purchasing activities, purchasing, vendor evaluation, inventory management, invoice verification and material inspection, etc.

Quality Management Module

- The functions in the quality management module support the essential elements of such a system.
- The internal functions of the quality management module do not directly interact with the data or processes of other modules.

- The quality management module fulfills the following functions:
 1. Quality planning (management of basic data for quality planning and inspection planning, material specifications, inspection planning)
 2. Quality inspection (trigger inspections, inspection processing with inspection plan selection and sample calculation, print shop papers for sampling and inspection, record results and defects, make the usage decision and trigger follow-up actions)
 3. 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 inspections and inspection results and quality notifications)

Review Questions

- What are the different modules of the ERP system?
- Explain how ERP systems improve the performance of the organization by integrating the different functional modules.
- Give a brief overview of the most common ERP functional modules.

UNIT 4

ERP Marketplace and Marketplace Dynamics

ERP Market

- The ERP market is a very competitive and fast growing market.
- According to AMR Research, the enterprise resource planning (ERP) market is experiencing double-digit growth in 2007, and is expected to continue to grow at an average of 10% over the next five years.
- The ERP market continues to benefit from a widespread acceptance of the idea that business must have integrated information systems to be competitive.
- SAP continues to be the biggest player in the market with an estimated 43% of the market share, or about \$12.5 billion in revenue in 2006.

- The top players of the ERP market are SAP, Oracle, Sage Group, Microsoft Business Solutions, Infor Global Solutions, Geac, Intenia, QAD, Lawson Software, etc.
- The ERP market is supposed to grow at 6–7 percent during the period 2006–2009.
- Replacement of ageing ERP systems will be the major factor driving sales of new ERP licenses at mid-size and large companies, as many mid-size companies are still using applications developed in the 1980s that are technologically obsolete and do not support current and emerging business practices.
- The popular operating systems for ERP software are Windows and Unix.
- The most popular databases for ERP software are Oracle and MS-SQL Server.

Indian ERP Market

- In India, the small and medium-sized businesses are the major force that pushes the growth.
- There is greater demand for componentized solutions with standard modules and specific functionality to address the unique processes.
- There is demand for customized solutions for sales and operations planning, tactical planning, demand management which are not served by traditional ERP systems.
- The major Indian ERP vendors are Ramco Systems, 3i Infotech, Godrej Infotech, Eastern Software Systems and Base Information, etc.
- Over the next five years, the ERP market in India is expected to reach Rs 1,550 crore (\$341 million), according to IDC.
- The USPs of the Indian ERP vendors are competitive price points and higher return on investments. Indian players have products that are cheap, can be implemented quickly, are flexible and need lower IT dependence and support.
- Indian ERP vendors have a better understanding of the local landscape and are in a better position to provide solutions with the right mix of functionality, technology and pricing for the Indian customer.

ERP Vendors

1. SAP (<http://www.sap.com/>)
2. Oracle (<http://www.oracle.com/>)
3. Oracle JD Edwards World (<http://www.oracle.com/applications/jdedwards-world.html>)

4. Oracle-JD Edwards-Enterprise-One (<http://www.oracle.com/applications/jdedwards-enterprise-one.html>)
5. Oracle-PeopleSoft (<http://www.oracle.com/applications/peoplesoft-enterprise.html>)
6. Sage Group plc (<http://www.sage.com/>)
7. Microsoft Dynamics (<http://www.microsoft.com/dynamics/>)
8. Infor Global Solutions (<http://www.infor.com/>)
9. SSA Global (<http://www.ssaglobal.com/>)
10. Geac (<http://www.geac.com/>)
11. Epicor (<http://www.epicor.com/>)
12. Intuitive Manufacturing Systems (<http://www.intuitivemfg.com/>)
13. Invensys (<http://www.invensys.com/>)
14. Lawson (<http://www.lawson.com/>)
15. QAD (<http://www.qad.com/>)
16. I2 (<http://www.i2.com/>)
17. IFS (<http://www.ifsworld.com/>)
18. Mapics (<http://www.mapics.com.com/>)
19. Ramco (<http://www.ramco.com/>)
20. Ceecom Software Solutions (<http://www.ceecom.com/>)
21. Friedman Corporation (<http://www.friedmancorp.com/>)
22. Verticent Corporation (<http://www.verticent.com/>)
23. Visibility Corporation (<http://www.visibility.com/>)
24. Made2Manage Systems (<http://www.made2manage.com/>)
25. Macola (<http://www.exactamerica.com/macola/>)
26. ProfitKey International (<http://www.profitkey.com/>)
27. Glovia (<http://www.glovia.com/>)

