LOVELY PROFESSIONAL UNIVERSITY

ENTERPRISE RESOURCE PLANNING

Edited By

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SYLLABUS

Enterprise Resource Planning

Objectives: The objective of ERP is:

- To provide the real time information.
- To enrich students with concepts and knowledge of ERP.
- To prepare them to become knowledgeable ERP user professionals suitable to Industry and Information Technology Companies.

S. No.	Topics
1	***ERP overview:*** Evolution, Reasons for growth, Benefits, failure of ERP Implementation, Integrated Data Model & Management Information, Business Modeling.
2	***ERP and Related Technologies:*** Business Process Reengineering, Management Information system, Decision Support System, Executive Information System. Data Warehousing, Data Mining, On-Line Analytical Processing, Supply chain Management.
3	***Manufacturing Perspective of ERP:*** CAD/CAM, MRP, BOM, MRP-II , DRP, PDM, MTS,ATO, ETO,CTO.
4	***ERP Modules:*** Finance, Plant Maintenance, Quality Management, Materials Management.
5	***ERP Benefits:*** Reduction in cycle Time, Lead Time & Cost, Improved Resource Utilization, Supplier Performance.
6	***ERP Benefits:*** Flexibility, Accuracy & Decision Making , Customer Satisfaction & On-time Shipment. ***ERP Market:*** SAP and its Technologies, ERP solution Companies: People Soft,Baan,Oracle,QAD,JD Edwards,SSA
7	***ERP Implementation Lifecycle:*** Pre-evaluation Screening, Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, End User Training & Post Implementation.
8	***ERP Vendors, Consultants & Users:*** Pro & Cons of In-house Implementation & End Users.
9	***ERP Future Directions:*** New Markets, New Channels, Faster Implementation Methodologies, Application Platforms, New Business Segments, Web Enabling & Snapshot.
10	***Case Studies*** like SAP R/3 at Tata Steel; Oracle at Qualcomm CDMA Technologies

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Objectives

After studying this unit, you will be able to:

- Describe enterprise resource planning
- State the growth reasons of ERP
- Explain the ERP benefits
- Discuss integrated data model and business modeling

Introduction

ERP systems are now ubiquitous in large businesses and the current move by vendors is to repackage them for small to medium enterprises (SMEs). This migration has many consequences that have to be addressed through understanding the history and evolution of ERP systems and their current architectures. The advantages and disadvantages of the ERP systems will impact their penetration in this new market. The market position and general strategy of the major

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systems providers in preparation for this push are described. The unit concludes that the growth and success of ERP adoption and development in the new millennium will depend on the legacy ERP system's capability of extending to Customer Relationship Management (CRM), Supply Chain Management (SCM) and other extended modules, and integration with the Internet-enabled applications.

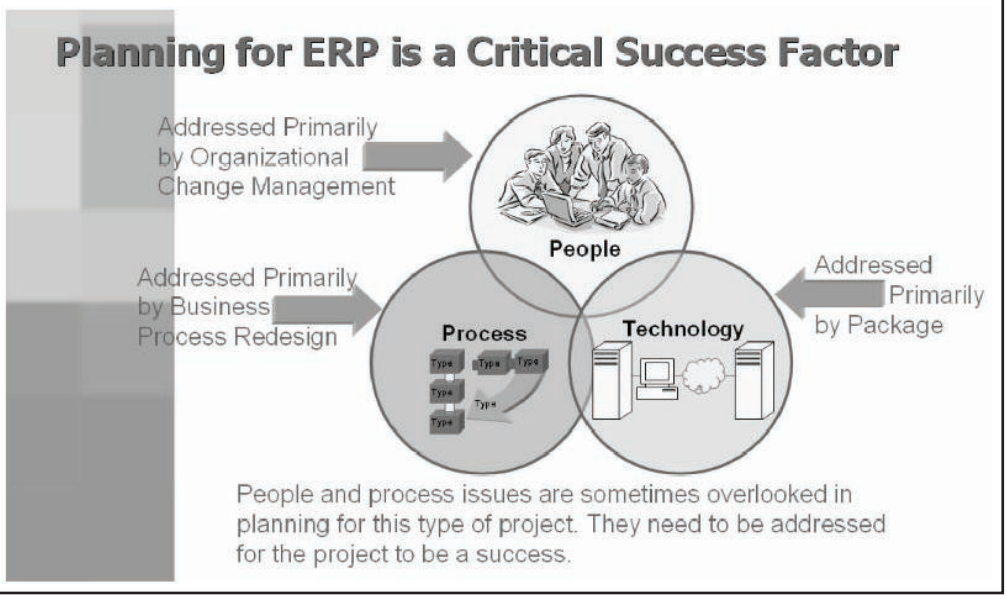
1.1 Introduction to ERP

Today, Enterprise Resource Planning (ERP) systems have come to signify a never-before opportunity for organisations to gain a clear edge over their competitors. In order to compete and grow, many organisations in India either have already implemented or are at the threshold of acquiring ERP systems.

1. ERP is a high-end sophisticated software solution that reduces the pressure and workload of the managers and provides accurate, timely information for taking appropriate business decisions.
2. Enterprise Resource Planning is the latest high end solution that information technology has lent to business application.

Information technology has transformed the way we live in and the way we do business. Since the last decade, IT has made a drastic change in our life. As compared to earlier stage, when computer was used just as a typewriter, nowadays users have become more intelligent and IT literate. Now the user knows that a PC can do many more things rather then just typing a letter in a word processing software or making balance sheets in Excel. They expect more things out of their PC. During this phase of industry, every one of us must have heard the word ERP in one or the other form. It may be in the title of any IT magazine or may be a point of discussion in any IT Seminar or may be in an advertisement of big IT Company. Thus in any form, we all have been through this word. In fact, ERP software consists of multiple software modules that integrate activities across functional departments - from production planning, parts purchasing, inventory control and product distribution to order tracking. Most ERP software systems include application modules to support common business activities like finance, accounting and human resources.

Figure 1.1: Planning for ERP



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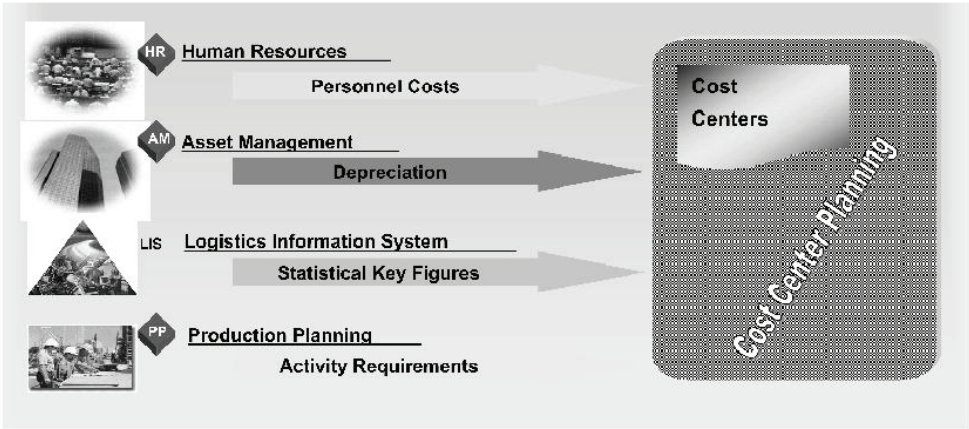
1.2 Overview of ERP

ERP is much more than just a computer software. An ERP System includes ERP Software, Business Processes, Users and Hardware that run the ERP software. An ERP system is more than the sum of its parts or components. Those components interact together to achieve a common goal - streamline and improve organizations' business processes. Most important factor for ERP system is the users. Successful implementation of any ERP System depends more on intelligent users who are going to use them, because any standard ERP Software would consist hundreds of input information for any particular business activity. Thus good knowledge of each entity of system by the users is the most important factor in ERP Software.

Figure 1.2: Functional Departments of ERP



Enterprise Resource Planning (ERP) is the evolution of Manufacturing Requirements Planning (MRP) II in 1980s, which was mainly related to Manufacturing Industry and was designed to control manufacturing process and planning the required production with efficient output. MRP is the evolution of Inventory Management & Control conceived in 1960s, which was mainly designed for management of Stocks in any particular industry. ERP has expanded from coordination of manufacturing processes to the integration of enterprise-wide backened processes like production planning and scheduling of delivery. In terms of technology, ERP has evolved from legacy implementation to more flexible tiered client-server architecture.

1.3 What is ERP?

It serves as a Cross-functional Enterprise Backbone that Integrates and Automates many Internal Business Process and Information Systems covering all functional areas.

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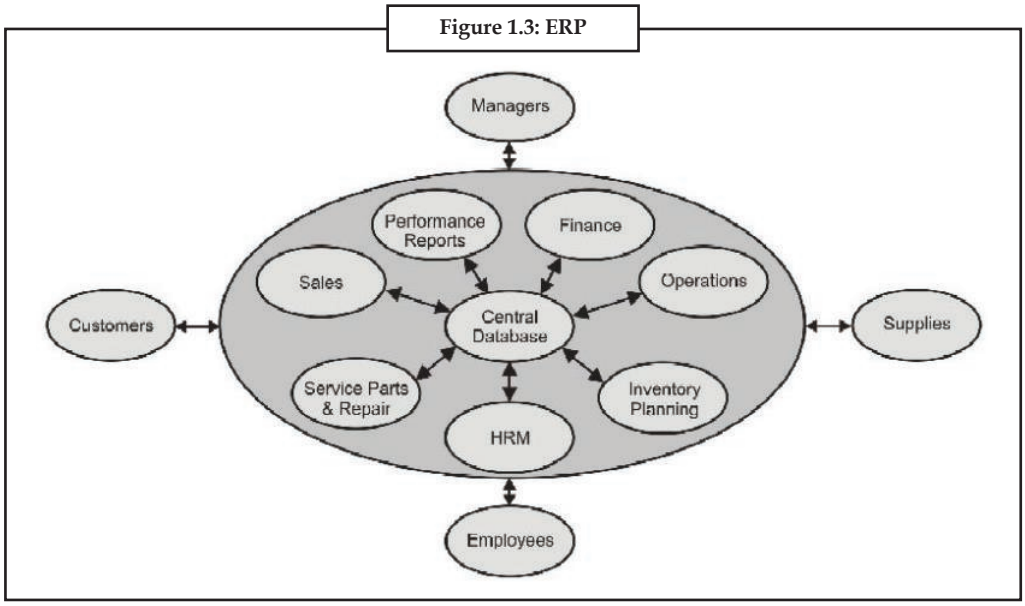
Figure 1.3: ERP



The term ERP originally implied systems designed to plan the use of enterprise-wide resources. Although the initialism ERP originated in the manufacturing environment, today's use of the term ERP systems has a much broader scope. ERP systems typically attempt to cover all basic functions of an organization, regardless of the organization's business or charter. Businesses, non-profit organizations, nongovernmental organizations, governments, and other large entities utilize ERP systems.

To be considered an ERP system, a software package must provide the function of at least two systems.

Example: A software package that provides both payroll and accounting functions could technically be considered an ERP software package.

However, the term is typically reserved for larger, more broadly based applications. The introduction of an ERP system to replace two or more independent applications eliminates the need for external interfaces previously required between systems, and provides additional benefits that range from standardization and lower maintenance (one system instead of two or more) to easier and/or greater reporting capabilities (as all data is typically kept in one database).

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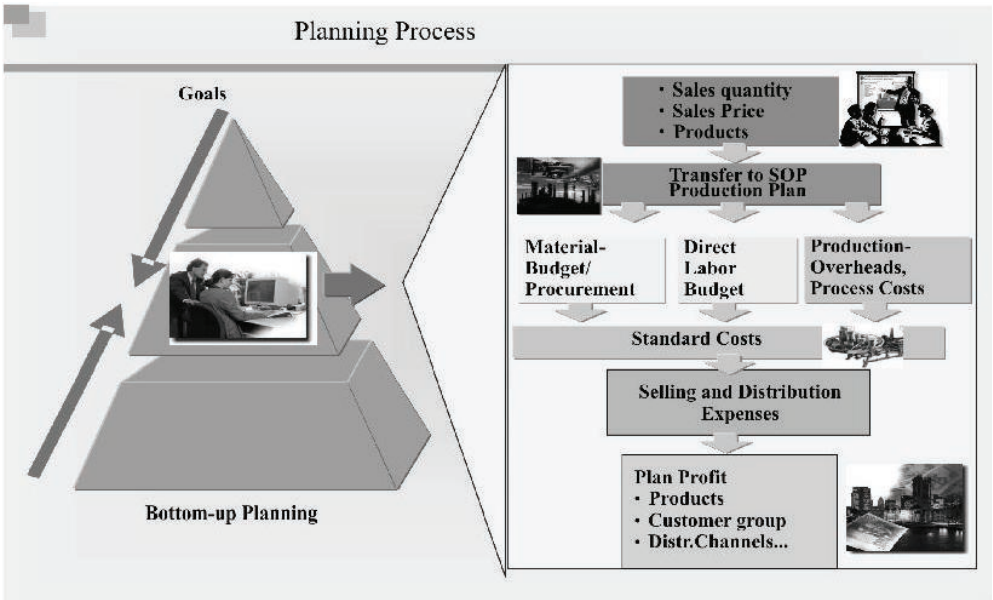
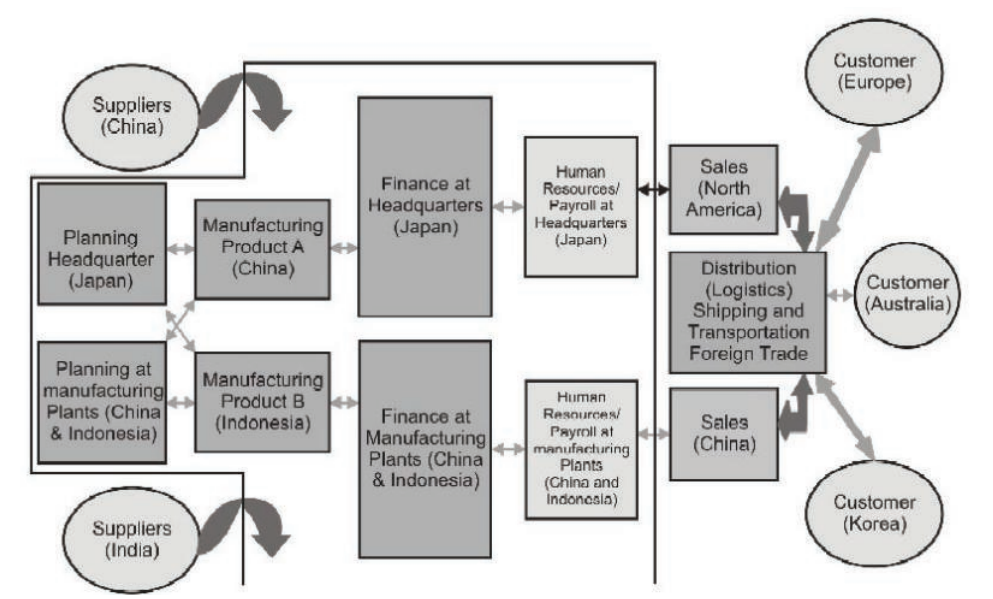
Figure 1.4: ERP Planning Process



Enterprise Resource Planning is a term originally derived from manufacturing resource planning (MRP II) that followed material requirements planning (MRP). MRP evolved into ERP when "routings" became a major part of the software architecture and a company's capacity planning activity also became a part of the standard software activity. ERP systems typically handle the manufacturing, logistics, distribution, inventory, shipping, invoicing, and accounting for a company. Enterprise Resource Planning or ERP software can aid in the control of many business activities, like sales, marketing, delivery, billing, production, inventory management, quality management, and human resource management.

Figure 1.5: Current Business Scenario



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ERP systems saw a large boost in sales in the 1990s as companies faced the Y2K problem in their legacy systems. Many companies took this opportunity to replace their legacy information systems with ERP systems. This rapid growth in sales was followed by a slump in 1999, at which time most companies had already implemented their Y2K solution.

1.3.1 The Ideal ERP System

An ideal ERP system is when a single database is utilized and contains all data for various software modules. These software modules can include:

1. ***Manufacturing:*** Some of the functions include; engineering, capacity, workflow management, quality control, bills of material, manufacturing process, etc.
2. ***Financials:*** Accounts payable, accounts receivable, fixed assets, general ledger and cash management, etc.
3. ***Human Resources:*** Benefits, training, payroll, time and attendance, etc
4. ***Supply Chain Management:*** Inventory, supply chain planning, supplier scheduling, claim processing, order entry, purchasing, etc.
5. ***Projects:*** Costing, billing, activity management, time and expense, etc.
6. ***Customer Relationship Management:*** Sales and marketing, service, commissions, customer contact, calls center support, etc.
7. ***Data Warehouse:*** Usually this is a module that can be accessed by an organizations customers, suppliers and employees.

1.3.2 Implementation of an ERP System

Implementing an ERP system is not an easy task to achieve, in fact it takes lots of planning, consulting and in most cases 3 months to 1 year +. ERP systems are extraordinary wide in scope and for many larger organizations can be extremely complex. Implementing an ERP system will ultimately require significant changes on staff and work practices. While it may seem reasonable for an in house IT staff to head the project, it is widely advised that ERP implementation consultants be used, due to the fact that consultants are usually more cost effective and are specifically trained in implementing these types of systems.

One of the most important traits that an organization should have when implementing an ERP system is ownership of the project. Because so many changes take place and its broad effect on almost every individual in the organization, it is important to make sure that everyone is on board and will help make the project and using the new ERP system a success.

Usually organizations use ERP vendors or consulting companies to implement their customized ERP system. There are three types of professional services that are provided when implementing an ERP system, they are Consulting, Customization and Support.

Consulting Services: Usually consulting services are responsible for the initial stages of ERP implementation, they help an organization go live with their new system, with product training, workflow, improve ERP's use in the specific organization, etc.

Customization Services: Customization services work by extending the use of the new ERP system or changing its use by creating customized interfaces and/or underlying application code. While ERP systems are made for many core routines, there are still some needs that need to be built or customized for an organization.

Support Services: Support services include both support and maintenance of ERP systems. For instance, trouble shooting and assistance with ERP issues.

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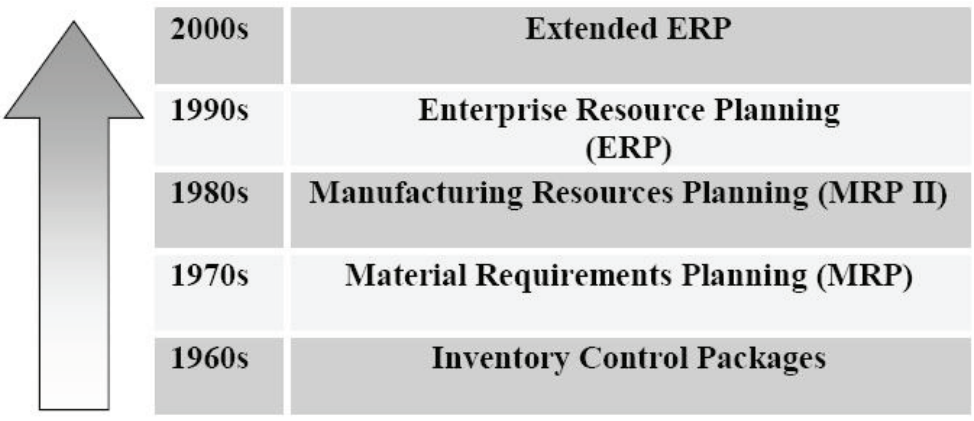
Task Suppose your father run a general store in a local area. If you implement ERP over there what are the benefits your father get after implementing ERP.

1.4 Evolution of ERP

The evolution of ERP systems closely followed the spectacular developments in the field of computer hardware and software systems. During the 1960s most organizations designed, developed and implemented centralized computing systems, mostly automating their inventory control systems using inventory control packages (IC). These were legacy systems based on programming languages such as COBOL, ALGOL and FORTRAN. Material requirements planning (MRP) systems were developed in the 1970s which involved mainly planning the product or parts requirements according to the master production schedule. Following this route new software systems called manufacturing resources planning (MRP II) were introduced in the 1980s with an emphasis on optimizing manufacturing processes by synchronizing the materials with production requirements. MRP II included areas such as shop floor and distribution management, project management, finance, human resource and engineering. ERP systems first appeared in the late 1980s and the beginning of the 1990s with the power of enterprise-wide inter-functional coordination and integration. Based on the technological foundations of MRP and MRP II, ERP systems integrate business processes including manufacturing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, and transportation, providing accessibility, visibility and consistency across the enterprise.

During the 1990s ERP vendors added more modules and functions as "add-ons" to the core modules giving birth to the "extended ERPs." These ERP extensions include advanced planning and scheduling (APS), e-business solutions such as customer relationship management (CRM) and supply chain management (SCM). Figure 1.6 summarizes the historical events related with ERP.

Figure 1.6: ERP Evolution



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1.5 Reasons for Growth of ERP

There are some reasons for the explosive growth of ERP market and ERP vendors. Following are some tangible benefits of ERP which have participated in its rapid growth.

1. Reduction of lead time
2. Cycle time cut
3. On time shipment
4. Increase of inventory
5. Doubled business
6. Eliminates limitations in legacy system (Century dating, inflexibility to change, etc).

Apart from the above tangible benefits there are some intangible benefits that cause the growth of ERP systems. They are:

1. Customer satisfaction
2. Increase flexibility
3. Better analysis and planning capabilities (decision making).
4. Reduce quality cost by implementing latest technology
5. Proper utility of resources
6. Improved information accuracy

The latest technologies like client server architecture, open system technology provides integration capabilities to entire enterprise system. It brings supplier and customers together by ensuring smoother flow of information at all levels and parts of organization. ERP helps to make the decision at the right time and by the right person as entire organization shows the same information and views. This provides powerful support to the decision making.

This provide powerful support to the decision making. The Customer is the ultimate winner as he could get better product and quality alongwith better service at affordable prices.

1.6 Benefits of ERP

The ERP packages promise the seamless integration of all information flowing through an organization; they are becoming the fastest growing softwares in the world. The ERP vendors like SAP, Oracle, Baan, QAD, J.D.Edwards, Peoplesoft are in demand for their packages. The main task of the ERP system is to deliver products to the companies to manage their internal and external functions efficiently. There are several other advantages of adopting the ERP system, few of them are as follows:

1. ***Improved efficiency:*** This is achieved by reduction of cycle time, inventory reduction, order fulfillment, improving support to supply chain, management, etc.
2. ***Business integration:*** ERP packages are integrated, i.e. Exchange of data among related business components is possible. In the large companies timing of system constructions, directive differs for each product and department function.
3. ***Better decision making:*** The decision making procedure become easier because of highly structured programmed process. These processes governs days to day operations and produces reports in structured form, which are further used by top management of organization to meet with its basic goals and objectives and to monitor the whole organization.

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4. ***Quick response time to customers:*** The system is easy to operate so, that not much computer skills are required to handle the operations. Because of its comprehensive nature the system avoids unnecessary duplication and redundancy in data gathering and storage. Thus the response time to customer is reduced.

5. ***Business integration:*** ERP creates the common database across the organization which is used by various departments within the organization. The ERP supports the flow of information within department automatically. This business integration capabilities makes it easy to group business details in real time and carry out various types of management decision in time. The support systems like DSS can use this common database. Thus information and the data are on the fingertip of top level management.

6. ***Analysis and planning capabilities:*** Though different types of decisions support systems and simulation function, ERP makes the analysis of data easier. The DSS also supports the middle and top management for tactical and strategic planning.

7. ***Technology support:*** Utilization of latest development in Information technology is quickly adapted by the ERP packages. Distributed system, open system, client server technology, internet, intranet, E – commerce, CALS (Computer aided Acquisition and Logistic Support) are some examples of flexible environment adopted by ERP. The ERP packages itself design in a way that they can incorporate with latest technology even during the customization, maintenance and expansion phases.

1.7 Failure of ERP Implementation

When firms fail to allot sufficient investment for the Enterprise Resource Planning software that they use, the approach can affect the functionalities and efficiency of departments. In this regard, it is important that corporations create a policy that will protect the files stored in the system to prevent experiencing the common problems associated with ERP.

One of the disadvantages of Enterprise Resource Planning is that the use of software that will manage the activities of a firm can affect the workflow, competitive advantage, and employee morale. In addition, the implementation of this approach is very expensive and very risky. Since the files, activities, and corporate reports are centralized, there is a high possibility that some important and confidential files could be lost.

While advantages usually outweigh disadvantages for most organizations implementing an ERP system, here are some of the most common obstacles experienced:

Usually many obstacles can be prevented if adequate investment is made and adequate training is involved, however, success does depend on skills and the experience of the workforce to quickly adapt to the new system.

1. Customization in many situations is limited
2. The need to reengineer business processes
3. ERP systems can be cost prohibitive to install and run
4. Technical support can be shoddy
5. ERP's may be too rigid for specific organizations that are either new or want to move in a new direction in the near future.

1.8 Integrated Data Model

Enterprise Resource Planning (ERP) software helps integrate management, staff, and equipment, combining all aspects of the business into one system in order to facilitate every element of the manufacturing process. ERP groups traditional company and management functions (such as

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accounting, human resources [HR], manufacturing management, and customer relationship management [CRM]) into a coherent whole. Manufacturing management also includes inventory, purchasing, and quality and sales management.

This is very common in the retail sector, where even a mid-sized retailer will have a discrete Point-of-Sale (POS) product and financials application, then a series of specialized applications to handle business requirements such as warehouse management, staff rostering, merchandising and logistics.

Ideally, ERP delivers a single database that contains all data for the software modules, which would include:

1. ***Manufacturing:*** Engineering, Bills of Material, Scheduling, Capacity, Workflow Management, Quality Control, Cost Management, Manufacturing Process, Manufacturing Projects, Manufacturing Flow
2. ***Supply Chain Management:*** Order to cash, Inventory, Order Entry, Purchasing, Product Configurator, Supply Chain Planning, Supplier Scheduling, Inspection of goods, Claim Processing, Commission Calculation
3. ***Financial:*** General Ledger, Cash Management, Accounts Payable, Accounts Receivable, Fixed Assets
4. ***Projects:*** Costing, Billing, Time and Expense, Activity Management
5. ***Human Resources:*** Human Resources, Payroll, Training, Time & Attendance, Rostering, Benefits
6. ***Customer Relationship Management:*** Sales and Marketing, Commissions, Service, Customer Contact and Call Center support
7. ***Data Warehouse:*** Various Self-service interfaces for Customers, Suppliers, and Employees
8. ***Access control:*** User privilege as per authority levels for process execution
9. ***Customization:*** To meet the extension, addition, change in process flow.

To implement ERP systems, companies often seek the help of an ERP vendor or of third-party consulting companies. These firms typically provide three areas of professional services: consulting, customization and support. The client organisation may also employ independent program management, business analysis, change management and UAT specialists to ensure their business requirements remain a priority during implementation.

Data migration is one of the most important activities in determining the success of an ERP implementation. Since many decisions must be made before migration, a significant amount of planning must occur. Unfortunately, data migration is the last activity before the production phase of an ERP implementation, and therefore receives minimal attention due to time constraints. The following are the steps of a data migration strategy that can help with the success of an ERP implementation:

1. Identifying the data to be migrated
2. Determining the timing of data migration
3. Generating the data templates
4. Freezing the tools for data migration
5. Deciding on migration related setups
6. Deciding on data archiving

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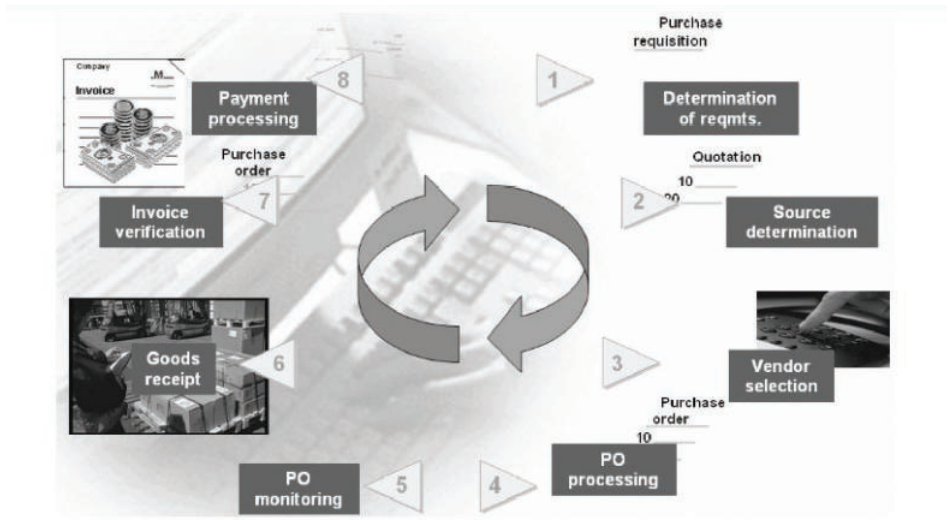
Making the Right Choice

Single-instance ERP is not for everybody. Here are the key characteristics of companies that tend to choose global ERP and of those that use regional systems.

Global ERP

1. Multinationals seeking to centralise financial reporting and close their monthly or quarterly financials faster.
2. Companies looking to minimise the variety of financial controls in place to simplify regulatory compliance activities.
3. Corporations that stand to gain operational efficiencies by centralising management and control of operational procedures, such as order management, materials handling and inventory control.
4. Organisations seeking to maintain common business processes across various divisions and geographies.
5. Corporations that are highly distributed or operate as collections of regional businesses.
6. Companies that need customised systems to meet unique business requirements in particular markets.
7. Multinationals subject to various local rules and regulations that require reporting of financials or operational data in formats different from those used by the rest of the company.
8. Far-flung companies whose regional units may be subject to infrastructure instability, making it difficult to maintain consistent high-speed connections to a host system located across the world.

Figure 1.7: Procurement Cycle



Companies that consolidate to a single global ERP system face many human and technical challenges, including these:

1. Managing change, including standardising business processes
2. Communicating project goals to constituents from different cultures

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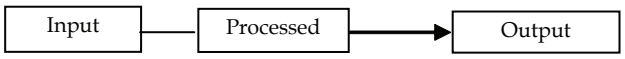
3. Gaining business unit buy-in
4. Achieving data integrity
5. Retiring dozens or even hundreds of discrete systems
6. Meeting regional legal and regulatory requirements
7. Achieving high system availability through high-bandwidth connections
8. Maintaining business as usual during the transition
9. Providing consistent global technical support

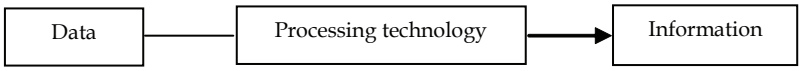
Task Can you give one single example of ERP enabled organization how they satisfy their customer with the help of ERP?

1.9 Integrated Management Information

In any information system there is a logical flow of information that is, in any information system, data supplied to the system (input), are manipulated (processed) and transformed into information (output). The simple IPO (Input – processed – output) model has been used.



Through the processing technology of information system data has been transformed into useable information.



Management Information System (MIS) is an integrated information system, which is one of the popular subsystem or technology used in ERP. It is defined as the management information system (MIS) a system, which provides information supports for the decision – making in the organization. The MIS may be depicted by IPO model. i.e. people follow procedures to manipulate data and produce information.

The MIS elements are TP (transaction process), RS (reporting system), DSS (Decision supports system).

1. ***TP*** is a collection, storage and processing of data and day – to day operational system
2. ***RS*** is providing report based on business rules and procedures
3. ***DSS*** is a system for providing information to help the management with new unstructured decision – making

This provides needs of managers at operational level of organization and working environment is isolated. They operate at the department level and only provides predefined information. This system provides different reports, which are based on specified business rules. As it provides the information only in the form of reports, it has several limitations.

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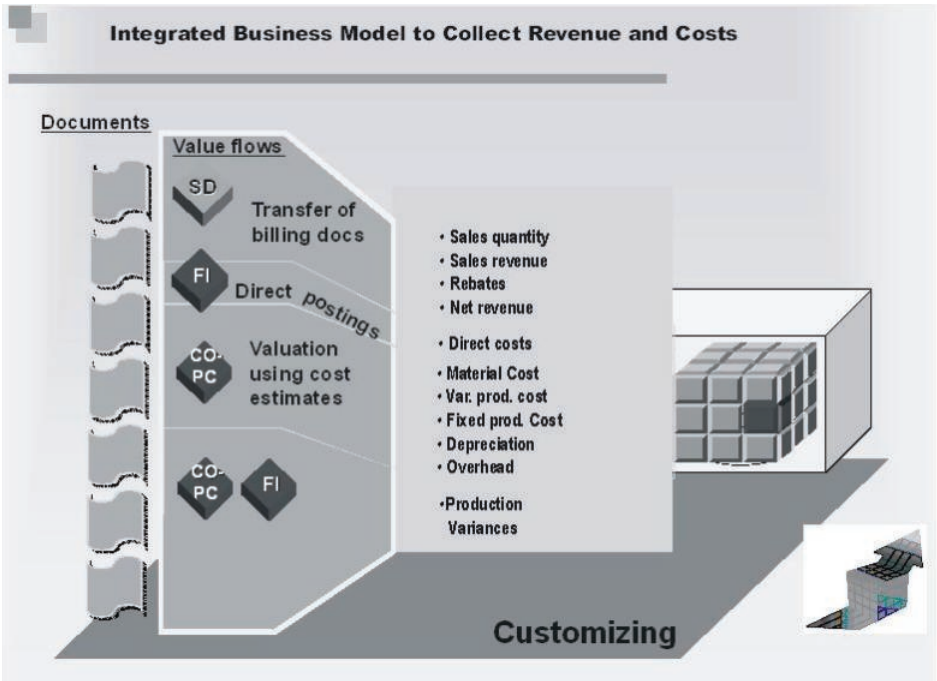
Did u know? After successful implementation of ERP in any organization it reduces cycle time and also reduces cost.

ERP are cross-functional and enterprise wide. All functional departments that are involved in operations or production are integrated in one system. In addition to manufacturing, warehousing, logistics, and information technology, this would include accounting, human resources, marketing, and strategic management.

Prior to the concept ERP systems, departments within an organization (for example, the human resources (HR) department, the payroll department, and the financials department) would have their own computer systems. The HR computer system (often called HRMS or HRIS) would typically contain information on the department, reporting structure, and personal details of employees. The payroll department would typically calculate and store paycheck information. The financial department would typically store financial transactions for the organization. Each system would have to rely on a set of common data to communicate with each other. For the HRIS to send salary information to the payroll system, an employee number would need to be assigned and remain static between the two systems to accurately identify an employee. The financial system was not interested in the employee-level data, but only in the payouts made by the payroll systems, such as the tax payments to various authorities, payments for employee benefits to providers, and so on. This provided complications. For instance, a person could not be paid in the payroll system without an employee number.

ERP software, among other things, combined the data of formerly separate applications. This made the worry of keeping numbers in synchronization across multiple systems disappear. It standardised and reduced the number of software specialities required within larger organizations.

Figure 1.8: Integrated Business Models



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Best practices were also a benefit of implementing an ERP system. When implementing an ERP system, organizations essentially had to choose between customizing the software or modifying their business processes to the "Best Practice" function delivered in the vanilla version of the software.

Typically, the delivery of best practice applies more usefully to large organizations and especially where there is a compliance requirement such as IFRS, Sarbanes-Oxley or Basel II, or where the process is a commodity such as electronic funds transfer. This is because the procedure of capturing and reporting legislative or commodity content can be readily codified within the ERP software, and then replicated with confidence across multiple businesses who have the same business requirement.

Where such a compliance or commodity requirement does not underpin the business process, it can be argued that determining and applying a Best Practice actually erodes competitive advantage by homogenizing the business as compared to everyone else in the industry sector.

Task Take an example of any courier company (ABC Couriers) and discuss the benefits of ERP at ABC couriers.

1.10 Business Modeling

ERP is nothing but total business solution. The entire enterprise could be managed by ERP, as it gives integrated and closed loop solutions. Before integrating the whole organizational functions a business model is planned.

Infact, formation of the business model is one of the basic activities in an ERP project. Business modeling is developed on the basis of organization's goals, objectives and strategic plans.

The business processes are under control of different individuals in the organization. Business model is a representation of the business – integrated system, which is having several interconnections and interdependences of several processes and subsystems. It helps for seamless integration through supply chain management, resource management, integrated data model technology and other functional department. This results in all resources function fully managed and well organized.

A good business model represents the actual mirror image of the business. It defines the various business functions of an organization, how several business functions are integrated and what are their interdependences.

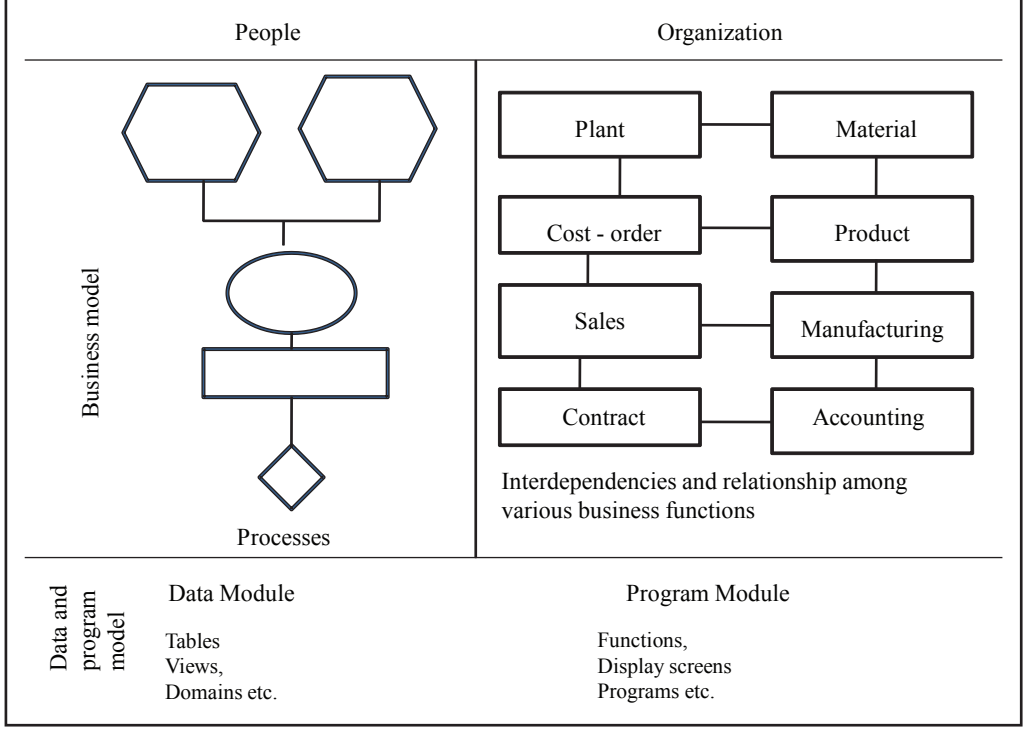
The business model is represented in graphical form using data flow diagrams, system diagrams and flow charts. Business model helps to create the data model of the system. A business model focus on the representation of the business as one large system showing the interconnections and interdependencies of various subjects and business processes. The business model is not a mathematical model.

Creating an integrated data model is critical step in the ERP implementation. While designing the data model for ERP system, one should keep in mind, the information integration and process procedure automation. The data model reflect the day – to – day transaction of the entire organization and can give a snapshot of the organization at any given time. The integrated data model derived from the business model should successfully depict and integrate the data.

Structures of the Entire Organization

Notes

Figure 1.9: Business Model



Case Study

Reaching Out

Rosenbluth, a privately held, family owned company, is the second largest travel services firm in the world, with American Express being number one. Rosebluth's Global Distribution Network (GDN) is a worldwide telecommunications network through which the airline reservation systems are accessible. All Rosenbluth agents are connected to GDN as most of the company's travel software applications. Client's planning trips can either use the network to research or book their travel arrangements, or they can work through a Rosebluth agent. Moreover, clients can choose to use a local Rosenbluth agent, or they can turn to specific agents of their choice anywhere in the world.

Hal Rosenbluth of the company had this to say, "…Now we will not only connect people by planes or trains but we will connect them through technology."

Questions

1. How has technology helped companies like Rosenbluth deliver customized services?
2. Is it possible for small companies to adopt technology similar to Rosenbluth's? Why or why not? Justify.
3. What is the significance of Rosenbluth's statement? Give your viewpoint.

Source: Himadri Barman, *Centre for Management Studies,* Dibrugarh University, Dibrugarh 786 004, Assam, India

Notes

1.11 Summary

- ERP is the abbreviation of Enterprise Resource Planning and means, the techniques and concepts for integrated management of businesses as a whole from the viewpoint of the effective use of management resources to improve the efficiency of enterprise management.
- ERP provides the backbone for an enterprise-wide information system.
- At the core of this enterprise software is a central database which draws data from and feeds data into modular applications that operate on a common computing platform, thus standardizing business processes and data definitions into a unified environment.
- With an ERP system, data needs to be entered only once.
- The system provides consistency and visibility or transparency across the entire enterprise.
- A primary benefit of ERP is easier access to reliable, integrated information.
- A related benefit is the elimination of redundant data and the rationalization of processes, which result in substantial cost savings.

1.12 Keywords

Customer Relationship Management (CRM): An approach to building and sustaining long-term business with customers.

Enterprise Resource Planning: Enterprise applications used to manage information about organizational resources such as raw materials, products, staff and customers as part of delivery of a product or service.

Information System: A collection of hardware, software, data, and people designed to collect, process, and distribute data throughout an organization.

1.13 Self Assessment

Choose the appropriate answers:

1. The general transformation cycle for information is:
   - (a) Knowledge to data to information.
   - (b) Information to data to knowledge.
   - (c) Data to information to knowledge.
   - (d) Data to knowledge to information.
2. SCARPE stands for:
   - (a) Supply Chain Advanced Resource Planning and Execution
   - (b) Source Chain Advanced Resource Planning and Execution
   - (c) Supply Chain Advanced Resource Program and Execution
   - (d) None

Notes

3. MRP stands for:
   (a) Material Requirement Planning
   (b) Management Requirement Planning
   (c) Material Resource Planning
   (d) None
4. CRM stands for:
   (a) Customer Retention Management
   (b) Customer Relationship Management
   (c) Computer Relationship Management
   (d) None

Fill in the blanks:

5. ..... used to solve a number of problems that have plagued large organizations in the past.
6. ERP (Enterprise Resource Planning) is the evolution of .....
7. ..... is the combination of information technology and business processes of maintaining the appropriate level of stock in a warehouse.
8. ..... is a commercial software package promising the seamless integration of all the information flowing through company.