28. 3i Infotech (<http://www.3i-infotech.com/>)

29. Godrej Infotech (<http://www.godrejinfotech.com/>)

30. Eastern Software Systems Pvt. Ltd. (<http://www.essindia.com/>)

31. Base Information Ltd. (<http://www.baseinformation.com/Home.htm>)

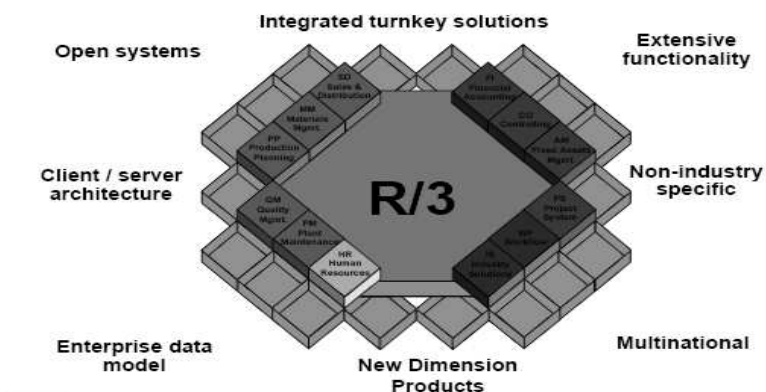
Introduction to ERP:

Overview of ERP Systems

SAP - The Company

- Founded in 1972 in Waldorf, Germany
- 4th largest software supplier in the world
- Revenues over \$5 billion in 1998
- SAP growing over 40% a year
- 18,330 employees worldwide (9/98) 1997 market share was 31% of the worldwide
- client/server enterprise application software
- Over 9,000 installations at 6,000 companies with
- more than 2,500,000 users in over 50 countries
- An average of 25% of revenue invested in R&D

SAP – The Product



SAP - Control Features

- SAP standard delivered automated enablers
 - Document balancing, database integrity, automatic
- posting, match codes.
- SAP configurable enablers
 - Credit checking, tolerances, document matching,
- document blocking, change documents, release
- strategy
- SAP Work Flow
- Application Security
 - Access definitions, transaction locks, user locks,
- system parameters
- Reports
 - ABAP, ABAP Query, Report Writer

Overview of ERP Systems

PeopleSoft - The Company

- Revenues over \$1.3 billion in 1998
- 2nd largest ERP supplier in the world
- Growing over 60% a year
- 7,000 employees worldwide
- 2,900 clients worldwide
- 1997 market share was 8.4% of total ERP
- software license market

- International growth and expansion will be focus through 2000

PeopleSoft - The Product

- HRMS
 - Payroll, Benefits, Human Resources, Pension Administration,
- Time & Labor
- Accounting and Control
 - General Ledger, Payables, Receivables, Asset Management,
- Projects, Budgets, Expenses, Cash Management
- Treasury Management
- Materials Management
- Supply Chain Planning
- Service Revenue Management
- Procurement
- Enterprise Performance Management
- Project Management

PeopleSoft - Control Features

- PeopleSoft delivered automated enablers
 - Document balancing, edits and validations
- PeopleSoft configurable enablers
 - Required fields, audit trails, trial mode vs. final mode,
- workflow approvals, control data, correction access,

- statistical auditing, positive pay banking
- Application Security
 - Menu/panel security, row level security, workflow
- security, field security, preferences
- Reports
 - Query, PS/Vision, SQR

Oracle - The Company

- Founded in 1977
- 2nd largest software supplier in the world
- Revenues over \$8 billion in 1998
41,000 employees worldwide, 16,000 U.S.
 - Reflects total company - not just applications business
- More than 6,000 customers in 76 countries
- 1997 ERP market share was 8.3% of total ERP
- license revenue
 - 50% of applications revenue comes from services
- Oracle's applications license revenue is growing
at 18% a year; significantly less than its rivals.

Oracle - The Product

- Financials
 - Planning (G/L, Analyzer)
 - Analysis

- Consolidation
 - Expenditure Management
 - Billing and Cash Collection
 - Cash Management
 - Asset Management
- Supply Chain
 - Strategic Procurement
 - Non-production Procurement
 - Strategic Sourcing
 - Catalogue Management
- Projects
 - Costing
 - Billing
 - Time and Expense
 - Activity Management
- Gateway
- Human Resources
- Materials Management
 - Inventory
 - Purchasing

Oracle - The Product

- Manufacturing
 - Factory & Item Definition

- Planning & Simulation
- Materials Management
- Production
- Cost Management
- Integrated Technologies

Oracle - Control Features

- Oracle standard delivered automated application enablers
- Oracle standard delivered configurable enablers
- Oracle “Work Flow” configurable enablers
- Oracle “Alert” configurable enablers
- Application Security
- Reports
 - standard delivered
 - newly developed

Baan - The Company

- Founded in 1978 in the Netherlands 5,500 employees worldwide
 - Announced 20% headcount reduction in Oct. 98
- Revenues over \$684 million in 1997
- 3,000 clients in 5,000 sites worldwide
- 1997 ERP market share was 5%
- Sales strategy changed in 1997 to drive 50% of
- sales through channels and value-added resellers
- BaanERP
 - Sales order management

- Procurement
 - Inventory
 - Warehousing
 - Project Management
 - Manufacturing
- BaanFrontOffice
 - Sales Management
 - Marketing Management
 - Call Center
 - Product Configuration
- BaanMaintenance
- BaanService
- BaanCorporateOffice
 - Accounting
 - Finance
 - Human Resource Management
- BaanSCS
 - Supply Chain Management
 - Demand Forecasting
 - Manufacturing Execution
- BaanDEMse
- BaanEngineering
- Baan-On-Board

ERP Market Outlook

- General Outlook Through 2002
- 1997 worldwide enterprise applications market grew at 20.2% to \$14.4 billion (licenses and maintenance)
- Top 10 ERP vendors growth rate was 32.9% collectively and they have a > 40% share of the total market
- ERP industry remains healthy and growth rate
- projections are 30-33% annually for the next 3-5 years
- This represents a decline from the 60-100%
- Growth rates some vendors have experienced in the past few years.
- Aggregate ERP Revenues
- Growth Trends Through 2002
- Vertical focus
- Down-market emphasis
- NT server
- Suite expansion
- E-commerce and Internet
- Channels
- Euro/EMU
- International expansion
- Pressures Contributing to ERP
- Industry Decline Through 2002
- Asia economic concerns Year 2000

- Slow down in high end of ERP market Industry pricing
- ERP stock valuations too high
- Earnings declines in ERP industry
- Weakness in global economy

Top 10 ERP Vendors

- SAP
- PeopleSoft
- Oracle
- Computer Associates
- Baan
- J. D. Edwards
- System Software Associates
- Geac Computer Corp.
- IBM
- JBA Holdings



Which Vendors Will Pull Away From The Pack by 2000?

- Industry analysts and market analysts believe these are the vendors to watch:
 - SAP
 - PeopleSoft
 - J. D. Edwards



- Oracle, Baan and a host of mid tier companies will lose ground as the industry continues to consolidate.

- Key difference - ability to execute!
- ERP Leaders Through 2002 Will develop an integrated application suite that is business-centric yet flexible to clients' needs
- Move from the role of software provider to business partner
- Be able to offer service bureau and
- Outsourcing operations (themselves or in partnership) which will stimulate demand for
- new solutions
- Make packages easier to implement and maintain
- **SAP's Focus Through 2000**
- Continue to componentize R/3
- Expansion outside of non-manufacturing industries
 - Retail
 - Financial Services
 - Public Sector and Higher Education
- Manufacturing industry segment specific functionality
 - Aerospace & Defense – Oil & Gas
 - Engineering & Construction Chemical
 - Pharmaceuticals
- Focus on post-implementation support and tools Continued expansion for front office, supply
- chain, business information warehouse
- E-commerce
- Small and mid-market expansion

- Speed of implementation
 - Tools
 - Turn key solutions
- Increased focus on trained and certified consultants globally (internal services and partners)
- Outsourcing
- **PeopleSoft's Focus Through 2000**
- The release of 7.5 will put PeopleSoft in the thick of the ERP market share race
- International expansion is key to increasing market share
 - Until recently PeopleSoft has been US-centric
- Outsourcing
- Continued expansion of partnerships with global systems integrators
- E-commerce
- Vertical market focus will be:
 - High Tech
 - Consumer packaged goods
 - Automotive
 - Energy and utilities
 - Higher education
- Continued investment in manufacturing applications
- Oracle's Focus Through 2000
- Complete reorganization that began in spring of 1998
- Retraining of 2,000 sales people to focus solely on applications business

- Multiple language support
- Implementation of “Business OnLine” outsourcing and application hosting
- Development of a dealer network for the midmarket
- Improve relationships with systems integrators
- Industry focus will be:
 - Telecom
 - Consumer packaged goods
 - Energy
 - Manufacturing
- Expansion of technical architecture
- Dominate the Asian market
- Baan’s Future
- Industry and Wall Street analysts are taking a “wait and see” position
- Belief is if Baan’s recent reorganization (Q4 98) announcements yield results in the next 4-6 months then the company will weather the current storm.
- Analysts say cause of Baan’s problems are:
 - Baan is trying to establish untested, indirect sales model
 - Integration of a number of acquired companies and products
 - General slow down in the market

- Belief is that traditionally Baan has been very decentralized but to resolve all of the current issues, they need to centralize which will have a “drastic and costly short-term effect” but ultimately it should let Baan recover.
- Continuing to see strength in sales of BaanFrontOffice Systems.