State whether the following statements are true or false:

9. ERP offers perfect solutions to business organizations in India.
10. ERP helps to make the decision at the right time and by the right person as entire organization shows the same information and views.

1.14 Review Questions

1. What are the advantages of ERP?
2. How business integration achieved by ERP system?
3. Discuss the evolution of ERP
4. Describe the reasons of growth of ERP market.
5. Explain the importance of ERP in Modern Business Organization.
6. State the significance of Integrated Management Systems.
7. Describe the reasons for the growth of ERP.
8. What are the obstacles of applying IT, ERP Market?
9. "ERP originally implied systems designed to plan the use of enterprise-wide resources." Explain
10. Describe business modeling process in detail.

Notes

Answers: Self Assessment

1. (b) 2. (a) 3. (a) 4. (b)
5. ERP 6. Manufacturing Requirements Planning (MRP) II
7. Inventory Management and Control
8. ERP 9. True 10. True

1.15 Further Readings

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Unit 2: ERP and Related Technology

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Objectives

After studying this unit, you will be able to:

- State the need for business process re-engineering
- Describe management information system, decision support system and executive information system
- Discuss the concepts data warehousing and data mining
- Explain the concept of supply chain management

Introduction

Business Process Re-engineering (BPR) is the fundamental rethinking and radical redesign of business processes of an organization to achieve dramatic improvement in critical contemporary measures of performance such as cost, quality, service and speed. In simple terms, the process of examining current processes and redesigning those processes to increase the efficiency and effectiveness of an organization is called BPR. More precisely, BPR means the rapid and radical redesign of strategic, value-added business processes and systems, policies and organizational structure that support them to optimize workflow and productivity in an organization. BPR concurrently pursues breakthrough improvements in quality, speed, service and cost by leveraging the potential of information technology while addressing the issues of organizational strategies and vision for change. Breakthrough improvement means quantum gains of 5 to 10 times compared to incremental improvements of 20-30 percent. These improvements are generally characterized in terms of improvement of product and service quality at low cost and less time lag between product designs to marketing.

2.1 Why Process Re-engineering?

Organizations re–engineer for a variety of compelling business reasons. Improving business processes is paramount for businesses to stay competitive in today's marketplace. Over the last few years organizations have been forced to improve their business processes because customers are demanding better products and services. Another apparent trend is the opening up of world markets and increased free trade. Such changes bring more companies into the marketplace, and competing becomes harder and harder. In today's marketplace, major changes are required to just stay even. It has become a matter of survival for most organizations.

Organizations re-engineer when the management feels that a significant gap is existing between the actual and desired results, creating a business problem. At times, senior management translates this business problem into process performance problems and opportunities. This allows the company to focus on fundamentally transforming the target process(es), thus, improving business results and solving the problem. At this early stage of identifying the need for radical change, senior management commitment and sponsorship is essential in taking the decision to re-engineer. Traditionally, nearly 70 percent of all re-engineering projects fail. This extreme failure rate has often been ascribed to a lack of senior management sponsorship or failure to make an ongoing commitment to the tough management decisions needed to effect these changes to the work environment.

2.2 What Re-engineering is and is not?

By definition, re-engineering is 'radical change, fast'. Re-engineering involves fundamental rethinking and transformation of an integrated set of business processes. Re-engineering requires not only a redesign of business processes but also concurrent examination and redesign of the

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information technologies and the organization that supports these processes. Understanding that process transformation is ultimately about doing work differently, is the key to successful transformation. According to Hammer (1990), "Re-engineering is rethinking work". Frequently there is confusion about what re-engineering is and is not, and how it differs from process improvement or 'quick hits'.

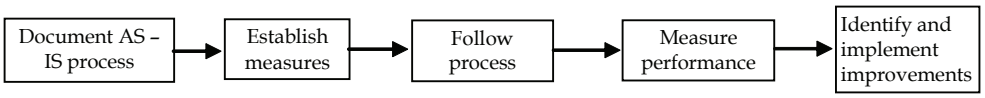
2.3 How Re-engineering is different from Process Improvements?

Typically, process improvements fall into three categories: quick hits, incremental improvement and re-engineering.

1. ***Quick Hits:*** These are typically low risk, easily achievable efforts that provide immediate payback opportunities (typically within a few months).
2. ***Incremental Improvement:*** This focuses on closing small performance gaps, delivers small degrees of change that achieve small but meaningful business results.

   Figure 2.1 illustrates the basic steps in Process Improvement.

Figure 2.1: Continuous Process Improvement Model



   This process begins by documenting what organizations do today, establish some way to measure the process based on what their customers want, follow the process, measure the results, and then identify improvement opportunities based on the data collected. Organizations then implement process improvements, and measure the performance of the new process. This loop repeats over and over again, and is called continuous process improvement. It is also called business process improvement, functional process improvement, etc. This method for improving business processes is effective to obtain gradual, incremental improvement. However, over the last few years several factors have accelerated the need to improve business processes. The most obvious is technology. Technologies (like the Internet) are rapidly bringing new capabilities to businesses, thereby raising the competitive bar and the need to improve business processes dramatically.

   As a result, companies have sought out methods for faster business process improvement. Moreover, organizations want breakthrough performance changes, not just incremental changes, and they want it now. Because the rate of change has increased for everyone, few businesses can afford a slow change process. One approach for rapid change and dramatic improvement is business process re-engineering (BPR).

3. ***Re-engineering:*** This demonstrates breakthrough thinking and aims at dramatic business results. Unlike quick hits and incremental improvement, re-engineering is a form of organizational change characterized by dramatic process transformation.

BPR relies on a different school of thought than continuous process improvement. In the extreme, re-engineering assumes that the current process is irrelevant, it does not work, it is broken, forget it. Start over. Such a clear slate perspective enables the designers of business processes to disassociate themselves from today's process, and focus on a new process. It is like projecting the organization into the future and asking themselves: what should the process look like? What do their customers want it to look like? What to other employees want it to look like? How do best-in-class organizations do it? What might they be able to do with ERP?

Such an approach is shown in Figure 2.2. It begins with mobilizing for action and defining the scope and objectives of the re-engineering project and then planning for it, then documenting

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the overall processes by looking from a broader perspective using Michael Porter's value chain. Given this documentation, the 'AS – IS' environment of the organization is analyzed, the current process performance, business performance is analyzed. Then the 'TO – BE' state is defined, thereby creating a plan of action based on the gap between the current processes, technologies and structures, and where the organization wants to go. It is then a matter of implementing the solutions.

The extreme contrast between continuous process improvement and business process re-engineering depends on where organizations start (with today's process, or with a clean slate), and with the magnitude and rate of resulting changes.

Figure 2.2: Re-engineering Model

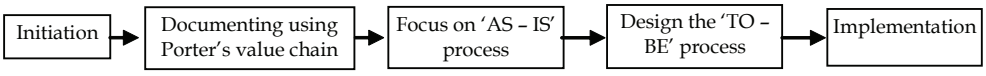

Table 2.1: How Re-engineering differs from other Forms of Process Improvement

It is not …	Although …
Downsizing	Jobs are often eliminated
Reorganizing	Structures are changed
Functional fixes	Functions operate better
A big technology project	Technology is critical

2.4 Characteristics of BPR

The major characteristics of BPR are: cross-functional orientation, process innovation, customer focus, clean slate and radical change in the organization's business processes by using ERP systems.

Cross-functional Orientation and Process Innovation

BPR is more of a cross functional perspective. The objective is to piece together the fragmented pieces of business processes. A process is a specific ordering of work activities across time and place with a beginning and an end and clearly identified inputs and outputs. In other words, business process is the structure of action for producing a specified output for a particular customer or market. Normally, a process crosses several functional units within the organization. In some cases, it may even cross through more than one organization. Since a business process can traverse several separate organizational units, often there is no single person who is in – charge of the performance of the whole process, from beginning to end. The lack of a 'process owner' results in diffused responsibility and accountability and often leads to the characteristic inefficiencies of business processes today.

Processes are more focused on carrying out internal procedures than meeting the customers and market needs. The business processes can be classified into two categories, namely, core processes and support processes. The core processes produce goods and products for the external customers of the organizations.

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The support processes generate products, services, or information for internal use. Typically, re-engineering efforts focus on core processes because they directly serve the customer and have the greatest impact on the organization's success. The goal of re-engineering is to design fast and accurate core processes which can provide a much wider access to information, breakdown of traditional organizational barriers and hierarchies, and allow more work steps to be performed simultaneously, instead of sequentially.

In short, business processes can be viewed as the basic unit of re-engineered organizations. These organizations are structured around processes rather than functions. Attempts should be made to reduce the number of functions and departments involved in the execution of the core business processes. A broad view of business processes comprises information about business process products, suppliers, customers, component activities and the relation between activities.

Business process products can be split into three categories: goods, services and information. Of the product flow in manufacturing or service organizations, 70 percent or more is due to information. Therefore, business process redesign methodologies should embody tools and guidelines that address the streamlining of the information flow in particular, rather than the material flow or the flow of activities.

Task "A process is a specific ordering of work activities across time and place with a beginning and an end and clearly identified inputs and outputs." Suggest

2.5 Business Process Redesign: An Overview

2.5.1 What is Business Process Redesign?

Business Process Redesign is "the analysis and design of workflows and processes within and between organizations" (Davenport & Short 1990). Teng *et al.* (1994) define BPR as "*the critical analysis and radical redesign of existing business processes to achieve breakthrough improvements in performance measures.*"

2.5.2 How does BPR differ from TQM?

Teng *et al.* (1994) note that in recent years, increased attention to business processes is largely due to the TQM (Total Quality Movement). They conclude that TQM and BPR share a cross-functional orientation. Davenport observed that quality specialists tend to focus on incremental change and gradual improvement of processes, while proponents of re-engineering often seek radical redesign and drastic improvement of processes.

Davenport (1993) notes that *Quality management*, often referred to as total quality management (TQM) or continuous improvement, refers to programs and initiatives that emphasize incremental improvement in work processes and outputs over an open-ended period of time. In contrast, *Re-engineering*, also known as business process redesign or process innovation, refers to discrete

Notes

initiatives that are intended to achieve radically redesigned and improved work processes in a bounded time frame. Contrast between the two is provided by Davenport (1993):

2.5.3 Process Improvement (TQM) versus Process Innovation (BPR)

	Improvement	Innovation
Level of Change	Incremental	Radical
Starting Point	Existing Process	Clean Slate
Frequency of Change	One-time/Continuous	One-time
Time Required	Short	Long
Participation	Bottom-Up	Top-Down
Typical Scope	Narrow, within functions	Broad, cross-functional
Risk	Moderate	High
Primary Enabler	Statistical Control	Information Technology
Type of Change	Cultural	Cultural/Structural

Source: Davenport (1993, p. 11)

2.6 What is a Business Process?

Davenport & Short (1990) define *business process* as "a set of logically related tasks performed to achieve a defined business outcome." A process is "a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis on how work is done within an organization" (Davenport 1993). In their view *processes have two important characteristics*: (i) They have customers (internal or external), (ii) They cross organizational boundaries, i.e., they occur across or between organizational subunits. One technique for identifying business processes in an organization is the value chain method proposed by Porter and Millar (1985).

Processes are generally identified in terms of beginning and end points, interfaces, and organization units involved, *particularly the customer unit.* High Impact processes should have *process owners*.

Example: Processes include: developing a new product; ordering goods from a supplier; creating a marketing plan; processing and paying an insurance claim; etc.

Processes may be defined based on three dimensions (Davenport & Short 1990):

Entities: Processes take place between organizational entities. They could be Interorganizational (e.g. EDI, i.e., Electronic data interchange), Interfunctional or Interpersonal (e.g. CSCW, i.e., computer supported cooperative work.).

Objects: Processes result in manipulation of objects. These objects could be Physical or Informational.

Activities: Processes could involve two types of activities: Managerial (e.g. develop a budget) and Operational (e.g. fill a customer order).

What are the Myths about BPR created by the Popular Literature?

The popular management literature has created more myth than practical methodology re-engineering. The concept of BPR has been with us since about 1990, however it is widely misunderstood and has been equated to downsizing, client/server computing, quality, ABC, and several other management nostrums of the past several years. Based on interviews and conversations with more than 200 companies, and 35 re-engineering initiatives, Davenport & Stoddard (1994) identify seven re-engineering myths.

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The Myth of Re-engineering Novelty: Re-engineering, although about familiar concepts, is new in that *these concepts are combined in a new synthesis*. These key components have never been together before.

The Myth of the Clean Slate: Regardless of Hammer's (1990) exhortation, "Don't automate, obliterate!" clean slate change is rarely found in practice. Or, as Davenport and Stoddard (1994) state, A "blank sheet of paper" used in design usually requires a "blank check" for implementation. Hence, a more affordable approach for most companies is to use Clean Slate Design which entails a detailed vision for a process without concern for the existing environment. However, the implementation is done over several phased projects. Also supported by preliminary findings of Stoddard & Jarvenpaa 1995: their findings ran contrary to Hammer (1990), "although re-engineering can deliver radical designs, it does not necessarily promise *a revolutionary approach to change*. Moreover, a revolutionary change process might not be feasible given the risk and cost of revolutionary tactics."

The Myth of Information Systems Leadership: In contrast to the much touted leadership role, Information Systems (IS) is generally viewed as a partner within a cross- functional team that is generally headed by a non-IS project leader and a non-IS business sponsor who have better control over the processes that are being redesigned.

The Myth of Re-engineering vs. Quality: Unlike Hammer & Champy's (1993) call for all out "radical change," most companies have a portfolio of approaches to organizational change including re-engineering, continuous improvement, incremental approaches, and restructuring techniques.

The Myth of Top-Down Design: The implementation and execution of the redesigned processes depends upon those who do the work. Hence, the participation, and more importantly, acceptance and ownership, at the grass roots level is essential for successful BPR.

The Myth of Re-engineering vs. Transformation: BPR is a process that contributes to organizational transformation (OT), however it is not synonymous with transformation. OT is defined as, "Profound, fundamental changes in thought and actions, which create an irreversible discontinuity in the experience of a system" (Adams 1984). OT is generally about the emergence of a new belief system and necessarily involves reframing, which is a discontinuous change in the organization's or group's shared meaning or culture. It also involves broad changes in other organizational dimensions besides the work processes: such as organizational structure, strategy, and business capabilities.

The Myth of Re-engineering's Permanence: Davenport & Stoddard (1994) speculate that re-engineering has peaked in the US in 1994 and would probably become integrated with much broader organizational phenomena: such as another synthesis of ideas that includes the precepts of re-engineering; its integration into existing change methods; or its combination with quality and other process-oriented improvement approaches into an integrated process management approach.

What is the Relation between BPR & Information Technology?

Hammer (1990) considers information technology (IT) as the key enabler of BPR which he considers as "radical change." He prescribes the use of IT to challenge the assumptions inherent in the work processes that have existed since long before the advent of modern computer and communications technology. He argues that at the heart of re-engineering is the notion of "discontinuous thinking – or recognizing and breaking away from the outdated rules and fundamental assumptions underlying operations... These rules of work design are based on assumptions about technology, people, and organizational goals that no longer hold." He suggests the following "principles of re-engineering": (a) Organize around outcomes, not tasks; (b) Have those who use the output of the process perform the process; (c) Subsume information processing work into the real work that produces the information; (d) Treat geographically dispersed resources as though

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they were centralized; (e) Link parallel activities instead of integrating their results; (f) Put the decision point where the work is performed, and build control into the process; and (g) Capture information once and at the source.

Davenport & Short (1990) argue that BPR requires taking a broader view of both IT and business activity, and of the relationships between them. IT should be viewed as more than an automating or mechanizing force: to fundamentally reshape the way business is done.

Business activities should be viewed as more than a collection of individual or even functional tasks: in a process view for maximizing effectiveness. IT and BPR have recursive relationship. IT capabilities should support business processes, and business processes should be in terms of the capabilities IT can provide. Davenport & Short (1990) refer to *this broadened, recursive view of IT and BPR as the new industrial engineering*.

Business processes represent a new approach to coordination across the firm; IT's promise – and its ultimate impact – is to be the most powerful tool for reducing the costs of coordination (Davenport & Short 1990). Davenport & Short (1990) outline the following capabilities that reflect the roles that IT can play in BPR: Transactional, Geographical, Automatical, Analytical, Informational, Sequential, Knowledge Management, Tracking, and Disintermediation.

Teng *et al.* (1994) argue that the way related functions participate in a process – i.e., the *functional coupling* of a process – can be differentiated along two dimensions: *degree of mediation* and *degree of collaboration*. They define the *Degree of Mediation* of the process as the extent of sequential flow of input and output among participating functions. They define the Degree of Collaboration of the process is the extent of information exchange and mutual adjustment among functions when participating in the same process. In their framework, information technology is instrumental in Reducing the Degree of Mediation and Enhancing the Degree of Collaboration. Also, innovative uses of IT would inevitably lead many firms to develop *new, coordination-intensive structures*, enabling them to coordinate their activities in ways that were not possible before. Such coordination-intensive structures may raise the organization's capabilities and responsiveness, leading to potential strategic advantages.

What is the Role of the IS Function in BPR?

Although, BPR has its roots in IT management, it is primarily a Business Initiative that has broad consequences in terms of satisfying the needs of customers and the firm's other constituents (Davenport & Stoddard 1994). The IS group may need to play a behind-the-scenes advocacy role, convincing senior management of the power offered by IT and process redesign. It would also need to incorporate the skills of process measurement, analysis, and redesign. The CIGNA IS group had to develop a new set of basic values that reflected a change in focus from technology to a focus on business processes and results (Caron et al. 1994). The specific business divisions led the BPR initiatives; IS groups served as partners in enabling the radical changes.

Is there a BPR Methodology?

BPR: All or Nothing?: Insights from CIGNA

At CIGNA BPR meant "breakthrough innovation focused on customer needs" (Caron et al. 1994). BPR was essentially driven by the senior management's strategic planning process that had concluded that the mix of business in its portfolio needed to change. It was viewed as a vehicle to realign strategy, operations, and systems to deliver significantly increased financial results. Caron *et al.* (1994) argue that the real life story of BPR at CIGNA represents a contrast to the general prescriptions of "radical" "all-or-nothing" organizational transformation. At CIGNA, BPR started out as an experimental pilot. The knowledge from the success of this initiative was disseminated for implementing other BPR projects. The BPR initiative was sustained "from the bottom up, with learning transferred "across."" At CIGNA, the prerequisite for BPR success

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was a corporate environment that promotes learning, especially learning from failure. Although, the process was initiated from the top, the ownership was moved down to the people who actually had to implement the changes and were affected by those changes. The BPR effort took into consideration the differences in management cultures in different countries. The BPR initiative started at the operational levels and was later moved to "higher forms" (strategic) of re-engineering over time.

Why BPR Projects Fail? What can be done about it?

70% of the BPR projects fail. Biggest obstacles that re-engineering faces are: (i) Lack of sustained management commitment and leadership; (ii) Unrealistic scope and expectations; and (iii) Resistance to Change.

Based on the BPR consultants' interviews, Bashein *et al.* (1994) outline the positive preconditions for BPR success as: Senior Management Commitment and Sponsorship; Realistic Expectations; Empowered and Collaborative Workers; Strategic Context of Growth and Expansion; Shared Vision; Sound Management Practices; Appropriate People Participating Full-Time (cf: CIGNA: BPR as a way of life); and Sufficient Budget. They also identify negative preconditions related to BPR as: The Wrong Sponsor; A "Do It to Me" Attitude; Cost-Cutting Focus; and, Narrow Technical Focus. The negative preconditions relating to the Organization include: Unsound Financial Condition; Too Many Projects Under Way; Fear and Lack of Optimism; and, Animosity Toward and By IS and Human Resource (HR) Specialists. To turn around negative conditions, firms should: Do Something Smaller First (CIGNA's pilot); Conduct Personal Transformation (CIGNA's change of mindset); and Get IS and HR Involved (CIGNA's CIO initiated the change and HR factors were given due emphasis).

King (1994) views the primary reason of BPR failure as overemphasis on the tactical aspects and the strategic dimensions being compromised. He notes that most failures of re-engineering are attributable to the process being viewed and applied at a tactical, rather than strategic, levels. He discusses that there are important strategic dimensions to BPR, notably, Developing and Prioritizing Objectives; Defining the Process Structure and Assumptions; Identifying Trade-Offs Between Processes; Identifying New Product and Market Opportunities; Coordinating the Re-engineering Effort; and, Developing a Human Resources Strategy. He concludes that the ultimate success of BPR depends on the people who do it and on how well they can be motivated to be creative and to apply their detailed knowledge to the redesign of business processes (cf: Davenport & Stoddard 1994, Markus *et al.* 1994).

Where is BPR Headed?

Over the last few years, the re-engineering concept has evolved from a "radical change" to account for the contextual realism (Caron *et. al* 1994, Earl 1994), and to reconcile with more incremental process change methods such as TQM, towards a broader, yet more comprehensive process management concept (Davenport 1995).

Based upon a theoretical analysis and survey of literature relevant to re-engineering, Kettinger & Grover (1995) outline some propositions to guide future inquiry into the phenomenon of BPR. Their propositions center around the concepts of knowledge management, employee empowerment, adoption of new IT's, and a shared vision. Earl *et al.* (1995) have proposed a "process alignment model" that comprises four lenses of enquiry: process, strategy, MIS, change management and control, and used it for developing an inductive taxonomy of BPR strategies. Malhotra (1996) has developed the key emphasis on these issues based primarily on an integrative synthesis of the recent literature from organization theory, organization control, strategy, and MIS.

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King (1994) believes that although the current fadism of BPR may end, however, process re-engineering, in some form or known by some other name (cf: Davenport & Stoddard 1994) would be of enduring importance.

2.6.1 Davenport and Short (1990) prescribe a Five-step Approach to BPR

Develop the Business Vision and Process Objectives: BPR is driven by a business vision which implies specific business objectives such as Cost Reduction, Time Reduction, Output Quality improvement, QWL (Quality of work life,Learning/Empowerment. (cf: Shared Vision of Senge 1990, Ikujiro & Nonaka 1995).

Identify the Processes to be Redesigned: Most firms use the *High- Impact* approach which focuses on the most important processes or those that conflict most with the business vision. Lesser number of firms use the *Exhaustive* approach that attempts to identify all the processes within an organization and then prioritize them in order of redesign urgency.

Understand and Measure the Existing Processes: For avoiding the repeating of old mistakes and for providing a baseline for future improvements.

Identify IT Levers: Awareness of IT capabilities can and should influence process design.

Design and Build a Prototype of the New Process: The actual design should not be viewed as the end of the BPR process. Rather, it should be viewed as a prototype, with successive iterations. The metaphor of prototype aligns the BPR approach with quick delivery of results, and the involvement and satisfaction of customers.

2.6.2 Customer – Focus and Outcome Orientation

Re-engineering is customer-focused and outcome-oriented. Customer needs are essential inputs for defining what these outcomes should be, especially while setting performance goals. It is perceived that the ultimate success of an organization depends on its ability to meet the needs of the customers. One should also realize that, on one hand the competition has become global and cut-throat and on the other hand, the customers have become much more sophisticated and demanding. Customers have a much greater range of alternatives and are much more knowledgeable about their own needs and therefore, are exerting even greater pressure on their suppliers. Organizations should have a comprehensive understanding of who their customers are and what their needs and expectations are, to serve, as the key input for improving the type, cost, quality, and timeliness of the products and services provided.

Identifying new customers for increasing the customer base is also a part of this exercise.

In the re-engineered organizations, apart from the needs and expectations of the external customers, the employees working within the organizations (internal customers), third party support services providers (transporters, warehouse owners, financiers, bankers, etc.) and stakeholders are also considered. Reassessing customer and stakeholder needs and other change drivers help the organizations to reassess and clarify its strategic vision and goals. It also helps an organization to detail out the description of its critical requirements and specifications which are needed to drive the design of business processes and the information systems that support them. This enables the organization to set mission performance goals for improving cost, quality and timeliness based on customer needs.

Task Give an example of real life situation where BPR relationship with information technology.

Notes

2.7 ERP and BPR

Innovation and major improvements in the performance of business processes are difficult to achieve without leveraging the potential of ERP. Most of the business processes were developed before modern computers and communication technologies existed. ERP and BPR go hand in hand. Therefore, it is recommended that ERP should be used to innovate the business processes and not just automate. ERP can be used not only to automate transactional and laborious business processes but also to redesign the work management systems in an organization. ERP improves coordination and information access across organizational units, thereby allowing for more effective management of task interdependence.

2.8 Management Information System (MIS)

A management information system ("MIS") is mainly concerned with internal sources of information. MIS usually take data from the transaction processing systems and summarize it into a series of management reports. MIS reports tend to be used by middle management and operational supervisors. Transaction systems are operations-oriented, where as Management Information Systems (MIS) are data oriented. It assists managers in decision-making and problem solving.

A key element of MIS is the database, a non-redundant collection of interrelated data items. In any organization, decisions must be made on many issues that persist regularly (weekly, monthly, quarterly, etc.) and require a certain set of information to make the decision. Because the decision process is well understood, the information that will be needed to formulate decisions can be identified. In turn, the information system can be developed so that reports are prepared regularly to support these recurring decisions.

Information systems specialists frequently describe the decisions supported by these systems as structured decision. The structured aspect refers to the fact that managers know what factors to consider in making the decision and which variables most significantly influence whether the decisions will be good or bad. Systems analysts develop well-structured reports containing the information that is needed for the decisions or that tells the state of the important variables. The primary users of MIS are middle and top management, operational managers and support staff. Once entered into the system, the information is no longer owned by the initiating user but becomes available to all authorized users.

A management information systems, or management reporting system, will feature reports based on the transaction level activities. For instance, regular reports on deposits and withdrawals in total and by branch office are routinely used by bank officers to keep informed on the performance of individual branches to monitor the ratio of loans made to deposits received, the level of cash reserves, interest paid to depositors, and other common performance indicators.

The information reported is often combined with other external information, such as details about economic trends, demand for loans, rate of consumer spending, and cost of borrowing. Bank officers can make informed decisions about the level of interest they will charge the following week for various types of loans or about whether they must raise the interest rates they pay customers to attract more deposits. The need to make each of these decisions recurs frequently, and the information needed to formulate the decisions is also prepared regularly.

MIS poses several problems. Most of the MIS reports are historical and tend to be dated. And many installations have databases that are not in line with user requirements. Finally an inadequate or incomplete update of the database makes vulnerable the reliability for all users.

A major problem encountered in MIS design is obtaining the acceptance and support of those who will interface with the system.

Notes

2.9 Decision Support Systems (DSS)

Decision support systems ("DSS") are specifically designed to help management make decisions in situations where there is uncertainty about the possible outcomes of those decisions. A decision is considered unstructured if there are no clear procedures for making the decision and if not all the factors to be considered in the decision can be readily identified in advance. DSS comprise tools and techniques to help gather relevant information and analyses the options and alternatives. DSS often involves in data warehouses, executive information systems (EIS). Decision-support systems are data and decision logic oriented.

A key factor in the use of decision support systems is determining what information is needed. In well-structured situation it is possible to identify information needs in advance, but in an unstructured environment, it is difficult to do so. As information is acquired the manager may realize the additional information is required; that is, having information may lead to the realization of other requirements.

Consider the decision process followed by banking officers who must decide whether to begin offering cash management accounts or installing automatic teller machines – both completely new banking services. Among the many questions to be addressed are these: What will watch service cost? How many teller locations will be needed? How will the competition respond to this? What limits should be placed on withdraws at any one time? Can a charge be imposed for this service? Will this service result in additional deposits and thus more cash inflow for the bank?

In such cases, it is impossible to pre – design system report formats and contents. A decision support system must therefore have greater flexibility than other information systems. The user must be able to request reports by defining their content and even by specifying how the information is to be produced. Similarly, the data needed to develop the information may alginate from many different files or databases, rather than from a single master file, as is often the case with transaction systems and many reporting systems.

Manager judgment plays a vital role in decision-making where the problem is not structured. The decision support system supports, but does not replace, manager judgment.

Information systems expressly designed to support individual and collective decision making by making it possible to apply decision models to large collections of data. These systems are designed to support the decision-making process, rather than render a decision.

Types of DSS

Data Analysis System

Data analysis systems are developed using simple data processing tools and business rules. These systems rely on comparative analysis, application formula, and use of algorithms. Such systems are generally used for conducting cash flow analysis and fund flow analysis.

Information Analysis System

Information available to the management needs to be analyzed to arrive at a result. The analyzed data is print in the form of reports for the perusal of the decision maker. By going through these reports, the decision makers can take decisions. Such information analysis systems are used form:

Generating sales analysis reports etc.

Notes

Accounting Systems

Though accounting systems do not contribute directly to decision making, they can be of great value in tracking business functions. These systems track information regarding cash, inventory, ad personnel. In most of these systems, predetermined standards are used a comparison made between the actual and the standards. The results of such comparison help the management exercise in the organization and arrive at a decision.

Status Enquiry System

Some decisions in the operational and middle management level do not require any elaborate computations, analysis, selection etc. These decisions can be taken easily if the current status is known. Railway reservation systems are an example of status enquiry systems. The system displays the status based on availability.

2.10 Executive Information System (EIS)

An Executive Information System (EIS) is a computer – based system intended to facilitate and support the information and decision making needs of senior executives by providing easy access to both internal and external information relevant to meeting the strategic goals of the organization. It is commonly considered as a specialized form of Decision Support System (DSS).

The emphasis of EIS is on graphical displays and easy – to – use user interfaces. They offer strong reporting and drill – down capabilities. In general, EIS are enterprisewide. DSS that help top – level executives analyze, compare, and highlight trends in important variables so that they can monitor performance and identify opportunities and problems. EIS and data warehousing technologies are converging in the market place.

EIS Characteristics

A number of definitions have been put forward to describe EISs. While a definition is useful, in a complex area such as EISs a better understanding is obtained by looking at their characteristics. Some of these are given below:

EISs are end – user computerized information systems operated directly by executive managers. They utilizes newer computer technology in the form of data sources, hardware and programs, to place data in a common format, and provide fast and easy access to information. They integrate data from a variety of sources both internal and external to the organization. They focus on helping executives assimilate information quickly to identify problems and opportunities. In other words, EISs help executives track their critical success factors. Each system is tailored to the needs and preferences of an individual user, and information is presented in a format which can most readily be interpreted.

Although these characteristics apply to all EISs, each individual system can potentially differ in scope, nature, purpose and content, depending on the environment in which it is implemented.

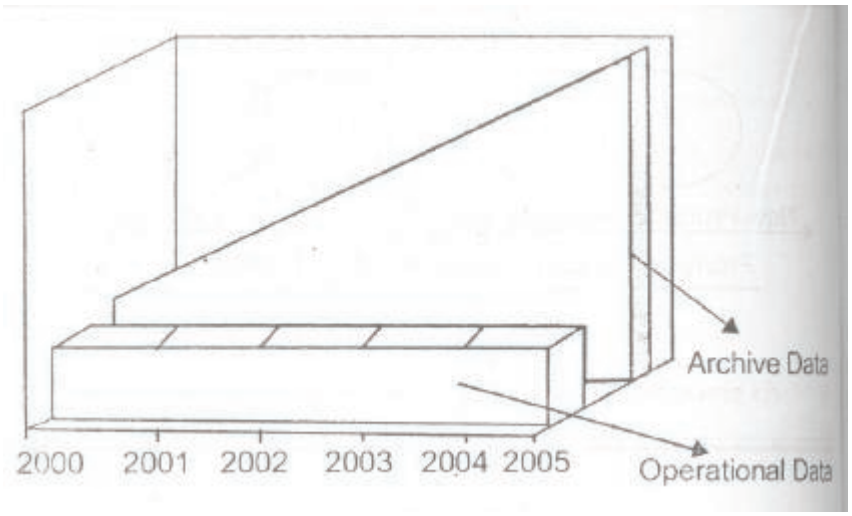
2.11 Data Warehousing

Today's competitive business environment needs automated system to improve the performance and quick response time. As the amount of data stored in ERP system increases, the performance of the system slows down. To overcome this problem the concept of data warehousing comes up. Data warehousing also helps to make the analysis process easier and sophisticated.

Notes

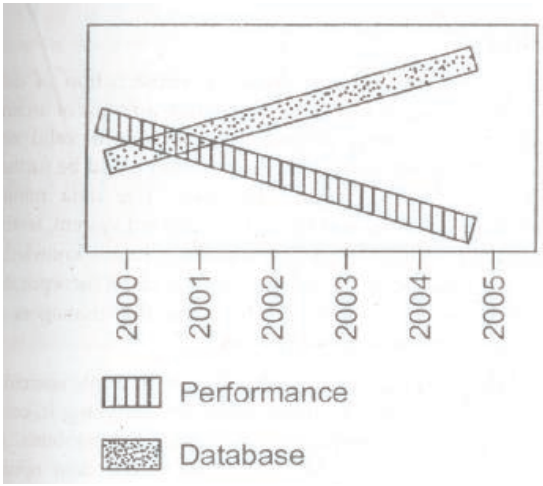
When the operational use of the data has been over, it should be transferred to data warehousing e.g. If one financial year is over the daily transactional data could be separated from operational data. If this data has been kept, as it is in the database total amount of data stored in operational database will go on increasing, and affect the performance and speed of the system.

Figure 2.3: What happens if the data is not achieved?



One cannot predict that, the database used once is useless; on the contrary it is most valuable resource of the business. This non – operational data can also be needed for data analysis. If this data is archived there, is little or not use for it, instead this data is very valuable resource and is too precious to be kept in some archive.

Figure 2.4: Database Volume affect the Performance



The data warehousing comes in handy when there is issue of separating of operational and non – operational data. To analyze the data and to separate it from database, the non – operational data is transformed (clean) in such a way that one could retrieve and analyze it very easy. To retrieve and analyze the data, data warehousing system uses analytical tools such as ad – query processing query processing, OLAP etc. These tools can organize the data for retrieval and analysis purpose.

Notes

Some of the advance data warehousing system supports to produce reports as well as on – line analysis, multidimensional analysis of the data.

Characteristics of Data Warehousing

According to Bill Inmon, author of Building the data Warehouse and the guru who is widely considered to be the originator of the data warehousing concept, there are generally four characteristics that describe a data warehouse:

1. ***Subject oriented***: Data are organized according to subject instead of application e.g. an insurance company using a data warehouse would organize their data by customer, premium, and claim, instead of by different products (auto, life, etc,). The data organized by subject contain only the information necessary for decision support processing.
2. ***Integrated***: When data resides in many separate applications in the operational environment, encoding of data is often inconsistent. For instance, in one application, gender might be coded as "m" and "f" in another by 0 and 1. When data are moved from the operational environment into the data warehouse, they assume a consistent coding convention e.g. gender data is transformed to "m" and "f".
3. ***Time variant***: The data warehouse contains a place for storing data that are five to 10 years old, or older, to be used for comparisons, trends, and forecasting. These data are not updated.
4. ***Non volatile***: Data are not updated or changed in any way once they enter the data warehouse, but are only loaded and accessed.

Task Data warehouse is a concept related to storage. What about executive information system?

2.12 Data Mining

Today, in industry, in media, and in the database research milieu, the term data mining is becoming more popular than the longer term of knowledge discovery from data. Therefore in a broader view of data mining functionality data mining can be defined as "the process of discovering interesting knowledge from large amounts of data stored in databases, data warehouses, or other information repositories."

For many years, statistics have been used to analyze data in an effort to find correlations, patterns, and dependencies. However, with an increased in technology more and more data are available, which greatly exceed the human capacity to manually analyze them. Before the 1990's, data collected by bankers, credit card companies, department stores and so on have little used. But in recent years, as computational power increases, the idea of data mining has emerged. Data mining is a term used to describe the "process of discovering patterns and trends in large data sets in order to find useful decision-making information." With data mining, the information obtained from the bankers, credit card companies, and department stores can be put to good use.

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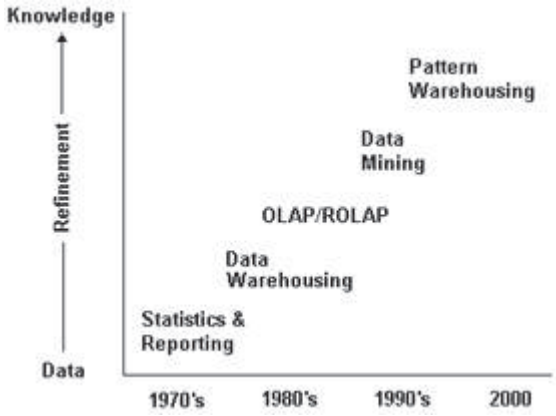
Figure 2.5: Data Mining Chart



Data mining is a technique based on construction of data warehousing. Data warehousing stores a huge amount of archive data whereas data mining process this data into valid and potentially useful information. This information could be further, used to make certain important decisions. The data mining systems considers previous history of investigated system, testing hypothesis about the rules; when concise and valuable knowledge about the system has been discovered, it should be incorporated into decision support system which helps the managers or executives to make the business decisions.

The problems like inadequacy of human brain while searching for complex data and lack of objectiveness in analyzing it, could be avoided by using computerized automated systems for analysis of huge amount of data. The automated data mining systems also reduces the cost of hiring the highly trained professional technicians.

The data mining system is a user – friendly system; it simplifies the job and allows an analyst to manage the process of extracting knowledge and meaningful information from data.

Data mining should be applicable to any kind of data repository, as well as to transient data, such as data streams. The data repository may include relational databases, data warehouses, transactional databases, advanced database systems, flat files, data streams, and the Worldwide Web. Advanced database systems include object-relational databases and specific application-oriented databases, such as spatial databases, time-series databases, text databases, and multimedia databases. The challenges and techniques of mining may differ for each of the repository systems.

A brief introduction to each of the major data repository systems listed above.

Flat Files

Flat files are actually the most common data source for data mining algorithms, especially at the research level. Flat files are simple data files in text or binary format with a structure known by the data mining algorithm to be applied. The data in these files can be transactions, time-series data, scientific measurements, etc.

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Relational Databases

A database system or a Database Management System (DBMS) consists of a collection of interrelated data, known as a database, and a set of software programs to manage and access the data. The software programs involve the following functions:

Mechanisms to create the definition of database structures:

1. Data storage
2. Concurrency control
3. Sharing of data
4. Distribution of data access
5. Ensuring data consistency
6. Security of the information stored, despite system crashes or attempts at unauthorised access.

A relational database is a collection of tables, each of which is assigned a unique name. Each table consists of a set of attributes (columns or fields) and usually stores a large set of tuples (records or rows). Each tuple in a relational table represents an object identified by a unique key and described by a set of attribute values. A semantic data model, such as an entity-relationship (ER) data model, is often constructed for relational databases. An ER data model represents the database as a set of entities and their relationships.

Some important points regarding the RDBMS are as follows:

1. In RDBMS, tables can also be used to represent the relationships between or among multiple relation tables.
2. Relational data can be accessed by database queries written in a relational query language, such as SQL, or with the assistance of graphical user interfaces.
3. A given query is transformed into a set of relational operations, such as join, selection, and projection, and is then optimised for efficient processing.
4. Trends and data patterns can be searched by applying data mining techniques on relational databases, we can go further by searching for trends or data patterns.

Example: Data mining systems can analyse customer data for a company to predict the credit risk of new customers based on their income, age, and previous credit information. Data mining systems may also detect deviations, such as items whose sales are far from those expected in comparison with the previous year.

Relational databases are one of the most commonly available and rich information repositories, and thus they are a major data form in our study of data mining.

Data Warehouses

A data warehouse is a repository of information collected from multiple sources, stored under a unified schema, and that usually resides at a single site. Data warehouses are constructed via a process of data cleaning, data integration, data transformation, data loading, and periodic data refreshing. Figure 2.6 shows the typical framework for construction and use of a data warehouse for a manufacturing company.

To facilitate decision making, the data in a data warehouse are organised around major subjects, such as customer, item, supplier, and activity. The data are stored to provide information from a historical perspective (such as from the past 510 years) and are typically summarised. For

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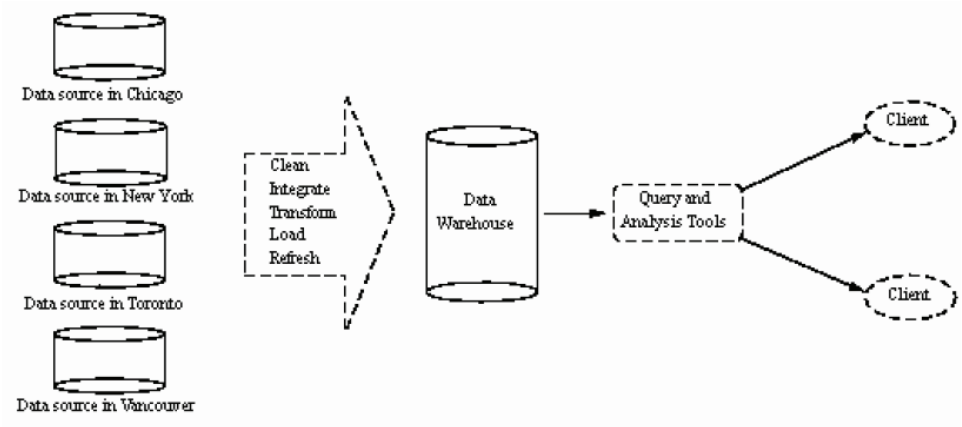
example, rather than storing the details of each sales transaction, the data warehouse may store a summary of the transactions per item type for each store or, summarised to a higher level, for each sales region.