Key Risks and Controls

- Business Exposures
 - Single Point of Failure
 - Reengineering or Business Process Redesign
 - Extensive Expertise Required
- Technical Exposures
 - New Technology Environment
 - Inexperience with System and Technology
 - IS Organization Transition
- Control Exposures
 - Controls Not Implemented During Implementation
 - Difficult to Understand and Audit

Control Implementation Approach

To ensure that controls are addressed during the implementation, ERP control specialists should be dedicated:

- Control Implementation Approach
 - **More Desired**
 - **Less Desired**
- Internal Audit involvement in design, implementation and testing

- Project team members design, implement and test while Internal Audit performs periodic reviews
- Internal Audit perform pre- & post implementation review of control environment.
- Control Issues During Implementation
- Systems Development and Configuration
 - Business Process Functionality Review
 - Include Controls in Business Process Design
 - Develop Solutions to Control Weaknesses
 - Agree Controls with Functional Owners
- System Implementation of:
 - Access Security
 - Data Conversion Strategy, Plan and Execution
 - Automated Interfaces
 - Change Control (e.g., programs, objects, tables)
- Security - What to Cover
- Access Privileges = Job Responsibilities
- Appropriate Segregation of Duties
- Sensitive Data is Protected
- Third Party Access complies with Policies
- User IDs Populated Appropriately
- Consistent Security Naming Conventions
- Security - Ongoing Development
- Identification and Suspension of little used User ID's

- Users who terminate, transfer are immediately identified and their accesses canceled
- Documentation and Authorization of Change Requests for all security changes
- Functional Access changes approved by Owners before being activated in System
- Data Conversion - Essential Controls
- Strategy, Planning, Identify Dependencies
- Data Cleansing of Predecessor Systems
- Data Reconciliation and Validation Procedures
- Parallel Maintenance of Master Files
- Ownership and Sign-Off of Converted Files
- Internal Staff have Primary Responsibility -
- Contract Staff work subject to additional validation
- Special Controls for Automated and Manual Conversions.

UNIT 5

Turbo Charge the ERP system

IT, ERP and Organizations

- The primary objective of almost all the information technology initiatives and innovations is to reduce the amount of time it takes to acquire and use information, to learn, to make decisions, to initiate action, to deploy resources and to innovate.
- Real-time business has finally become cost-effective because of the convergence of three technologies:

1. Enterprise resource planning (ERP) applications
 2. data warehousing and other BI technologies
 3. Internet.
- Today's ERP packages allow customers to access their ERP data and applications over the Internet and extranets with a user interface that supports HTML, Java and XML.
 - ERP systems also provide an Internet interface for existing EDI data systems so that manufacturing companies can integrate their trading partners in a modern e-commerce system.
 - ERP systems help the organizations to manage complex business processes so it can improve profitability, increase productivity and run more efficiently.
 - ERP systems serve an important function by integrating separate business functions—materials management, product planning, sales, distribution, financials and others—into a single application.

Turbo Charging ERP

- One simple and cost-effective way to overcome the limitations of the ERP system is to add a data warehouse and a business intelligence front-end to the ERP system.
- A data warehouse or data mart organizes ERP data so that it is easily accessible for on-line analysis.

- Business intelligence systems improve business competitiveness by providing reporting and analysis tools to the desktop, enabling communication with the entire supply chain via the Web and automating alerts and actions.
- By allowing flexible reporting and analysis, a business intelligence system can unlock the value of the data in ERP reports.
- Business intelligence systems provide on-line analytical processing (OLAP) and data mining tools that managers can use from the desktops to answer the what, why and how types of questions and to discover significant trends and patterns.
- Businesses can optimize their investment in ERP systems by closing the loop between the business intelligence system and the ERP system.
- Business intelligence systems for ERP can also issue alerts when certain events occur or thresholds are met, enabling your business to react more quickly to problems and opportunities.
- The ultimate value from the ERP investment results from integrating the ERP system not only with a business intelligence front-end, but also with the Internet.

Review Questions

1. Discuss the importance of the convergence of three technologies—enterprise resource planning (ERP) applications, data warehousing and the Internet.
2. Discuss the limitations of ERP systems.
3. Explain what you mean by flexible reporting and analysis.

4. Explain how to improve the power of ERP using business intelligence.
5. What are the implementation requirements of integrating the business intelligence as the front-end to an ERP system?

Enterprise Application Integration (EAI)

- Enterprise Application Integration (EAI) is the process of linking these applications and others in order to realize financial and operational competitive advantages.
- EAI intends to transcend the simple goal of linking applications and attempts to enable new and innovative ways of leveraging organizational knowledge to create further competitive advantages for the enterprise.
- Enterprise application integration (EAI) is a business computing term for the plans, methods and tools aimed at modernizing, consolidating, and coordinating the business applications in an enterprise.
- The advantages of EAI are real-time information access among systems, streamlined business processes that helps in raising the organizational efficiency and ability to maintain information integrity across multiple systems, etc.
- The disadvantages include prohibitively high development costs, especially for small and medium business (SMBs), resources intense, complex and long duration implementations, need for highly skilled professionals and project managers and so on.

EAI Implementation Pitfalls

- 70% of the time EAI projects fail. Most of these failures are not due to the software itself or technical difficulties, but due to management issues.
- EAIIC European Chairman Steve Craggs has outlined the 7 main pitfalls undertaken by companies using EAI systems.
- The pitfall of EAI implementation are:
 1. Constant change
 2. Lack of EAI experts
 3. Competing standards
 4. Thinking of EAI as a tool as opposed to a system
 5. Discarding details along the way
 6. Emerging requirements
 7. Unclear accountability

Uses of EAI

- EAI can be used for different purposes:
 1. Data (information) integration — ensuring that information in multiple systems is kept consistent. This is also known as EII
 2. Process integration — linking business processes across applications

3. Vendor independence — extracting business policies or rules from applications and implementing them in the EAI system, so that even if one of the business applications is replaced with a different vendor's application, the business rules do not have to be re-implemented
 4. Common interface — an EAI system could front-end a cluster of applications, providing a single consistent access interface to these applications and shielding users from having to learn to interact with different applications.
- Given the complexity of EAI applications and a number of applications to choose from, finding the right EAI tool for an application integration project requires a substantial amount of research.