Figure 2.6: Typical Framework of a Data Warehouse for a Manufacturing Company



A data warehouse is usually modeled by a multidimensional database structure, where each dimension corresponds to an attribute or a set of attributes in the schema, and each cell stores the value of some aggregate measure, such as count or sales amount. The actual physical structure of a data warehouse may be a relational data store or a multidimensional data cube. A data cube provides a multidimensional view of data and allows the precomputation and fast accessing of summarised data.

Engineering Design Data

Database technology has evolved in parallel to the evolution of software to support engineering. In these applications relatively simple operations are performed on large volumes of data with uniform structure. The engineering world, on the other hand, is full of computationally intensive, logically complex applications requiring sophisticated representations. Recent developments in database technology emphasise the need to provide general-purpose support for the type of functions involved in the engineering process such as the design of buildings, system components, or integrated circuits etc.

Task A semantic data model, such as an entity-relationship (ER) data model, is often constructed for relational databases.

2.13 Online Analytical Processing

OLAP is an acronym for Online Analytical Processing and it is considered as an extension of decision support systems. OLAP designates a category of applications and technologies that allow the collection, storage, and reproduction of multidimensional data. Multidimensional analysis is the analysis of data based on more than one factor. The two basic components of OLAP are dimensions and measures. The dimensions that are included in the analysis are time, location, product, and customers. Measures are the quantitative representation of dimensions.

Example: Revenues, costs, and units sold.

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The main task of an OLAP is to transform relational or non – relational data into a highly explorable structure, which means that data can be broken down into small units to derive meaningful information. These explorable structures are commonly called cubes or Power Cubes.

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Data Warehousing and OLAP Technology for Toyota Financial Services

In Toyota financial services, applications were initially run on a legacy system written in COBOL that used the UNIX operating system. However, ad hoc reporting was not possible without the help of COBOL programmers. With a large dealer network it was time consuming and costly to use the system. Toyota implemented SAP for internal financial and accounting system. This was when Eagle Technology Group suggested the use of data warehousing. It suggested a data warehousing system using Microsoft SQL Server 7.0. The data warehousing system would consolidate, cleanse, and summarize information from heterogeneous sources. Apart from this, it would enable users to identify patterns and trends that would be useful in decision-making. In this context, Eagle suggested a pilot project that would enable Toyota to evaluate the solution.

After the pilot project was accepted by Toyota, the project was expanded to include other business dimensions and modification of the data structure. Eagle focused on designing an interface that had minimum installation and training requirements. This was achieved by using web browser technology for standard reports and Microsoft Excel for data storage. This helped the company in preparing internal reports and in understanding the customer base, markets, and stakeholders better. Satisfied with this system, Toyota was planning to upgrade to the SQL Server 2000. Upgrading was being undertaken with the view to implement extranets, data mining, and financial modeling.

OLAP is useful to managers, analysts, and executives. It supports multidimensional data analysis and makes data access easier and faster. Moreover, the ability to view data in different formats makes the system flexible. Apart from answering questions like who and what, an OLAP also provides answers to what – if and why.

Fast Analysis of Shared Multidimensional Information

Fast: The system deliver responses to users within five seconds, with the simplest analysis it takes one second and very few taking more than 20 seconds.

Analysis: The system cope with any business logic and statistical analysis. That is relevant for the application and make it more usable for each user of the system.

Shared: The system implements security to maintain confidentiality of important data at different levels. Concrete locking is provided at appropriate level where multiple access is needed.

Multidimensional: The system must provide a multidimensional conceptual view of data with multiple hierarchies.

Information: This is refined data with accuracy. It also includes appropriate information to the appropriate user.

2.14 Supply Chain Management

Enterprise resource planning software plays a vital role in centralizing transaction data. Supply chain management solutions are gaining significance as organizations strive to respond faster to market conditions. Gartner provides guidance relating to the selection, implementation and management of these technologies.

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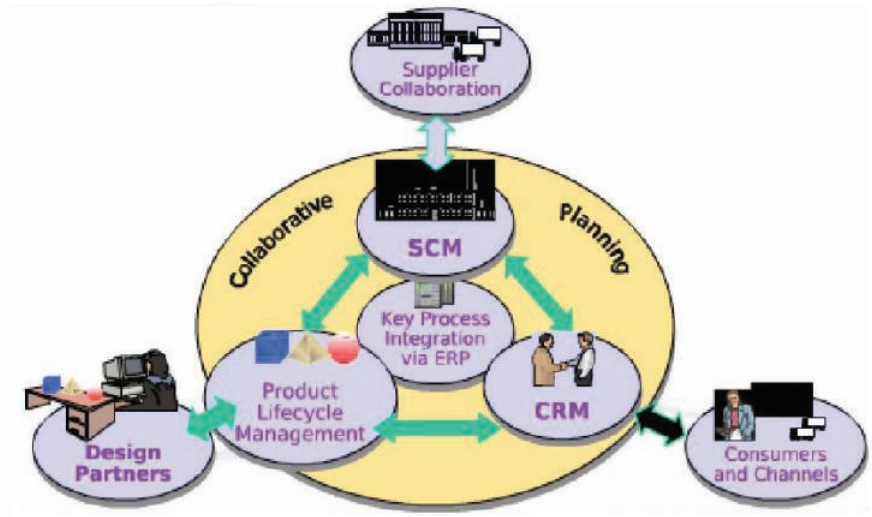
Supply chain management (SCM) is the 21st century global operations strategy for achieving organizational competitiveness. Companies are attempting to find ways to improve their flexibility and responsiveness and in turn competitiveness by changing their operations strategy, methods and technologies that include the implementation of SCM paradigm and information technology (IT). However, a thorough and critical review of literature is yet to be carried out with the objective of bringing out the pertinent factors and useful insights into the role and implications of IT in SCM. The literature available on IT in SCM have been classified using suitable criteria and then critically reviewed to develop a framework for studying the applications of IT in SCM.

Supply chain management practices and principles are evolving and changing rapidly, e.g. through modern information and communication technologies. These changes affect the ways supply chains are designed, the way they are managed, and how planning and control activities take place within these chains. But how far have companies come in dealing with supply chain issues? This paper investigates supply chain management strategies and practices in a sample of 128 Swedish manufacturing firms. We specifically study issues related to the supply chain design, integration, planning and control, and communication tools for managing supply chains. The main findings indicate the following. The extent to which suppliers and customers are involved in supply chain planning and control is expected to increase steadily over the next 2 years. The primary priority for the selection of supply chain partners is quality performance. However, delivery dependability, cost efficiency, volume flexibility, and delivery speed are also judged to be important inputs to the supply chain partner selection process. Today, companies expect to broaden and deepen the use of new information and communication technologies for improving supply chain operations.

Supply chain management (SCM) lets an organization get the right goods and services to the place they are needed at the right time, in the proper quantity and at an acceptable cost. Efficiently managing this process involves overseeing relationships with suppliers and customers, controlling inventory, forecasting demand and getting constant feedback on what's happening at every link in the chain.

Figure 2.7: ERP, CRM and SCM



The supply chain involves several elements:

1. ***Location:*** It's important to know where production facilities, stocking points and sourcing points are located; these determine the paths along which goods will flow.

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2. ***Production:*** An organization must decide what products to create at which plants, which suppliers will service those plants, which plants will supply specific distribution centers, and, sometimes, how goods will get to the final customer. These decisions have a big impact on revenue, costs and customer service.

3. ***Inventory:*** Each link in the supply chain has to keep a certain inventory of raw materials, parts, subassemblies and other goods on hand as a buffer against uncertainties and unpredictabilities. Shutting down an assembly plant because an expected parts shipment didn't arrive is expensive. But inventory costs money too, so it's important to manage deployment strategies, determine efficient order quantities and reorder points, and set safety stock levels.

4. ***Transportation:*** How do materials, parts and products get from one link in the supply chain to the next? Choosing the best way to transport goods often involves trading off the shipping cost against the indirect cost of inventory. For example, shipping by air is generally fast and reliable. Shipping by sea or rail will likely be cheaper, especially for bulky goods and large quantities, but slower and less reliable. So if you ship by sea or rail, you have to plan further in advance and keep larger inventories than you do if you ship by air.

2.14.1 Managing the Chain

Once you've determined all of the elements in the supply chain, how do you manage the chain? There are three main paths in the process:

1. ***Product flow*** includes the movement of goods from a supplier to a customer, as well as customer returns.

2. ***Information flow*** involves transmitting orders and updating the status of delivery.

3. ***Financial flow*** consists of credit terms, payments and payment schedules, plus consignment and title ownership.

Juggling these elements involves record-keeping, tracking and analysis by many departments. Supply chain software, especially large, integrated packages, combines many different technologies to give a single view of supply chain data that can be shared with others.

SCM applications fall into two main categories: planning applications and execution applications. Planning applications determine the best way to route materials and the quantities of goods needed at specific points. When such applications work well, they make possible the "just-in-time" delivery of goods. Execution applications track financial data, the physical status and flow of goods, and ordering and delivery of materials.

A relatively new SCM option involves Web-based software with a browser interface. Several major Web sites now offer auctions and other electronic marketplaces for buying and selling goods and materials. Also, Web-based application service providers are now promising to provide part or all of the SCM services for companies that rent their services.

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Figure 2.8: ERP Integrated with SCM

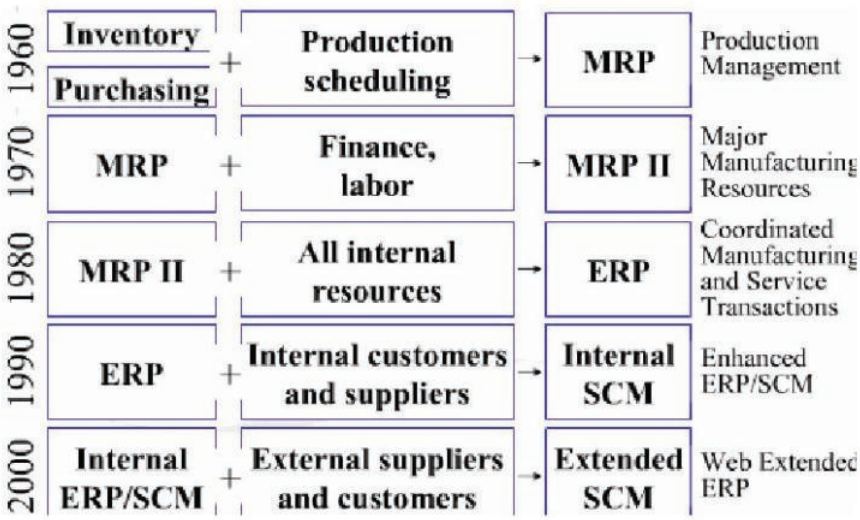
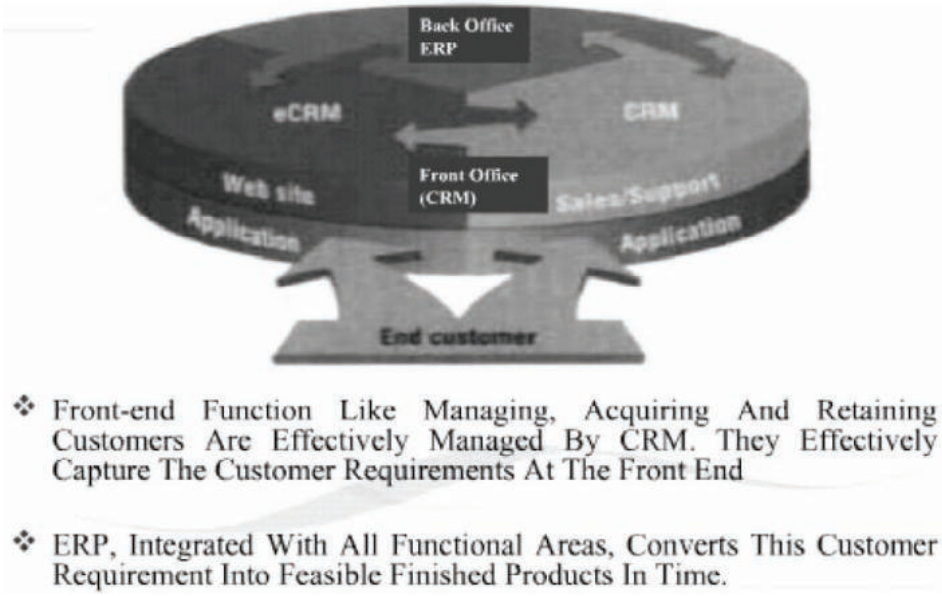


Figure 2.9: ERP and CRM



Computerized Systems and SCM

PHASE 1: 1950s - 60s, the first software programs to support the supply chain arrive.

PHASE 2: Development of the Material Requirement Protocol (MRP).

PHASE 3: Enhanced MRP known as Material Resource Planning became available.

PHASE 4: Enterprise Resource Planning (ERP) integrates transaction processing activities.

PHASE 5: Extended ERP/SCM software.

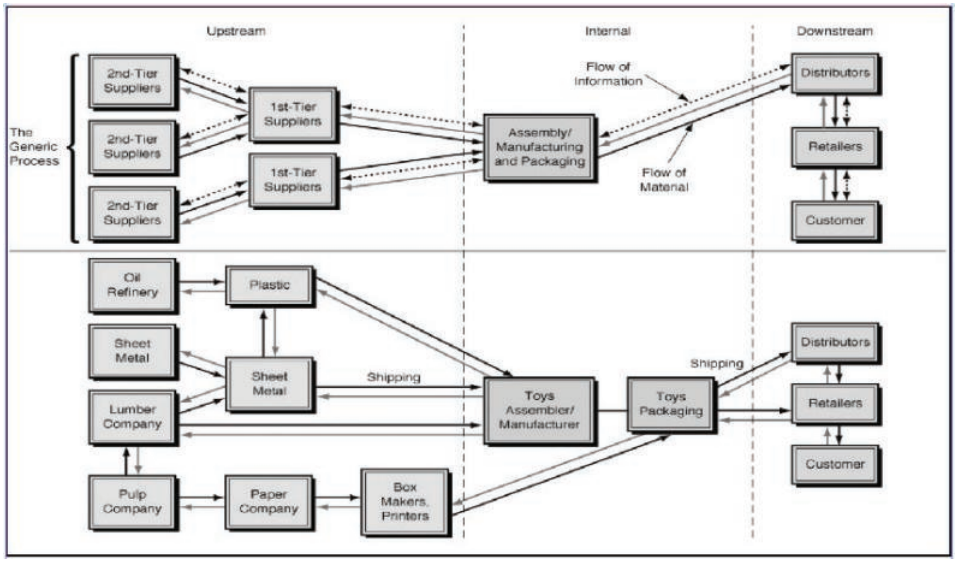
Notes

During the past decades, globalization, outsourcing and information technology have enabled many organizations, such as Dell and Hewlett Packard, to successfully operate solid collaborative supply networks in which each specialized business partner focuses on only a few key strategic activities.

Supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain as efficiently as possible. Supply Chain Management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption.

The definition one American professional association put forward is that Supply Chain Management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies.

Figure 2.10: Supply Chain



Some experts distinguish Supply Chain Management and logistics, while others consider the terms to be interchangeable.

Supply Chain Management is also a category of software products:

Supply chain event management (abbreviated as SCEM) is a consideration of all possible occurring events and factors that can cause a disruption in a supply chain. With SCEM possible scenarios can be created and solutions can be planned.

2.14.2 Supply Chain Management Problems

Supply chain management must address the following problems:

1. ***Distribution Network Configuration***: Number and location of suppliers, production facilities, distribution centers, warehouses and customers.
2. ***Distribution Strategy***: Centralized versus decentralized, direct shipment, cross docking, pull or push strategies, third party logistics.

Notes

3. ***Information***: Integration of systems and processes through the supply chain to share valuable information, including demand signals, forecasts, inventory and transportation, etc.
4. ***Inventory Management***: Quantity and location of inventory including raw materials, work-in-process and finished goods.
5. ***Cash-Flow***: Arranging the payment terms and the methodologies for exchanging funds across entities within the supply chain.

Supply chain execution is managing and coordinating the movement of materials, information and funds across the supply chain. The flow is bi-directional.

Activities/Functions

Supply chain management is a cross-functional approach to managing the movement of raw materials into an organization, certain aspects of the internal processing of materials into finished goods, and then the movement of finished goods out of the organization toward the end-consumer. As organizations strive to focus on core competencies and becoming more flexible, they have reduced their ownership of raw materials sources and distribution channels. These functions are increasingly being outsourced to other entities that can perform the activities better or more cost effectively. The effect is to increase the number of organizations involved in satisfying customer demand, while reducing the management control of daily logistics operations. Less control and more supply chain partners led to the creation of supply chain management concepts. The purpose of supply chain management is to improve trust and collaboration among supply chain partners, thus improving inventory visibility and improving inventory velocity.

Several models have been proposed for understanding the activities required to manage material movements across organizational and functional boundaries. SCOR is a supply chain management model promoted by the Supply Chain Management Council. Another model is the SCM Model proposed by the Global Supply Chain Forum (GSCF). Supply chain activities can be grouped into strategic, tactical, and operational levels of activities.

Strategic network optimization, including the number, location, and size of warehouses, distribution centers and facilities.

Strategic partnership with suppliers, distributors, and customers, creating communication channels for critical information and operational improvements such as cross docking, direct shipping, and third-party logistics.

Product design coordination, so that new and existing products can be optimally integrated into the supply chain, load management.

Information Technology infrastructure, to support supply chain operations.

Where-to-make and what-to-make-or-buy decisions.

Aligning overall organizational strategy with supply strategy.

Operational

1. Daily production and distribution planning, including all nodes in the supply chain.
2. Production scheduling for each manufacturing facility in the supply chain (minute-by-minute).
3. Demand planning and forecasting, coordinating the demand forecast of all customers and sharing the forecast with all suppliers.
4. Sourcing planning, including current inventory and forecast demand, in collaboration with all suppliers.

Notes

5. Inbound operations, including transportation from suppliers and receiving inventory.
6. Production operations, including the consumption of materials and flow of finished goods.
7. Outbound operations, including all fulfillment activities and transportation to customers.
8. Order promising, accounting for all constraints in the supply chain, including all suppliers, manufacturing facilities, distribution centers, and other customers.

2.14.3 Supply Chain Business Process Integration

Successful SCM requires a change from managing individual functions to integrating activities into key supply chain processes. An example scenario: the purchasing department places orders as requirements become appropriate. Marketing, responding to customer demand, communicates with several distributors and retailers, and attempts to satisfy this demand. Shared information between supply chain partners can only be fully leveraged through process integration.

Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems and shared information. According to Lambert and Cooper (2000), operating an integrated supply chain requires continuous information flows, which in turn assist to achieve the best product flows. However, in many companies, management has reached the conclusion that optimizing the product flows cannot be accomplished without implementing a process approach to the business. The key supply chain processes stated by Lambert (2004) are:

1. Customer relationship management
2. Customer service management
3. Demand management
4. Order fulfillment
5. Manufacturing flow management
6. Supplier relationship management
7. Product development and commercialization
8. Returns management

Figure 2.11: Distribution Architecture

Notes

Task In supply chain what are the main applications of ERP. Suggest

2.14.4 Distribution Supply Chain Feature Highlights

1. Improve supplier performance through comprehensive supply chain management software reporting
2. First fully web designed ERP software solution that gives everyone access to decision information.
3. Increase client satisfaction by establishing and monitoring on-time delivery plan.
4. Just in time processing to reduce unwanted inventory and receive a faster response to the customer.
5. Full circle Returns processing, including integration with manufacturing inventory software.
6. Improve market knowledge and strategic decision-making through comprehensive real-time sales performance.
7. Built in Customer Relationship Management (CRM) to keep customer the status of order processing.

Case Study

Select Comfort finds Comfort in ERP

Select comfort is the bed that invented the "sleep number" system, which provides a range of mattress firmness setting to accommodate sleeping preferences.

Founded in 1987, the Minneapolis, Minnesota-based company delivered net sales of $691 million in 2005. The company has 32U.S.-issued or pending patents and was ranked by Furniture/Today as the top bedding retailer in the nation for the sixth consecutive year.

Needless to say, a company of this size depends on enterprise-wide software systems to provide access to valuable information throughout the organization. A few years ago, Select Comfort began moving away from its hard-to-maintain legacy systems to integrated enterprise resource planning (ERP) software. The e-Business Suite from Oracle provides ERP services through a convenient Web-based interface. The suite helps Select Comfort coordinate its sophisticated made-to-order manufacturing operations in South Carolina and Utah, and keep mattress orders flowing smoothly from the store to the factory to the consumer's home. Select Comfort adopted several e-Business Suite modules to assist in varying parts of its business: an order management module to fulfill the hundreds of mattress orders it receives daily, a customer relationship management (CRM) module for keeping track of customer interaction, and modules that handle typical business needs such as assets management, general ledger, payables, purchasing and receivables. The ERP system ensures that all these modules and services are synchronized and centralized so they can provide up-to-date information.

Seeking to make use of the latest technologies, Select Comfort adopted business intelligence (BI) software from Siebel Systems, Inc. BI software allows a business to combine its databases and extract useful information to apply to business strategies. The BI software from Siebel

Contd....

Notes

caught the interest of Select Comfort because of its power and ease of use. Select Comfort plans to deploy Siebel Business Analytics to 2,500 users company-wide by 2008.

The software will deliver alerts and dashboard capabilities to show how the company's 400 stores are performing in real time.

Select comfort had concerns about using enterprise-wide software from two vendors, Oracle and Siebel. When companies adopt new software, the software, the software must be able to integrate with existing systems. Select Comfort resigned itself to the fact that it would have to work with Siebel on integration issues.

Shortly after Select Comfort purchased the Siebel software, Oracle announced that it was purchasing Siebel. The partnership means that the Siebel BI software will eventually be integrated with oracle's database and ERP software. David Dobrin, an analyst at B2B Analysts, Inc., in Cambridge, Massachusetts, said Select Comfort will likely have to wait for a strong link between the products. Integration "will take years and years, and probably Oracle will have to do a major revision to data systems," he said.

Questions

1. What benefits does Select Comfort's ERP system provide that individual software solutions from a variety of vendors could not?
2. What risk did Select Comfort assume when it chose software from a different vendor?

2.15 Summary

- To enable a company achieve its objectives, it is essential that the management has a clear understanding of the kind of information that needs to be collected, stored, and analyzed. This information should be consistent with the requirement of the organizational level at which it is targeted.
- Information systems that process data generated from the occurrence of business transactions are called transaction processing systems.
- Information systems in many large organizations are combinations of various functional information systems like marketing information systems, manufacturing information systems, human resource information systems, accounting information systems, and financial information systems.
- An MIS can be defined as an integrated, user – machine system that provides information to support the managerial, operational, and decision – making functions in an organization.
- The characteristics of an MIS are that it is management – oriented, management – directed, an integrated system, enables maintenance of a common database, and is flexible.
- The functions of an MIS are data collection, data storage, and information presentation.
- DSSs are used to help in managerial decision-making.
- A DSS is flexible, based on simple models, and uses a database.
- An EIS aims at providing timely information to the top management. For the successful implementation of the EIS, a consensus between a senior management person and a project leader is essential.
- OLAP helps in multidimensional analysis and provides timely information. A well designed OLAP can help in efficient data management.

Notes

2.16 Keywords

Business Process Management: BPM is a business process approach to improving business activity and creating automated applications that is supported by a group of new process modelers, application generators, application interface engines, and performance monitoring software.

Business Process Re-engineering: The analysis and design of workflows and processes within and between organizations. Business activities should be viewed as more than a collection of individual or even functional tasks; they should be broken down into processes that can be designed for maximum effectiveness, in both manufacturing and service environments.

Re-engineering: Re-engineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed.

Transaction-Processing System: A system that records and collects data related to exchanges between two parties. This data forms the foundation for all other information system capabilities. MIS support typically consists of databases, communication networks, and security controls.

2.17 Self Assessment

Choose the appropriate answers:

1. TPS stands for:
   - (a) Transnational Processing Systems
   - (b) Transaction Processing System
   - (c) Total Process System
   - (d) None of the above
2. An information system always:
   - (a) Requires hardware even if only a pencil.
   - (b) Transforms information. to the unit
   - (c) Is computer-based.
   - (d) None of these
3. ..... is the main copy of database and is the main operational database for the TPS.
   - (a) Report file
   - (b) Master file
   - (c) Program file
   - (d) Work file
4. MIS work with inputs of
   - (a) High Volume Data
   - (b) Low Volume Data
   - (c) Summary reports
   - (d) Senior Managers

Notes

5. Work file is
   (a) Temporary file created during a transaction
   (b) File on which work is done
   (c) Main file where all records are maintained
   (d) All of the above
6. TPS is designed for top senior management
   (a) True
   (b) False
7. Important characteristics of TPS.
   (a) Rapid Response
   (b) Reliability
   (c) Controlled Processing
   (d) All of the above
8. Hardware, Software and People are components of a TPS.
   (a) True
   (b) False
9. Which of the following statements do you agree with?
   (a) ICT should be the starting point for a knowledge management strategy
   (b) Organisations should spend heavily in ICT to achieve knowledge management strategy success
   (c) The most important factor in a knowledge management strategy is ICT
   (d) ICT should enable knowledge management strategy rather than drive it
   (e) ICT is not relevant to knowledge management strategy
10. EIS means
   (a) Executive Information System
   (b) Excellent Info systems
   (c) Excessive Information System
   (d) None of the above

2.18 Review Questions

1. What is BPR? How it makes an organization competent?
2. Write short notes on SCM
3. Explain DSS
4. Explain MIS
5. What is data warehousing? Explain how data warehousing and data mining are integrated part of successful ERP package?
6. What is data warehousing?

Notes

7. What is data mining?
8. What is OLAP?
9. Explain Business Process re-engineering
10. Explain the process of Data warehousing State its importance.
11. What is EIS? Explain its features
12. Give difference between MIS and DSS
13. How data mining differs from data warehousing?
14. Write a short note on OLAP
15. Explain the concept of SCM. State its benefit

Answers: Self Assessment

1. (b)	2. (a)	3. (b)	4. (a)
5. (a)	6. (b)	7. (d)	8. (a)
9. (d)	10. (a)		

2.19 Further Readings

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Unit 3: Business Process Re-engineering

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Objectives

After studying this unit, you will be able to:

- Discuss the concept of BPR
- State the characteristics of BPR
- Know the history of BPR
- Identify elements of BPR
- Discuss BPR challenges

Notes

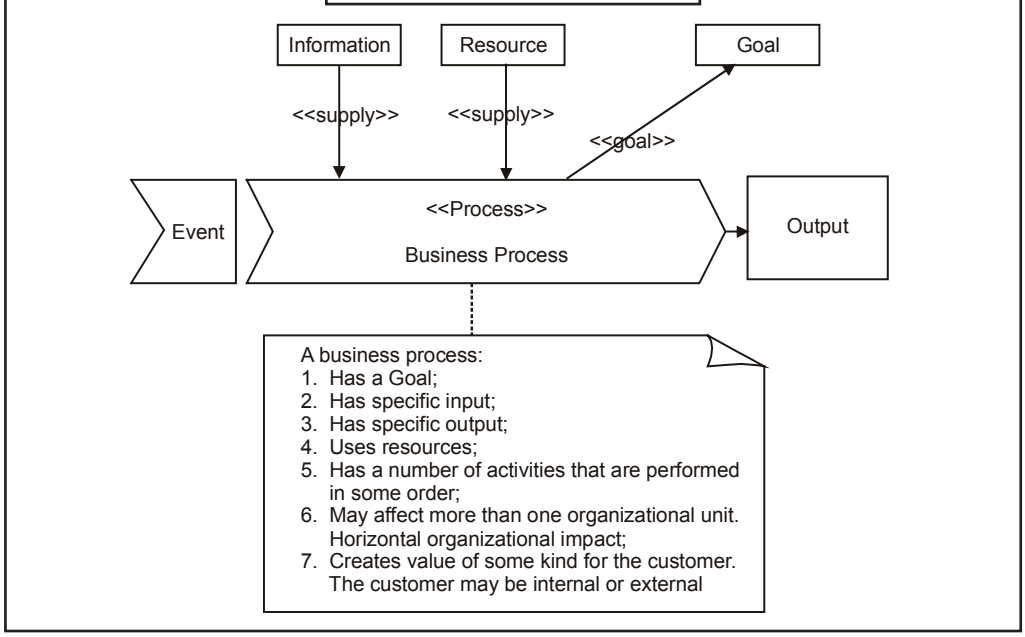
Introduction

Business process re-engineering is one approach for redesigning the way work is done to better support the organization's mission and reduce costs. Re-engineering starts with a high-level assessment of the organization's mission, strategic goals, and customer needs. Basic questions are asked, such as "Does our mission need to be redefined? Are our Basic questions are asked, such as "Does our mission need to be redefined? Are our strategic goals aligned with our mission? Who are our customers?" An organization may find that it is operating on questionable assumptions, particularly in terms of the wants and needs of its customers. Only after the organization rethinks what it should be doing, does it go on to decide how best to do it.

In this unit, we will discuss the concept of BPR and its advantages and challenges.

A business process or business method is a collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers. It often can be visualized with a flowchart as a sequence of activities.

Figure 3.1: Business Process



A business process:

1. Has a Goal
2. Has specific inputs
3. Has specific outputs
4. Uses resources
5. Has a number of activities that are performed in some order
6. May affect more than one organizational unit. Horizontal organizational impact
7. Creates value of some kind for the customer. The customer may be internal or external.

Notes

3.1 Process Models

Business Process

A business process is a collection of activities designed to produce a specific output for a particular customer or market. It implies a strong emphasis on how the work is done within and organization, in contrast to a product's focus on what. A process is thus a specific ordering of work activities across time and place, with a beginning, an end, and clearly defined inputs and outputs: a structure for action.

Connections

Supply link from object information: A supply link indicates that the information or object linked to the process is not used up in the processing phase.

Example: Order templates may be used over and over to provide new orders of a certain style - the templates are not altered or exhausted as part of this activity.

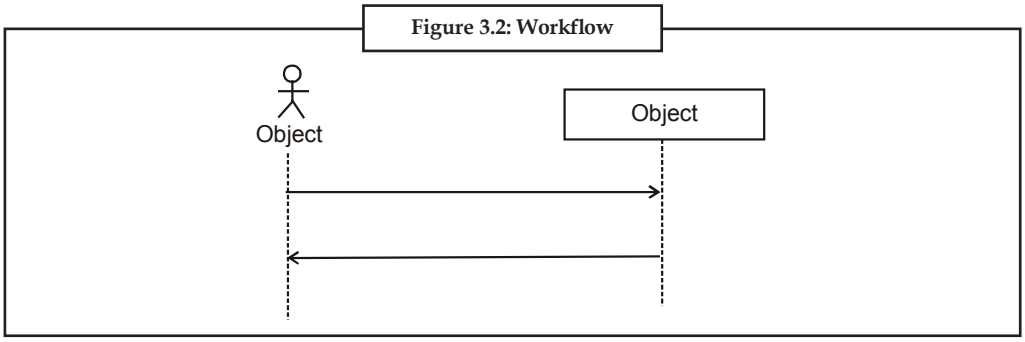
Supply link from object resource: An input link indicates that the attached object or resource is consumed in the processing procedure. As an example, as customer orders are processed they are completed and signed off, and typically are used only once per unique resource (order).

Goal link to object goal indicates the attached object to the business process describes the goal of the process. A goal is the business justification for performing the activity.

Stateflow Link to Object Output

Stateflow link from event indicates some object is passed into a business process. It captures the passing of control to another entity or process, with the implied passing of state or information from activity to activity.

Figure 3.2: Workflow



Goal

A business process has some well defined goal. This is the reason the organization does this work, and should be defined in terms of the benefits this process has for the organization as a whole and in satisfying the business needs.

Goal link from activity Business Process indicates the attached object to the business process describes the goal of the process. A goal is the business justification for performing the activity.

Notes

Information

Business processes use information to tailor or complete their activities. Information, unlike resources, is not consumed in the process - rather it is used as part of the transformation process. In formation may come from external sources, from customers, from internal organizational units and may even be the product of other processes.

Supply link to activity Business Process indicates that the information or object linked to the process is not used up in the processing phase.

Example: Order templates may be used over and over to provide new orders of a certain style - the templates are not altered or exhausted as part of this activity.

Output

A business process will typically produce one or more outputs of value to the business, either for internal use of to satisfy external requirements. An output may be a physical object (such as a report or invoice), a transformation of raw resources into a new arrangement (a daily schedule or roster) or an overall business result such as completing a customer order.

An output of one business process may feed into another process, either as a requested item or a trigger to initiate new activities.

Resource

A resource is an input to a business process, and, unlike information, is typically consumed during the processing. For example, as each daily train service is run and actual recorded, the service resource is 'used up' as far as the process of recording actual train times is concerned.

Supply link to activity Business Process. An input link indicates that the attached object or resource is consumed in the processing procedure. As an example, as customer orders are processed they are completed and signed off, and typically are used only once per unique resource (order).

Task
Suggest

How business processes use information to tailor or complete their activities?

3.2 Business Process Re-engineering

Business process re-engineering (BPR) is an approach aiming at improvements by means of elevating efficiency and effectiveness of the business process that exist within and across organizations. The key to BPR is for organizations to look at their business processes from a "clean slate" perspective and determine how they can best construct these processes to improve how they conduct business.

Business process re-engineering is also known as BPR, Business Process Redesign, Business Transformation, or Business Process Change Management. It is the radical redesign of an organization's processes, especially its business processes. Rather than organizing a firm into functional specialties (like production, accounting, marketing, etc.) and considering the tasks that each function performs; complete processes from materials acquisition, to production, to marketing and distribution should be considered. The firm should be reengineered into a series of processes.

The main proponents of re-engineering were Michael Hammer and James A. Champy. In a series of books including Re-engineering the Corporation, Re-engineering Management, and The

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Agenda, they argue that far too much time is wasted passing-on tasks from one department to another. They claim that it is far more efficient to appoint a team who are responsible for all the tasks in the process. In The Agenda they extend the argument to include suppliers, distributors, and other business partners.

Re-engineering is the basis for many recent developments in management. The cross-functional team, for example, has become popular because of the desire to reengineer separate functional tasks into complete cross-functional processes. Also, many recent management information systems developments aim to integrate a wide number of business functions. Enterprise resource planning, supply chain management, knowledge management systems, groupware and collaborative systems, Human Resource Management Systems and customer relationship management systems all owe a debt to re-engineering theory.

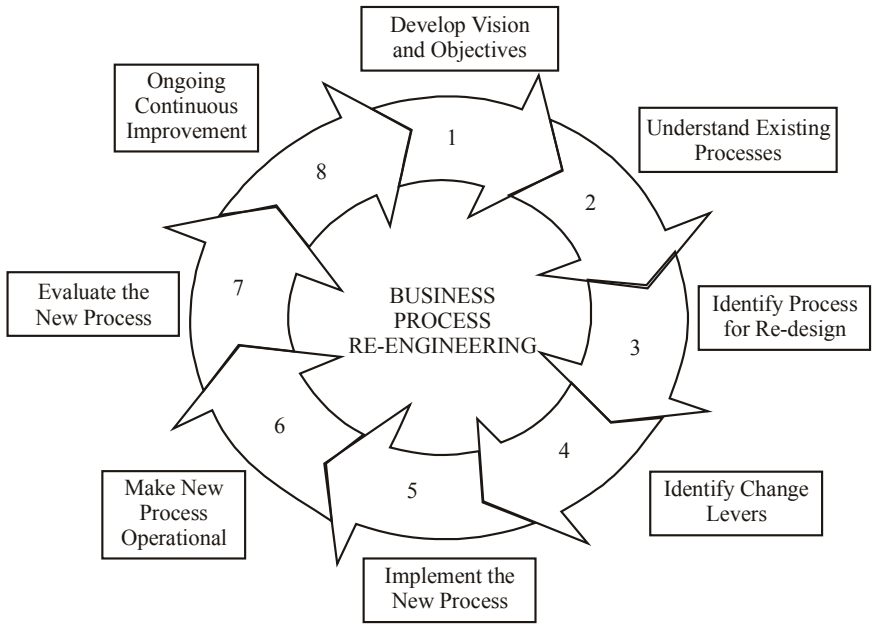
Hammer and Champy (1994) define BPR as "fundamental revision and radical redesign of processes to reach spectacular improvements in critical and contemporary measurements of efficiency, such as costs, quality, service and quickness." Keywords in this BPR definition are:

1. ***Fundamental:*** What is the company's basic style of working?
2. ***Radical:*** All existing procedures and structures must be forgotten and new styles of working must be discovered. Superficial changes are not useful. Changes must be made at the very root.
3. ***Spectacular:*** Spectacular changes must be discovered, not marginal improvements.
4. ***Processes:*** Redesign must be fixed on the processes not on the tasks, jobs, people, or structures.

Consequently, a firm must start over, leaving their old procedures behind, testing the work without prejudices, and forgetting systems used up to now. In other words, redesigning is changing. Re-engineering is centered in the processes. Davenport and Short (1990) define a process as a set of logically related tasks performed to achieve a defined business outcome. Furthermore, a process is a sequence of activities which, when jointly taken, produce a valuable result for the customer.

Other methodologies are also centered in the processes, such as continuous improvement or total quality management, and they reorient ate the basic tasks of the company to satisfy customers' needs. However, they can be quite comfortable with their existing processes and they may not want to introduce new ones.

Figure 3.3: BPR System



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Parker defines BPR as the analysis and redesign of the business and manufacturing processes with a view to eliminating the activities that do not add up value. These definitions enable us to outline the following main characteristics of BPR:

1. Concentration should be given on fundamental problems and not on departments or other organizational elements.
2. Concentration should be given on processes and less on activities, functions, people and structures. A process is a total of activities, which take one or several inputs, and creates an output, which is valuable for the client.
3. A radical approach which presupposes going to the root of things not only making superficial changes of the existing things but acting by removing what is obsolete and inventing new ways of carrying on the activity.
4. Changes that have a spectacular character that is achieving spectacular results and not simply effecting marginal or gradual improvements.
5. A strong link of BPR with informatics technologies, a very important characteristic which cannot be seen directly from definitions. The processes introduced through BPR could not exist without applying informatics technologies.

3.3 Concept of BPR

Business Process Re-engineering (BPR) began as a private sector technique to help organizations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world-class competitors.

A key stimulus for re-engineering has been the continuing development and deployment of sophisticated information systems and networks. Leading organizations are becoming bolder in using this technology to support innovative business processes, rather than refining current ways of doing work.

Business process re-engineering is one approach for redesigning the way work is done to better support the organization's mission and reduce costs. Re-engineering starts with a high-level assessment of the organization's mission, strategic goals, and customer needs. Basic questions are asked, such as "Does our mission need to be redefined? Are our strategic goals aligned with our mission? Who are our customers?" An organization may find that it is operating on questionable assumptions, particularly in terms of the wants and needs of its customers. Only after the organization rethinks what it should be doing, does it go on to decide how best to do it.

Within the framework of this basic assessment of mission and goals, re-engineering focuses on the organization's business processes – the steps and procedures that govern how resources are used to create products and services that meet the needs of particular customers or markets. As a structured ordering of work steps across time and place, a business process can be decomposed into specific activities, measured, modeled, and improved. It can also be completely redesigned or eliminated altogether. Re-engineering identifies, analyzes, and redesigns an organization's core business processes with the aim of achieving dramatic improvements in critical performance measures, such as cost, quality, service, and speed.

Re-engineering recognizes that an organization's business processes are usually fragmented into sub-processes and tasks that are carried out by several specialized functional areas within the organization. Often, no one is responsible for the overall performance of the entire process.

Re-engineering maintains that optimizing the performance of sub-processes can result in some benefits, but cannot yield dramatic improvements if the process itself is fundamentally inefficient and outmoded. For that reason, re-engineering focuses on redesigning the process as a whole in order to achieve the greatest possible benefits to the organization and their customers. This drive

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for realizing dramatic improvements by fundamentally rethinking how the organization's work should be done distinguishes re-engineering from process improvement efforts that focus on functional or incremental improvement.

Successful organizations are envisioned to be networked across functional boundaries and business processes rather than functional hierarchies. However, simply using the latest technology on existing processes, respectively procedures, is no valid solution to the problem. The solution is found in taking a step further, rethink and question the business activities being a fundament for business processes. Effective redesign of business processes by removing unnecessary activities and replacing archaic, functional processes with cross-functional activities, in combination with using information technology as an enabler for this type of change will, according to the advocates of BPR lead to significant gains in speed, productivity, service, quality and innovation. Business re-engineering normally includes a fundamental analysis of the organization and a redesign of:

1. Organizational structure
2. Job definitions
3. Reward structures
4. Business work flows
5. Control processes and, in some cases
6. Reevaluation of the organizational culture and philosophy.

3.4 Requirement of BPR

Business Process Re-engineering (BPR) calls for a radical redesign and systematic overhauling of strategic systems and processes in an organization. In the technology-centric business environment of today, more and more organizations are using Information Technology (IT) tools in their mainstream organizational processes. Hence, for BPR, it is required that the functionalities of these IT systems are modified.

The goal of business process re-engineering is to redesign and change the existing business practices or process to achieve dramatic improvement in organizational performance. Organizational development is a continuous process but the pace of change has increased in manifolds. In volatile global world organizations enhance competitive advantage through Business Process Re-engineering (BPR) by radically redesigning selected processes.

The business process re-engineering implies transformed processes that together form a component of a larger system aimed at enabling organization to empower themselves with contemporary technologies business solution and innovations. Organizational effective performance has become a watchword in modern business; as a result there is inexorable pressure for Business Process Re-engineering.

The rampant and rapid expansion of competition across markets and geographic raises important questions such as "how should work be redesigned", "who does it"? and "where do they do it"? "how to get it performed"? These questions necessitate venturing of Business Process Re-engineering into the overall strategy for sustained competition advantage, check costs, and differentiate products and effective price management with greater intensity and then flawless execution. At this juncture, it is pertinent to ask what is "Business Process" and as well as "Business Process Re-engineering".

According to Stoddard and Jarvenpea (1995) Business Process are simply a set of activities that transformed a set of inputs into a set of outputs (goods or services) for another person or process using people and equipments. Business process entails set of logically related tasks performed to achieve a defined business output or outcome.