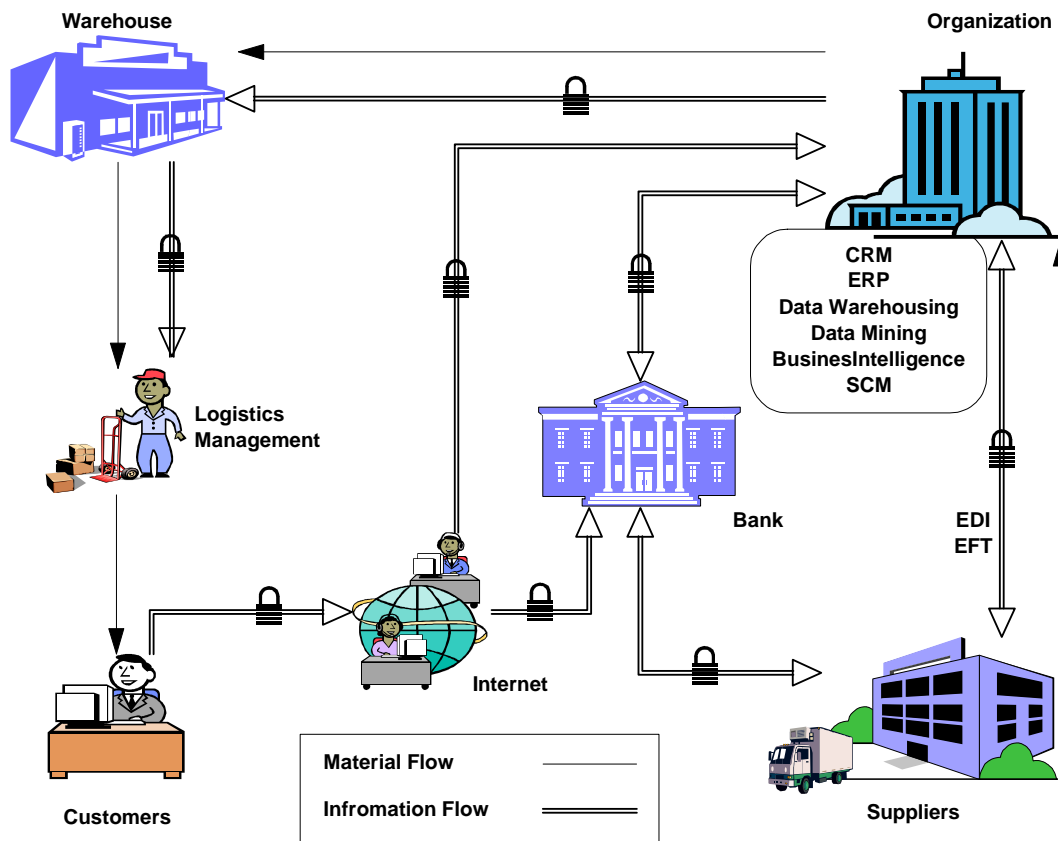
Review Questions

1. What do mean by enterprise application integration?
2. Discuss the limitations of ERP systems.
3. What are the uses of EAI?
4. What are the EAI implementation pitfalls?
5. Discuss the advantages and disadvantages of EAI.
6. Discuss the trends in EAI.
7. What are the EAI products?
8. What do mean by messaging-oriented middleware?

ERP and E-Business

- ERP is a structured approach to optimizing a company's internal value chain. The software, if implemented fully across an entire enterprise, connects the various components of the enterprise through a logical transmission and sharing of data.
- E-business stands for "electronic business," which involves communications and doing business electronically through the Internet. E-business is defined as the use of electronically enabled communication networks that allow business enterprises to transmit and receive information.
- When e-business is integrated with ERP, the whole extended system provides a vision of business processes that span multiple businesses and enterprises.
- In the most ideal case, companies should be able to connect disparate platforms, applications and data formats across the value chain, including not only suppliers but customers as well.
- E-business is focused on efficiency and effectiveness of external, cross-enterprise processes. While ERP technology supports business strategy, e-business opens the door to new strategic opportunities, which forces ERP to take one step further—to move from the single ERP system model to the extended ERP system model.

Supply Chain Integration



- A fully integrated ERP system will capture and create accurate, consistent and timely relevant data, and assist in intelligent business decision-making.
- The impact of ERP/ e-business integration is substantial, ranging from reduced inventory and personnel level to improved order and cash management.
- It also results in improved customer responsiveness, reduced IT costs and the availability of resources for value-added activities.
- Traditional businesses spend a lot of time, effort for communicating business information and making and accepting payments. E-businesses do the same thing over digital networks.

- The savings in terms of time, effort, error reduction, etc. are quite dramatic. EDI messages help business to automate the procurement and supply processes. EFT is used to accept and make payments between trading partners.
- The organizations can accept payments—credit card payments, digital cash, etc.—over the Internet. The use of electronic media for information transmission and financial transactions greatly reduce the time required for completing a transaction at the same time automating the business processes involved.
- A well run Web enabled ERP system will make the entire value chain very powerful.

Review Questions

1. How has e-business changed the definition of enterprise systems?
2. Discuss the connection between ERP and E-business.
3. Explain supply chain integration.
4. Discuss the E-business process model.
5. Explain the components of the e-business supply chain.

E-Business & E-commerce

- E-commerce (electronic commerce or EC) is the buying and selling of goods and services on the Internet, especially the World Wide Web. E-commerce is also known as e-tailing, i-commerce, etc.

- E-commerce can be broadly classified as the set of business activities involving consumers, service providers, manufacturers and intermediaries who use computer networks such as the Internet for conducting their business transactions.
- E-commerce can be divided into:
 1. E-tailing or virtual storefronts on Web sites with online catalogs, sometimes gathered into a virtual mall
 2. The gathering and use of demographic data through Web contacts
 3. Electronic Data Interchange (EDI), the business-to-business exchange of data
 4. e-mail and fax and their use as media for reaching prospects and established customers (for example, with newsletters)
 5. Business-to-business buying and selling
 6. The security of business transactions
- The primary goal of e-commerce is to bring organizations closer to their actual customers, thus providing the customers with products and services much faster and at a lesser cost than possible by traditional business models.
- The other goals include reduction in product and service cost, improved customer response time, improved the quality of the products and services and improved customer satisfaction.
- Implementing e-commerce has become a business necessity, as companies that fail to take advantage of this technology will soon find themselves out of business.

- Electronic commerce integrates communications, data management, and security services, to allow business applications within different organizations to automatically interchange information.
- E-commerce is a multi-disciplinary field that includes technical areas such as networking and telecommunications, security and storage and retrieval of multimedia information, business areas such as procurement, purchasing, production, marketing, billing and payment, and supply chain management.
- Information is an integral part of electronic commerce, but electronic and traditional commerce each deal with information differently. In electronic commerce, information can be conveyed via a communications network or other electronic media.
- A number of activities, including mail exchanges, electronic funds transfer, remote access to database systems and automatic monitoring of store inventory levels, automated production planning and JIT manufacturing, automatic purchase order processing and fulfillment, web-based customer support, etc. can be used in electronic commerce.
- By integrating communications, data management and security services with the business application, electronic commerce can make these services transparently available to the user. Through this integration and automation, conducting commerce is made more efficient, convenient and accurate.

Evolution of E-Commerce

- E-commerce has been around in various forms for over 30 years.

- Electronic data interchange (EDI) and electronic funds transfer (EFT) technologies were first introduced in the latter half of the 1970s.
- The growth and acceptance of credit cards, phone banking and automated teller machines (ATM) in the 1980s are also forms of e-commerce.
- The exponential increase in popularity of the Internet and WWW is the foundation that propelled the growth of e-commerce.
- The advancements in data encryption and capability to securely transfer data across commercial networks was another factor that contributed for the growth of e-commerce.
- “In this emerging digital marketplace nearly anyone with a good idea and a little software can set up shop and then become the corner store for an entire planet. The Internet makes any connected computer that central location and any desktop can be a doorway to a global mall with a sign that says, 'Open 24 hours a day, 7 days a week, 365 days a year.’”
– Al Gore (former US Vice President), 1998.

E-Commerce Growth Factors

- Growth of internet and internet population - The most important factor is the growth and commercialization of the Internet and the popularity of the WWW.
- Technology - The explosion of methods and applications of information technology is another growth factor.
- Consumer protection and privacy - Another set of factors that plays an important role in the growth of e-commerce is the increasing confidence in consumer protection and privacy.

- Improvements in Internet security - The emergence of modern encryption and security methods like Virtual Private Networks (VPN), Secure Socket Layers (SSL), Secure Electronic Transactions (SET), etc. have played a major role in improving consumer confidence and reducing fraud over the Internet.
- Entry of small and medium sized business - Internet has made it possible for small and medium sized enterprises (SMEs) to compete effectively with the larger organizations.
- Global reach - With the global reach of the Internet, e-commerce quickly connects buyers and sellers from around the world.

E-Commerce and E-Business

- E-commerce is generally associated with the buying and selling of information, products and services via computer networks.
- E-business (electronic business) is the conduct of business on the Internet, not only buying and selling but also servicing customers and collaborating with business partners.
- Today, major corporations are rethinking their businesses in terms of the Internet and its new culture and capabilities.
- Companies are using the Web to buy parts and supplies from other companies, to collaborate on sales promotions, and to do joint research.
- Exploiting the convenience, availability, and world-wide reach of the Internet, many companies, such as Dell Computers, Amazon.com, FedEx, McGraw-Hill Education, Citibank, Indiaplaza, etc. have already discovered how to use the Internet successfully.

- With the security built into today's browsers and with digital certificates now available for individuals and companies from certifying companies like Verisign, much of the early concern about the security of business transaction on the Web has abated and e-business accelerating.

E-Business

- E-Business is, in its simplest form, the conduct of business on the Internet. It is a more generic term than E-Commerce because it refers to not only buying and selling but also servicing customers and collaborating with business partners.
- E-business, in addition to encompassing e-commerce, includes both front and back office applications that form the engine for modern business. E-business is not just about e-commerce transactions; it's about re-defining old business models, with the aid of technology, to maximize customer value.
- E-business involves not merely setting up the company web site and being able to accept credit card payments or being able to sell products or services on-line. It involves fundamental re-structuring and streamlining of the business using technology.
- Transforming a traditional organization to do e-business involves using technology to the fullest.
- E-business uses technologies like enterprise resource planning (ERP) systems, supply chain management (SCM), customer relationship management (CRM), data warehousing, data marts, data mining, on-line analytical processing (OLAP), geographical information systems (GIS), etc. to conduct business on the Internet at 'Internet speed'.

- It is technology and innovative and new business processes that are making the conduct of business at 'Internet speed' possible.

Review Questions

1. Discuss the terms e-commerce and e-business.
2. Discuss the IT revolution and how it has changed the people and organizations.
3. How have technological advancements affected our lives?
4. Trace the evolution of e-commerce.
5. What were the growth factors of e-commerce? Discuss.
6. Discuss the transformation of organizations from e-commerce users to e-businesses.
7. Discuss e-business with examples.
8. Discuss how an e-business is different from a traditional business.