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It involves a wide spectrum of activities procurement, order fulfillment, product development, customer service and sale.

Thus, Business Process Re-engineering becomes an offshoot of Business Process. Hammer and Champy (1993) argued that the fundamental reconsideration and radical redesign of organizational process, in order to achieve drastic improvement of current performance in cost, service and speed enjoys a fair measure of consensus. One can then assume that Business Process Re-engineering connotes the analysis and design of workflows and processes within and between organizations (Davenport and Short 1990).

Business Process Re-engineering relies on a different school of thought. It believes in continuous process improvement, re-engineering assumes that current process is irrelevant and there is need to commence another one. Such a clean slate perspective enables the designers of business process to focus on new process. This is to project oneself on what should the process look like? How do my customers want it to be like? How do best-in-class companies do it? What we might be able to do with no technology?

Business Process Re-engineering in the actual sense, have mixed successes therefore, business process re-engineering projects aimed at transforming inefficient work process. Henceforth, organizations such as banks and other financial institutions need to optimize results from this model in real business situations.

The need for businesses to improve the way they operate by increasing the efficiency and effectiveness of their business processes is a well-proven and documented approach. The rapid developments in enabling technology and changing customer needs, demands and sophistication have continued to fuel the need for ever-changing process improvements.

Based on this need, PricewaterhouseCoopers continues to offer its clients a superior business process improvement service, based on robust methodologies and tools and underpinned by a proven track record of results, locally and across the globe. Process re-engineering services include:

1. Process design and development
2. Process modeling
3. Process analysis
4. Process simulation
5. Process implementation support

3.4.1 Methodology

PricewaterhouseCoopers' approach to process re-engineering assignments is underpinned by our Process Improvement Through Benefits Management (PITBM) methodology.

In our approach, project success is achieved through benefits realization. Quite often, change projects have focused on the traditional project measures of success - on-time, to cost and to specification. However, this perspective may be too narrow as, whilst the project may be a success using these traditional measures, it still may be a failure from a business viewpoint if the planned benefits from the change project are neither realised nor measured.

The PITBM methodology has a whole lifecycle approach to obtaining beneficial returns on change and process improvement project investments by ensuring that the benefits realisation processes become an integral part of the organisational activities that remain in place after project completion. Benefits management addressed in this way is a business process and a management philosophy and not just a technique for investment justification.

Notes

Benefits realisation management is enabled through:

1. Focusing on business outcomes from the inception of the change initiative and how they will be achieved and measured;
2. Ensuring that the organisation's change initiative is supported throughout by a robust Business Case for change;
3. Matching the use of appropriate cost/benefit techniques to the desired business outcomes.
4. Incorporating comprehensive project, benefits, change and transition management activities throughout the change initiative.

3.4.2 Process Modelling Tool

In executing process re-engineering assignments PricewaterhouseCoopers makes use of a comprehensive set of tools. Our approach for business transformation, streamlining and simplification, together with our access to our Global Best Practices database and benchmarking tools enables us to fast-track the identification of operational process issues and opportunities.

PwC has selected Casewise Corporate Modeller as our advanced process modelling tool to complement other flowcharting tools already used in our practice.

We acknowledge that some assignments may require only a simple process mapping tool to manage a small number of "flat" flowcharts. However, in other client engagements the processes subject to improvement may require the capturing of additional information or relationships between process components for further analysis (i.e. transaction volumes, processing times, people, locations, technologies). Thorough analysis may also require simulation to facilitate resource planning, cycle time improvement, queue management or bottleneck identification and resolution. Casewise Corporate Modeller is deployed where clients require a more advanced approach to process re-engineering.

Task "Business process re-engineering concept really support the organization for improvement their business strategy." Discuss.

3.5 History of BPR

In 1990, Michael Hammer, a former professor of computer science at the Massachusetts Institute of Technology (MIT), published an article in the Harvard Business Review, in which he claimed that the major challenge for managers is to obliterate non-value adding work, rather than using technology for automating it. This statement implicitly accused managers of having focused on the wrong issues, namely that technology in general, and more specifically information technology, has been used primarily for automating existing processes rather than using it as an enabler for making non-value adding work obsolete.

Hammer's claim was simple: Most of the work being done does not add any value for customers, and this work should be removed, not accelerated through automation. Instead, companies should reconsider their processes in order to maximize customer value, while minimizing the consumption of resources required for delivering their product or service.

A similar idea was advocated by Thomas H. Davenport and J. Short in 1990, at that time a member of the Ernst & Young research center, in a paper published in the Sloan Management Review the same year as Hammer published his paper.

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This idea, to unbiased review a company's business processes, was rapidly adopted by a huge number of firms, which were striving for renewed competitiveness, which they had lost due to the market entrance of foreign competitors, their inability to satisfy customer needs, and their insufficient cost structure. Even well established management thinkers, such as Peter Drucker and Tom Peters, were accepting and advocating BPR as a new tool for (re)achieving success in a dynamic world. During the following years, a fast growing number of publications, books as well as journal articles, was dedicated to BPR, and many consulting firms embarked on this trend and developed BPR methods.

However, the critics were fast to claim that BPR was a way to dehumanize the work place, increase managerial control, and to justify downsizing, i.e. major reductions of the work force, and a rebirth of Taylorism under a different label.

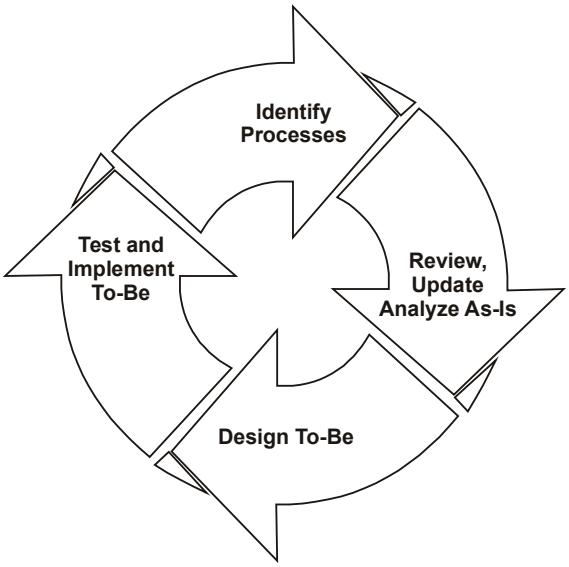
Despite this critique, re-engineering was adopted at an accelerating pace and by 1993, as many as 65% of the Fortune 500 companies claimed to either have initiated re-engineering efforts, or to have plans to do so. This trend was fueled by the fast adoption of BPR by the consulting industry, but also by the study Made in America, conducted by MIT, that showed how companies in many US industries had lagged behind their foreign counterparts in terms of competitiveness, time-to-market and productivity.

With the publication of critiques in 1995 and 1996 by some of the early BPR proponents, coupled with abuses and misuses of the concept by others, the re-engineering fervor in the U.S. began to wane. Since then, considering business processes as a starting point for business analysis and redesign has become a widely accepted approach and is a standard part of the change methodology portfolio, but is typically performed in a less radical way as originally proposed.

More recently, the concept of Business Process Management (BPM) has gained major attention in the corporate world and can be considered as a successor to the BPR wave of the 1990s, as it is evenly driven by a striving for process efficiency supported by information technology. Equivalently to the critique brought forward against BPR, BPM is now accused of focusing on technology and disregarding the people aspects of change.

3.6 BPR Life Cycle

Figure 3.4: BPR Life Cycle



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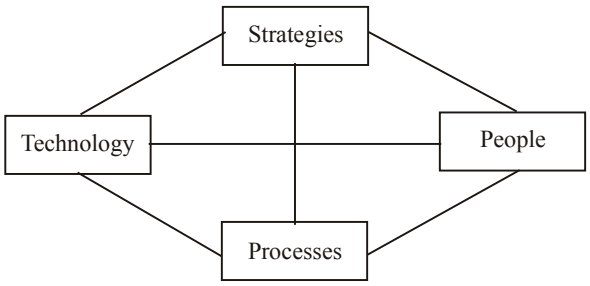
The BPR Life Cycle represents a closed-loop learning system for the organization to promote continuous improvement and organizational learning. The major components of a Business Process Re-engineering Life Cycle include the following:

1. Identification of current business processes
2. Review, update and analysis of "As-Is" processes
3. Design of "To-Be" processes
4. Test and implementation of "To-Be" processes

3.7 Elements of BPR

BPR is generally conceived as consisting of four elements to be considered, as there are strategies, processes, technology and humans where strategies and processes are building the ground for the enabling utilization of technologies and the redesign of the human activity system. A brief description of these four dimensions will be given below:

Figure 3.5: Elements of BPR



3.7.1 Strategies

The strategy dimension has to cover strategies within the other areas under concern, namely organization strategy, technology strategy and human resources strategy. The determination of all strategies has to be performed with respect to the dynamic marketplaces the organization is acting on and is not focussed on internalities, but the external presumptions for successful acting on markets. Beyond that, strategies have to be current and relevant to the company's vision, as well as to internal and external constraints, which implies, that a reconsideration and redefinition of strategies might be a presumption for further change. Finally, the strategies must be defined in a way that enables understanding and motivation of employees in order to align the work force with them.

3.7.2 Processes

Processes can be defined on different levels within the organization. The issue is, to identify core processes which are statisfying customer needs and add value for them.

It is important to point out, that processes are not determined by internal organizational requirements, but by customer requirements, even though organizational constraints have to be taken under consideration. The shift from functional departments to inter-functional processes includes a redesign of the entire organizational structure and the human activity system and implies process- instead of task optimizing.

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3.7.3 Technology

Information technology is considered as the major enabler for spanning processes over functional and organizational boundaries and supporting process driven organizations. However, the point is not to use IT as an improver for existing activities, as which it often has been conceived, but as enabler for the new organization. This includes using new technologies such as groupware, as well as new methods for using them and an acceptance of technological changes and the fact that information technology will be shaping the future.

3.7.4 People

The human activity system within the organization is the most critical factor for re-engineering. While top management support for re-engineering efforts is rather simple to ensure, the real change agents, middle management are far harder to win due to the fact, that they have to identify change opportunities and perform them, while they are the group facing most threats, as BPR often is used for cutting hierarchies and reducing the work force. The other crucial factor is to align the work force with the strategies defined and to address the variable cultural and environmental contexts within the organization. Finally, flattening hierarchies implies decision making to be moved down in the organization and empowerment of the employees taking them.

This requires training and education as well as motivation and trust from top management that people are able and willing to take responsibility, a fact that is rather contradictory to the "trust is good, control is better" way of thinking.

3.8 Advantages of BPR

BPR has/gives following advantages:

1. ***Satisfaction:*** A big advantage of re-engineering is that the work becomes more satisfying because the workers get a greater sense of completion, closure, and accomplishment from their jobs. The employee performs a whole job, a process or a sub-process, that by definition produces a result that somebody cares about. The workers not only try to keep the boss happy or to work through the bureaucracy. More important is the fact to satisfy the customer needs.

2. ***Growth of Knowledge:*** Furthermore, the personal development within a process team environment does not play such an important role which means climbing up the hierarchy is a minor goal.

   In this case it is much more important to get a widespread knowledge of the whole process and there are no such things as "mastering" a job; as a worker's expertise and experience grow, his or her job grows with it.

3. ***Solidarity to the Company:*** Moreover, since workers in a reengineered process spend more time on value adding work and less time on work that adds no value, their contributions to the company increase, and, consequently, jobs in a reengineered environment will on the whole be more highly compensated.

4. ***Demanding Jobs:*** There is, however, a challenging side to all this good news about work in a reengineered environment. If jobs are more satisfying, they are also more challenging and difficult. Much of the old, routined work is eliminated or automated. If the old model was simple tasks for simple people, the new one is complex jobs for smart people, which raises the bar for entry into the workforce. Few simple, routine, unskilled jobs are to be found in a reengineered environment.

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This fact that the jobs are more demanding can be either an advantage or a disadvantage. It depends on the view from where you consider it. Unskilled employees might get difficulties to get along with the process changing. Some people are just not able to perform several tasks. For such persons it will be probably difficult to survive within this new environment which mostly leads to a personal failure in their job.

5. ***Authority:*** In a traditional oriented company the management expects from the employees that they follow some specific rules. In contrast to that the reengineered companies do not want employees who can follow rules; they want people who will make their own rules.

   As management invests teams with the responsibility of completing an entire process, it must also give them the authority to make the decisions needed to get it done.

3.9 BPR Challenges

The benefits of BPR are evident from the above examples, but are all BPR projects as successful as those described? Unfortunately, studies have shown that the likelihood of a project failing is greater than of it succeeding. In fact, some re-engineering experts estimate that up to 90 percent of all BPR projects fail to meet all their intended objectives.

Re-engineering business processes is challenging because the concept is difficult to implement. The possibilities of BPR success can be enhanced through an understanding of some of the challenges and obstacles organizations may encounter:

1. ***Resistance:*** Often the most serious problem in re-engineering business processes is resistance to change. Many people will go to great lengths to avoid adapting to new ideas and ways of doing things.
2. ***Cost:*** A thorough examination and questioning of the way business is conducted is expensive. So is starting with a clean sheet of paper and rethinking the company's business processes.
3. ***Job Losses:*** A reengineered system making maximum use of advanced technology will usually result in employee layoffs. Before re-engineering runs its course, as many as 25 million jobs may be lost to BPR.
4. ***Tradition and Culture:*** The inefficient business processes that are being reengineered are often decades old. The traditional ways of doing things often are a part of the organizational culture. This means that the corporate culture will have to change, and changing corporate culture is not an easy process.
5. ***Time Requirements:*** Re-engineering often takes two or more years. Consider what AT&T had to do in one of its re-engineering projects: make massive changes in manufacturing, shipping, installation, billing, and dealing with customers; significantly change the processes for financial reporting and creating contracts and proposals; completely reorganize the information system; write new policies and procedures manuals and change the job descriptions of hundreds of employees; and create new ways to evaluate and reward the employees in the new job functions.
6. ***Lack of Management Support:*** Many top managers, not convinced of the benefits of re-engineering, are afraid of "big hype, few results." Others bail out at the first sign of difficulty. Without the firm commitment and ongoing support and involvement of top management, re-engineering has little chance of succeeding.
7. ***Risks to Managers:*** Pushing a re-engineering project can be a risky career move. If it is a success, managers are looked on with great favor in the organization. If it does not succeed, they may be looking for a new job.

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8. ***Skepticism:*** Some people view BPR as the same old traditional systems development with a fancy new name and a more attractive wrapper. Others doubt it can be done. Skeptics must either be convinced of the merits of BPR or kept from negatively influencing others if BPR is to succeed.

9. ***Retraining:*** In many re-engineering projects the way work is done changes dramatically. That means that workers have to be retrained, a time-consuming and expensive process.

Task Suggest how people play important role in business process re-engineering concept.

3.10 Implications of Business Process Re-engineering

Undoubtedly, Michael Hammer has garnered most of the BPR press because of the radical rhetoric with which he communicates. However, the ideas expressed by Hammer (and later Hammer and Champy) are similar to the new business process redesign concepts of Davenport and Short. They agree that the processes should be transformed holistically rather than by fixing bottlenecks in small increments. Furthermore, they agree on the essential role IT should play in business process transformation. Most importantly, their ideas point to a formulation of the process enterprise that is different from the functional hierarchical organization with which corporations had been aligned. In their writings, the founders of BPR have repeatedly demonstrated the poor coordination of functional organizations and the superiority of process organizations in coordination and in achieving performance gains. In its most radical form, the process enterprise is one that eliminates functional structure in favor of an exclusive process-based structure. The more realistic approach for becoming a process enterprise is to have a matrix structure of process-hierarchy and functional-hierarchy. Table 3.1 illustrates the differences between process organization versus functional organization.

As illustrated above, process enterprise holds the promise of being more responsive to market requirements, and it is suited for companies that offer differentiated products/services rather than competing on cost alone. However, organizational realignment by itself does not result in improvements. Organizational realignment has to be accompanied by change in management practices and mindsets. A 1996 Harvard Business Review article by Ann Majchrzak and Qianwei Wang of University of Southern California presents data supporting this viewpoint.

Table 3.1: Functional versus Process Organization

	Functional Organization	**Process Organization**
Work Unit	Department	Team
Key Figure	Functional Executive	Process Owner
Benefits	Functional excellence Easier work balancing because workers have similar skills Clear management direction on how work should be performed	Responsive to market requirements Improved communication and collaboration between different functional tasks Performance measurements aligned with process goals
Weaknesses	Barrier to communication between different functions Poor handover between functions that affects customer service. Lack of end-to-end focus to optimize organizational performance	Duplication of functional expertise Inconsistency of functional performance between processed Increased operational complexity
Strategic Value	Support cost leadership strategy	Supports differentiation strategy

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In their study, the cycle times of 86 printed circuit board assembling departments at electronic companies were analyzed. These departments performed the same manufacturing processes at large and small electronics companies. They labeled 31 of the 86 departments as process-complete, meaning these departments perform manufacturing processes, support tasks, and customer interfacing. The rest are traditional functional departments that do not perform most activities outside of the manufacturing processes. To the authors' surprise, they discovered process-complete departments did not have faster cycle times than functional departments. After more analysis, they found process-complete departments had faster cycle times when management practices were put in place to foster collective responsibility. These practices include jobs with overlapping tasks, group-based rewards, open workspaces, and collaborative work procedures. Analysis of the data, after taking into account these management practices, revealed that process complete departments that implemented these practices achieve cycle times as much as 7.4 times faster than process-complete departments that have not implemented these practices. Furthermore, process-complete departments that operated on traditional functional mindsets have cycle times as much as 3.5 times longer than functional departments. Organizational restructuring alone does not inherently bring about forecasted improvements. Structural change has to be accompanied by changes in managerial practices and mindsets to reach the desired objectives. In fact, as we will discuss a little later, the lack of focus on the human side of change is one of the biggest drawbacks of traditional BPR practices.

What are the effects of BPR on corporate performance? Several success stories have been widely publicized. Ford was able to reduce 75 percent of its staff in its accounting department, Mutual Benefit Life achieved 60 percent productivity improvement in its insurance applications department, Hewlett-Packard improved on-time delivery performance by 150 percent in its purchasing department, and American Express was able to reduce average time for transaction processing by 25 percent. However, by Hammer's own admission, 50 percent to 70 percent of business process re-engineering projects failed. In addition to Hammer's own assessment of the failure rate, one study indicated that only 16 percent of corporate executives were fully satisfied with their BPR implementations.

The radical nature of BPR implementation has often been associated with its failure. Instead of building on what already existed, BPR implementations approached business process changes as blank slates. In the ideal world, this approach should bestow competitive advantage from innovative business process designs. The reality often turned out to be quite different. There was usually inadequate representation of the business users and decision makers on the project implementation teams. IT and outside consultants often comprised the majority of project team members. This resulted in solutions heavily influenced by best practices suggested by ERP systems being implemented. These best practice business processes are generic and usually do not represent innovative, differentiating processes. BPR has often been used to disguise restructuring. Thus, it often engendered resentment from the employees. Initial BPR prescriptions did not include recommendations on how to cope with organizational change and human resource issues. Change management on many BPR projects often served only training and communication roles. The combination of a top-down implementation approach and an inadequate change management function in BPR project methodologies resulted in strong resistance from front-line workers and middle managers. Furthermore, early BPR implementations were heavily technical and process focused. Often, these changes were undertaken without corresponding changes in the organizational setup. This resulted in halfway measures of re-engineering with redesigned cross-functional processes that were partly owned by various functional departments. The lack of identifiable process ownership often led to chaos. These various factors led to unsatisfactory opinions of BPR in the corporate world.

Do these explanations of failure and the high failure rate mean the fundamental approach of BPR is faulty? Studies that profile successful BPR projects do not come to this conclusion. A McKinsey study conducted in 1993, at the height of the BPR fad, discovered BPR projects that are broad based and in-depth generate the highest business unit benefits. This study analyzed the BPR

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implementation results of 20 companies. It found that 11 of the 20 projects achieved performance improvements of less than 5 percent. The performance measure evaluated was earnings before interest and taxes, or reduction in total business unit cost. These results hardly show the massive improvements BPR gurus had in mind. However, six of the 20 projects achieved an average of 18 percent in business unit cost reduction. The authors investigated these six projects and discovered these projects were more radical (in terms of breadth and depth) than the rest of the 20 projects. Breadth is defined as the number of key processes that have been re-engineered. Depth is defined as the number of the six organizational elements (roles and responsibilities, measurements and incentives, organization structure, IT, shared values and skills) that are included in the re-engineering projects. In their study, the six successful projects include all the key processes and organization elements in their BPR implementations. The authors conclude the degree of radical change is proportional to the business benefits that BPR projects generate. Perhaps it is important to remember that this study profiles successful implementations rather than all implementations and was published during the height of the BPR craze. Teng et al. published another study that profiled successful BPR projects in 1998. This was a broad-based survey of 105 firms that completed at least one BPR project. The authors discovered there is a strong correlation between the degree of radical change and the level of success at responding firms. The degree of radical change is determined by respondents' perceived level of change in seven aspects of re-engineering. The seven aspects of re-engineering are similar to those of the McKinsey study: process work flows, roles and responsibilities, performance measurements and incentives, organizational structure, IT, culture and skill requirements. Other interesting results from this study are, the importance of process evaluation, process transformation, and social design. Respondents rate these three stages as most important to success among the eight project stages. The eight stages in sequence are as follows:

1. Identification of BPR opportunities
2. Project preparation
3. Analysis of existing process
4. Development of process vision
5. Technical design
6. Social design
7. Process transformation
8. Process evaluation

Respondents rated analysis of existing process and technical design as least important to perceived success. The two studies discussed here illustrate that successful BPR projects share a high degree of radical change. We can also conclude from the second study that existing processes and technical designs are not important factors in BPR success. However, social design, execution of process transformation, and the ability to evaluate reengineered processes are important to the success of the BPR implementations. These results correlate to the contention that change management and the human side of implementations are more important than the solutions themselves.

Early BPR results led to the formulation of a new generation of BPR rhetoric from its founders. This revisionist BPR thinking increasingly focuses on the cultural context of the organization. The founders no longer stress the radical approach that was in the original BPR thinking. The new rhetoric of BPR emphasizes the importance of people and the change management aspects of implementation. Instead of dramatic and wideranging process changes, revised BPR thinking calls for a holistic approach to re-engineering that involves business processes, technology, and social system issues (including culture). Revisionist BPR thinking looks to redesign critical business processes that will confer the most value through targeted changes to organization, processes, technology, and culture. The aim is no longer to change the organization's entire culture but only

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to target those aspects of culture that are critical to the success of re-engineering implementation. An illustration of this is the case of instituting multi-skilled jobs and job rotations in a culture that values specialized trade skills. A blanket enforcement of this change will undoubtedly engender widespread resistance. The recognition that wholesale change of the corporation is likely to fail led to changes in BPR thinking toward focusing on small leap improvement projects. It is often easier to achieve consensus among the affected parties in this type of project, which has been shown to significantly reduce implementation timeline. Although IT is still a key enabler, it has become less important in revisionist BPR thinking. Peopleled change, rather than system-led change, is increasingly viewed as critical to achieve project success. In short, the ideal of process enterprise is still the goal; however, the path to this goal is not in one gigantic step but a series of smaller steps.

Did u know? Business Process Re-engineering (BPR) began as a private sector technique to help organizations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world-class competitors.

Case Study

Business Process Re-engineering in the Small Firm

Business process re-engineering (BPR) is being attempted by many firms that are looking for radical gains from the successful redesign of their processes. BPR is a high risk, time consuming activity, with no guarantee of success, and yet many businesses claim to be re-engineering their processes. There is no universal definition of BPR, however common components of individual definitions exist. Typical characteristics of BPR include: the radical redesign of business processes; the deployment of information technology as an enabler; major disruption to the organization during the process of re-engineering; and attempts at achieving organization wide improvements in performance.

As BPR is relatively new there is a lack of empirical research in the field. Of the few studies conducted, the focus has been on the large organization, and the majority have used the case study approach on one or a few individual firms. Despite the youth of the field, certain principles and attempts at establishing a universal re-engineering methodology have emerged. However, there has been little consideration for the small firm in the BPR literature. This is confirmed by the small proportion of the literature specifically encompassing the small business, and of this small amount, even less is written explicitly for the small firm. There is a need to investigate the small firm arena in order to determine whether the same principles for BPR apply, or whether a different approach needs to be taken by a small business looking for radical change.

This study attempts to provide some initial indication of the extendability of the existing principles and methodologies in the BPR literature to the small firm. A number of BPR methodologies have been provided, however, the range of firms for which they are devised is not often stated. It is possible that the characteristics of the small firm are such that a customised approach to BPR is necessary. In order to investigate this, a case study on a New Zealand firm consisting of four divisions was conducted. The next section summarises the literature, including BPR methodologies, and the application of BPR to small firms. The method used in the study is outlined in the third section, followed by the results from the case study. Finally the implications of the results are discussed, and conclusions are drawn.

Source: Davenport 1993; Hammer & Champy, 1993; Grover, Teng & Fiedler, 1993.

Notes

3.11 Summary

- Business process is a set of logically related tasks performed to achieve a defined business outcome.
- Business process re-engineering (BPR) is a management approach aiming at improvements by means of elevating efficiency and effectiveness of the processes that exist within and across organizations.
- The key to BPR is for organizations to look at their business processes from a "clean slate" perspective and determine how they can best construct these processes to improve how they conduct business.
- Business process re-engineering is also known as BPR, Business Process Redesign, Business Transformation, or Business Process Change Management.
- The key to BPR is for organizations to look at their business processes from a "clean slate" perspective and determine how they can best construct these processes to improve how they conduct business.

3.12 Keywords

BPR Lifecycle: The BPR Life Cycle represents a closed-loop learning system for the organization to promote continuous improvement and organizational learning.

Business Process Re-engineering (BPR): It is a management approach aiming at improvements by means of elevating efficiency and effectiveness of the processes that exist within and across organizations.

Business Process or Business Method: It is a collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers.

PITBM: Process Improvement through Benefits Management

Process: It is a structured, measured set of activities designed to produce a specified output for a particular customer or market.

Resource: A resource is an input to a business process, and, unlike information, is typically consumed during the processing.

3.13 Self Assessment

Fill in the blanks:

1. BPR is a ..... change in the organization.
2. The main proponents of re-engineering were ..... and .....
3. A ..... is the business justification for performing the activity.
4. BPR is generally conceived as consisting of ..... elements.
5. Full form of BPM is .....
6. Often the most serious problem in re-engineering business processes is ..... to change.

State whether the following statements are true or false:

7. A business process has some well defined goal.

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8. The BPR Life Cycle represents a closed-loop learning system for the organization to promote continuous improvement and organizational learning.
9. The human activity system within the organization is the least critical factor for re-engineering.
10. Pushing a re-engineering project can be a risky career move.

3.14 Review Questions

1. What is the process?
2. What is BPR?
3. How BPR adds value to an organization?
4. What are the elements of BPR?
5. Explain the requirement of BPR in an organization.
6. Describe the life cycle of BPR.
7. Write an essay on the evolution of BPR.
8. What are the benefits of BPR?
9. What are the challenges of BPR? How at to overcome it?
10. Describe the business process model

Answers: Self Assessment

1. radical
2. Michael Hammer, James A. Champy
3. goal
4. four
5. Business Process Management
6. Resistance
7. True
8. True
9. False
10. True

3.15 Further Readings

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Unit 4: Manufacturing Perspective of ERP

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Objectives

After studying this unit, you will be able to:

- Discuss manufacturing information system
- Describe CAD/CAM, MRP-I and II
- Realise the use of bill of material
- Explain physical distribution management

Notes

Introduction

In enterprises, row materials moves through a process and transformed into usable products. Similarly, in an information system, data are supplied to a system (input), it is proceed and transformed into information (output). Through the ERP, technology transforms the data that are available in the enterprise in usable information.

4.1 Manufacturing Information Systems

Manufacturing information systems support the production/operations function, which includes all activities concerned with the planning and control of the processes that produce goods or services. The production/operations function is concerned with the management of the operational systems of all business firms. Information systems used for operations management and transaction processing support all firms that must plan, monitor, and control inventories, purchases, and the flow of goods and services.

Information system helps in these manufacturing activities:

1. Plant activity scheduling
2. Material requirement assessment
3. Material reallocation between orders
4. Dynamic inventory management
5. Grouping work orders by "characteristics"
6. Resource qualification for task completion

Computer-integrated Manufacturing (CIM)

Computer-based manufacturing information systems use several major techniques to support computer-integrated manufacturing (CIM). CIM is an overall concept that stresses that the goals of computer use in factory automation must be to:

1. ***Simplify:*** (re-engineer) production processes, product designs, and factory organization as a vital foundation to automation and integration.
2. ***Automate:*** Production processes and the business functions that support them with computers, machines, and robots.
3. ***Integrate:*** All production and support processes using computers, telecommunications networks, and other information technologies.

Overall goal of CIM

Is to create flexible, agile, manufacturing processes that efficiently produce products of the highest quality. Thus, CIM supports the concepts of:

1. Flexible manufacturing systems
2. Agile manufacturing
3. Total quality management

Notes

Results of CIM

Implementing such manufacturing concepts enables a company to quickly respond to and fulfill customer requirements with high-quality products and services.

Uses of computers in manufacturing include:

1. Computer-aided Engineering (CAE)
2. Computer-aided Design (CAD)
3. Computer-aided Process Planning (CAPP)
4. Material Requirements Planning (MRP)
5. Manufacturing Resource Planning (MRP-II)
6. Computer-aided Manufacturing (CAM)

Computer-aided manufacturing: CAM systems are those that automate the production process.

Example: This could be accomplished by monitoring and controlling the production process in a factory (manufacturing execution systems) or by directly controlling a physical process (process control), a machine tool (machine control), or machines with some humanlike work capabilities (robots).

Manufacturing execution systems: MES are performance monitoring information systems for factory floor operations. They monitor, track, and control the five essential components involved in a production process:

1. Materials
2. Equipment
3. Personnel
4. Instructions and specifications
5. Production facilities.

MES includes:

1. Shop floor scheduling and control systems
2. Machine control systems
3. Robotics control systems
4. Process control systems

Some of the benefits of CIM are:

1. ***Increased efficiency through:***
   (a) Work simplification and automation,
   (b) Better production schedule planning
   (c) Better balancing of production workloads in production capacity
2. ***Improved utilization of facilities, higher productivity, better quality control through:***
   (a) Continuous monitoring
   (b) Feedback and control of factory operations, equipment and robots.

Notes

3. ***Reduced investments in production inventories and facilities:***
   (a) Work simplification
   (b) Just-in-time inventory policies
   (c) Better planning and control of production
   (d) Better planning and control of finished goods requirements
4. ***Improved customer service:***
   (a) Reducing out-of-stock situations
   (b) Producing high-quality products that better meet customer requirements

4.2 Computer-aided Design (CAD)

Computer-aided design (CAD), also known as computer-aided design and drafting (CADD), is the use of computer technology for the process of design and design-documentation. Computer Aided Drafting describes the process of drafting with a computer. CADD software, or environments, provides the user with input-tools for the purpose of streamlining design processes; drafting, documentation, and manufacturing processes. CADD output is often in the form of electronic files for print or machining operations. The development of CADD-based software is in direct correlation with the processes it seeks to economize; industry-based software (construction, manufacturing, etc.) typically uses vector-based (linear) environments whereas graphic-based software utilizes raster-based environments.

CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetics, and many more. CAD is also widely used to produce computer animation for special effects in movies, advertising and technical manuals. The modern ubiquity and power of computers means that even perfume bottles and shampoo dispensers are designed using techniques unheard of by engineers of the 1960s. Because of its enormous economic importance, CAD has been a major driving force for research in computational geometry, computer graphics (both hardware and software), and discrete differential geometry.

Uses of CAD

Computer-aided design is one of the many tools used by engineers and designers and is used in many ways depending on the profession of the user and the type of software in question.

CAD is one part of the whole Digital Product Development (DPD) activity within the Product Lifecycle Management (PLM) process, and as such is used together with other tools, which are either integrated modules or stand-alone products, such as:

1. Computer-aided engineering (CAE) and Finite element analysis (FEA)
2. Computer-aided manufacturing (CAM) including instructions to Computer Numerical Control (CNC) machines
3. Photo realistic rendering
4. Document management and revision control using Product Data Management (PDM).

4.3 Computer-aided Manufacturing (CAM)

Computer-Aided Manufacturing (CAM) is the use of computer software and hardware in the translation of computer-aided design models into manufacturing instructions for numerical controlled machine tools.

Notes

4.3.1 Applications of Computer-aided Manufacturing

The field of computer-aided design has steadily advanced over the past four decades to the stage at which conceptual designs for new products can be made entirely within the framework of CAD software. From the development of the basic design to the Bill of Materials necessary to manufacture the product there is no requirement at any stage of the process to build physical prototypes.

Computer-aided Manufacturing takes this one step further by bridging the gap between the conceptual design and the manufacturing of the finished product. Whereas in the past it would be necessary for a design developed using CAD software to be manually converted into a drafted paper drawing detailing instructions for its manufacture, Computer-Aided Manufacturing software allows data from CAD software to be converted directly into a set of manufacturing instructions.

CAM software converts 3D models generated in CAD into a set of basic operating instructions written in G-Code. G-code is a programming language that can be understood by numerical controlled machine tools – essentially industrial robots – and the G-code can instruct the machine tool to manufacture a large number of items with perfect precision and faith to the CAD design.

Modern numerical controlled machine tools can be linked into a 'cell', a collection of tools that each performs a specified task in the manufacture of a product. The product is passed along the cell in the manner of a production line, with each machine tool (i.e. welding and milling machines, drills, lathes etc.) performing a single step of the process.

For the sake of convenience, a single computer 'controller' can drive all of the tools in a single cell. G-code instructions can be fed to this controller and then left to run the cell with minimal input from human supervisors.

4.3.2 Origin of CAD/CAM

CAD had its origins in three separate sources, which also serve to highlight the basic operations that CAD systems provide. The first source of CAD resulted from attempts to automate the drafting process. These developments were pioneered by the General Motors Research Laboratories in the early 1960s. One of the important time-saving advantages of computer modeling over traditional drafting methods is that the former can be quickly corrected or manipulated by changing a model's parameters. The second source of CAD was in the testing of designs by simulation. The use of computer modeling to test products was pioneered by high-tech industries like aerospace and semiconductors. The third source of CAD development resulted from efforts to facilitate the flow from the design process to the manufacturing process using numerical control (NC)

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technologies, which enjoyed widespread use in many applications by the mid-1960s. It was this source that resulted in the linkage between CAD and CAM. One of the most important trends in CAD/CAM technologies is the ever-tighter integration between the design and manufacturing stages of CAD/CAM-based production processes.

The development of CAD and CAM and particularly the linkage between the two overcame traditional NC shortcomings in expense, ease of use, and speed by enabling the design and manufacture of a part to be undertaken using the same system of encoding geometrical data. This innovation greatly shortened the period between design and manufacture and greatly expanded the scope of production processes for which automated machinery could be economically used. Just as important, CAD/CAM gave the designer much more direct control over the production process, creating the possibility of completely integrated design and manufacturing processes.

The rapid growth in the use of CAD/CAM technologies after the early 1970s was made possible by the development of mass-produced silicon chips and the microprocessor, resulting in more readily affordable computers. As the price of computers continued to decline and their processing power improved, the use of CAD/CAM broadened from large firms using large-scale mass production techniques to firms of all sizes. The scope of operations to which CAD/CAM was applied broadened as well. In addition to parts-shaping by traditional machine tool processes such as stamping, drilling, milling, and grinding, CAD/CAM has come to be used by firms involved in producing consumer electronics, electronic components, molded plastics, and a host of other products. Computers are also used to control a number of manufacturing processes (such as chemical processing) that are not strictly defined as CAM because the control data are not based on geometrical parameters.

Using CAD, it is possible to simulate in three dimensions the movement of a part through a production process. This process can simulate feed rates, angles and speeds of machine tools, the position of part-holding clamps, as well as range and other constraints limiting the operations of a machine. The continuing development of the simulation of various manufacturing processes is one of the key means by which CAD and CAM systems are becoming increasingly integrated. CAD/CAM systems also facilitate communication among those involved in design, manufacturing, and other processes. This is of particular importance when one firm contracts another to either design or produce a component.

Task CAD is just a design process. How it beneficial in development of a new product? Take a real life example for discussion.

4.4 Material Requirements Planning (MRP)

Material Requirements Planning (MRP) is designed to assist manufacturers in inventory and production management. Using MRP helps ensure that materials will be available in sufficient quantity and at the proper time for production to occur, without incurring excess costs by having the materials on hand too early. MRP assists in generating and (as needed) revising production plans to meet expected demands and replenishment plans to assure the timely availability of raw materials and all levels of product components.

MRP begins by compiling a Bill of Materials (BOM) for each end product or component of interest. This is a listing of the components and quantities that are needed to manufacture the end product or component. Theoretically, the compilation of BOMs continues recursively, enumerating the subcomponents that are needed to manufacture each component, until only raw materials appear in the generated BOMs. In practice, a manufacturer may prefer to extend the BOM enumeration for only a specified number of levels and to assume that components and/or raw materials beneath that level are available on demand.

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MRP requires information on the lead times associated with each manufacturing or assembly procedure that is required to produce the components and end products. Lead time is the time required to assemble or manufacture the needed components into the end product (or higher-level component), and thus is the time elapsed between the point at which all needed components are present and the end of assembly or manufacturing. These lead times may be compiled per unit of each component/product or may be based on predetermined batch sizes.

MRP combines the BOMs, the lead times, and estimates of demand for end products to generate the Master Production Schedule, which details a schedule of assembly and production that enables the manufacturer to meet the estimated demand. This schedule addresses only the final level of assembly or production (resulting in end products), and includes both the timing and quantities of production. The Master Production Schedule serves as the basis for all further output information from MRP.

Using the Master Production Schedule as a starting point, it is a conceptually simple (but computationally demanding) task to combine it with the data on lead times and BOMs to derive a schedule of component (and possibly raw materials) requirements, through as many levels of assembly and production as the manufacturer chooses. This schedule can account for such factors as work-in-progress, current inventory of and pending orders for materials and components, and direct demand for components as service items. Using this schedule of requirements, the manufacturer must determine a material replenishment strategy that satisfies these requirements. A wide variety of ordering rules and heuristics can be incorporated into computer-based MRP models.

In addition to the material requirements, other useful data can be generated from the Master Production Schedule. These include the projected inventory levels for any end product, the projected schedule for any assembly or production process, and the projected utilization of capacity for a particular production operation. Any of this information should aid in evaluating current or potential materials replenishment strategies.

Production control systems often sound dauntingly technical and complicated. However, the need for a system like MRP can be explained with a simple analogy (Slack et al. 1995). Imagine that in 4 weeks time you are hosting a party for around 40 guests. You have decided to provide beer, wine and soft drinks plus sandwiches and savoury snacks. Putting all of this together on the night would involve some planing and production control. First, you would need some simple estimates of your guests' preferences for red or white wine, beer, fruit juice etc. Before shopping for these items, you would take into account what you already had in stock in the house. Again, shopping for the food at the party would involve identifying from your food recipes what ingredients were required to make up the various dishes (subtracting what you already have from your shopping list).

Then as well as specifying the quantity of your needs for materials and ingredients against likely demand, you also need to think about the sequencing of the cooking and preparation. You can't do everything on the night, so you might choose for example to do some of the cooking a week before and then freeze the results. This might mean shopping for some ingredients first, leaving others till later. In short, to organize a party, you need to plan and control your acquisition of materials and your process of production. You need to make decisions about the quantity and timing of the purchasing and production of different ingredients, based on forecasts of the numbers coming to the party and your recipes for making the finished products.

Although a production process is much more complex than organizing a party, production control systems like MRP are designed to address similar problems. The front end produces the master production schedule (MPS) (the equivalent of food and drink at the party). The MPS plans the production of the goods offered to customers over a given planning horizon. The back end handles factory scheduling and manages materials from suppliers (this equates with bringing home the shopping and planning cooking and preparation). Material requirements planning

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(MRP) is the core of the engine. It takes a period-by-period set of MPS requirements and (in the way our food recipes produce shopping lists) generates a related set of component and raw materials requirements. MRP is the detailed plan for the components required to enable the MPS to be fulfilled.

As well as the MPS, MRP has two other inputs. A bill of material (BOM) shows, for each part number, the associated component part numbers. Thus for a dining room table, the BOM would show that a top assembly and four legs were required. The BOM for the top assembly would show that two end panels, a sub frame, and two leaf inserts were required. The BOM for the legs would show that solid timber stock and associated hardware kits (screws and castors) were required. Inventory status data (the third input into MRP) would indicate how many legs or leaf inserts, etc., were on hand, how many of those were already committed for production, and how many hardware kits had been ordered. This would then allow the requirements for further table production to be worked out.

MRP data thus make it possible to generate a time-phased requirement record for any part number. This data can also drive the detailed capacity planning modules. This is a massive computational task, only made possible by the use of modern computers.

4.5 Bill of Material (BOM)

A bill of materials (sometimes bill of material or BOM) is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, components, parts and the quantities of each needed to manufacture an end product.

A BOM can define products as they are designed (engineering bill of materials), as they are ordered (sales bill of materials), as they are built (manufacturing bill of materials), or as they are maintained (service bill of materials). The different types of BOMs depend on the business need and use for which they are intended. In process industries, the BOM is also known as the formula, recipe, or ingredients list. In electronics, the BOM represents the list of components used on the printed wiring board or printed circuit board. Once the design of the circuit is completed, the BOM list is passed on to the PCB layout engineer as well as component engineer who will procure the components required for the design.

Features of Bill of Materials

1. Insight into current and future availability with Available to Promise and Component Availability
2. Visual drill-down into existing bills of material
3. Use stock or non-stock components
4. Attach media objects for videos or pictures of assemblies
5. Global replacement of components
6. User-defined cost groupings
7. Optional routing definition
8. Tracking of engineering change history
9. Various user-defined fields for each assembly
10. Copy from functionality to ease setup of new bills
11. Engineer name, revision numbers, drawing numbers, effective dates
12. Engineering change order (ECO) tracking

Notes

4.6 Manufacturing Resource Planning (MRPII)

Manufacturing Resource Planning (MRP II) is defined by APICS as a method for the effective planning of all resources of a manufacturing company. Ideally, it addresses operational planning in units, financial planning in dollars, and has a simulation capability to answer "what-if" questions and extension of closed-loop MRP.

Manufacturing Resource Planning (or MRP2) - Around 1980, over-frequent changes in sales forecasts, entailing continual readjustments in production, as well as the unsuitability of the parameters fixed by the system, led MRP (Material Requirement Planning) to evolve into a new concept : Manufacturing Resource Planning (e.g. MRP 2)

MRP II is not a proprietary software system and can thus take many forms. It is almost impossible to visualize an MRP II system that does not use a computer, but an MRP II system can be based on either purchased–licensed or in-house software.

Almost every MRP II system is modular in construction. Characteristic basic modules in an MRP II system are:

1. Master Production Schedule (MPS)
2. Item Master Data (Technical Data)
3. Bill of materials (BOM) (Technical Data)
4. Production Resources Data (Manufacturing Technical Data)
5. Inventories and Orders (Inventory Control)
6. Purchasing Management
7. Material Requirements Planning (MRP)
8. Shop Floor Control (SFC)
9. Capacity planning or Capacity Requirements Planning (CRP)
10. Standard Costing (Cost Control)
11. Cost Reporting / Management (Cost Control)

Benefits of MRPII

1. MRP II systems can provide:
   (a) Better control of inventories
   (b) Improved scheduling
   (c) Productive relationships with suppliers
2. For Design / Engineering:
   (a) Improved design control
   (b) Better quality and quality control
3. For Financial and Costing:
   (a) Reduced working capital for inventory
   (b) Improved cash flow through quicker deliveries
   (c) Accurate inventory records
   (d) Timely and valid cost and profitability information

Notes

MRP II systems have been implemented in most manufacturing industries. Some industries need specialised functions e.g. lot traceability in regulated manufacturing such as pharmaceuticals or food. Other industries can afford to disregard facilities required by others e.g. the tableware industry has few starting materials – mainly clay – and does not need complex materials planning. Capacity planning is the key to success in this as in many industries, and it is in those that MRP II is less appropriate.

Task Would you suggest the basic difference of MRP and MRP-II techniques?

4.7 Distribution Requirement Planning

A supply channel is composed of three structures. At one end of the channel is the manufacturer. The manufacturer focuses on the development and production of products and originates the distribution process. The terminal point in the channel is the retailer who sells goods and services directly to the customer for their personal, non-business use. In between the two lies a process called distribution, which is more difficult to define. One involved in the distribution process is labeled a "distributor." The *APICS Dictionary* describes a distributor as "a business that does not manufacture its own products but purchases and resells these products. Such a business usually maintains a finished goods inventory." The proliferation of alternative distribution forms, such as warehouse clubs, catalog sales, marketing channel specialists, and mail order, have blurred functional distinctions and increased the difficulty of defining both the distribution process and the term distributor.

One ultimately could maintain that distributors include all enterprises that sell products to retailers and other merchants—and/or to industrial, institutional, and commercial users—but do not sell in significant amounts to the ultimate customer. According to this definition, most companies that are involved with the disbursement of raw materials and finished products belong, in one sense or another, to the distribution industry. By adopting this definition, distribution is expanded to cover nearly every form of materials management and physical distribution activity performed by channel constituents, except for the processes of manufacturing and retailing.

Distribution involves a number of activities centered around a physical flow of goods and information. At one time the term distribution applied only to the outbound side of supply chain management, but it now includes both inbound and outbound. Management of the inbound flow involves these elements:

1. Material planning and control
2. Purchasing
3. Receiving
4. Physical management of materials via warehousing and storage
5. Materials handling

Management of the outbound flow involves these elements:

1. Order processing
2. Warehousing and storage
3. Finished goods management
4. Material handling and packaging

5. Shipping
6. Transportation

Distribution channels are formed to solve three critical distribution problems: functional performance, reduced complexity, and specialization.

The central focus of distribution is to increase the efficiency of time, place, and delivery utility. When demand and product availability are immediate, the producer can perform the exchange and delivery functions itself. However, as the number of producers grows and the geographical dispersion of the customer base expands, the need for both internal and external intermediaries who can facilitate the flow of products, services, and information via a distribution process increases.

Distribution management also can decrease overall channel complexity through sorting and assistance in routinization. Sorting is the group of activities associated with transforming products acquired from manufacturers into the assortments and quantities demanded in the marketplace. Routinization refers to the policies and procedures providing common goals, channel arrangements, expectations, and mechanisms to facilitate efficient transactions. David F. Ross describes sorting as including four primary functions:

1. Sorting is the function of physically separating a heterogeneous group of items into homogeneous subgroups. This includes grading and grouping individual items into an inventory lot by quality or eliminating defects from the lot.
2. Accumulating is the function of combining homogeneous stocks of products into larger groups of supply.
3. Allocation is the function of breaking down large lots of products into smaller salable units.
4. Assorting is the function of mixing similar or functionally related items into assortments to meet customer demand. For example, putting items into kit form.

As the supply chain grows more complex, costs and inefficiencies multiply in the channel. In response, some channels add or contain partners that specialize in one or more of the elements of distribution, such as exchange or warehousing. Specialization then improves the channel by increasing the velocity of goods and value-added services and reducing costs associated with selling, transportation, carrying inventory, warehousing, order processing, and credit.

DRP is a widely used and potentially powerful technique for helping outbound logistics systems manage and minimize inbound inventories. This concept extended the time-phase order point found in material requirements planning (MRP) logic to the management of channel inventory. By the 1980s DRP had become a standard approach for planning and controlling distribution logistics activities and had evolved into distribution resource planning.

DRP is usually used with an MRP system, although most DRP models are more comprehensive than stand-alone MRP models and can schedule transportation. The underlying rationale for DRP is to more accurately fore-cast demand and then use that information to develop delivery schedules. This way, distribution firms can minimize inbound inventory by using MRP in conjunction with other schedules.

One of the key elements of DRP is the DRP table, which includes the following elements:

1. Forecast demand for each stock-keeping unit (SKU)
2. Current inventory level of the SKU
3. Target safety stock
4. Recommended replenishment quantity
5. Replenishment lead time

Notes

The concept of DRP very closely mimics the logic of MRP. As with MRP, gross requirements consist of actual customer orders, forecasted demand, or some combination of both; scheduled receipts are the goods the distributor expects to receive from orders that already have been released, while goods that already are received and entered into inventory constitute the on-hand inventory balance. Subtracting scheduled receipts and on-hand inventory from gross requirements yields net requirements. Based upon the distributor's lot-sizing policy and receiving behavior, planned order receipts are generated. Firms may order only what they need for the next planning period or for a designated time period. Known as economic order quantity (EOQ), this involves a lot size based on a costing model. Alternatively, firms may be limited to multiples of a lot size simply because the supplying firm packages or palletizes their goods in standard quantities. Also, some distributors may require some time interval between the arrival of goods on their docks and the entry of the goods into the inventory system. For example, a firm may have a staging area where goods remain for an average time period while awaiting quality or quantity verification. Hence, planned order receipt may be during the planning period when the goods are needed, or they may need to be received earlier depending on time requirements. Order release is then determined by offsetting the planned order receipt by the supplier's lead time.

Did u know? The Master Production Schedule serves as the basis for all further output information from MRP.

4.8 Physical Distribution Management

There are many decisions that must be taken, when a company organizes a channel or network of intermediaries, who take responsibility for the management of goods as they move from the producer to the consumer. Each channel member must be carefully selected and the company must decide what type of relationship it seeks with each of its intermediate partners. Having established such a network, the organization must next consider how these goods can be efficiently transferred, in the physical sense, from the place of manufacture to the place of consumption. Physical distribution management (PDM) is concerned with ensuring the product is in the right place at the right time.

It is now recognized that PDM is a critical area of overall supply chain management.

Business logistical techniques can be applied to PDM so that costs and customer satisfaction are optimized. There is little point in making large savings in the cost of distribution if in the long run, sales are lost because of customer dissatisfaction.

Similarly, it does not make economic sense to provide a level of service that is not required by the customer but leads to an erosion of profits. This cost/service balance is a basic dilemma that physical distribution managers face.

The reason for the growing importance of PDM is the increasingly demanding nature of the business environment. In the past it was not uncommon for companies to hold large inventories of raw materials and components. Although industries and individual firms differ widely in their stockholding policies, nowadays, stock levels are kept to a minimum wherever possible. Holding stock is wasting working capital for it is not earning money for the company. To think of the logistical process merely in terms of transportation is much too narrow a view. Physical distribution management (PDM) is concerned with the flow of goods from the receipt of an order until the goods are delivered to the customer. In addition to transportation, PDM involves close liaison with production planning, purchasing, order processing, material control and warehousing. All these areas must be managed so that they interact efficiently with each other to provide the level of service that the customer demands and at a cost that the company can afford.

Notes

Components of PDM

There are four principal components of PDM namely; Order processing, Stock levels or inventory, Warehousing and Transportation.

Order Processing

Order processing is the first of the four stages in the logistical process. The efficiency of order processing has a direct effect on lead times. Orders are received from the sales team through the sales department. Many companies establish regular supply routes that remain relatively stable over a period of time ensuring that the supplier performs satisfactorily. Very often contracts are drawn up and repeat orders (forming part of the initial contract) are made at regular intervals during the contract period. Taken to its logical conclusion this effectively does away with ordering and leads to what is called 'partnership sourcing'. This is an agreement between the buyer and seller to supply a particular product or commodity as and when required without the necessity of negotiating a new contract every time an order is placed.

Order-processing systems should function quickly and accurately. Other departments in the company need to know as quickly as possible that an order has been placed and the customer must have rapid confirmation of the order's receipt and the precise delivery time. Even before products are manufactured and sold the level of office efficiency is a major contributor to a company's image. Incorrect 'paperwork' and slow reactions by the sales office are often the un-recognized source of ill will between buyers and sellers. When buyers review their suppliers, efficiency of order processing is an important factor in their evaluation. A good computer system for order processing allows stock levels and delivery schedules to be automatically updated so management can rapidly obtain an accurate view of the sales position. Accuracy is an important objective of order processing, as are procedures that are designed to shorten the order processing cycle.

Inventory

Inventory, or stock management, is a critical area of PDM because stock levels have a direct effect on levels of service and customer satisfaction. The optimum stock level is a function of the type of market in which the company operates. Few companies can say that they never run out of stock, but if stock-outs happen regularly then market share will be lost to more efficient competitors. The key lies in ascertaining the re-order point. Carrying stock at levels below the re-order point might ultimately mean a stock-out, whereas too high stock levels are unnecessary and expensive to maintain. Stocks represent opportunity costs that occur because of constant competition for the company's limited resources. If the company's marketing strategy requires that high stock levels be maintained, this should be justified by a profit contribution that will exceed the extra stock carrying costs.

Warehousing

Many companies function adequately with their own on-site warehouses from where goods are dispatched direct to customers. When a firm markets goods that are ordered regularly, but in small quantities, it becomes more logical to locate warehouses strategically around the country. Transportation can be carried out in bulk from the place of manufacture to respective warehouses where stocks wait ready for further distribution to the customers. This system is used by large retail chains, except that the warehouses and transportation are owned and operated for them by logistics experts. Levels of service will of course increase when number of warehouse locations increases, but cost will increase accordingly. Again, an optimum strategy must be established that reflects the desired level of service.

Notes

Transportation

Transportation usually represents the bulk of distribution cost. It is usually easy to calculate because it can be related directly to weight or numbers of units. Costs must be carefully controlled through the mode of transport selected amongst alternatives, and these must be constantly reviewed.

The patterns of retailing that have developed, and the pressure caused by low stock holding and short lead times, have made road transport indispensable. When the volume of goods being transported reaches a certain level some companies purchase their own vehicles, rather than using the services of haulage contractors. However, some large retail chains have now entrusted all their warehousing and transport to specialist logistics companies.

For some types of goods, transport by rail still has advantages. When lead-time is a less critical element of marketing effort, or when lowering transport costs is a major objective, this mode of transport becomes viable. Similarly, when goods are hazardous or bulky in relation to value, and produced in large volumes then rail transport is advantageous. Rail transport is also suitable for light goods that require speedy delivery (e.g. letter and parcel post). Except where goods are highly perishable or valuable in relation to their weight, air transport is not usually an attractive transport alternative. For long-distance overseas routes air transport is popular. Here, it has the advantage of quick delivery compared to sea transport, and without the cost of bulky and expensive packaging needed for sea transportation, as well as higher insurance costs.

The chosen transportation mode should adequately protect goods from damage in transit (a factor just mentioned makes air freight popular over longer routes as less packaging is needed than for long sea voyages). Not only do damaged goods erode profits, but frequent claims increase insurance premiums and inconvenience to customers, endangering future business.

4.9 Make-to-stock

With this strategy of manufacturing, company manufactures the products and keeps in stock or inventory before it receives the orders. Then customers could directly purchase the products from the inventory at a retail outlet or at the factory or at any of its distribution centers.

4.10 ERP for Make-to-order

Manufacturers are measured by their ability to responding quickly to the customer's changing needs and services. To compete with this, one has to choose multi mode manufacturing applications. Traditionally, two fundamental ways for the quick response to customers orders are: MTO and MTS. The response of this two to the customer's demand could be as follows:

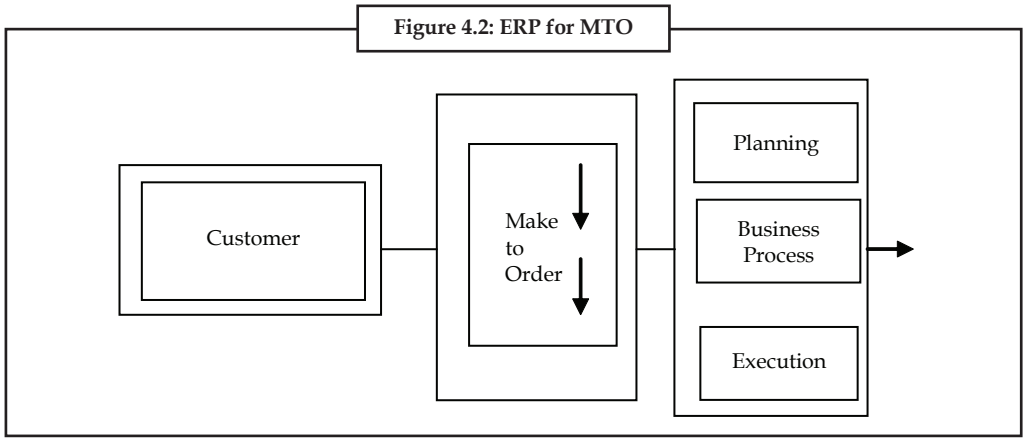
Figure 4.1: Customer's Orders with Traditional Approach

Notes

In today's competitive business environment, it is not feasible to follow a single method of order fulfillment. Mix mode manufacturing methods adapted by ERP allows more flexibility in order fulfillment process than ever before. To satisfy the lead time standards Just-in-time (JIT) delivery technique has been adapted. ERP vendors provide the freedom to change manufacturing and planning methods. The modules could be changed as and when they needs.

Computer base Database System allows information integration as well as process and procedures automation to deliver customer specific products with the lead – time and off the shelf products.

Figure 4.2: ERP for MTO



Task Is inventory really a part of PDM? How it effect organization planning.

4.11 Assemble-to-order

Assemble-to-order is a production method that occurs when an item is assembled after receipt of a customer's order. The key items used in the assembly or finishing process are planned and usually stocked in anticipation of a customer order. Receipt of an order initiates assembly of the customized product.

Assemble-to-order manufacturing companies require integrated processes and systems to quickly assemble parts and components, which will in turn enable them to finish the product on time, and deliver faster at competitive rates.

The ERP solution helps you automate your entire assemble-to-order process. You can optimally plan and produce key items used in the assembly or finishing process in anticipation of your customer orders. You can also effectively check the material and resource availability, at the moment when the sales order is created. This will help you to quote reliable delivery dates and meet deadlines.

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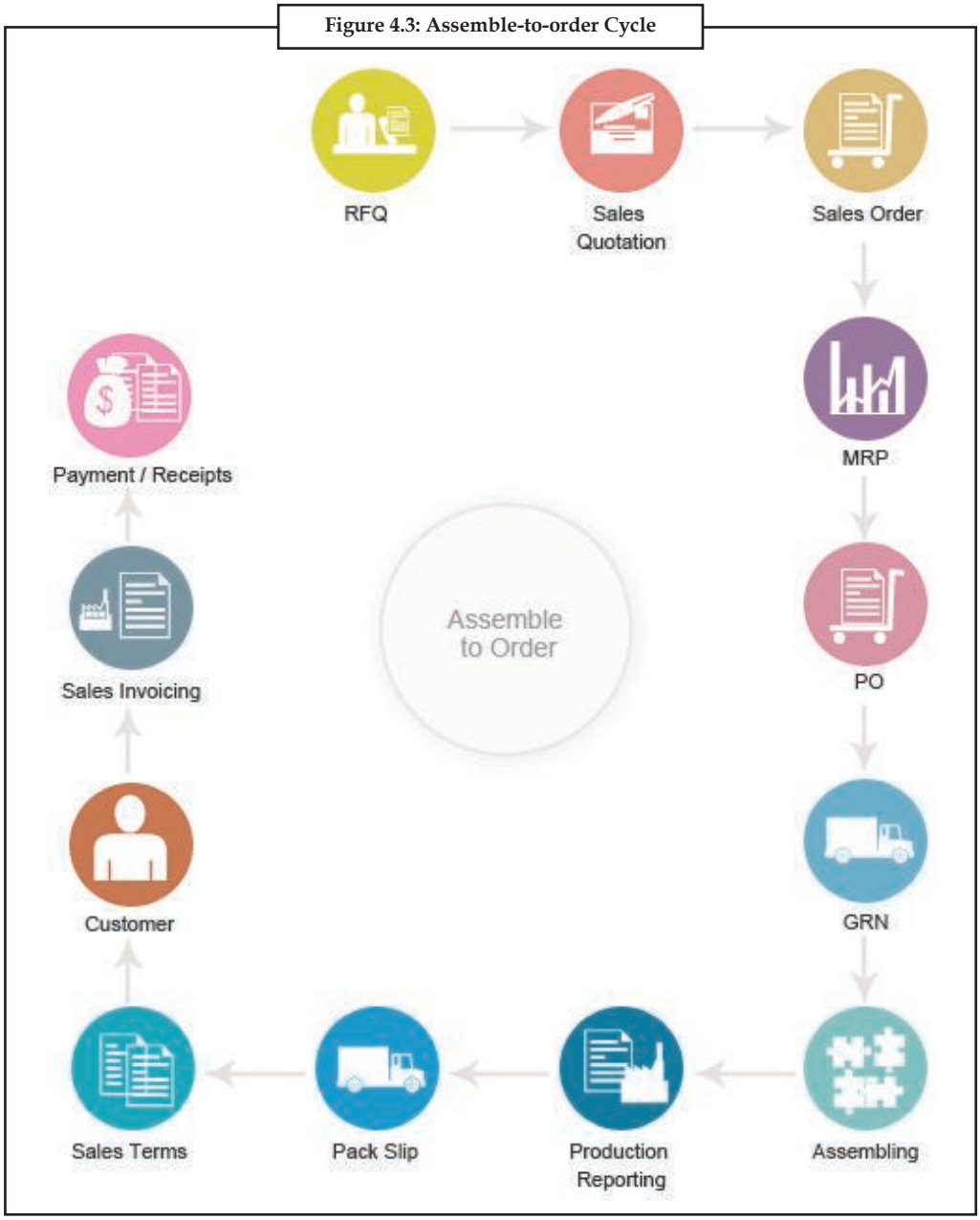
Assemble-to-Order Cycle

Figure 4.3: Assemble-to-order Cycle



4.12 Engineer-to-order

Engineer-to-order (ETO) manufacturers today, especially the ones in growth sectors such as energy and infrastructure are facing a formidable challenge. They are enjoying an increasing demand on the one hand, and are constrained by an inability to quickly increase engineering and production resources on the other. (It is also not prudent to make significant investments in new capacity because the boom might not last long enough for the investments to pay off).

Notes

Understandably reluctant to refuse orders, what ETO's are forced to compromise is delivery – lead times stretch and due-date performance plummets – which not only hurts the bottom line with excessive expediting costs and lateness penalties, but also jeopardizes customer relationships and market standing in the long run.

4.13 Configure-to-order

Configure-to-order (CTO) represents the ability for a user to define the component make-up (configuration) of a product at the very moment of ordering that product, and a vendor to subsequently build that configuration dynamically upon receipt of the order.

Configure-to-order (CTO) is a method of manufacturing which allows you, or your customer, to select a base product and configure all the variable parameters associated with that product. Based on the configurable items on each quote or order, Configure-to-Order (CTO) systems typically generate the manufacturing routing and/or bill of materials based on features and options such as color, size, etc.

Configure-to-order, or CTO, is a manufacturing technique which facilitates customers in configuring the features of a general product according to their specific requirements at the time an order is placed. Providing customized goods presents manufacturers and vendors with a unique advantage to stay ahead of the competition. The CTO product or service is assembled or provided after the order is confirmed by the buyer.

The CTO process is a highly critical one as it requires great expertise to cater to personal demands and provide complete customer satisfaction. The processes and applications are extremely complex and can affect business functions such as customer service, supply chain management, bills and order accomplishment. The vendors who provide CTO services have to ensure that their solutions and services display comprehensive and cutting-edge capabilities that can handle the movement of materials in the supply chain.

An expert CTO service provider has deep knowledge of the latest processes and applications pertinent to the CTO environment. They can easily integrate the processes with other important business functions. Their services can handle low-volume-high mix through high-volume-low-mix orders. The solutions help customers to configure desired products through websites also. The designing team and technicians work based upon the specifications of the design as ordered by customers. Then software tools are introduced for the customer to implement the design. The CTO providers also have to ensure that customers are provided with regular updates on the status with real-time information.

Web-based solutions help customers with order processing and quotation functions by enabling self-service requests. They also maintain the pricing and configuration roles. These tools allow customers to create and test configurations online as well as execute an easy and simplified ordering process. It is a well-invented model with extensive operational qualities that cater to mass customization while maintaining deadlines. Those providing CTO services are professionals with commendable experience in configuring, testing and debugging abilities for many different products, such as PCs, servers, switches, hubs, video, peripherals, voice, imaging products, parts and accessories.

Task Take a real life example and apply assemble-to-order cycle in this example. (like "Preparation of McDonald's Burger")

Notes

Case Study

MIS & Security

Retailers turn to smart carts:

The retail industry is going through an extraordinary metamorphosis as transactions are increasingly supported by a wide variety of digital technologies. The previous chapters provided many examples of businesses expanding to the Web to reach more customers. New forms of transaction data collection are also evident in brick-and-mortar stores. For example, consider the rapidly expanding number of self-service checkout systems in popular grocery stores, department stores, super discount stores, home warehouse stores, and even fast food restaurants.

Fujitsu calls it the Pervasive Retailing Environment: the use of digital technologies to integrate wired and wireless network devices to facilitate transactions in retail stores.

Self-serve check-outs are only the tip of the iceberg. Soon customers will have access to product information from any location in the store through devices like Fujitsu's U-Scan Shopper. Mounted on a shopping cart, the U-Scan Shopper is a rugged wireless computer with an integral bar code scanner. The device provides services to shoppers as well as retailer.

The device reduces checkout time by allowing customers to scan and bag items themselves as they pick them off the selves. Shoppers can view the running total to see exactly how much is being spent as they shop. No more surprises at the checkout counter. If an item is missing a price, the device can be used as a price-checker. Consumers can also use the U-Scan Shopper to place orders with departments in the store for pickup.

You can place a deli or prescription order when you arrive at the store and pick it up at the deli counter or pharmacy. The U-Scan Shopper also provides a store directory so you can easily find the department or goods you want.

U-Scan devices are integrated into the store network and internet. This means customers can upload a shopping list to the store's Web site before leaving home, and then download the list to the shopping cart upon arriving at the store. When shopping is completed, the U-Scan device uploads information to the self-serve checkout and the shopper is out the door after a quick swipe of a debit or credit card.

For retailers, the U-Scan device offers what Fujitsu calls "true 1:1 marketing" the enables personalized in-store advertisements campaigns that are relevant both to shoppers' preferences and to their location in the store. Location is determined by shelf-mounted, battery-powered infrared transmitters that track the movement of U-Scan devices through the store. As a shopper passes the condiments aisle, for example, the shopping cart display might post a message stating. "It has been over a month since you purchased mustard. If you want to pick some up today, turn down this aisle." A retailer can offer special deals to each consumer. For example, as a shopper passes the condiments aisle, message on the U-Scan device might state, "You have just won an electronic coupon for $0.89 off mustard. Turn now to take advantage of this special deal!" The 89 cents would be deducted as the item is scanned on the U-Scan device.

Questions

1. What transaction processing services does the U-Scan Shopper provide for consumers?
2. How does U-Scan technology provide retailers with a competitive advantage? Why might you choose a U-Scan store over one without U-Scan devices?

Notes

4.14 Summary

- You note that the future organizations would be facing a shortage and a redundancy of information.
- To solve the problems of "information-glut" arising from the evermore affordable information and communication technologies that provide for evermore high-capacity, fast, long-distance transmission, organizations would need to introduce methods for "selective dispersion of information" to their various parts.
- Work tasks would be grouped in organizational units created around a common program for information processing.
- Improvements in telecommunications will make it easier to control (which will be primarily a matter of information exchange) organizational units dispersed over different parts of the world. Advances in telecommunications (such as videophone), coupled with diminishing costs, would result in increased distance-communication.

4.15 Keywords

Database: A collection of related data that can be retrieved easily and processed by computers; a collection of data tables.

Information: Data that has been processed, organized, and integrated to provide insight. The distinction between data and information is that information carries meaning and is used to make decisions.

Management information system (MIS): An MIS consists of five related components: hardware, software, people, procedures, and databases. The goal of management information systems is to enable managers to make better decisions by providing quality information.

4.16 Self Assessment

Fill in the blanks:

1. ..... is a group of people working together with a common goal, which has resources at its disposal to achieve that goal.
2. With ..... all internal / external information and functions working in isolated form and have their own information systems of data collection and analysis.
3. The information integration provide to meet the ..... ERP helps the top management at various levels of enterprise.
4. A good business model represents the ..... of the business.
5. The ..... reflect the day – to – day transaction of the entire organization and can give a snapshot of the organization at any given time.
6. Manufacturers are measured by their ability to responding quickly to the customer's .....

State whether the following statements are true or false:

7. ERP is nothing but total business solution.
8. ERP packages specify the best configuration for the business.
9. ERP helps the top management at various levels of enterprise.
10. ERP vendor doesn't provide the freedom to change manufacturing and planning methods.

Notes

4.17 Review Questions

1. Explain computer-integrated manufacturing.
2. What do you mean by computer-aided design?
3. Describe various applications of CAM.
4. Describe material requirement planning.
5. Differentiate between MRP-I and MRP-II
6. What do you mean by bill of material?
7. Explain distribution requirement planning.
8. What are the different components of PDM? Describe
9. Describe configure-to-order concept.
10. Write short note on:
    (a) ETO
    (b) MTO
    (c) MTS
    (d) ATO

Answers: Self Assessment

1. An organization
2. MIS approach
3. goal of common objective
4. actual mirror image
5. data model
6. changing needs and services
7. True
8. True
9. True
10. False

4.18 Further Readings

Books

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Notes

Unit 5: ERP Modules

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Objectives

After studying this unit, you will be able to:

- Discuss the modules of ERP
- Explain the finance module and plant maintenance module
- State the need for quality management
- Describe the material management module of ERP

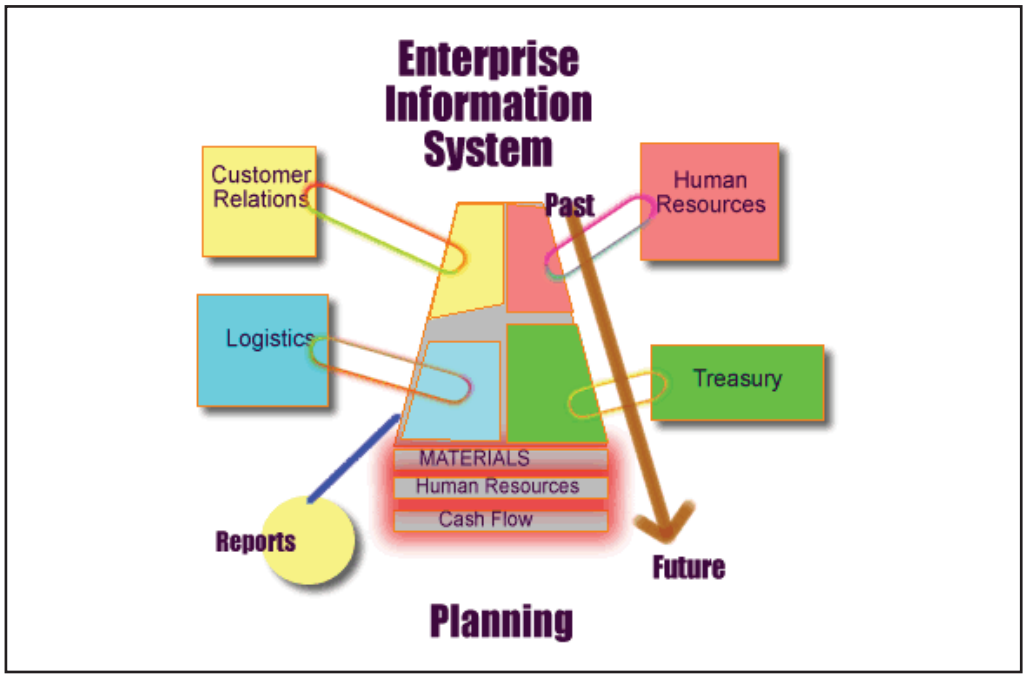
Introduction

Today, more and more organizations are using the ERP system in order to improve their business transactions. A company can have various kinds of data that is scattered; ERP integrates this information and store on a single central database. To achieve the high performance ERP packages contain many modules. Each ERP package has its own features and benefits. The modules like finance module, plant maintenance, quality management, material management etc. are some common modules available with all ERP packages.

Notes

5.1 Modules of ERP

An ERP system consists of a variety of functions that are linked together. The various modules of an ERP system include financial system include financial accounting, controlling, asset accounting, materials management, production planning for discrete as well as for process manufacturing, quality management, plant maintenance, sales and distribution, human resource management, project management. Although ERP features vary from application, the typical ERP functionality covers the following core enterprise functions and the associated sample modules.



5.1.1 Functional Modules of ERP Software

ERP software is made up of many software modules. Each ERP software module mimics a major functional area of an organization. Common ERP modules include modules for product planning, parts and material purchasing, inventory control, product distribution, order tracking, finance, accounting, marketing, and HR. Organizations often selectively implement the ERP modules that are both economically and technically feasible.

5.1.2 Manufacturing and Logistics Modules

It consists of a group of applications for planning production, taking orders and delivering products to the customer.

Production Planning: Performs capacity planning and creates a daily production schedule for a company's manufacturing plant.

Materials Management: Controls purchasing of raw materials needed to manufacture products,

The main sub-system of material management modules are:

1. Pre purchasing activities
2. Purchasing
3. Vendor evaluation

Notes

4. Inventory management
5. Invoice verification and material inspection

1. ***Pre Purchasing Activities:*** It specially includes items with services and items with materials. For this data and manual entry efforts are reduced to minimum. The entering service specification may be planned and unplanned.

   Planned service specification means that services whose precise nature and intended scope are already known at beginning of procurement project.

   Unplanned service specifications are service, which are not defined initially. A procurement project may include number of individual services, which can not or do not wish specify in detail is having unplanned service specification.

2. ***Purchasing:*** The system performs the functions like procurement of materials and services, determination of possible sources of supply for requirement identified by the materials planning and control systems or arising directly within a user dept monitoring of deliveries and payments of vendors etc.

3. ***Vendor Evaluation:*** This system also offers the users a point based evaluation system. This evaluation is based on certain selection criteria the performance of vendor is measured eg price, quality, delivery, support, replacement of returns, lead times etc. The scores are computed automatically with the help of predefined criteria.

4. ***Inventory Management:*** Inventory management is not only related to the stock but also handles goods movement and maintaining information pertaining to this like

   (a) Stock value for inventory management

   (b) Account assignment for cost accounting

   (c) Corresponding G/L accounts for financial accounting via automatic account assignment

5. ***Invoice Verification and Material Inspection:***

   (a) Starts with purchase requisition, continues with purchasing and goods receipt and ends with invoice receipt.

   (b) It allows invoices that do not originate in materials procurement to be processed e.g. on line buying

   (c) It permitted credit memos to be processed, either as invoice cancellation and discounts

Sales and distribution: Tracks activities from the receipt of a request for qualification to billing and shipping the products.

Order entry and processing: Automates the data entry process of customer orders and keep track of the status of orders.

Warehouse management: Maintains records of warehoused goods and process movement of products through warehouse.

Transportation management: Arranges, schedules and monitors delivery of products to customers by trucks, trains and other vehicles.

Project management: Monitors costs and works schedules on a project by project basis.

Plant maintenance: Sets plans and oversees the upkeep of internal facilities.

Customer service management: Administers installed base service agreements and checks contracts and warranties when customers call for help.

Notes

5.2 Finance Module

The accounting and finance module is divided into four main parts.

1. General Ledger
2. Accounts Receivable
3. Accounts Payable
4. Asset Accounting

General Ledger

The central task of G/L accounting is to provide a comprehensive picture of external accounting and accounts. Recording all business transactions (primary postings as well as settlements from internal accounting) in a software system that is fully integrated with all the other operational areas of a company ensures that the accounting data is always complete and accurate.

The ERP FI General Ledger has the following features:

1. Free choice of level: corporate group or company
2. Automatic and simultaneous posting of all sub-ledger items in the appropriate general ledger accounts (reconciliation accounts)
3. Simultaneous updating of general ledger and cost accounting areas
4. Real-time evaluation of and reporting on current accounting data, in the form of account displays, financial statements with different balance sheet versions and additional analyses.

Essentially, the general ledger serves as a complete record of all business transactions. It is the centralized, up-to-date reference for the rendering of accounts. Actual individual transactions can be checked at any time in real-time processing by displaying the original documents, line items and monthly debits and credits at various levels such as:

1. Account
2. Journals
3. Summary of monthly debits and credits (balances)
4. Balance sheet/profit and loss evaluations

Accounts Payable

Records and administers accounting data for all vendors. It is also an integral part of purchasing, where deliveries and invoices are recorded based on each vendor. The system automatically makes postings to the FI component in response to these transactions. In the same way, the system supplies the Cash Management application component with figures from invoices in order to optimize liquidity planning.

Outstanding payables are settled by the payment program, which supports all standard payment methods (checks, transfers, and so on), in printed form as well as in electronic form (data medium exchange on diskette and electronic data interchange). Payment methods specific to different countries are also covered by this program. If necessary, you can create dunning notices for outstanding receivables (for example, to receive payment for credit memos). This function is supported by the dunning program.

Postings made in Accounts Payable are simultaneously recorded in the General Ledger where different G/L accounts are updated based on the transaction involved (payables, down payments and so on). To help you keep track of open items, there are due date forecasts and other standard reports that you can carry out.

Notes

You can design balance confirmations, account statements and other forms of reports to suit your requirements in business correspondence with vendors. There are balance lists, journals, balance audit trails and other internal evaluations available for documenting transactions in Accounts Payable.

Accounts Receivable

Records and administers the accounting data of customers. It is also an integral part of sales management.

All postings in Accounts Receivable are also recorded directly in the General Ledger. Different G/L accounts are posted depending on the transaction involved (for example, receivables, down payments, bills of exchange and so on). The system contains a range of tools that you can use to monitor open items; for example, account analyses, alarm reports, due date lists and a flexible dunning program. The printed material linked to these tools can be individually formulated to suit your requirements. This is also the case for payment notices, balance confirmations, account statements and interest calculations. Incoming payments can be allocated to due receivables using user-friendly screen functions or by electronic means such as EDI and data communication. The payment program can automatically carry out direct debiting and down payments.

There are a range of tools available for documenting the transactions which occur in accounts receivable, including balance lists, journals, balance audit trails and other standard reports. When drawing up financial statements, the items in foreign currency are revalued, customers who are also vendors are listed, and the balances on the accounts are sorted by remaining life.

Not only is accounts receivable one of the branches of accounting that forms the basis of adequate and orderly accounting, it also provides (thanks to its close integration with the Sales and Distribution component) the data required for effective credit management, as well as (through its link to Cash Management) information important for the optimization of liquidity planning.

Asset Accounting

The Asset Accounting (FI-AA) component is used for managing and supervising fixed assets with ERP System. In ERP Financial Accounting, it serves as a subsidiary ledger to the FI General Ledger, providing detailed information on transactions involving fixed assets.

As a result of the integration in the ERP System, FI-AA transfers data directly to and from other systems. For example, it is possible to post from the Materials Management (MM) component directly to FI-AA. When an asset is purchased or produced in-house, you can directly post the invoice receipt or goods receipt, or the withdrawal from the warehouse, to assets in FI-AA. At the same time, you can pass on depreciation and interest directly to Financial Accounting (FI) and Cost Accounting (CO). From the Plant Maintenance (PM) component, you can settle maintenance activities that require capitalization to assets

The FI-AA component consists of the following parts:

1. Traditional asset accounting
2. Leased assets
3. Preparation for consolidation
4. Information system

Traditional asset accounting encompasses the entire lifetime of the asset from purchase order or the initial acquisition (possibly managed as an asset under construction) through its retirement. The system calculates, to a large extent automatically, the values for depreciation, interest, insurance and other purposes between these two points in time, and places this information at your disposal in a varied form using the Information System. There is a report for depreciation forecasting and simulation of the development of asset values.

Notes

The system also offers special functions for leased assets, and assets under construction. The system enables you to manage values in parallel currencies using different types of valuation. These features simplify the process of preparing for the consolidation of multinational group concerns.

5.3 Controlling

This module consists of:

1. Overhead cost controlling
2. Product cost controlling

Overhead Cost Controlling

Overhead costs are indirect costs that cannot be directly assigned to cost objects. Overhead Cost Controlling component enables you to plan, allocate, control, and monitor overhead costs.

Planning in the overhead area lets you specify standards which enable you to control costs and evaluate internal activities.

All overhead costs are assigned to the cost centers where they were incurred, or to the jobs which led to their being incurred. The ERP system provides you with many methods for the further allocation of overhead. Using these methods you can allocate the overhead costs true to their origins. Some of the overheads can be assigned to cost objects with minimum effort and converted to direct costs.

At the end of a posting period, when all allocations have been made, the plan (target) costs are compared with the corresponding actual costs on the basis of the operating rate. You can analyze the resulting target/actual variances by cause and use the analyses for further managerial accounting measures within controlling.

Product Cost Controlling

Product Cost Planning is an area within Product Cost Controlling in which you can plan the non-order related costs of, and determine the prices for, materials and other cost accounting objects. Product Cost Planning comprises the following:

1. Cost Estimate with Quantity Structure
2. Cost Estimate without Quantity Structure
3. Reference and Simulation Costing
4. Price Update

Enterprise Controlling

The ERP System's EC (Enterprise Controlling) application has been designed with four subcomponents to account for these various aspects and organizational options.

Profit Center Accounting

Profit center accounting creates a company organization which is distinct from all other organizational concepts. Profit centers are master data from a management perspective. To avoid additional entries, the corresponding allocations can be effected in the operational systems (for example, material, project, cost center). Profits and losses are determined for these profit centers (valuation with transfer prices) as well as the key figures for responsibility accounting (ROI, cash flow, and so forth). For the latter, some balance sheet items must be available for each profit center.

Notes

Consolidation

This subcomponent consists of general consolidation functions. These functions are for external as well as for internal reporting. Integrated application areas are not only consolidated financial statements on the group level as required by law but also business area consolidation, profit center consolidation or consolidation based on group-wide profitability analysis by product line. The advantages lie in a rule-based reconciliation between external and internal consolidation values.

Executive Information System

ERP-EIS makes it possible to define company-specific data structures which are oriented toward multidimensional evaluation views. Data acquisition programs are available for most of the ERP components and for many R/2 components. Data can also be transferred from non-ERP applications. Many functions are available to process this data into a consistent, uniform whole. A graphical interface is available for presentations, particularly for management. Hierarchical processing and elimination functions make simple consolidation functions possible.

5.4 Plant Maintenance

The achievement of world-class performance demands delivery of quality products expeditiously and economically. Organizations simply cannot achieve excellence with unreliable equipment. The attitude towards maintenance management has changed as a result of quick response manufacturing, "just-in-time" reduction of work-in-progress inventory, and the elimination of wasteful manufacturing practices. Machine breakdown and idle time for repair was once an accepted practice. Times have changed. Today when a machine breaks down, it can shut down the production line and the customer's entire plant.

The plant maintenance module provides an integrated solution for supporting the operational needs of an enterprise-wide system. The module includes an entire family of products covering all aspects of plant/equipment maintenance and becomes integral to the achievement of process improvement.

Plant maintenance supports various options for structuring technical systems with its object, type and function-related views, and enables flexible navigation. Data concerning the planning, processing and history of maintenance tasks is documented in the system and complies with business verification requirements. You can use the catalog feature of the plant maintenance system to define causes, activities and maintenance tasks. All maintenance tasks such as inspection, servicing and repair activities are saved in a historical database. In addition to standard indicators, diverse analysis options are also available in many systems for evaluating this data.