ERP, Internet, and WWW—ERP

ERP II

- By extending the existing applications to support e-commerce, organizations could not only leverage existing investments in their ERP solution but also speed the development of their e-commerce capabilities.
- ERP needs to be tightly integrated with the Internet and WWW or World Wide Web, in order to take advantage of that powerful medium.

- Since most of the business transactions are conducted over the Internet and most information is accessed and disseminated over the organization's portal on the WWW, these two media are becoming important for organizations.
- With the advancements in encryption technologies and Internet security, conducting business over the Internet is becoming safer. So extending the ERP applications to the Internet and WWW is the next logical step for organizations.
- ERP systems are used to integrate and optimize an organization's internal manufacturing, financial, distribution and human resource functions. In contrast, ERP II addresses the integration of business processes that extend across an enterprise and its trading partners.
- ERP II forms the basis of Internet enabled e-business and collaborative commerce.
- The main reason why ERP II came into existence was the need to look at a way to give customers and partners access to scheduling, delivery, inventory, manufacturing, invoicing and planning information.
- Over the last few years, solutions like CRM and SCM have leveraged the Internet to support these processes. ERP II incorporates them all in a single package.
- To be globally competent, an organization needs to open and reach out to its collaborative partners. ERP II enables businesses to compete by providing information on-line and adding real value to businesses of all types and sizes.
- ERP II is a solution that includes the traditional materials planning, distribution, and order-entry functionality strengthened by capabilities like customer relationship management (CRM), human resources management (HRM), document/ knowledge

management (KM) and workflow management. Such a system can quickly, accurately and consistently operate an entire organization.

- With ERP II the customer, the vendor, the supplier and the company all work in unison.
- The strongest features of ERP II are its web-centricity and designed-to-integrate architectures.

Review Questions

1. Explain the growth and popularity of Internet and its impact on ERP systems.
2. Explain the importance of the integration of ERP with Internet and WWW.
3. What is ERP II? Explain its importance and advantages.
4. Discuss the best practices of ERP II.

Future Directions and Trends in ERP

ERP Trends

The main ERP trends and future directions are:

1. New markets - As larger enterprises become saturated with new generation client/ server ERP systems, vendors are being forced to find new markets for their product suites to continue to drive their growth.
2. New channels – ERP vendors are building re-seller channels to reach the smaller businesses that are looking for the complete one-stop shop for their ERP solutions.

3. Faster implementation methodologies – ERP vendors and other organizations are creating methodologies and tools to make the implementation process simpler and faster.
4. Easier customization tools - Customization is one of the hidden costs of any ERP implementation. In order to lower the customization costs, most ERP vendors offer customization tool kits along with their products.
5. Business models and BAPIs – These products help the implementation teams in reviewing and to perform simulations of changes thereby making implementation easier.
6. Application platforms – ERP vendors are trying to extend the reach of its products and make them more like an application platform than a suite of modules.
7. New business segments – All the ERP vendors are now capable of delivering specialized variants of their applications to service vertical markets such as government, healthcare, financial service or retail environments.
8. Need-based applications - The latest ERP software programs offer need-based applications. The organizations can choose and install software programs pertaining to that particular function.
9. Product cost - ERP was a very costly affair. The popularity of the Internet and open source applications has helped SMEs to enter the market of prospective buyers, by offering low-priced products.
10. Reduction in implementation time – The new ERP systems are easier to implement, offer many implementation tools and thereby reduce the implementation time.

11. Open source, web enabled and wireless technologies - These are three important elements that have rejuvenated the functioning of ERP. Open source ERP has done away with the hassles of paying license fees. Web enabled ERP helps in making the enterprise operations go on-line. Wireless ERP has helped organizations to make use of the communication channels effectively and efficiently.
12. Enterprise application integration - As the need for integrating the supply chain is becoming more and more urgent, most ERP vendors are offering these applications (like supply chain management, customer relationship management, business intelligence, analysis and reporting, etc.) as part of their ERP offerings.
13. Market snapshot - SAP will remain the undisputed leader of the ERP market for the foreseeable future, but the acquisitions of PeopleSoft and JD Edwards by Oracle make it a worthy competitor. These two organizations together hold more than 60% of the market share and will decide the events of the ERP marketplace. The next 8 competitors put together, account for only 16% of the ERP market share.
14. Shifting revenue models - Significant shifts are taking place in how ERP vendors generate revenues. Echoing changes taking place throughout the software industry, the transition is toward recurring and variable revenue models—with maintenance charges driving industry growth.
15. The SOA factor - The need to implement service-oriented architectures (SOAs) will continue to grow as a factor in ERP purchase decisions.