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

1. Preventive maintenance control
2. Equipment tracking
3. Component tracking
4. Plant maintenance calibration tracking
5. Plant maintenance warranty claims tracking

Notes

Table 5.1: Various ERP Modules and the Sub-systems as given in ERP by Milind Oka

Sales and Marketing	**Project**
Forecasting	Project Definition
Demand Management	Project Budgeting and Estimation
Quotations and Proposals	Network planning
Sales Order processing	Project Monitoring and Control
Shipping	Project Requirements Planning
Despatch and Billing	
Sales Analysis	

Service	**Materials**
Contract Control	Inventory Management
Installation Control	Materials Accounting
Warranty Operations	Materials Requirement Planning
Service Control	Purchasing
Service Analysis	Vendor Development and Evaluation
	Sub Contracting
	Contract Control

Distribution & Transportation	**Quality**
Distribution resource Planning	Inward Quality Assurance
Electronic Data Interchange	Outward Quality assurance
Inventory tracking and control	Statistical Quality Control
Invoicing	Calibration
Transport Fleet Management	Test and Measuring Instruments
	Test Records

Finance and Accounting	**Manufacturing**
General Ledger	Capacity Requirement Planning
Accounts Payable	Master Production Scheduling
Accounts Receivables	Production Planning and Control
Management Accounting	Plant Operations
Fixed Assets Management	Process and Shop Floor Management
Cost Control	Tool Management
Cost Management	Routing and Work Order
Statutory Costing	Bills of Material
Legal Consolidation	Engineering Changes Management
Financial reporting	Work in Progress
Budgetary control	Product Definition
Cash Flow Management	Product Configuration
Investment Management	
Treasury Management	
Funds Management	

Human Resource	**Plant Maintenance**
Human Resource Information	Equipment
Skills Set Available	Maintenance Operations
Development and Training	Planning and Execution
Payroll	Calibration
	Maintenance Stores Management
	Maintenance Control

Notes

Task Suppose you are the account manager of retail showroom (e.g. Big Bazar) discuss how EPR provide help to you for manager account system.

5.5 Quality Management

The Quality management area facilitates the establishment and execution of business quality. In today's global marketplace, quality management and quality assurance ideals are now the requirements of doing business rather than elective efforts left to the choice of a business. In ERP, quality management is based on the driving standards first set forth by the ISO 9000 series of quality measures and business certification.

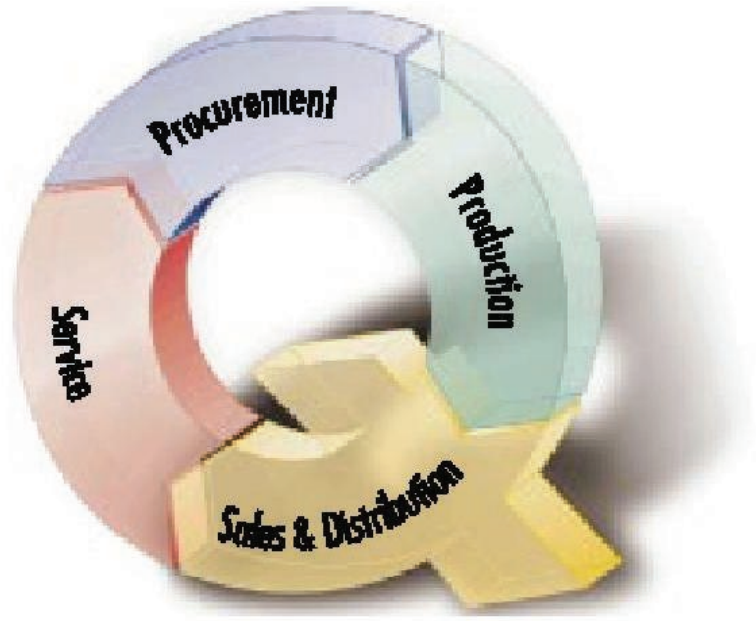
ERP's Quality Management module has been built to automate ISO compliance. By ISO Standards, Quality management must be applied to all areas of a business – not just production but internal company management and business processes as well. Therefore elements of quality management can be found throughout the different modules. QM module exists as a central control point to establish, track, and maintain quality measurements and analyses throughout the ERP business architecture.

In ERP, the QM module manages the following key aspects of business quality management:

Material Management: Vendor evaluation, goods receipt evaluations, material inspection result management, provision of inspection data to the procurement team.

Production: Inspection planning and work scheduling, inspection activities within production activities, production quality monitoring, surfacing of problems in production areas.

Figure 5.1: Integration of QM



Sales & Distribution: Inspection upon creation of delivery orders, proof of quality for approved deliveries, surfacing of problems in order fulfillment.

Notes

Accounting: Surfacing of costs associated with quality management actions.

In relation to the activities directly related to the act of monitoring quality management, ERP also provides the following functions:

Quality Planning: Creation of plans to manage various quality inspection procedures.

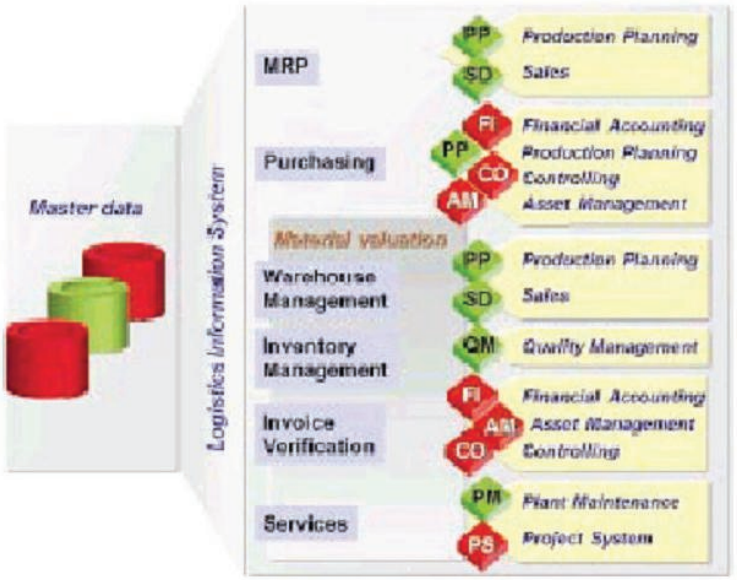
Quality Inspection: Scheduling of quality inspection activities, generate documents resulting from inspections, collect and analyze quality data, suggest corrective or follow up measures.

Quality Controls: Establish benchmark quality standards and sample groups of information, generate statistical tools to monitor and evaluate quality compliance, development of corrective task plans.

5.6 Production Planning and Material Management

This function is used for entering planning data related to the entire organization. Model-supported simulations can be carried out based on this planning data as well as on actual data. The resulting company planning data can be provided to the company units as performance targets. Integration of the operational ERP applications permits group-wide investment controlling with investment programs and budgeting, investment monitoring of ongoing measures, and depreciation simulation.

Figure 5.2: Materials Management



5.6.1 Materials Management

Purchasing

Purchasing is a component of Materials Management (MM). The MM module is fully integrated with other modules in the ERP System. It supports all phases of materials management: materials planning and control, purchasing, goods receiving, inventory management, and invoice verification.

Notes

The Purchasing component has the following tasks:

1. External procurement of materials and services
2. Determination of possible sources of supply for a requirement identified by the materials planning and control system or arising directly within a user department
3. Monitoring of deliveries and payments to vendors

Good communication between all participants in the procurement process is necessary for Purchasing to function smoothly.

Purchasing communicates with other modules in the ERP System to ensure a constant flow of information. For example, it works side by side with the following modules:

Controlling (CO)

The interface to the cost accounting system (Controlling) can be seen above all in the case of purchase orders for materials intended for direct consumption and for services, since these can be directly assigned to a cost center or a production order.

Financial Accounting (FI)

Purchasing maintains data on the vendors that are defined in the system jointly with Financial Accounting. Information on each vendor is stored in a vendor master record, which contains both accounting and procurement information. The vendor master record represents the creditor account in financial accounting.

Through PO account assignment, Purchasing can also specify which G/L accounts are to be charged in the financial accounting system.

Sales and Distribution (SD)

Within the framework of materials planning and control, a requirement that has arisen in the Sales area can be passed on to Purchasing. In addition, when a requisition is created, it can be directly assigned to a sales order.

Inventory Management

ERP's Inventory Management system allows you to:

1. Manage your stocks on a quantity and value basis
2. Planning, Entry, and Proof of Goods Movements
3. Carrying Out the Physical Inventory

1. ***Managing Stocks by Quantity:*** In the Inventory Management system, the physical stocks reflect all transactions resulting in a change in stock and thus in updated inventory levels. The user can easily obtain an overview of the current stocks of any given material. For each material, not only the stocks in the warehouse are shown, but also the stocks ordered but not yet delivered, reserved for production or for a customer, and the stocks in quality inspection can be monitored. For example, if a further subdivision by lots is required for a material, one batch per lot is possible. These batches are then managed individually in the stock. Special stocks from the vendor or from the customer (for example, consignment stocks) are managed separately from your company's own stock. This guide discusses the various stock types used in the ERP System and how the corresponding stocks vary due to goods movements.

Notes

2. ***Managing Stocks by Value:*** The stocks are managed not only on a quantity basis but also by value - a prerequisite for cost accounting. With every goods movement, the following values are updated:

   (a) The stock value for inventory management

   (b) The account assignment for cost accounting

   (c) The corresponding G/L accounts for financial accounting via automatic account assignment

   Both the quantity and the value are updated automatically when entering a goods movement.

   This mainly deals with monitoring inventories by quantity.

3. ***Planning, Entry, and Proof of Goods Movements:*** Goods movements include both "external" movements (goods receipts from external procurement, goods issues for sales orders) and "internal" movements (goods receipts from production, withdrawals of material for internal purposes, stock transfers, and transfer postings).

   For each goods movement a document is created which is used by the system to update quantities and values and serves as proof of goods movements. Goods receipt/issue slips are printed to facilitate physical movements and the monitoring of the individual stocks in the warehouse.

This focuses on planning and entering all types of goods movements.

Physical Inventory

The adjustment between the physical stocks and the book inventories can be carried out independently of the physical inventory method selected.

The ERP System supports the following physical inventory methods:

1. Periodic Inventory
2. Inventory Sampling
3. Cycle-Counting

5.6.2 Inventory Management and Warehouse Management

The Inventory Management system can be extended by the Warehouse Management system (WM) which manages storage bins in complex warehouse structures.

While Inventory Management manages the stocks by quantity and value, the Warehouse Management component does even more by reflecting the special structure of a warehouse, monitoring the allocation of the storage bins and any transfer transactions in the warehouse via completion confirmation procedures.

Invoice Verification

The Invoice Verification component is part of the Materials Management (MM) system. It provides the link between the Materials Management component and the Financial Accounting, Controlling, and Asset Accounting components.

Notes

Invoice Verification in Materials Management serves the following purposes:

1. It completes the materials procurement process - which starts with the purchase requisition, continues with purchasing and goods receipt and ends with the invoice receipt. It allows invoices that do not originate in materials procurement (for example, services, expenses, course costs, etc.) to be processed.

2. It allows credit memos to be processed, either as invoice cancellations or discounts. Invoice Verification does not handle the payment or the analysis of invoices. The information required for these processes are passed on to other departments.

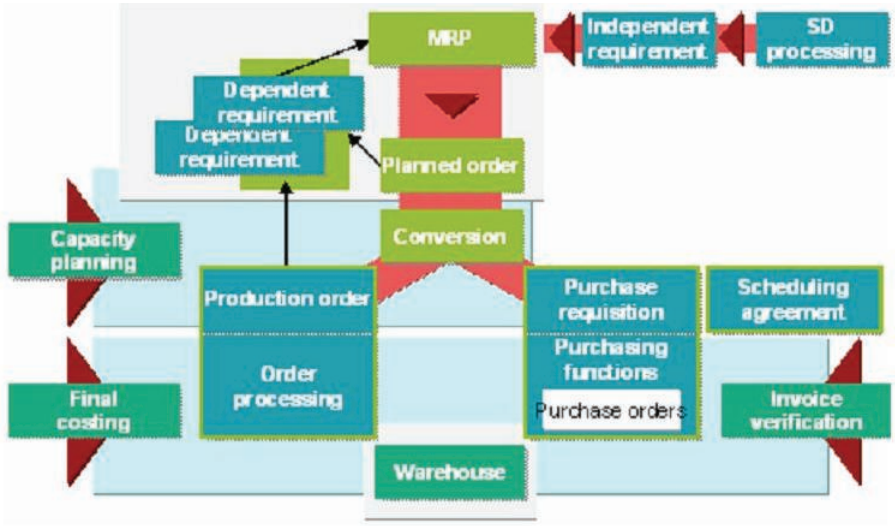
Invoice Verification Tasks include:

Entering invoices and credit memos that have been received. Checking the accuracy of invoices with respect to contents, prices, and arithmetic. Executing the account postings resulting from an invoice. Updating certain data in the ERP system, for example, open items and material prices. Checking invoices that were blocked because they varied too greatly from the purchase order. The high degree of integration in the ERP system allows these tasks to be carried out smoothly and efficiently.

5.6.3 Production Planning

This area is used to manage the planning activities that enable a factory to project and execute plans that reflect product and service deliveries. The production functionality allows for the control and manipulation of factory resources in regard to materials capacity, shop floor capacity and personnel capacity – all elements essential to producing materials and services.

Figure 5.3: Production Planning



Following are the definitions of the key elements you will find in the production.

Master Data: Master data plays an important role in each functional area and contributes to effective integration. Master data in the production area centers on information that further defines the material master as well as provides critical master data that specifies bills of material, production work centers, process routing methods and engineering change management. A planning team is typically responsible for the activities in this area.

Notes

Master Planning: Here you will find additional materials forecasting, demand management, long-term planning and master Production Schedule development. This sort of activity is to be managed by a factory planning team.

MRP (Materials Requirement Planning): From an overall factory planning perspective, this is where all demand, supply and resources are pooled and a total factory plan is developed to drive the different areas responsible for supporting a company's product or service delivery throughput. This area is typically driven by a planning team, but procurement teams can sometimes provide analysis and input into the results of this business area's activity.

Repetitive Manufacturing: The production submenu provides for the control and maintenance of production. Other methods are available, which help factories work with the production methods that best meet their needs.

Task Should ERP provide help for calculating inventory cost occurred in any manufacturing firm.

Case Study

Building Information Systems at the Wireless Café

Barbara and Jeremy have done some serious economic justification of the myriad technologies that could benefit their business, and they have chosen CRM as the top priority. They feel that they have grown to a point where they will need a full-time project manager to oversee the acquisition and implementation of the CRM, and they have asked you to describe how you would proceed on this project. At the start of your intership, you were hopeful it might lead to a full-time job offer after graduation, so you see this as your opportunity to impress Barbara and Jeremy with your business education and your systems expertise.

Questions

1. Propose a systems development life cycle for implementing a CRM at the Wireless Cafe (TWC). Consider methodologies that are well-suited to rapid development of Web-based applications.
2. Once a CRM system is identified, should its implementation be outsourced? Assuming you do decide to outsource the entire implementation of the selected CRM, how would you manage the outsourcer to make sure the implementation is successful?
3. As TWC expands its utilization of IT, the concept of an application service provider becomes increasingly attractive. What are some risks and benefits to a small business of using an ASP for major applications?

5.7 Summary

- 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.

Notes

- Entrepreneurs or managers combine resources like land, labor and capital in different ways to produce goods or services.
- Enterprise Resource Planning can be configured depending on the business requirements of the organization.
- This project contains the implementation of the following modules of ERP.
  - Finance
  - Controlling
  - Materials Management
  - Production Planning
  - Quality Management
  - Sales and Distribution
  - Project System

5.8 Keywords

Accounting Systems: Information systems that record and report business transactions, the flow of funds through an organization, and produce financial statements. This provides information for the planning and control of business operations, as well as for legal and historical record-keeping.

Computer-aided Manufacturing: The use of computers to automate the production process and operations of a manufacturing plant. Also called factory automation.

Cross-functional Integrated Systems: Information systems that are integrated combinations of business information resources across the functional units of an organization.

E-business: e-business is the use of the Internet and other networks and information technologies to support electronic commerce, enterprise communications and collaboration, and web-enabled business processes both within an internetworked enterprise, and with its customers and business partners.

Manufacturing Systems: Information systems that support the planning, control, and accomplishment of manufacturing processes. This includes concepts such as computer-integrated manufacturing (CIM) and technologies such as computer-aided manufacturing (CAM) or computer-aided design (CAD).

Marketing Systems: Information systems that support the planning, control, and transaction processing required for the accomplishment of marketing activities, such as sales management, advertising and promotion.

Online Transaction Processing Systems: A real-time transaction processing system.

Real-time Processing: Data processing in which data is processed immediately rather than periodically. Also called online processing.

Transaction Processing Cycle: A cycle of basic transaction processing activities including data entry, transaction processing, database maintenance, document and report generation, and inquiry processing.

Notes

5.9 Self Assessment

Fill in the blanks:

1. Organizations often selectively implement the ERP modules that are both ..... feasible.
2. ..... could produce the information in the form of reports useful in making strategic decisions.
3. ..... is widely implemented ERP module.
4. ..... means meeting customer's requirements for a product or service
5. ..... finance and accounting module facilitates the collection of all financial data required to prepare financial statements.

State whether the following statements are true or false:

6. The financial module is the core of many ERP software systems.
7. The purpose of asset accounting is not to manage assets of organization.
8. Legal consideration subsystem is fully integrated and linked to the financial.
9. Project management-monitors costs and works schedules on a project by project basis.
10. The plant maintenance module do not provides an integrated solution for supporting the operational needs of an enterprise-wide system.

5.10 Review Questions

1. What are the popular modules in an ERP system?
2. State and explain any four subsystems of the financial module.
3. Discuss. The plant maintenance module help in achieving competitiveness.
4. Explain material management system (in brief).
5. What are the different functions of quality management module?
6. How manufacturing module help respond to customers? Explain any three points.
7. Explain plant maintenance. Which sub-module should be incorporated into plant maintenance module?
8. What is quality management and computer integrated quality management?
9. Explain the relevance of treasury sub module in finance module.
10. Explain general ledgers in detail.
11. Explain investment management module.
12. Discuss the sales order management process.
13. Explain the personnel management system of HR.
14. Describe the pre-purchasing and purchasing activities of material management.
15. Explain financial accounting module.

Notes

16. Discuss the purchase order management system.
17. Explain the major subsystems of plant maintenance module.
18. Describe the function of Material management.
19. Explain any two subsystems under the HR module.
20. Explain Quality Management Module and CIQ.

Answers: Self Assessment

1. economically and technically
2. General ledger
3. HR (Human Resources)
4. Better customer satisfaction
5. SAP
6. True
7. False
8. True
9. True
10. False

5.11 Further Readings

Books

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Unit 6: ERP Benefits

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Objectives

After studying this unit, you will be able to:

- State the benefits of ERP
- Realise how to bring about reduction in cycle time and lead time
- Identify how resource utilization is improved
- Explain how supplier performance is improved

Introduction

Interactions between manufacturing and marketing departments often determine the competitiveness and profitability of a firm. Enterprise resource planning (ERP) systems address integration issues of business functions; and benefits contributed by ERP implementation found in the literature are similar to those achieved through the integration of manufacturing and marketing functions.

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6.1 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.

Figure 6.1 taken from a survey conducted by Deloitte Consulting shows the major quantifiable (tangible) benefits of an ERP system. The respondents who participated in the survey were asked to check the tangible benefits of the ERP systems from a set of benefits. Most respondents felt that inventory reduction was the main benefits, followed by personnel reduction and productivity improvements.

Figure 6.1: Tangible Benefits of EPR

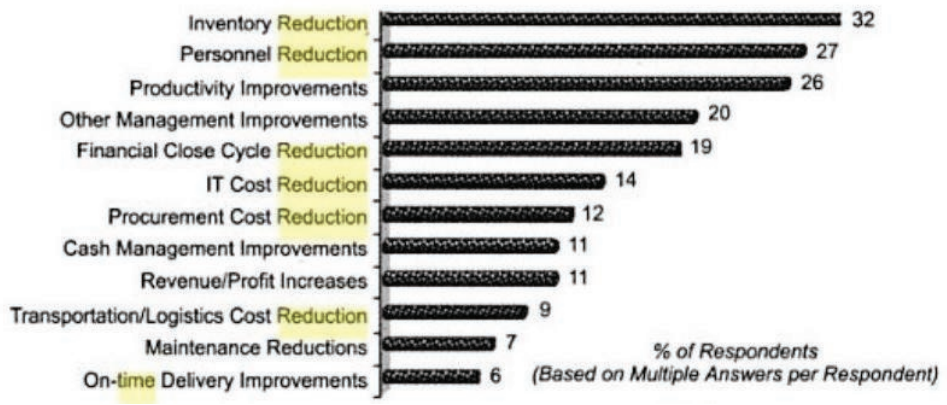
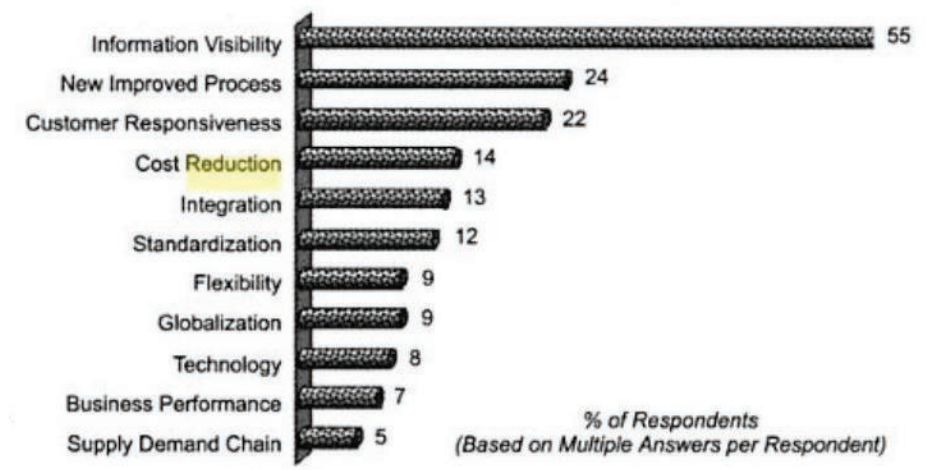


Figure 6.2 taken from a survey conducted by Deloitte Consulting shows the major non-quantifiable (intangible) benefits of an ERP system. The respondents who participated in the survey were asked to check the intangible benefits of the ERP systems from a set of benefits. Most respondents felt that information visibility or better information availability was the main benefit followed by improved business process and improved customer responsiveness.

Figure 6.2: Intangible Benefits of ERP



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There are some tangible and intangible benefits of EPR systems and these are:

1. Information integration
2. Reduction of lead time
3. On time shipment
4. Cycle time reduction
5. Better customer satisfaction
6. Improved supplier performance
7. Increased flexibility
8. Reduced quality costs
9. Improved resource utilization
10. Better analysis and planning capabilities
11. Improved information accuracy and decision-making capability
12. Use of latest technology

ERP systems are integrated, enterprise-wide, packaged software applications that impound deep knowledge of business practices accumulated from vendor implementations in many organizations. ERP systems are evolving to incorporate new technologies, such as E-commerce, data warehousing, and customer relationship management. ERP software is a semi-finished product with tables and parameters that user organizations and their implementation partners configure to their business needs. Implementation of ERP systems therefore involves both business and IT managers who work together to define new operational and managerial processes.

Table 6.1: Advantages of ERP

In What?	How?
Reliable information access	Common database, consistent and accurate data, improved reports
Avoid data and operation redundancy	Avoids multiple data input to the central database
Delivery and cycle time reduction	Minimizing retrieving and reporting delays
Cost reduction	Time saving in decision making
Easy adaptation	Changes in business processes easy to adapt and restructure
Improve scalability	Structured and modular design
Improve maintenance	Vendor supported long term contracts as a part of procurement
Global outreach	Extended modules like CRM and SCM
e-commerce, e-business	Collaborative culture

ERP software attempts to integrate business processes across departments into a single enterprise-wide information system. The major benefits of ERP are improved coordination across functional departments and increased efficiencies of doing business. The implementations of ERP systems help to facilitate day-to-day management as well. ERP software systems are originally and ambitiously designed to support resource planning portion of strategic planning. In reality, resource planning has been the weakest link in ERP practice due to the complexity of strategic planning and lack of adequate integration of ERP with Decision Support Systems (DSS).

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Table 6.2

	BEFORE ERP	WITH ERP
Business Processes	Proliferation of fragmented processes with duplication of effort	Re-engineering around a business models that confirms with "best practice"
Productivity	Lack of openness to customers and suppliers	Direct interactions with customer and suppliers by enhanced ERP modules like SCM and ERP
Supply chain management	Lack of integration	Linkage with suppliers and customers
e-Business	Web based interfaces support isolated systems and their components	Web based interfaces are front end to integrated system
Information	Lack of tactical information for effective monitoring and control of organizational resources	Allows cross functional access to the same data for planning and control.
Communication	Lack of effective communications with customers and suppliers	Facilitate organizational communications with customers and suppliers

6.2 Reduction in Cycle Time

Cycle time is the time between placement of the order and delivery of the product. At one end of the manufacturing spectrum us the make-to-order operation where the cycle time and cost of production are high. This is because in a make-to-order situation the manufacturer starts making the product or designing the product only after receiving the order. He will procure the materials and components required for production only after getting the order. On the other end of the manufacturing operations is the make-to-stock approach, where the products are manufactured and kept in the finished goods inventory before the order is placed.

In both cases the cycle time can be reduced by the ERP systems, but the reduction will be more in the case of make-to-order systems. In the case of make-to-stock, the items are already manufactured and kept in warehouses or with distributors, for sales. Here the cycle time is reduced not in the shop floor, but during the order fulfillment. In the earlier days, even for the made-to-stock items, the cycle time used to be high. This is because the process was manual and if computerized, was not integrated. Suppose a customer places an order. The order entry clerk has to check whether the ordered product is available in the warehouse nearest to the customer. If it is not available there, then he will have to check whether it is available in other warehouses or with any of the distributors. Then he will have top process the order, inform the concerned warehouse or distributor to ship the item and then inform the finance department to raise the invoice and so on. All these used to take time, days and sometimes weeks. But with an ERP system, as soon as the order is entered into the system, the system checks the availability of the items. If it is not available at the warehouse closest to the customer, then the warehouse that is closer and which has the item in stock is identified. The warehouse is informed about the order and the shipment details are sent to the distribution module, which will perform the necessary tasks like packaging, picking and so on, so that the goods are delivered on-time. The finance module is also altered about the order so that they can raise the invoice. All these actions are triggered by the click of a button by the order entry clerk. Since all the data, updated to the minute, is available in the centralized database and since all the procedures are automated almost all these activities are done without human intervention. This efficiency of the ERP systems helps in reducing the cycle time.

In the case of make-to-order items, the EPR systems save time by integrated with CAD/CAM systems. Dramatic time and cost reductions are possible when CAD-engineered design are

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converted automatically into software programs for computerized production machines using CAD/CAM systems. This automatic conversion eliminates the costly and time-consuming steps of having a person convert design drawing into a computer program for computer-controlled production equipment such as robots or machine tools. These systems reduce cycle times by 30-50%. Combined with this, the automation achieved in material procurement, production planning and the efficiency achieved through the plant maintenance and production systems of the ERP packages go a long way in reducing the cycle times.

Measurable cycle time reductions were found in three kinds of activities that support customers, employees and suppliers.

1. ***Customer support activities*** in order fulfillment, billing, production, delivery and customer services.
2. ***Employee support activities*** in reporting, month-end closing, purchasing, or expense requisition, HR and payroll and business learning.
3. ***Supplier support activities*** in speed payments and combined multiple orders with discount gained
   (a) *Productivity improvement.* Products produced per employee or labor cost, customer served per employee or labor cost, or mission accomplished per employee in non-profit organization.
   (b) *Quality improvement.* Error rate reduction, duplicates reduction, accuracy rate or reliability rate improvement.
   (c) *Customer services improvement.* Ease of customer data access and customer inquiries.

Task ERP system really reduces in cycle time. Take an example to describe how it's done.

6.3 Reduction of Lead Time

The elapsed time between placing an order and receiving it is known as the lead-time, it plays a significant role in purchasing and inventory control. Most purchasing departments urge the materials management to anticipate material demands well ahead of actual need. All inventory systems have safety mechanisms like safety or buffer stock, re-order level and so on built into them to avoid a situation where the material is out of stock. The non-availability of an item that is required for production can result in several problems like missing delivery schedules, losing customer goodwill due to the delayed delivery or even losing the customer to competition. One can avoid this situation by requesting for the materials ell in advance to when they are actually needed or by keeping a large buffer stock or maintaining a very high re-order level. But all this means that larger inventories must be kept, which is money blocked. Also the practical consequence of allowing longer allowed. Perhaps this is due to the 'squeaky wheel principle' buyers who expect the shortest lead-times complain the loudest when deliveries are late and thereby receive the most attention from suppliers. So, the company should find out the minimum lead-time and should attempt top correct suppliers' delivery delays instead of automatically increasing allowed lead-times.

So, in order to reduce the lead-times the organization should an efficient inventory management system, which is integrated with the purchasing, production planning and production departments. In this era of just-in-time manufacturing the knowledge of exact lead-times for each and every item is of paramount importance for uninterrupted production. For a company

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dealing with hundreds and thousands of raw materials and components, keeping track of the lead-times for each and every individual item manually is a practically impossible task.

ERP systems help in automating this task and thus make inventory management more efficient and effective. Also, since the ERP system is integrated and the materials management module is integrated with other modules like sales, marketing, purchasing, manufacturing and production planning, the demand for a particular item can be known as early as an order is received. For example, consider that an order is received for supplying say 100 cars with air-conditioners. As soon as the order details are entered into the system, a lot of actions are triggered. The system will check whether the items are available in the finished goods inventory. Then it will generate a BOM for the order and will check whether all the items are available in the inventory. Since all the records are kept in the system's database and since everything is up-to-date, finding out the parts that are to be ordered takes no time. So, once the items that are to be manufactured are identified and once the production planning system prepares a production plan, the materials management module will prepare purchase orders for each and every item taking into account the lead-times and when the items are required for production. If the purchasing process has to go through the invitation of quotations, vendor selection, etc, the system does that also.

Since most suppliers are also connected to the organization's system as soon as purchase order or requisition is issued the supplier's system is updated with that information. Thus, the supplier knows what items are to be supplied, and when. Since activities like preparation of contracts, issuing of purchase orders and payments, etc. happen through the system electronically, the saving in time are phenomenal. So the ERP systems by virtue of their integrated nature, the use of latest technologies (like electronic funds transfer (EFT) electronic data interchange (EDI)) reduce the lead-times and make it possible for organizations to have the items at the time they are needed (just-in-time inventory systems).

Some other benefits of reduction lead-time are:

1. Labor cost reduction: the automation and removal of redundant processes or redesign of processes led to full time staff reduction in tasks in business areas including: customer services, production, order fulfillment, administrative processes, purchasing, financial, training and human resources.
2. Inventory cost reduction in management, relocation, warehousing, and improved turns.
3. Administrative expenses reduction in printing papers and supplies.
4. Better resource management.
5. Improved decision making and planning.
6. Performance improvement.

6.4 Reduction in Cost

Quality is defined in many different ways excellence, conformance to specifications, fitness for use, value for the price and so on. Whereas manufacturing and design engineers typically are responsible for some of the technological issues in quality assurance for products, operations managers often conduct the analysis of quality related costs, which is an important task. Strategic opportunities of threats frequently motivate the launch of aggressive quality management initiatives. Analyzing the cost of quality can provide the financial justification for implementing them. Typically the quality costs are in the range of 20% of the cost of goods sold. Carefully planning quality improvement activities not only improves quality but, lowers quality related costs.

Increased business flexibility by response to internal and external changes quickly at lower costs and provide a range of options in response to the changed requirements.

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IT costs reduction in:

1. Legacy system integration and maintenance
2. Mainframe or hardware replacing
3. IT expense and staff for developing and maintaining the system
4. Year 2000 compliance upgrade
5. System architecture design and development
6. System modification and maintenance
7. Disparate information reconciliation and consolidation
8. Technology R&D
9. Streamlined and standardized platform
10. Global platform with global knowledge pipeline
11. Database performance and integrity
12. IS management transformation and increased IS resource capability
13. Continuous improvement in system process and technology
14. Global maintenance support

Flexibility

1. Modern technology adaptability
2. Extendable to external parties
3. Expandable to a range of applications
4. Comparable with different systems
5. Customizable and configurability

Task Discuss the concept of just-in-time in the context of inventory management.

6.5 Improved Resource Utilization

As manufacturing processes become more sophisticated and as the philosophies of elimination of waste and constraint management achieve broader acceptance, manufacturers place increased emphasis upon planning and controlling capacity. The creation of an accurate achievable production schedule requires the availability of both material and capacity. It is useless and indeed wasteful to have financial resources tied up in material if the capacity is insufficient or improperly planned. Waste not only raise costs, it also affects customer service levels and customer goodwill.

The capacity planning features of most ERP systems offer both rough-cut and detailed capacity planning. The system loads each resource with production requirements from master production scheduling, material requirements planning, and shop floor control. All planned, firm planned and released production is evaluated and loaded against capacity definitions for each resource, and all capacity requirements are pegged back to the orders comprising the load. Capacity definitions

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are provided from work center and machine records. Work centers can be facility-specific or enterprise-wide. Any work center can be designated as a critical work center fro evaluation by rough-cut capacity planning. This capability provides an easy and efficient way to designate bottleneck operations that act as system constrains. As the constraints changeover time, the user can re-designate the work centers as critical or non-critical. High volume repetitive environments are further supported with both from and to material movement location designations. These locations are used for pull system back-flushing/replenishment and can be designated by individual machines within the work center. These systems provide further refinement of available capacity by providing definitions for specific machines or pieces of equipment. Each work center also has user-defined input/output control tolerance factors to control the level of action message sensitivity a factor for average efficiency, separate speed factors for labor and machine, designation of shift/hours schedule and maximum desire load percentage. Capacity minimums can also be designated for processes involving vessel size constraints and fixed cycle constraints.

Also the ERP system have simulation capabilities that will help the capacity and resource planners to simulate the various capacity and resource utilization scenarios and choose the best option. The efficient functioning of the different modules in the ERP system like manufacturing, materials management, plant maintenance, sales and distribution ensures that the inventory is kept to a minimum and the finished goods are delivered to the customer in the most efficient way. Thus the ERP systems help the organization in drastically improving the capacity and resource utilization.

6.6 Improved Supplier Performance

The quality of the raw materials or components and the capability of the vendor to deliver them on-time are of critical importance for the success of any organization. So, an organization needs to choose its supplies or vendors very carefully and monitor their activities closely so that problems can be corrected before it can disrupt the functioning of the company. To realize these benefits corporations rely heavily on supplier management and control systems to help plan, manage and control the complex processes associated with global supplier partnerships.

ERP systems provide vendor management and procurement support tools designed to coordinate all aspects of the procurement process. They support the organization in its efforts to effectively negotiate, monitor and control procurement costs and schedules while assuring superior product quality. The supplier management and control processes are comprised of features that will help the organization in managing supplier relations, monitoring vendor activities and managing supplier quality.

These is a growing trend for organizations to establish partnership agreements with their suppliers. Through such business relationships, mutually beneficial results have been achieved in the areas of quality, delivery and cost. To realize these benefits companies rely heavily on procurement support systems to help manage and control processes associated with supplier partnership agreements. Request for quotations, contract negotiation and control, purchase order release and delivery are process steps considered when formalizing such partnerships. Complexities arise in the areas of types of products or services being procured, quantity and price breaks, terms of the agreement and methods employed for tracking and controlling the process. The procurement support system that provides immediate feedback, flexibility and comprehensiveness in managing supplier partnerships will provide a clear competitive advantage to the enterprise.

ERP systems have features that will enable the companies in realizing the benefits associated with established partnership agreements. Supplier quotations and contracts can be created to support the procurement of all products and service required by the enterprise. Examples of this include inventory and non-inventory products, office supplies and services, as well as products requiring direct shipment to customers. Since each agreement must stand on its own merit,

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multiple quantity and price breaks along with terms specifying when the quotation or contract becomes effective and expires, are supported. To address the methods companies employ when tracking and controlling these agreements these systems provide a number of alternatives.

First, after contracts are established, purchase order and requisitions are tracked as they are released against a corresponding contract. The ERP system searches for the best-fit supplier contract and automatically assign it to the corresponding purchase order or requisition. If changes are know the status of a supplier quotation or contract, the system provides immediate feedback to the organization. Detailed history provides for the deployment of in-depth procurement analysis tools. The supplier management professional can easily compare total quotation or contract commitments to actual purchasing activities.

With the flexibility and comprehensiveness of the system's supplier quotation and contract management capabilities, organizations can efficiently manage their supply-side partners and, as a result gain significant cost and delivery procurement benefits for their business.

Also, since most suppliers have their connected to the company's system, the information regarding an order is transmitted to the supplier's systems almost instantaneously. This saves a lot of time and gives the supplier more time for fulfilling the orders.

Businesses generally classify their suppliers into certified, approved and probationary categories for quality management and auditing purposes. Additionally, supplier certification programs must be capable of distinguishing between suppliers and original manufacturers. The objective of supplier auditing and classification programs is to ensure conformance of purchased materials and services to specification, while minimizing lead-times and costs.

The quality management system in the ERP systems provides all the tools needed to implement total quality management programs within an organization's procurement function. Using the system, organizations can establish and manage highly effective supplier certification programs, which ensure maximum conformance of purchased material to specification, while maintaining lead-times and costs. The quality control program can be managed on the basis of original manufacturer, leaving the buyers free to seek the best possible price and delivery terms from a variety of qualified distributors or brokers.

6.7 Increased Flexibility

Because competition is growing companies must learn to respond more rapidly to customer's wishes as well as changes in the market. They will need to be able to design new products or re-design old products quickly and efficiently. Only then will companies have the chance to capitalize on opportunities while they are available. The window of opportunity is often quite small. The manufacturing process must be flexible enough to accommodate new product designs with minimal disruption or time loss.

Flexibility is a key issue in the formulation of strategic plans in companies. Sometimes flexibility means quickly changing something that is being done or changing completely to adjust to new product designs. At other times flexibility is the ability to produce in small quantities in order to obtain a product mix that may better approximate actual demands and reduce work-in-progress inventories. Regardless of the definition of flexibility, traditional fixed automation manufacturing facilities while efficient are often inflexible. Similarly extremely flexible operations are often inefficient. An argument can be made for the relative merits of both efficiency and flexibility. Actually both are desirable.

Product flexibility is the ability of the operation to efficiently produce highly customized and unique products. Manufacturers tried to introduce some amount of flexibility by using the assemble-to-order approach. This provided some amount of flexibility without increasing the production cost, but could not be applied to all situations. Along the broad spectrum of make-to-order manufacturing, there is a growing convergence between strictly assemble-to-order and

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completely engineer-to-order environments. This evolving environment is often referred to as configure-to-order. Most ERP systems have now added this technique also to their systems. Using a rules-based product configuration system, configure-to-order (CTO) manufacturers are able to simplify the order entry process and retain engineer-to-order (ETO) flexibility without maintaining bills of material for every possible combination of product options.

ERP systems not only improve the flexibility of the manufacturing operations, but also the flexibility of the organization as a whole. A flexible organization is one that can adapt to the changes in the environment, rapidly. With the technological revolution the rules of the marketplace are changing at a rapid pace. Newer and more competitions are emerging each day. New and complex problems have to be tackled every day. New market segments have to be penetrated not in order to succeed but simply to stay in business. New marketing strategies have to be devised and implemented at very short notices. Companies have to constantly find new ways to keep the customer satisfied. For doing all these the company has to be flexible. The old methods of functioning will no longer work. ERP systems help the companies to remain flexible by making the company information available across the departmental barriers and automating most of the processes and procedures. Thus enabling the company to react quickly to the changing market conditions.

Enable Worldwide expansion with:

1. Centralized world operation
2. Global resource management
3. Multi-currency capability
4. Global market penetration
5. Deploy solution quickly and cost effectively across worldwide

Enabling e-business by attracting new or getting closer to customers through the web integration capability. The web-enabled ERP system provides benefits in business to business and business to individual in:

1. Interactive customer service
2. Improved product design through customer direct feedback
3. Expanding to new e-market
4. Building virtual corporation with virtual supply and demand consortium
5. Deliver customized service
6. Provide real time and reliable data enquiries

6.8 Improved Information Accuracy and Decision-making Capabilities

To survive, thrive and beat the competition in today's brutally competitive world one has to manage the future. Managing the future means managing information. in order to manage information, deliver high-quality information to the decision-making at the right time, and automate the process of data collection, collation and refinement, organizations have it in the best way possible.

Some other point related to improved information accuracy and decision-making capabilities are:

1. Gives a Company an Integrated Real-time View of its Business Process
2. Helps Improve the Quality and Efficiency of Customer Service
3. Reductions in Transaction Processing Costs and Hardware, Software, and it Staffs

4. Lead to Improved Performance, better Decision Making, Competitive Advantage
5. Replace a Multiplicity of different systems and database
6. Allows replacement of disparate systems
7. E.G. Exxon Mobile used ERP to replace 300 different systems
8. Increase organizational real time information flow
9. Process Re-engineering—Update Old Process
10. Foundation for new processes, such as E-procurement
11. Lays Foundation for Electronic Commerce

Did u know? ERP systems are evolving to incorporate new technologies, such as e-commerce, data warehousing, and customer relationship management.

6.9 Better Customer Satisfaction

Customer satisfaction means meeting or exceeding customer's requirements for a product or service. Assessment of the degree of satisfaction is usually made on at least three measures:

1. Whether the product or service includes the features that are most important to the customer.
2. Whether the company can respond to the customers demands in a timely manner, a criterion that is especially important for custom products and services.
3. Whether the product or service is free of defects and performs as expected.

ERP systems have proved that they can produce goods at the flexibility of make-to-order approach without losing the cost and time benefits of made-to-order operations. This means that the customer will get individual attention and the features that he/she wants without spending more money or waiting for long periods. Also, with the introduction of web enabled ERP systems customers can place the order, track the status of the order and make the payment sitting at home. The customer could get technical support by either accessing the company's technical support knowledge base or by calling the technical support. Since all the details of the product and the customer are available to the person at the technical support department, the company will be able to better support the customer. All these are possible because of the use of the latest developments in information technology by the ERP systems and go a long way in improving customer satisfaction.

Task "ERP systems not only improve the flexibility of the manufacturing operations, but also the flexibility of the organization as a whole." Discuss with the help of suitable example

6.10 On-time Shipment

Today, companies must be able to deliver customer specific products with the lead-time of standard, off-the-shelf products. They must be able to change the mode of production from make-to-stock to make-to-order, yet retain the cost and time advantages of off-the-shelf products. Today, ERP systems provide the freedom to change manufacturing and planning methods, as needs change, without modifying or re-configuring the workplace or plant layouts. With ERP systems,

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businesses are not limited to a single manufacturing method, such as make-to-stock or make-to-order. Instead many manufacturing and planning 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. In addition, this control and visibility comes without having to sacrifice the functionality needed to efficiently mange different types of production. Because these systems support the entire range of production strategies, only one system is needed to manage all manufacturing activities. Engineer-to-order products are planned using these systems while the forecasting and distribution planned using the extensive production planning capabilities of these ERP packages. Various production scenarios can be simulated using the simulation features and the best one can be selected. Also, since the different functions involved in the timely delivery of the finished goods to the customer purchasing, materials management, production, production planning, plant maintenance, sales and distribution are integrated and the procedures automated, the chances of errors are minimal and the production efficiency will be high. Since all the information is available to the management at the desired level of detail and since the system has exception handling features, the management can keep track of things and can take corrective actions at the appropriate time.

Another step to shorter product development cycles is increased efficiency in design and development activities. ERP systems are designed to help your company trim data transfer time, reduce errors and increase design productivity by providing an automated link between engineering and production information. Most of these systems allows smooth integration with popular CAD packages to simplify the exchange of information about drawings, items, BOMs and routings. Using the engineering change control (ECC) system, businesses can gain effective control over engineering change orders. The company can define the authorization steps for approving and implementing an engineering change order (ECO). When these steps are completed, the ERP system automatically implements the change in the production database. Thus, by integrating the various business functions and automating the procedures and tasks the ERP system ensures on-time delivery of goods to the customers.

Some other benefits of on-time shipment are:

1. Cost reduction,
2. Cycle time reduction,
3. Productivity improvement,
4. Quality improvement.

Case Study

SystemX Inc. Withdraws ₹ 1 Billion SoftGuide Acquisition Offer

The following is an excerpt from a news article in the Daily Update, March 07, 2010

"SystemX Inc., called off its acquisition of SoftGuide Knowledge Consultants, Friday, saying that 1 Billion was too high a price." (SoftGuide has a considerable market share in Training and Development services and would therefore help SystemX to diversify and expand its range of services to customers.)

"Although SystemX officials would not comment further, several observers said that problems discovered at SoftGuide probably lay behind the decision…. The article said that SystemX feared that SoftGuide's data-processing system was inadequate to handle the new products planned for the SoftGuide sales staff. SystemX officials were also concerned

Contd...

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about the 30 percent annual turnover among sales personnel… Tabrez A., SoftGuide CEO, responded that the SoftGuide's data-processing was quite competent and has absorbed at least one new product a month for two years."

Questions

1. Why should SystemX be so concerned about the capabilities of SoftGuide's data processing?
2. What competitive advantages to a Training and Consultancy services company may be provided by an information system?

Source: Himadri Barman, *Centre for Management Studies,* Dibrugarh University, Dibrugarh 786 004, Assam.

6.11 Summary

- Installing an EPR 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.

6.12 Keywords

CAD: Programs that are used to create engineering drawings. CAD programs make it easy to modify drawings. They also make it easier to keep track of material specifications. They can perform spatial and engineering estimates on the designs, such as surface or volume calculations.

Decision Process: The steps required to make a decision. It includes problem identification, research, specification of choices, and the final selection. Midlevel managers are often involved in the initial stages and affect the outcome, even though they may not make the final decision.

Enterprise Resource Planning: An integrated computer system running on top of a DBMS. It is designed to collect and organize data from all operations in an organization. Existing systems are strong in accounting, purchasing, and HRM.

Product Flexibility: Product flexibility is the ability of the operation to efficiently produce highly customized and unique products. Manufacturers tried to introduce some amount of flexibility by using the assemble-to-order approach.

6.13 Self Assessment

Fill in the blanks:

1. The major benefits of ..... are improved coordination across functional departments and increased efficiencies of doing business.
2. ..... is the time between placement of the order and delivery of the product.
3. In the earlier days, even for the made-to-stock items, the cycle time used to be .....
4. ..... is a key issue in the formulation of strategic plans in companies.
5. ECO stands for .....

State whether the following statements are true or false:

6. ERP systems are evolving to incorporate new technologies, such as E-commerce, data warehousing, and customer relationship management.

Notes

7. In the case of make-to-stock items, the EPR systems save time by integrated with CAD/CAM systems.
8. The elapsed time between placing an order and receiving it is known as the lead-time.
9. Supplier quotations and contracts can be created to support the procurement of all products and service required by the enterprise.
10. Capacity definitions are provided from work center and machine records.

6.14 Review Questions

1. Explain the benefits of ERP implementation.
2. How are the ERP systems helpful to reduce the lead time and improved supplier performance?
3. Discuss the tangible and intangible benefits of ERP systems.
4. "Sometimes, the intangible benefits are more important than the tangible benefits." Discuss the above statement.
5. "Product flexibility is the ability of the operation to efficiently produce highly customized and unique products." Explain.
6. How will you satisfy customer in better way with the help of ERP? Explain
7. What do you mean by on-time shipment?
8. What do you think ERP is absolutely beneficial in financial department of a big organization?
9. Distinguish between EFT and EDI.
10. How will you manage quality with the help of ERP implementation?

Answers: Self Assessment

1. ERP	2. Cycle time	3. high	4. Flexibility
5. Engineering Change Order		6. True	7. False
8. True	9. True	10. True	

6.15 Further Readings

Books

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Notes

Unit 7: ERP Market

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Objectives

After studying this unit, you will be able to:

- State the trends in ERP market
- Discuss SAP and its technology
- Know about People Soft and BAAN

Introduction

Enterprise systems or ERP systems are commercial software packages promises the seamless integration of all the information flowing through an enterprise e.g. Financial and accounting information, Customer information, supply chain information, human resources information, manufacturing information, plant maintenance information and so on.

For the managers who have struggled with great frustration while working with incompatible information systems and inconsistent operating practices got the great business solution through ERPs. ERPs are user friendly and works successfully at each level of organization (from operational through decision making).

Notes

The fully automated system provided through ERP system increases the revenue of the organization in billions. Nowadays, most of the businesses have been beating paths to open the doors of ERP system. As the demand increases, the number of ERP vendors in the market increases and it will grow to 40-60 percent within next five years. Some of top – tier ERP vendors are SAP AG, BAAN, PeopleSoft, Oracle Application and J.D.Edwards.

These companies are covering the major ERP market revenue. It is estimated that business around the world is now spending more than $ 10 million per year on ERP systems and associated consulting expenditures.

In this unit, you will see the profile of some of the top vendors of ERP market. Each ERP vendor offers some special features. The references given in this unit has been from Enterprise Resource Planning – Alexis Leon and Internet.

7.1 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.

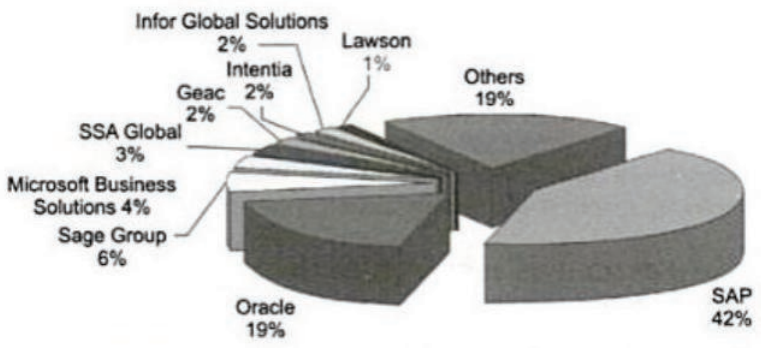
The ERP market saw solid growth in 2004, even as the vendor landscape continued to consolidate Going forward SAP is expected to boost overall growth of this market as its share approaches 50% offsetting flat to declining revenues of several mature, mid-size vendors. Oracle's acquisition of PeopleSoft and JD Edwards may limit near term license revenue growth due to product overlaps and customer hesitancy to commit to add-on purchases until project fusion is more clearly defined and upgrade paths are evaluated. The mid-market remains a fertile area for growth as well as a key competitive battleground with industry specialization representing the best opportunity for differentiation.

The ERP market continues to benefit from a widespread acceptance of the idea that business must have integrated information systems to be competitive. The integrated best-of-breed debate still goes on in some organizations, but the suite advocates are clearly winning. AMR Research predicted that the would grow about 14% in 2006, from $25.4 billion to $29 billion in 2007.

ERP Market Share

The ERP market has grown in revenue, but consolidation continues to change the industry. in 1999, the top five vendors in the ERP market accounted for 59% of the industry's revenue. APR Research expects the top five vendors in 2005 (SAP, Oracle, Sage Group. Microsoft, and SSA Global) to account for 72% of ERP vendor total revenue. The trend has remained the same in 2007 also the top position occupied by SAP, Oracle, Sage Group, Microsoft, Infor Global Solutions, etc.

Figure 7.1: ERP Market Share in 2006



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Global ERP vendor revenue grew by some 14% in 2004, although a substantial portion of this can be attributed to favorable, Euro to U.S. dollar exchange rates. There was however, substantial organic market growth of between 8-9% in 2004, regardless of exchange rate issues. While many ERP vendors struggle din 2004, SAP AG increased worldwide revenues by 17% and license revenues by 20% without any acquisitions.

Analyzing ERP market share is quite different when compared with reviewing the market segments for any other product or service. The segmentations in that case will be numerous and in the form of many criteria like physical, geographical, functional, distribution level and many more factors. ERP the segmentation falls in three main categories, namely, type of the industry, size of the industry and geographical areas in terms of the nations where the product is demanded. This helps in arriving at ERP market and ERP software market share.

While discussing size of industry it refers to the volume of business transacted and the capacity of the firm in terms of large sized or mid sized or low rung. When it comes to the question of type it refers to the mode of business viz. hospitality or insurance or manufacturing or health etc. The market for them purely depends on the services offered by the vendor. The question of geographical segmentation involves a detailed study when it comes to ERP markets.

ERP calls for constant modifications and upgradations. ERP developers are facing tremendous pressure both from vendors and companies. In this context it becomes important to analyze ERP's trends and modalities.

Thus to conclude, by reflecting on what has been said above with regard to an ERP and what implementing this into your business strategy can do for your business success, it is imperative that you should deeply consider an ERP solution for the benefit of your company. Identifying that your company needs aid in order to achieve its ultimate goals and dreams at the end of the day is the first step to putting your company on the right track towards total business improvement and success. ERP is a popular business solution subsequently being implemented by a number of companies which are enjoying the benefits of this solution for themselves today. Enterprise Resource Planning is a great, if not the best way, to ensure that you allow your company the opportunity to become the success of which it has the potential to ultimately attain.

7.2 SAP and its Technology

SAP (System Applications and Products in data processing) based in Walldorf, Germany is one of the top most (more than 107 countries) ERP vendors providing the client – server business application solution. SAP serves as a standard in the industries like chemicals, consumer products, oil and high technology and electronics.

The SAP group has offices in more than 50 countries worldwide and employs a workforce of over 19300. SAP is most successful vendor of standard business application.

In 1998 SAP AG reported revenues of DM 847 billion and 41% increases over 1997's revenues and at the some time sales of SAP R/3 rose by 31%.

In 1988, SAP AG introduced its shares publicly. In 1995 the company was added to the DAX, the index of German blue – chip companies. In 1998 SAP listed its ADRs (American depository Rights) on the NYSE (New York Stock Exchange).

SAP's ERP packages comes in two versions i.e. mainframe version (SAP R/2) and client server version (SAP R/3). SAP provides the enterprise application suit R/3 for open client /server systems. With SAP customers can install the core system and one or more of the software as a complete package.

Notes

Product and Technology

SAP has developed extensive library of more than 800 predefined business processes. These processes may be selected from SAP library and included within installed SAP application solution to suit the user exact requirements.

SAP software has special features like, linking a company's business processes, and applications and supporting immediate responses to changes throughout different organizational levels and real time integration. Also, the new technologies are available regularly to cop-up with the changes of the new business trends. The international standards have been considered while designing the software like support of multiple currencies simultaneously, automatically handles the country specific import/export, tax, legal and languages requirements e.g. The R/3 system has an unbeatable, combination of functionality and technology. The modules of R/3 can be used individually as well as user can expand it in stages to meet specific requirement.

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

1. Aerospace and defence
2. Automotives
3. Chemicals
4. Consumer products
5. Engineering,construction and operations
6. High tech
7. Health care
8. Industrial machinery and components
9. Mill projects
10. Mining
11. Oil and natural gas
12. Pharmaceuticals
13. Retail
14. Professional services
15. Utilities
16. Wholesale distribution

R/3 System

R/3 employees' three-tier client/server architecture widely recognized by SAP customers, industry analysts and technology partners to solving some of today's most demanding information management challenges.

There are three functional layers and each support the demands of its functions.

1. The first layer is data layer resides on control servers.
2. Second layer i.e. the application layer holds the processing logic of the system, prepares and formats the data for individual offices and departments.
3. The presentation layers handles all the tasks related to presentation of data including tasks interfaced by users of personal computers.

Notes

SAP also integrated the intranet and Internet technologies business solution. Through the network and its Industry Business Units (IBUs), SAP develops new information technology approaches. With this approach, customers become members of SAP development team and share their experiences.

SAP R/3 system is the world's most standard business solution for client/server system. With this approach customer could get quick response, which makes the business process more flexible. R/3 system is ideal for all types of industries and can optimize the business functions. The system provides a powerful program for each department form the industry i.e. according and controlling, sales and distribution, production and material management, quality management, project management, human resource management etc. All these applications supports decision making at the top level as warehouse conveniently edits external data and internal data.

R/3 Application Modules

The R/3 system provides a flexible organizational structure. It can connect all the business processes together and every employee could have fast access to the required information. The in house staff can do the work easily with reference ABAP/4R development workbench, which is an integral parts of R/3. R/3 application modules are either used alone or in combination with other solutions. Following are some R/3 modules:

1. ***Financial Accounting:*** It collects and controls the data relevant to financial accounting. It provides reports and documentations and comprehensive information
2. ***Treasury:*** This module provides a complete solution for efficient financial management. Treasury module helps in ensuring the liquidity of your company worldwide structures, the assets profitability and minimizes risks.
3. ***Controlling:*** This module has a uniform reporting system for company wide controlling with all procedures and controls content of the company's internal processes.
4. ***Enterprise controlling:*** This module has been designed to monitor the company's success factors and performance indicators on the basis of management information.
5. ***Investment management:*** This module offers integrated management and processing of investment measures. This also participates in pre investment analysis, depreciation simulation. Investment management monitors the projects from planning to settlement.
6. ***Production Planning:*** Production planning provides all types of manufacturing strategies, from repetitive MTO and ATO through processes, lot and MTS manufacturing, to integrated supply chain management.
7. ***Material management:*** It manages the purchasing processes with workflow driven processing functions. This also handles warehouse management and integrates invoice verification
8. ***Plant maintenance and service management:*** This allows the planning, control and processing of the inspection, maintenance, damages and service management.
9. ***Quality management:*** This offers all processes relevant to your quality assurance along with supply chain, co – ordinates inspection processing and integrates laboratory information systems

R/3 also provides its applications in HR managements, project management, sales and distribution with all standard business processes and functionality.

Task Suggest what are the reasons behind the success of ERP?

Notes

7.2.1 SAP Advantages

R/3 offers integrated solution for client/server information system to create smoothly functioning communication networks along with network administration and backup solution

SAP's partnership with technology and service companies, hardware manufactures and database providers helps to provide a complete business solution.

The server coordinates with actual applications and controls communication with the database while client level, shares this database with the end users by distributing it across the various levels. This client/server solution is infinitely expandable and can be used with anywhere between 30 and several thousand end users. This ensures that R/3 can always grow with the growing requirements of company.

The strengths and weakness of SAP are listed as follows:

1. Long term partnership with customers
2. In depth knowledge of business
3. Commanding market position
4. Brand recognition
5. Sound financial situation
6. Sustained investment in R&D
7. Very strong investment in R&D
8. Strong technology very broad and hard core ERP solution

7.2.2 Weakness

A problem for SAP is that the growth of the market for large companies SAP's primary clients tends to slow down Most of the large firms that need an ERP system have already implemented one. SAP expects to sell a lot more R/3 modules to its existing clients but growth will be led by converting the smaller organizations.

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

7.3 BAAN Company

BAAN Company is founded in Netherlands in 1978 by brothers Jan and Paul BAAN. The company has dual headquarters in Barneveld, the Netherlands and Reston, Virginia, USA. Since 1995 the company has expanded its sales and services in North America, Latin America, Europe and Asia.

The BAAN Company provides enterprise business software and reduces complexity and cost improves core business processes, adapting changes and optimizes the management of information. The products offered by the company supports several business tools as well as flexible suit of year 2000 complaint software solutions. The tools are based on multi-tier architecture.

Technology and Products

The BAAN's products are having open component architecture. The special feature of BAAN product is, the use of BAAN DEM (Dynamic Enterprise Modeling).

Notes

BAAN DEM provides a business view via a graphical process/model based views. BAAN Company enterprise application tailored or templated to the specific need of industry groups or individual customers and reflects company's most current organizational practices.

BAAN's product has multi-tiered architecture for maximum and flexible configuration. The application supports to the new hardware, operating system, networks and user interfaces without any modification to the application code e.g. BAAN Company supports UNIX platforms as well as Windows NT. These products also support relational database system like Oracle, Informix, DB2, Sybase and Microsoft, SQL server and Year 2000 complaint.

The BAAN series based products include BAAN ERP, BAAN Front Office, BAAN Corporation solutions, and BAAN Supply Chain Solution.

The main advantages of BAAN series-based family of products are best in class components version independent integration and evergreen delivery.

ERP Modules

BAAN ERP is fully integrated solutions and consists of a number of independent components. The BAAN ERP allows maximizing the benefits of both best in class solution and fully integrated, high performance system. The applications modules provided by BAAN ERP are manufacturing, finance, project and distribution.

Manufacturing Module

This offers Bill of material, production planning cost price calculation, engineering data control and management, product configuration and classification, production planning and control, project budgeting and controlling, routings, repetitive manufacturing, shop floor control, tools required capacity requirement planning, master production scheduling and material requirements planning.

Finance Module

BAAN EXP finance module includes G.L.Cost Accounting, Financial Reporting System, Cash Management, Financial Budgets System, Accounts Payable, account receivable, fixed assets, and sales voicing.

Project Module

This includes Project Budget, Project Planning, Project estimating, Project invoicing, monitoring, Project definition, Project progress and requirements planning.

Distribution Module

This module provides the services in sales management, purchase management and warehouse management.

7.4 Oracle Corporation

Oracle Corporation was founded in 1977. It is world's second largest software company. The company offers its database, tools and applications products, alongwith related consulting education and support services. Oracle Corporation has its own Internet computing model for developing and deploying enterprise software. It provides databases, relational servers software, application development and decision support tools and enterprise business application.

Technology

Notes

Oracle software supports to the network computers, personal digital assistants, minicomputers, mainframes and parallel computers, set top devices and PCs. The latest version of Oracle industry is Oracle 8i, which is the industry's leading database and supports Internet device. With the help of its database, networking and gateway products Oracle Corporation allows to access any data on any server, any network from any client device.

Oracle's Warehouse Technology Initiative (WTI) provides customers with a complete data warehousing solution. WTI is supported with Oracle database and more than 60 complimentary third party software products and services.

The WTI provides the Oracle based database warehousing solution with greater choice, oracle optimized products, specialized tool and streamlined support.

Oracle's Solution serves powerful decision making capabilities to the enterprise at anywhere in the enterprise, at any time. The Oracle's Corporation gives entire range of Business Intelligence solution. The products includes Oracle's enterprise reporting tools, Oracle Reports, Oracle's Industry leading enterprise OLAP engine, Oracle's Financial analyzer, Sales analyzer and ad – hoc query and analyzer's tool.

Oracle Application is division of Oracle Corporation. It is leading provider of integrated front office and ERP solutions. This offers the business solution with advanced technologies, business expertise and partnership, required to enable customers execute strategies, minimize the risks and maximize the benefits.

Oracle Application serves over 45 modules for financial, human resource, manufacturing, supply chain and front office automation.

The Oracle Application comprise of 45 – plus software modules, which are divided into the different categories. They are,

1. Oracle Financials
2. Oracle Human Resource
3. Oracle Projects
4. Oracle Front office
5. Oracle Supply Chain
6. Oracle Manufacturing

All these applications exploit the low cost and universal access inherent in the Internet computing.

These applications provide a complete automated and integrated business process. The Oracle application support local business practices, legal requirement and can handle business critical operation across borders as well as can operate in multiple currencies and languages. Because of all above benefits, more than 6000 customers in 76 countries use Oracle application. The modules are as follows:

1. ***Financial Modules:*** With Oracle financial application companies are allowed to work globally. It provides improved cash management solution lower the administrative costs and also provide the strategic information required for making timely and accurate decisions.
2. ***Human Resource:*** The Oracle Human Resource management System (HRMS) provides facilities for organizations to improve the bottom line and contribute to competitive advantage. It has ability to hire, motivate and retain the capable workforce, manage employees and line managers in their skills and carriers. HRMS provides comprehensive and up to date information for each management level.

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3. ***Project:*** Oracle project management application allows user to integrate the project management environment and fully supports the lifecycle of every project in your enterprise through the facilities like central repository of validated cost, revenue, billing and performance data. Oracle projects application can increase top line revenue growth and bottom line profitability.

4. ***Front Office:*** Oracle Front office solution allows user to better understand his customer with a true customer centric application. This helps to increase the line revenues, decrease sales and service cost. The service marketing and service solution provides the full integration with entire enterprise suite of application.

5. ***Supply Chain:*** This simplifies supply chain process by providing a single, integrated environment for managing the enterprise. From Supplier's supplier to Customer's customer, Oracle allows effective trading partner's collaboration and supply chain optimization. Thus helps in gaining and sustaining competitive advantage.

6. ***Manufacturing:*** Oracle manufacturing applications are mix mode manufacturing solutions. This support from small, single facilities environment to multi – plant environment. Oracle manufacturing help companies increase revenue, profitability and customer loyalty by universally capturing demand by ensuring the most efficient manufacturing process used to produce each product.

7. ***Vertical Solutions:*** Oracle provides vertical solutions for industries including automotive, aerospace and defense, aviations, energy upstream, financial service, high – tech public sectors and utilities.

The strengths and weakness of oracle are:

Strengths

1. Oracle's core product is database application which forms the basic foundation of an ERP package.
2. Good reputation of horizontal application for functionality and scalability.
3. Strong international professional services.
4. One of the top leaders in the ERP market position.
5. Sustained investment in R&D
6. Financially sound global organization.
7. Early Internet architecture adoption and entry to CRM market.

Weakness

1. Regarded as a late entrant in the ERP arena
2. Product integration issues
3. Insufficient sales execution

Task Describe the share of BAAN in ERP application into the market.

Notes

7.5 PeopleSoft

PeopleSoft was established in 1987, to provide the software solutions for the business. The mission of this company is to provide innovative software solution that meets the changing demands of enterprises. The annual revenue of the year in 1998 was 1. 3 billion. The company employs more than 7000 people worldwide.

The PeopleSoft solution includes, Human Resource management, project management, treasury management, financial services, accounting and control, supply chain management etc. PeopleSoft also provides customarily solutions including financial services, healthcare, manufacturing, communication, transportation, public sector, higher education, US federal government, public sector and utilities.

PeopleSoft runs on leading hardware and platforms, they are Compaq, IBM, Sun Microsystems, Informix, Microsoft SQL server, Sybase, DB2 etc. The applications also delivers web – enabled applications, workflow, OLAP etc.

The PeopleSoft application serves the business management solutions, commercial solution and industry solution.

The Business Management Solutions

This application supports to the whole business processes, from human resource and finance to supply chain management. One can go for implementation of a single application or complete enterprisewide solution. The flexible design allows the users to tailor the application to their specific needs. The PeopleSoft's business management solutions are enlisted below:

1. H.R. management
2. Accounting and control
3. Treasury management
4. Performance management
5. Project management
6. Sales and logistics
7. Supply chain planning
8. Procurement
9. Material management
10. Service revenue

Commercial Solutions

Supply Chain Management

PeopleSoft's ERP solution is built around supply chain optimization. This provides complete suit of supply chain management that support for any organization, which can produce or market physical products.

Notes

Service Industry Solutions

PeopleSoft provides commercial support solution for service industries. These modules support to the tracking of time and labour, payroll processing, project management and billing, expense and receivables processing. A procurement module is also available with purchasing management, inventory management, payables and expense processing and asset management.

Industry Solutions

The Industry specific solutions are also provided by PeopleSoft. It has 11 distinct business units, which provides software solutions to the industries. The business units are, federal government, Healthcare, Higher education, Public sector, Retail, Service industries, Transportation, Utilities, Financial services, communications etc.

Technology

PeopleSoft continuously adds and refine latest technology to optimize their information system. The technologies like self-service application, web client applications, multi-tier transaction processing, OLAP, workflow alongwith several tools to maintain and tailor the application. Tools are also helpful for reporting, customization and workflow.

7.6 J.D. Edward World Solution Company

On March 17, 1977 J.D.Edwards was formed, by the Jack Thompson, Dan Gregery and Ed – Mc Vaney.

In early years J.D. Edwards designed software for small and medium size computers.

In 1980's it focused on IBM system/38.

As the company began to out grow, its headquarter in Denver, opened branch offices in Dallas and Newport Beach, California, Houston, San Francisco and Bakenfield. And then internationally expanded its Europe headquarters in Brussels and Belgium.

Technology

As the business grew company adapted new technology and instead of going for small computer application; it started to design enterprise wise software. J.D.Edward is a leading provider of integrated software for distribution, human resource, finance, manufacturing, and SCM. These softwares are operated in multiple computing environments and also JAVA and HTML enabled.

Products

ActivEra is a product, which is customer centric and allows companies to change enterprise software after implementation if their business requires.

The company also provides the products such as Oneworld and JD Edwards SCOREX products.

Oneworld

Oneworld provides a solution by integrating with legacy, best of breed and third party products. Oneworld supports the industry standards such as CORBA, ODBC and other packaged integration solutions.

Notes

Oneworld processes the information into five functional elements: database, data warehouse, business objects, reporting and GUI.

The users are allowed to link these elements in variety of configuration. It also allows to add new server, even web servers, without rewriting application for new machine.

It supports both client/server and Internet modes. With this it can distribute the enterprise application to employee, business partners and customers (web based technology).

It supports the databases like DB2, SQL server and Oracle alongwith hardware technology.

WorldSoftware and World Vision

Worldsoftware is very flexible and easy to use. It allows mix match and integrate software application from several industry product lines and easily tailor it to on going business; local and organization specific requirement.

It supports advanced graphical user interface through worldvision, to gain client/server benefits. Oneworld is network-centric solution, which incorporate other computing plateforms into your network. One can have Worldvision as a Windows 95/n T interface for PC and as a JAVA based interface3 for Internet, Intranets.

Modules

The different product modules and subsystem provided by J. D. Edwards are:

Foundation Suite, Financial suite, Logistics/Distribution suite, Service suite, Manufacturing Suite, Architecture Suite, Engineering suite, Construction, Mining and Real estate suite, Energy and Chemical suite, Payroll suite, HR suite, Customer services suite, Utility and energy solution and government, education and not for profit solutions. These suites have successfully contributed in business integration.

7.7 SSA Inc

System Software Associates, Inc. (SSA) was founded in 1981. It has its branches in more than 91 countries and more than 2000 employees. SSA has BPCS client/server V6 technology is implemented in more than 1000 industrial sector firms in over 4000 sites worldwide.

SSA's vision is to be the best global partner to the world's industrial companies. To achieve competitive advantage for clients through ERP system, SSA's follows its Mission Statement 1981. The statement has six key goals. They are,

1. Best client satisfaction
2. Single image worldwide
3. Enterprise Solutions leadership
4. Proven leading technology
5. Highly skilled and motivated professional
6. Strong financial results

Technology

BPCS Client/Server: BPCS client/server is a set of integrated client/server application, its core system such as, SCM, financial application, multimode manufacturing and CIM application as well as EDI application. The server is supported with HP9000, AS/400 or Windows NT.

Notes

A BPCS client/server product offers numerous industrial applications. With the help of BPCS client/servers, it is possible to improve customer's satisfaction, product quality and reduce the time in launching a product in the market.

The Microsoft desktop is the BPCS client/server desktop. It has a powerful graphical interface and fully compliant with Microsoft Windows 95.

BPCS client/server is used worldwide. There are more than 500 companies at 25000 sites and 3, 000, 000 end users. The industries clients are automotive, chemical, consumer goods, electronics, fabrication and assembly, food and beverage, pharmaceuticals etc.

Alongwith distributed object – computing architecture, BPCS designs enterprise wide application in industrial sector companies. SSA reduced time to benefit implementation cycles to 6 – 12 months with advanced version of BPCS client/server and allows organization to quickly and easily alter the solution.

7.8 QAD

QAD was founded in 1979. The products of this company include MFG/PRO, Service/Support management, Decision Support and ON/Q and Qwizard.

The ERP products i.e. MFG/PRO is available in 26 languages and has more than 4000 installations in over 80 countries.

Products and Technologies: (MFG/PRO)

QAD serves in automotive, consumer products, food and beverage, electronics, industrial products and medical sectors. Especially provides supply chain and ERP softwares to manufacturing industries. These softwares increase the speed of internal process and synchronise the distribution operations.

The MFG/PRO is one of the software, product offered by QAD, provides multinational organization with integrated Global Supply Chain. Internet enabled MFG/PRO offers the facilities like information sharing and commercial transactions over the internet with the help of open system environment. The MFG/PRO provides its solution for manufacturing, distribution, financial and service support management application. MFG/PRO supply chain management includes functions like, centralized processing, enterprise operation planning, distribution and material transfer planning, centralized purchasing. These functions are supported by client –server like technologies to meet the objectives of rapid response to the customer needs.

The MFG/PRO software is configurable, inter operatable and can run in UNIX, Windows and Windows NT environments alongwith Oracle or Progress database. The interface is an Ultra Thin Java browser as well as available with Windows GUI or Character user interface.

The QAD's an IQ is an extended SCM application manage the complex demand of multinational corporations. Service/support management is one more product that offers after sales service and support.

The Decision – Support tool is the product designed to provide necessary information for decision making. Q wizard is more interactive mentor for users of MFG/PRO provides easy to business modeling implementation and interactive learning.

Task "A BPCS client/server product offers numerous industrial applications." What about PeopleSoft.

Notes

Modules

The various modules of MFG/PRO are distribution, financial, Service Support, Supply Chain Management, master files etc.

MFG/PRO module is appropriate for process, batch process, configure-to-order, repetitive manufacturing, and make to stock. MFG/PRO popular in multinational companies. Following MFG/PRO modules provide world class supply chain tools.

1. ***Distribution:*** These modules are used to monitor inventory balances as well as manages purchasing and sales order entries.
2. ***Manufacturing:*** To regulate the manufacturing activities within the various types of production environment. (repetitive to configure-to-order).
3. ***Financial:*** This module have an interface with various MFG/PRO modules in the supply chain like, planning and manufacturing, distribution modules to report the financial implications.
4. ***Service/Support service/Support:*** These are the modules designed for companies that provides sales service and support after the manufacturing and sales of the product.
5. ***Supply Chain:*** The supply management provide the functionality in control of goods and information from supplier to customer.
6. ***Master files:*** This provides access to series of foundation modules used by MFG/PRO applications. The Master files includes the information about, Item/site addresses/taxes, physical inventory multiple database configuration, Inventory control and manager functions.

Case Study

Implementing SAP R/3 at the University of Nebraska

On a Monday morning in August 1998, Jim Buckler, project manager of the University of Nebraska's Administrative System Project (ASP), was preparing for his weekly meeting with the project's steering committee, the Financial System Task Force (FSTF). The ASP is an effort charged with implementing SAP's R/3 client/server enterprise resource planning (ERP) product for the University of Nebraska's multicampus system.

As a result of mapping the University's future business process to the SAP R/3 system, a number of gaps were identified between these processes and those offered by the SAP R/3 system. These critical gaps were tracked as one of the project's critical success factors. Project management and the FSTF had to consider all factors that could potentially be impacted by the critical gaps. Such factors include the scope of the project, resources (human and budgetary), the timeline, and the previous configuration of the system, to name a few.

Top tier ERP vendors are SAP AG, BAAN, PeopleSoft, Oracle Application and J.D.Edwards.

Four options were developed as possible solutions to resolve the 14 critical gaps. Table summarizes the options presented to the FSTF by project management. With a number of constraints and issues in mind, Buckler contemplated which one or combination of the four options was the best course of action. Should SAP and IBM be working concurrently on resolving the gaps (i.e., options 1 and 2)? This seemed to be the safest course of action, but it would be very costly. Should the project timeline be extended until July 1, 1999? What if SAP could not resolve all the gaps by that time?

Contd...

Notes

Would that deter the University from transitioning smoothly into the new millennium? Should the implementation of the HR/Payroll module be delayed? These options would have to be carefully considered and a recommendation made at Buckler's meeting with the FSTF in a few hour's time.

Table 1: Possible Solutions to Critical Gaps

Option	Description	Gaps Affected	Risk	Costs
SAP provides on-site developer(s)	SAP provides on-site developers to edit the R/3 system's core program code and incorporate the changes in future R/3 system releases.	This option would resolve all gaps.	Moderate risk, as solutions will be incorporated in future R/3 system releases; however, developers must begin immediately.	Expected low cost to the University as SAP would be asked to absorb most of the costs.
IBM providers developers to create workarounds	IBM creates temporary workaround solutions that are "bolted on" to the system and are not part of the core SAP R/3 system code.	This option would resolve most gaps as attempts to develop workarounds for some gaps would not be feasible.	High risk, as solutions are not guaranteed to be in future R/3 system releases.	High cost to the University for the consulting resources needed to complete the workarounds.
Extend project timeline until July 1, 1999, to implement the next version of SAP R/3	Push project timeline back three months, resulting in some implementation activities being conducted simultaneously to meet the July 1 "Go live" date.	SAP validates that all critical gaps are resolved in the next R/3 system release.	High risk, as new version must be delivered on time and resolution of critical gaps must be supported.	Moderate cost for some additional resources, potential for high cost if gaps are not resolved in new version.
University delays payroll until the next phase of implementing functionality	"Go live" with non-HR modules as outlined in the project scope and interface the R/3 system with the University's current human resource management system.	This option addresses only those gaps related to the human resources (HR) application module.	Low risk, as current payroll system is functional.	Moderate cost for some additional resources and to address change management issues; potential for high cost if payroll system has to be updated for Y2K compliance.

Questions

1. Which of the four options or combination of options would you recommend to project management and the steering committee? What are the risks involved in your recommendation? How would you manage the risks?

2. Discuss the advantages and disadvantages of a purchased system that forces different organizational units to change their business processes and policies to conform to the

Contd...

Notes

new system. Identify situations where this standardization would be desirable, and other situations where it would be undesirable.

3. Can you think of circumstances where a company might want to install and enterprise management system, such as SAP R/3, even though it appears that this would be significantly more expensive than developing a comparable system in-house? Discuss.

4. Go to the site at sap.com. Follow the links on the page to look at the features of some cross-industry solutions. Prepare a report on the capabilities of the SAP solution.

Source: Condensed from Sieber *et al.* (1999) and sap.com (2003).

7.9 Summary

- 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 saw solid growth in 2004, even as the vendor landscape continued to consolidate Going forward SAP is expected to boost overall growth of this market as its share approaches 50% offsetting flat to declining revenues of several mature, mid-size vendors.
- Oracle's acquisition of PeopleSoft and JD Edwards may limit near term license revenue growth due to product overlaps and customer hesitancy to commit to add-on purchases until project fusion is more clearly defined and upgrade paths are evaluated.
- The mid-market remains a fertile area for growth as well as a key competitive battleground with industry specialization representing the best opportunity for differentiation.
- The ERP market continues to benefit from a widespread acceptance of the idea that business must have integrated information systems to be competitive. The integrated best-of-breed debate still goes on in some organizations, but the suite advocates are clearly winning.
- AMR Research predicted that the would grow about 14% in 2006, from $25.4 billion to $29 billion in 2007.

7.10 Keywords

Investment Management: Investment management monitors the projects from planning to settlement.

Quality: Defined as "that aspect of things under which they are considered in thinking or speaking of their nature, condition, or properties".

SAP R/3 System: SAP R/3 system is the world's most standard business solution for client/server system.

7.11 Self Assessment

Fill in the blanks:

1. ..... system is the world's most standard business solution for client/server system.
2. ..... is ideal for all types of industries and can optimize the business functions.

Notes

3. DEM stands for .....
4. Oracle Corporation was founded in .....

State whether the following statements are true or false:

5. PeopleSoft's ERP solution is built around supply chain optimization.
6. Worldsoftware is not very flexible and easy to use.
7. System Software Associates, Inc. (SSA) was founded in 1983.
8. BPCS client/server is used worldwide.
9. SAP R/3 system is the world's most standard business solution for client/server system.
10. Oracle Application is not the division of Oracle Corporation.

7.12 Review Questions

1. Explain any three modules of SAP R/3 application.
2. Explain any two software modules of Oracle.
3. Explain any three modules available of MFG/PRO.
4. State the factors on which selection of ERP packages and module depends.
5. Explain why package evaluation and selection is a phase which decides the success of failure of the project.
6. Write short note on SSA technology and products.
7. Write a short note on company profile of Oracle Corporation and explain its any four modules.
8. Describe any four modules of QAD's product.
9. Describe any three modules of Oracle Application.
10. Explain any four module of MFG/PRO.
11. Describe any three of ERP product of SAP.

Answers: Self Assessment

1. SAP R/3	2. R/3 system	3. Dynamic Enterprise Modeling	
4. 1977	5. True	6. False	7. False
8. True	9. True	10. False	

7.13 Further Readings

Books

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Notes

Unit 8: ERP Implementation Lifecycle

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Objectives

After studying this unit, you will be able to:

- Discuss the ERP implementation cycle
- Explain project planning phase
- Realise the gap analysis
- Identify the need of end user training

Introduction

ERP systems are adopted in the hopes that they will improve the performance of an organization on a number of key performance indicators, such as profitability, efficiency, and accuracy in information system data and reports. ERP vendors typically promise gains of 10 to 15 percent in revenue customer satisfaction, and other measures of value. The effort required to build these systems is significant. Meta Group found that the average ERP implementation takes 23 months with total ownership cost of $15 million.

Notes

It is typical for firms adopting ERP to go through an initial period where they realize few improvements. Some firms even experience a decline in performance for a period. Major reasons for such declines are failure to thoroughly re-engineer business processes, management errors in system configuration, failure to map changes to the system deriving from changing business needs, mistakes in estimating processing power and data storage requirements and insufficient training of end users. In a perfect world, all of these factors would have been considered in planning and taken care of before going live. In practice it is impossible to anticipate every factor.

8.1 ERP Implementation Lifecycle

Successful implementation is the obvious goal of any organization that has chosen to go in for enterprise resource planning (ERP). ERP implementation is a special event since it involves the entire organization over a period of time. It brings together different functionality, people, procedures, and ideologies, and leads to sweeping changes throughout the organization.

Given this kind of complexity coupled with time constraints that are inherent in almost all such projects, the risks involved are considerable. But what does it take to sail smoothly through the apparent rough weather of an implementation? How does one sustain the enthusiasm of the users? How do we reap the benefits of ERP in the shortest possible time?

Any company can have the best package, knowledgeable users, substantial resources, but although these elements play a part, they are not enough to guarantee the success of ERP.

This unit discusses the roles of consultants, vendors and users, the process of customization, the precautions, the key issues, the implementation methodology and the guidelines for ERP implementation.

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But what does it take to sail smoothly through the apparent rough weather of an implementation? How does one sustain the enthusiasm of the users? How do we reap the benefits of ERP in the shortest possible time? Company can have the best package, knowledgeable users, substantial resources, but although these things all play a part, they are not enough to guarantee the success of ERP.

1. Need analysis for ERP solution
2. Feasibility analysis
3. ERP project life cycle

ERP project life cycle can be classified into the following three stages

Stage 1: Pre-implementation Stage

This phase is the one in which companies must question the need for a new ERP system by the development of the business case analysis is carried out to establish the need for ERP system. Various methodologies are used to assess the critical processes and practices of that company and also attempts are made to forecast the impact it can have both financially and business wise this phase consist of selection of the product that best fits the requirements of the company thus minimizing the need for customization. Factors such as price, training and maintenance services are analysed and the contractual agreement is defined. In this phase it is also important to make an analysis of the return on investment of the proposed solution.

Notes

Business Case Analysis

Most of the companies tend to take the high risk decision of carrying on with the implementation of ERP because of the following reason.

1. It is the in thing although it may not at all be suitable for them. In some cases it has even led companies to bankruptcy. Yet people seem to be blindly choosing the implementation of ERP.
2. It is supposed to cut costs and time and streamline the process of their organization.
3. Mindset to change to invest heavily in terms of money, energy and time. Generally it is seen that interest and enthusiasm remains only in the initial phases. Over a period of time the interest starts declining due to lack of commitment.

Pre implementation stage or development of business case analysis which basically looks into studying the existing and future impact involved in terms of the following:

1. Process
2. Practices being followed
3. Mindset of people (their involvement, cooperation)
4. Availability of resources (money, time and energy)
5. Sustainability
6. Adaptability of the system
7. Feasibility

Business case analysis basically focuses on all the related issues involved and the various methodologies that are followed in carrying out this phase successfully, so that one can take the decision with regard to the implementation of ERP with strong evidences, which can be quantified and measured during each phase of the life cycle of ERP.

The following points are studied in business case analysis:

1. Need to adopt global best business practices
2. Need to adopt global best practices
3. Need to adopt global IT infrastructure
4. Competitive environment analysis
5. Strategic need analysis
6. Feasibility analysis

1. ***Need to adopt global best business practices:*** Best practice is the process of finding and using ideas and strategies from other companies and industries to improve performance in any given area business has used best practice benchmarking over the decades and realised billions in saving and revenues in all areas of business operations and sales best practices are studied in two ways:

   (a) As is best practice this addresses or includes the present practices followed by the specific company which is planning to implement the changes required to keep itself in the league of other top companies in the industry. This is done in all functional areas like HR, operations, Finance, Maintenance etc.

   (b) To be best practice. They are generally the best practices which exist in the industry and have been refined over a period of time companies should aim at adopting their

industry specific best practices for their future benefit. Some of the best practices are: preventive maintenance, activity based costing, kanban etc.

2. ***Need to adopt global best processes:*** As is best processes address or include the following:

   (a) Design of products and services

   (b) Marketing and selling

   (c) Production and delivery of products

   (d) Conversion of resources or inputs into products

   (e) Warehousing

   (f) Managing inventory

   (g) Product quality assurance

   (h) Maintenance process

   (i) Servicing of customers

   (j) After sales service

   (k) Customer relationship management

   (l) Managing human resources

To be Best Processes

Companies need to be define their own employees in order to improve their way of operation and efficiency by adopting these methods the company will be able to save a lot of operating costs and expenditures and also eliminate unnecessary bottlenecks in the processes.

3. ***Need to adopt global IT infrastructure:*** As is IT infrastructure study is done in order to know the following points:

   (a) What is the application that is running in that company-in –house or customized/ standardize one

   (b) Are all modules integrated or run on different packages and platforms?

   (c) What is the connectivity scenario-whether using web based interface or stand alone ones?

   (d) Is a centralised database or a different one being used?

   (e) What is the present platform in terms of front end and backend?

   (f) To what extend does it serve the purpose?

   (g) Is there any duplication of effort in order to capture vital data that impacts employee efficiency?

   To be best practices include some of the practices which are already adopted globally and are taken as industry standards for swiftly operating businesses in a competitive global scenario.

   Some of the best practices that can be adopted are as follows:

   (a) *Information liquidity:* Much like cash liquidity, the liquidity of information is a measure of business success. In a successful company, data flows smoothly and information is transformed into economic value.

Notes

(b) *Availability:* As most of the companies become more and more dependent on IT, it is very important to ensure the maximum availability of the services. This does not mean that all IT systems have to be absolutely flawless and foolproof but good thought has to be given to what could be the consequences for the company if all or part of the IT services are temporarily unavailable and what can be done to minimize these consequences.

(c) *Agility:* market changes constantly and so does legislation and technology. It is said that the product lifecycle and their time to reach the market are getting shorter and shorter as a consequence, IT systems have to be built for maximum agility cross compatibility, reuse and lightweight functionality are the ideas to be considered.

4. ***Competitive environment analysis:*** Porter's five force model studies the five driving forces in an industry which are as follows:

(a) *Barriers to entry:*

(i) Absolute cost advantage

(ii) Proprietary learning curve

(iii) Access to inputs

(iv) Government policy

(v) Economies of scale

(vi) Capital requirements

(vii) Brand identity

(viii) Switching costs

(ix) Access to distribution

(x) Expected retaliation

(b) *Threats to substitutes:*

(i) Switching costs

(ii) Buyer propensity to substitute

(iii) Relative price performance of substitutes

(c) *Bargaining power of buyers*

(i) Bargaining leverage

(ii) Buyer volume

(iii) Buyer information

(iv) Brand identity

(v) Price sensitivity

(vi) Product differentiation

(d) *Bargaining power of suppliers:*

(i) Supplier concentration

(ii) Importance of volume to supplier

(iii) Differentiation of inputs

(iv) Impact of inputs on cost or differentiation

Notes

(v) Threat of forward integration

(vi) Cost relative to total purchases in industry

(e) *Degree of rivalry:*

(i) Exit barriers

(ii) Industry growth

(iii) Industry concentration ratio

(iv) Fixed costs/value added

(v) Product differentiation

(vi) Buyer's incentives

The as is study can reveal:

(a) Identity of competitors

(b) Competitors' strengths and weakness

(c) Intensity of competition

(d) Favorability of environment

(e) Influencing power of both the buyers and the suppliers in the company

An SWOT analysis of the individual companies can be done based on this model it will check where the company stands in the present scenario of competition this competitive pressure is a major factor in deciding the implementation of ERP on the company.

5. ***Strategic need Analysis:*** Strategic need analysis develops the vision and strategy of the company for the next few years. It analyses the company's growth, their business concept and company strategy, strategic planning and operating budgets. The strategic need for ERP to be analyzed.

6. ***Feasibility Analysis:*** Feasibility analysis guides the company in determining whether to proceed with an ERP project. It also identifies the important risks associated with the project the project that must be addressed if the project is approved.

(a) *Technical:* Assess whether the project can be developed and checks:

(i) Familiarity with application

(ii) Familiarity with technology

(iii) Project size

(iv) Compatibility-what must the new system integrate with?

(v) Related to determining methodology to be used

(b) *Organizational:* Assess whether project will be adopted and the political feasibility involved with it:

(i) Top management support

(ii) Sponsor must have enough clout preferably a senior person

(iii) User involvement and support

(iv) Strategic alignment

(v) Political scenario

(vi) Other stakeholders

Notes

(c) *Schedule:* Assess whether the project can be developed by a specified date

(i) Focus is on third dimension of project success

(ii) Utilizes project management techniques to assess if the project is on track

(iii) Assessment of the time of the year to install the system

(d) *Other Issues:*

(i) Availability

(ii) Reliability

(iii) Security

(iv) Responses required

(v) Return on investment

(e) *Risk:*

(i) Address purpose of project, scope, overall feasibility

(ii) High/low on impact on operations, impact on competition, etc.

Cost Benefit Analysis

Economic: Assess cost/benefits of project overtime, legal feasibility involved with it and analyses the following:

1. Present value analysis
2. Development, operations, labour related cost
3. Determine benefits
4. Represent both cash flows as present values
5. Intangible benefits
6. Contracts, service level agreements
7. Vendor and consultant performance

Financial: Assess financial viability of the project and the implication thereof:

1. Return on investment-a ratio indicating financial performance
2. Internal rate of return
3. Payback-is the time taken until the total investment is recovered through revenues
4. Break even equals the number of units that must be sold to recover the investments using profits.

Task "ERP implementation is a special event since it involves the entire organization over a period of time." Discuss

Notes

Stage 2: Implementation Stage

It mainly deals with change management, project management, IT infrastructure management and the implementation approach due to the implementation of ERP a lot of change occur in the company structure and the existing business process to cope up with this change, training programmes are conducted, visits to ERP sites are arranged and workshops are held to educate employees about the change process and also about the ERP pakage and its effective utilization project management schedules are made in which the project orientation time cost and quality are considered. After assessing the company's readiness, decision for the implementation approach is taken, as to whether it should be a phased one or a big bang approach.

Stage 3: Post-implementation Stage

The ERP life cycle does not end when the project goes live. After that the post impact analysis of the project is done, generally After 1-2 years of implementation. Analysis is carried out regarding the optimum utilisation of resources in the project. The impact such as financial, operational, organisational etc. Which ERP implementation had on the total business is calculated and the profitability is measured there of. It is studied whether further improvements can be done on the project for future upgradation and benefits.

8.2 ERP Implementation Methodology

Broadly, the steps involved in a total ERP implementation can be listed as follows:

1. Identification of the needs for implementing an ERP package
2. Evaluating the "as-is" situation of your business
3. Deciding upon the desired would-be situation for your business
4. Reengineering of the business processes to achieve the desired results
5. Evaluation of the various ERP packages
6. Finalizing of the ERP package
7. Installing the requisite hardware and networks
8. Finalizing the implementation consultants
9. Implementation of the ERP package

We now briefly discuss these steps:

Identification of the needs for Implementing an ERP Package

The first step for implementing an ERP package is to identify the reasons for going in for an ERP solution for your business. This step prepares you for some basic questions like:

1. Why should I implement an ERP package?
2. Will it significantly improve my profitability?
3. Will it lead to reduced delivery times for my products?
4. Will it enhance my customer's satisfaction level in terms of cost, delivery time, service and quality?
5. Will it help reduce the costs of my products?

Notes

6. Will it enable me to achieve the same business volume with reduced manpower?
7. Will it enable me to re-engineer my business processes?

The above questions, although very obvious, should form the basis of the decision to adopt an ERP implementation and should at all times be the final goal. The other factors that should be taken into consideration are:

1. Need for quick flow of information between business partners
2. Effective management information system for quick decision-making
3. Elimination of manual preparation of various statutory statements
4. Need for a high level of integration between the various business functions

Evaluating the "as – is" Situation of your Business

In this step, one needs to thoroughly understand what existing business processes the organization is following to transact its business. The various business functions should first be enumerated.

Example: Procurement, production, sales, etc.

Now the processes used to achieve the business transactions should be listed in detail. The technique of process mapping can be used here. The process map should give you the following details for any business process:

1. The total time the business process takes to complete
2. The total number of decision points involved
3. The number of departments / geographical locations that the business process involves
4. The flow of information
5. The number of reporting points

Deciding upon the desired would – be Situation for your Business

In this step, we decide on what we want our business processes to finally look like. Here we use the techniques of **benchmarking** to ensure that the targets set are comparable to the best in the industry. Benchmarking can be done on various aspects of the business like cost, quality, lead time, service, etc.

Re-engineering of the Business Processes to Achieve the desired Results

To achieve the new business processes we re-engineer the existing processes in such a manner that

1. The business process cycle time is reduced significantly
2. The number of decision points are reduced to the bare minimum
3. The flow of information is streamlined, i.e. there is no unnecessary to – and - fro flow of information between departments.

Notes

Evaluation of the various ERP Packages

In this step various ERP packages available in the market are evaluated with respect to the following aspects:

Global presence: Check the performance and acceptability of the package globally.

Local presence: Check how the package is performing in the local market – this gives an idea as to how well a package is taking care of the country specific business needs.

Investment in R & D: Evaluate the package from the point of view of investments the ERP vendor is making in R & D to continuously upgrade their product. A good investment in R & D is a healthy indication of the longevity of the package.

Target market: See which segment of the industry the package is basically aiming at. Some packages, for example, are specific to process industry type of applications whereas others cater specifically to discrete manufacturing. Choose a package that has a strong hold in your type of industry.

Price: This is of course the main criterion that decides what package you will finally go in for

Modularity: This aspect needs to be considered when you want to implement only some particular functions in the ERP package. The availability of the package as independent modules is a must in this case.

Obsolescence: While considering a package it is essential to see what would be the active life of the product before it become obsolete. As mentioned above the investments in R & D directly contribute to upgrade a package from time to time thus increasing its useful life.

Ease of implementation: This factor needs to looked into in detail because a quick, smooth and hassle-free implementation is the key to successful transition from the legacy system. This in turn ensures that your business is not adversely affected in the transition period.

Cost of implementation: With large-scale integration of ERP packages and the consequent complexity built into them, it has become essential to consider the cost of implementation which in some cases can be phenomenal.

Post-implementation support: Before deciding on an ERP package, it is advisable to check the quality and range of the post-implementation support that the vendor provides for his package.

Finalizing of the ERP Package

After a thorough evaluation of all the ERP packages vis-a-vis the key factors of your business, the package best suited to your business needs is selected. The process of finalizing can be simplified by making a matrix of the key factors. You can then rate all the packages under these heads.

Installing the requisite Hardware and Networks

In this step one has to install the hardware and networks required for the chosen ERP package. The installation of the hardware has to be well planned because generally the hardware arrives in time and lies idle due to the delays in implementation. Also, the induction of the hardware should be in a phased manner to avoid blocking of capital.

Finalizing the Implementation Consultants

The factors which go into the selection of the consultant are:

1. Skill – set available with the consultant (application area)
2. Installation base of the consultant

Notes

3. Industry – specific experience (knowledge of the various industry – specific business processes)
4. Finances involved in hiring the particular consultant

Implementation of the ERP Package

The broad steps involved in the implementation of the ERP package are:

1. Formation of implementation team
2. Preparation of implementation plan
3. Mapping of business processes on to the package
4. Gap analysis
5. Customization
6. Development of user – specific reports and transactions
7. Uploading of data from existing systems
8. Test runs
9. User training
10. Parallel run
11. Concurrence from user on satisfactory working of the system
12. Migration to the new system
13. User documentation
14. Post-implementation support
15. System monitoring and fine tuning

Formation of Implementation Team

It is of the greatest importance to form an implementation team consisting of knowledgeable users from all functions along with IT personnel and personnel from the implementation consultant. From the people chosen, the project manager, project leaders and the module leaders should be identified and also a steering committee should be formed. The functions of the steering committee are:

1. To monitor the progress of the implementation
2. To see to it that the schedule of the implementation is adhered to
3. Resolve any problems that come up in the due course of the implementation
4. Allocation of resources for implementation

Preparation of Implementation Plan

An important task is the preparation of a detailed implementation plan that covers the total implementation process. Here various project management techniques like PERT charts can be used. The implementation plan should have clear components and should include the schedule for the following:

1. Training of the project team
2. Mapping of business processes onto the software

3. Function-wise implementation
4. Customization
5. Uploading of data
6. Test runs
7. Parallel run
8. Crossover

Mapping of Business Processes on to the Package

This is a crucial step where the re-engineered business processes are mapped on to the software. In mapping, the implementation team tries to fulfill the user requirements by making use of the standard functionality available in the software. However, if the requirements cannot be covered fully by the standard system, then the next step of implementation, i.e. gap analysis comes into the picture.

Gap Analysis

As mentioned above, the user requirements that cannot be directly mapped on to the standard system form the basis of gap analysis. Here, all such uncovered requirements are compiled into a gap analysis report. The 'gaps' are then classified into the following three heads:

1. Gaps which can be taken care of with a little programming effort
2. Gaps which involve an extensive programming effort and hence require extra resources
3. Gaps which cannot be taken care of in the system.

For the first category, the project team directly takes action and resolves the issue. For the second and third category of gaps, however, the steering committee comes into the picture and decides on the extra resource allocation / process change.

Customization

Once the process mapping and gap analysis have been done, the actual customizing starts. In this step, first the customizing needs are chalked out and then the actual job is handed over to the respective functional teams.

Development of User – Specific Reports and Transactions

As mentioned under gap analysis, any user requirements not covered by the standard system need to be provided by extra programming effort. In this step, the required reports and transactions are created.

Uploading of Data from Existing Systems

With customizing in place, the system is now ready to receive the master and transaction data from the existing system. In this step, programmed transfer of data takes place from the existing system to the new system. To avoid wrong tabulation of master data, the transfer process needs to be thoroughly checked in the trial runs. At times it too involves a lot of programming effort.

Notes

Test Runs

In this step, the test runs on the system are started. Sample transactions are tried to see whether the customizing and master data uploading has been error – free. The result of the sample transactions is evaluated and any changes required in settings to get the desired results are incorporated.

User Training

The training of users can be started alongside the test runs. Users belonging to different functionalities are trained in their respective function. Normally user training includes:

1. Logging in and logging out
2. Getting to know the system
3. Navigating through the various menu paths
4. Trying sample transactions in respective functions

Parallel Run

With the successful test runs and user training in place, the parallel run of the system can be now started. In parallel run, the business transactions are carried out both through the existing system as well as through the new system. The implementation team then takes care of any lacunae which come to light during the parallel run.

Concurrence from user on Satisfactory Working of the System

If the parallel run is satisfactory and error – free, or errors that may have come up have been resolved, the users may be asked for their final approval.

Migration to the New System

When the parallel run has been successfully tried for a reasonable length of time and when the users and the implementation team feel absolutely confident, it is time to go 'live'.

User Documentation

User documentation includes the details on how to carry out the various transactions. It is different from the regular ERP package documentation in the sense that it is more specific in nature than general documentation. It only covers alternatives that are being used in the particular business so as to make it easy for the user to understand and use them.

Post-implementation Support

Post – implementation support generally involves queries from the user, minor changes in the report formats, as well as small changes in layouts of various printed formats like purchase orders etc.

System Monitoring and Fine Tuning

In this phase, the IT people monitor the system closely to see the performance aspects and fine tune the database and other administrative aspects of the system so that the user can derive the best performance from it.

Notes

Task "User training is must for ERP implementation." Suggest your answer

8.3 Strategies to Attain Success

IN addition to obtaining needed IT capabilities, Willcocks and Sykes suggested the following strategies to successfully implement and ERP system.

8.3.1 User versus Technology Focus

The focus can be given to better support methods currently in place or on the ERP design. An ERP is intended to enable to do their jobs better. Business process re-engineering inherently leads to changing views of business requirements. Therefore, requirements lists tend to be unstable, and flexibility is required in ERP system implementation. This change can also outdate vendor software capabilities. Willcocks and Sykes recommend focusing on user needs over technology. Technology focus should be adopted only when the technological maturity required is high and detailed specification can be developed.

8.3.2 Governance and Staffing

Willcocks and Sykes consistently found that effective business innovations require high-level support and a project champion. This top support usually comes from the business side rather than the IT side. Project managers for ERP implementation projects need to be credible to top stakeholders have a record of success and be able to keep the project on its critical path. A multifunctional team is essential including end users, in-house IT specialists, people with the ability to get diverse groups to work together, and specialists in IT and business needs.

8.3.3 Time-box Philosophy

A short time frame for ERP implementation may seem clearly preferable, from a systems perspective, this time frame is ideally six to nine months. Often this may be identified as impractical. If so, it might be possible to decompose implementation into smaller projects, each with tangible business benefits. This approach to time discipline helps reduce project risk of failure to satisfy business requirements. This approach was referred to as converting "whales" into "dolphins" by Willcocks and Sykes.

One reason short ERP implementation projects are undesirable is the time required for employees to adjust to the new system. If employees have been working with different systems for extensive periods a longer transition will be required to refocus the thinking of these employees.

8.3.4 Supplier/Consultant Role in ERP

Consultants can provide a great deal of knowledge and ERP experience. In highly innovative ERP systems supporting activities that the organization has as core competencies it is best to strictly control outside consultants. The alternative is to outsource management of business innovation. This is counterproductive because the consultant gains the business's expertise to sell to others.

Notes

8.3.5 ERP Implementation – Roles and Responsibilities Guide

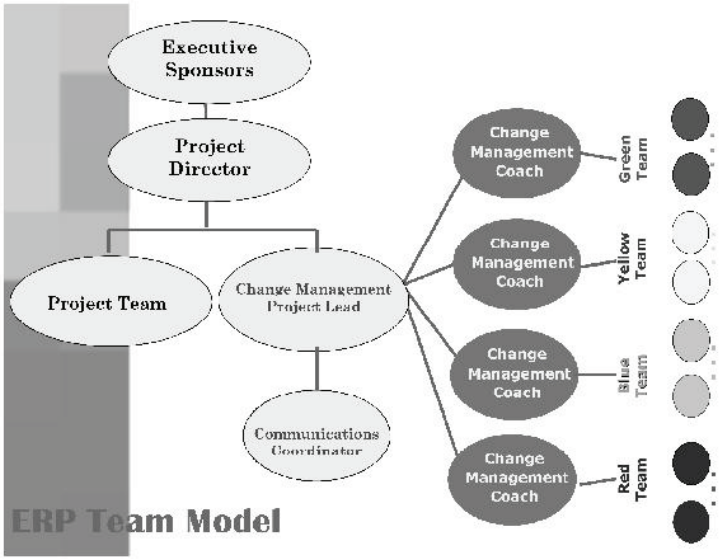
Introduction

This User's Guide is intended to provide the basic guidelines regarding the roles to be performed by the various members in the ERP implementation team.

ERP Team Composition

1. Project Sponsor
2. Steering Committee
3. Project Manager
4. Project Coordinator
5. Functional Owner
6. Functional Team

Figure 8.1: ERP Team



7. Project Manager
8. Process Team
9. Functional Team
10. Technical team

Notes

Project Sponsor

Role of Project Sponsor

1. Ultimate contact for long-term goals and vision.
2. Has the final responsibility to set priorities, approve scope, and settle enterprise-wide issues.
3. Must promote the ERP project throughout the organization.

Primary Responsibilities of Project Sponsor

1. The ERP Project Sponsor must be a member of the Steering Committee and must participate in integrated project status meeting.
2. Ultimate ownership and decision-making power in the fulfillment of the primary responsibilities as outlined for the Steering Committee members.
3. Where conflict exists in the completion of these responsibilities, the sponsor is empowered to negotiate and promote a solution.
4. The Project Sponsor has final budget authority.

Steering Committee Member

Role of Steering Committee Member

1. Primary contact for Corporation's long-term goals and visions.
2. Must be able to set priorities, approve scope, and settle enterprise-wide issues.
3. Aid in promoting the ERP project throughout the organization.

Primary Responsibilities of Steering Committee Members

1. Commit the resources to the project
2. Monitor the progress and the organizational impact of the project
3. Conduct reviews and sign off major deliverables
4. Empower the core team to make decisions and address escalated issues
5. Generate quick decisions
6. Support the Project Manager to accomplish the project goals

Project Manager (Client)

Role of Project Manager

1. Ownership of project deliverables and day-to-day management of the entire project.
2. The project manager is the main liaison with the Steering Committee members and Project Sponsor as well as the ERP implementation team.

Notes

Responsibilities of the Project Manager include:

1. Review of implementation strategy and maintenance of project plan.
2. On-going management of project resources.
3. Communicate project status to both the Steering Committee members and the executive sponsors as well as the Project team, and streamline the resolution of issues when necessary.
4. Proactively anticipate project "deviations" and be responsible for taking immediate corrective action.
5. Obtain a complete understanding of ERP Business Process integration.
6. Participate in decomposition of the current business processes.

Project Coordinator

Role of Project Coordinator

1. Assist the Project Manager in managing the project
2. Responsible for the communication plan for the project

Responsibilities of the Project Coordinator

1. Maintaining a record of the proceedings from the inception of the project
2. Communication of project goals, milestones and status through means such as intranet

Functional Owner

Role of Functional Owner

1. Ownership of the functional area project deliverables and day-to-day management of the functional area.
2. Work with the project manager to develop and manage scope, resources, schedules, and business case of project.
3. Identifying the impact on and requirements for business processes to support the organization's "To-Be" vision with the ERP System.
4. Verify that the project team is meeting the business objectives.

Responsibilities of Functional Owner

1. Manage the effort to provide an analysis of and the document the decomposition of current business processes.
2. Work with the Functional Team Members and end user community to develop the functional design.
3. Review of documentation of all processes and information models.
4. Participate in workshops and presentations to validate business design with the user.

Notes

Functional Team

Role of Functional Team

1. Detail design and configuration of the current business processes in ERP product.
2. Working with the Process Team in the analysis and decomposition of current business processes
3. Perform the scripting exercises, and design and configure the ERP system to support the organization's "To-Be" process vision.

Responsibilities of Functional Team

1. Participate in system unit testing and integration testing.
2. Participate in workshops and presentations
   (a) Overview of ERP in general and functional modules.
   (b) Validate business design with the end user community.
3. Review End-user documentation

Project Manager

Role of Project Manager

1. Overall co-ordination of the project along with the Project Manager
2. Provide the required support to accomplish the goals of the project and ensure customer satisfaction. This includes
   (a) Attending monthly customer project steering committee or management team meetings to observe and influence project direction
   (b) Keep Project Manager updated on project status through regular communications
   (c) Facilitate customer escalations and problem management where necessary.
3. Quality Assurance to ensure a successful implementation. Conduct reviews to be focused on four primary areas: Project Start Up, Process Review, Blueprint Review, and Pre-Live Review.

Responsibilities of the Project Manager include:

1. Definition of implementation strategy and maintenance of project plan
2. Definition and ongoing management of project resources
3. Communication of project status to both the Steering Committee members and executive sponsors as well as the Project team, and streamline the resolution of issues when necessary.
4. The project manager must be able to proactively anticipate project "deviations" and be responsible for taking immediate corrective action.
5. It is also the responsibility of the project manager to obtain a complete understanding of the ERP Business Process integration.
6. The project manager must be able to participate in the decomposition of current business processes.

Notes

7. The project manager must be qualified to effectively serve as a member of the Steering Committee and be fully supported by that body.
8. Participate in Change Management throughout the implementation.
9. Is responsible for evaluating and communicating the audit tracking requirements that result from the implementation to the Project Management Team and Functional Team.
10. Assist the project management and project team in internalising the Accelerated ERP Implementation Roadmap.
11. Aid in the definition of project deliverables and critical target dates to be reflected in the project plan; assist in the definition of project scope and objectives, aid in the resolution of issues when necessary.

Process Team

Role of Process Team

1. Development of Information model ('As-is') and assisting Functional Team Owners and Steering Committee in the development of 'To-be' processes
2. Co-ordinate with Functional team to apply best practices from ERP to the redesigned process
3. Co-ordinate with Functional Owners and Functional team for the process redesign exercise
4. The role of the change management team member is to determine where and how the implementation of the ERP system will affect the organisation and identify which jobs will be impacted by the change.

Responsibilities of Process Team

1. Conduct workshops on processes covering
   (a) Process mapping basics
   (b) To-Be process design workshop
2. Documentation of processes in keeping with IDEF standards
3. Preparation of project charter
4. Work closely with the technical team in the design and development of reports, forms, interfaces and conversions.
5. The change management team member is responsible for co-coordinating with the Project Co-coordinator for external communications regarding the project and the new system. They inform the various groups of the organization about the change.

Functional Team

Role of Functional Team

Provide ERP expertise

1. Implementation of Functional modules
2. Effectively transfer configuration knowledge to Process Team Leads and End-users.
3. Provide 'Best Business Practices' to aid in the design process.

Notes

Responsibilities of Functional Team

Execution of the detail design and configuration of the current business processes in ERP's product. This includes working with the Process Team Lead in the analysis and decomposition of current business processes, perform the scripting exercises, and design and configure the ERP system to support the organization's "To-Be" process vision.

1. Responsible for the execution of the system unit testing and integration testing. This includes performing the test, making changes in configuration based on results, and error resolution.
2. Conduct workshops/presentations/demonstrations
   (a) Introductory session on ERP
   (b) Workshop to validate business design with the end user community.
3. Documentation - identification of business processes and system tasks to be documented
4. Providing training to the end-user
5. They must also provide post-implementation production support.
6. Aid the project team in all tasks as necessary.

Technical Team

Role of Technical Team

Provide ERP expertise in data conversion management and application development.

Responsibilities of Technical Team

1. Creation of development standards and naming standards, design, development, and testing of conversion programs, interface programs, and ABAP/4 custom reports.
2. Responsible for the data mapping, design, development, and testing of conversion programs, interfaces programs, and ABAP/4 custom reports.
3. Aid in the execution of system unit testing, integration testing, and volume and performance testing.
4. Aid in the execution of system unit testing and integration testing as it relates to output forms.
5. Management and documentation of the development projects. This may include the definition of standards and design and management of the Workbench Organizer.
6. Responsible in assisting the Technical Project Lead in the development of a
7. Go-Live Plan.

Did u know? An SWOT analysis of the individual companies can be done based on Porter five force model.

8.4 User Training

The activities of selecting and installing an ERP system have received the greatest focus. However, there are many important issues remaining in making ERP systems work. Training

Notes

of user personnel is critical. Usually for about one year the trauma of the new system is very difficult to bear by all concerned. Adopting a thorough training program makes this difficult period easier to cope with. There is a strong tendency to underestimate the magnitude required in such a training program.

Wheatley reported a vice president of research for a large consulting firm saying that ERP software is rarely the source of implementation problems. Nor was there a detectable difference in problems across vendors or by location. poor training of users was blamed for most of the problems. Organizations with higher proportions of new employees may find ERP implementation easier. Firms with many employees with many years if experience require greater levels of change. Managerial and professional employees are often easier to convince of the positive impact of ERP on organizational effectiveness. Further, the degree of change required within the organization can have an impact on ERP installation timing. If the system is implemented too quickly, this may not provide sufficient time for the organizational climate to change.

Only 10 to 15 percent of ERP implementations run smoothly. Some of the pitfalls that Wheatley reported were:

1. Placing employees in software–specific training, without attention to business processes.
2. Focusing training on command sequences without explanation of why.
3. Skimping on training time.
4. Solving problems the old way rather than learning the new system.

Training in new ERP systems is difficult for several reasons, including diversity, the complexity of the new system, and the variety of training methods available. By their nature, ERP systems are going to radically change how people do their jobs. The leading to user is to integrate computer support to all aspects of the business, naturally leading to user diversity. These people also are busy, especially in coping with the requirements of the new system. Training users in new ERP systems can be extremely expensive more than 10 percent of total ERP system cost.

Experience has demonstrated the importance of training. The need for flexibility in timing and place as well as the need for training in specific functions rather than the comprehensive ERP system affect training delivery. This has led to creation of an entire industry providing ERP training. Availability delivery formats include:

1. Web-based virtual training
2. Computer-based training
3. Video courses
4. Self-study books.
5. Pop-up help screens.

The next milestone shall be giving training to the end-users on the set-up, configuration, transaction processing and report generation. This shall be the post-implementation training phase.

Develop

1. Training strategy
2. Training Plan
3. Training Design
4. Materials

Training Plan Strategy

Notes

1. Identify different users who require training
2. Conduct training needs assessment and skill gap analysis
3. Document requirements for the training team
   (a) Training development schedule

Task "Organizations with higher proportions of new employees may find ERP implementation easier." Why?

8.5 Maintaining ERP

ERP maintenance is defined as post-implementation activities undertaken from the time the system goes live until it is retired from production.

Enterprise resource planning (ERP) maintenance and upgrade activities are receiving much attention in ERP-using organizations. Annual maintenance costs approximate 25% of initial ERP implementation costs, and upgrade costs as much as 25-33% of the initial ERP implementation. Still, the area of ERP maintenance and upgrade is relatively new and understudied as compared to ERP implementation issues. Many organizations lack experience and expertise in managing ERP maintenance and upgrade effectively. This situation is not helped by the lack of a standard ERP maintenance model that could provide practitioners with guidelines on planning, implementing and upgrading an ERP.

Enterprise resource planning (ERP) is integrated packaged software, which addresses most fundamental business processing functionality across different functional areas and business units, in a single software system, with single database and accessible through a unified interface and channel of communication. ERP is distinct from traditional in-house software, in several ways. For example: it is bought from a vendor versus built in-house; helpdesk and maintenance support available from the vendor versus entirely internally-supported maintenance activities; installed version replaced by choosing from readily available versions versus reengineering or rewriting the whole system internally. These differences make clear that the organization, management, control and execution of ERP maintenance and upgrade, are not purely internal issues nor are they driven entirely by internal users and internal IT-staff (as is the case with in-house software where software is built, subcontracted and/or bought from a vendor and 100% maintained in-house). However, neither is ERP maintenance nor upgrade a 100% external matter controlled entirely by the vendor or a third-party outsourcer, although the ERP software vendor has significant influence on ERP-client maintenance and upgrade activities. The vendor plays an important role in maintenance support, and thus maintenance management and upgrade decisions and processes have become more complex as a result.

However, the area of ERP maintenance and upgrade is still relatively new and understudied as compared to ERP implementation. Many organizations still lack experience and expertise in this area. There are no proper guidelines or standards for ERP maintenance and upgrade preparation - no step-by-step procedure for conducting these activities and no upgrade processes to assist practitioners in this area (as yet).

With in-house software, in order to capture and reflect an organization's software maintenance procedures and management issues, a maintenance model is usually defined and used. The main advantages of a maintenance model are that it helps to define, plan and manage maintenance activities; improving maintenance processes, and facilitating modification of the software. It

Notes

provides the clarity to foster understanding and communication among all parties involved, facilitates effective and high quality maintenance support to the system users or stakeholder in general, and therefore helps in reducing the effort and cost of maintenance. Although there are several standard software maintenance models, they are designed for internally maintained software. There is a lack of standards for maintenance model for large commercial off-the-shelf software, particularly ERP, which is "co-maintained" by both the employing-organization and the software vendor.

Case Study

Ten Guidelines for Strategic MIS Planning

Robert V. Head, a consultant on MIS planning, provided ten guidelines to help MIS executives who are on the threshold of experimenting with strategic MIS planning:

1. Make provisions in the systems plan for taking small steps rapidly. "Don't have a plan with goals extending so far into the future that there is no way of tracking it."
2. Develop alternative plans when significant contradictory trends are discerned in business objectives or technology.
3. Interface the systems plan with the corporate plan, modifying both appropriately.
4. Document the systems plan in a format intelligible to top management and arrange for personal presentation.
5. Establish a formal mechanism for review and reiteration of the systems plan.
6. Develop a system for tabulating and forecasting utilization of installed data processing (DP) equipment.
7. Fix the organizational responsibility for systems planning.
8. Rotate the assignment of technical personnel to the planning staff in order to avoid an "ivory tower aura."
9. Budget for research and development.
10. Set up a comparative systems intelligence activity.

Question

1. What can be the drawback of having a formal system as mentioned in point 5?
2. Can transparency make organizational responsibility more effective?

Source: Himadri Barman, *Centre for Management Studies,* Dibrugarh University, Dibrugarh 786 004, Assam.

8.6 Summary

- Different companies may install the same ERP software in totally different processes.
- The same company may implement different ERP software in the same approach. There are three commonly used methodologies for implementing ERP systems.
- Companies layout a grand plan for their ERP implementation.
- The installation of ERP systems of all modules happens across the entire organization at once. The big bang approach promised to reduce the integration cost in the condition of thorough and careful execution.
- This method dominated early ERP implementations, it partially contributed the higher rate of failure in ERP implementation. Today, not many companies dare to attempt it anymore.

Notes

- The premise of this implementation method is treating ERP implementation as the implementation of a large-scale information system, which typically follows SDLC (Systems Development Life Cycle). But an ERP system is much more than a traditional information system in the fact that the implementation of ERP continuously calls for the realignment of business processes. Many parties involved in ERP software systems are not IT professionals. ERP more than automates existing business processes.
- ERP transforms the business processes.
- The method of modular implementation goes after one ERP module at a time. This limits the scope of implementation usually to one functional department. This approach suits companies that do not share many common processes across departments or business units.
- Independent modules of ERP systems are installed in each unit, while integration of ERP modules is taken place at the later stage of the project. This has been the most commonly used methodology of ERP implementation. Each business unit may have their own "instances" of ERP and databases.
- Modular implementation reduces the risk of installation, customization and operation of ERP systems by reducing the scope of the implementation. The successful implementation of one module can benefit the overall success of an ERP project.
- The process-oriented implementation focuses on the support of one or a few critical business processes which involves a few business units. The initial customization of the ERP system is limited to functionality closely related to the intended business processes.
- The process-oriented implementation may eventually grow into a full-blown implementation of the ERP system. This approach is utilized by many small to mid-sized companies which tend to have less complex internal business processes.

8.7 Keywords

Benchmark: A set of routines or actions used to evaluate computer performance. By performing the same basic tasks on several machines, you can compare their relative speeds. Benchmarks are especially useful when the machines use different processors and different input and output devices.

Customized Maintenance: This type of maintenance refers to the creation of new features or adapting existing ones as required by changes in the organization or by the users.

Feasibility Analysis: Feasibility analysis guides the company in determining whether to proceed with an ERP project.

Information Center: An MIS group responsible for supporting end users. It typically provides a help desk to answer questions, programmers who provide access to corporate databases, training classes, and network support people to install and maintain networks.

Local Area Network (LAN): A collection of personal computers within a small geographical area, connected by a network. All of the components are owned or controlled by one company.

Preventive Maintenance: This type of maintenance may be one of the most cost effective, since if performed timely and properly, it can avoid major problems with the system.

Software Maintenance: The act of fixing problems, altering reports, or extending an existing system to improve it. It refers to changes in the software, not to hardware tasks such as cleaning printers.

Notes

8.8 Self Assessment

Fill in the blanks:

1. ..... guides the company in determining whether to proceed with an ERP project.
2. The ..... of business consultants and product consultants involved in the ERP implementation would also be a very crucial factor in ensuring its success.
3. ..... is a special event since it involves the entire organization over a period of time.
4. In order to avoid setbacks in an ERP project, a ..... play vital role.

State whether the following statements are true or false:

5. The ERP life cycle does not end when the project goes live.
6. It is important to understand that an ERP package cannot fit in completely with the existing business practices of an organization.
7. Many users expect their workload to decrease after an ERP implementation, but this may not always happen.
8. It is not the responsibility of the consultant to help users appreciate the fact that is they who are ultimately benefited by implementing the standard package.
9. ERP implementation is a special event since it involves the entire organization over a period of time.
10. Organizations with higher proportions of new employees may find ERP implementation easier.

8.9 Review Questions

1. Why package evaluation is a phase which decides the success or failure of the project?
2. Why does implementation fail?
3. Write short notes on gap analysis.
4. How the ERP package is evaluated?
5. List out the different phases of ERP implementation life cycle and explain package evaluation in detail.
6. Explain the various stages of ERP project implementation.
7. Describe the features of successful ERP implementation practices.
8. Write short notes on user training.
9. What do you mean by information system maintenance?
10. What do you mean by feasibility analysis?

Answers: Self Assessment

1. Feasibility analysis		2. quality and commitment
3. ERP implementation		4. consultant
5. True	6. True	7. True
8. False	9. True	10. True

8.10 Further Readings

Notes

Books

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Unit 9: ERP Vendors, Consultants and Users

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Objectives

After studying this unit, you will be able to:

- State the role of ERP vendors
- Explain the role of ERP consultants
- Discuss about ERP users

Introduction

Developing on ERP package is a time consuming and very complex process. It needs a lot of skilled manpower and other resources. Many organizations have their own departments and experts who have experience in developing sophisticated system. But specialized computer work is not the main objective of these companies. They should direct their resources into improving their own products and services, so that they can serve their customers better and continue to grow. Thus inspite of going in-house implementation it is better to approach any ERP vendor or software firm.

As creating and implementing integrated software is the main business of these software firms they can offer a more sophisticated technology and functionality along with scope and quality which can improve the reserves, profits and shareholders' returns.

Notes

To successfully carry out the designing and implementation of the whole project, ERP vendors needs a group of people with definite roles. (e.g. team of consultants, in-house team, users and so on). These people helps organization to follow a standard approach or methodology of ERP implementation.

9.1 Vendors

Vendors are the people who have developed the ERP software's. These people have invested huge amount of time and efforts in research and development to create the software solutions. The ERP vendors spend billions of rupees in research to come-up with innovations that make the package more efficient, flexible and easy to implement and use.

9.1.1 Role of Vendors

Along with development and research, the vendors are also responsible for upgradations in the technology. The vendors constantly upgrade their products to become best and latest in advancements of technology.

The vendor has to play various roles from designing till implementation of the project. The responsibilities of vendors are being changed in various situations. The various responsibilities of the ERP vendors are enlisted below.

1. The vendor should supply the product and its documentation as soon as the contract is signed. Only then the software is delivered and company develop its training and testing environment for the implementation. For fixing any problem in implementation, a vendor should have license officer who should interact with the implementation team.
2. The another role or responsibility of a vendor is as a trainer – to offer initial training for company's key users. This informs the users how the package works and what are the major components, how the data and information flows across the system, what is flexible and what's not, what can be configured and what cannot, what are the limitations, what are the strengths and weaknesses, what can be customized and what should not and so on.
3. The vendors also support the project functions and must exercise the quality control when product is implemented. If the implementation fails, most of blame will fall on the vendors.
4. On the other hand, providing this support means, more satisfied the client, improved goodwill and good reference.
5. Vendors should continue to participate in all phases of implementation of a project, mostly in an advisory capacity; addressing specific technical questions about technology and product offered.

Rather than these responsibilities, vendors should also involve in customizing the product filling the gaps between package and actual business and offer the guarantee of customization. It will be able to benefit from the future software solutions improvements introduced growth improvements introduced by the vendors.

9.1.2 Tips for ERP Vendor Selection

Most of the ERP software vendors in the market are busy promoting their product. Some of them can also provide efficient software solution. Nevertheless, it is challenging to decide which software is apt for efficient and dependable ERP software system. Moreover, there are innumerable vendors in the market, which makes the task Spartan. The company needs a vendor qualifying all the parameters from service to cost.

Notes

There are various criteria that should be considered before ERP vendor selection. To begin with, the company needs to study about the ERP vendor. The studies should be conducted thoroughly so that the outcomes are applicable. The company must take decisions on the basis of the studies, as it is not proper to go for the Market leader in ERP vendors, if the studies suggest that they do not meet the requirement. The popularity of ERP software vendors does not necessarily mean that their service in terms of the needs and business of the company should comply.

There are a large number of ERP vendors competing in the market. They should look for the vendor who offers some extra features as compared to others. This narrows the selection in the right direction and increases competition among vendors. Further, the vendors strive to improve the quality in products and services in order to attract the companies. In either way the results are in favor of the company.

The company should verify the ERP software through practical demonstrations. It is difficult to have an idea of the services unless they experience it. The decision-making authority should even visit the vendor's premises to ensure the criterion, standards, and other features. For better execution, the authorities can choose few players in the ERP vendors list.

It is essential to collect information about the ERP vendor's stake in the market. This would help determining the advantages and problems while choosing a vendor. A look at the background, previous experiences, and business will help to decide, if that particular vendor is apt to offer services. The credibility of the ERP vendor should be analyzed with respect to the field of service where the company desires to implement ERP. If such an assessment is conducted it will add value and meaning in terms of making the decision of choosing the ERP vendor.

The company should go for an ERP vendor who has flexibility. In a broader sense, it means that the vendor should abide and implement the suggestion of the vendors. On the other end, the company should pay heed to the suggestions of the vendor in terms of technical aspects and expertise. Both the sides should be able to work in coordination and find solutions. This would help in attaining mutual benefits.

Having ERP in India is like an investment that most business houses look up to. ERP or enterprise resource planning can be defined as an integrated, multi-module system that assimilates all the data and processes of an organization into a unified system. To attain this goal, it is essential to strike a successful combination of both hardware and software.

The whole concept of enterprise resource planning originated in the large industrial types of companies where the system was used to simplify their processes and workflow. However, with the passage of time, ERP has evolved as a more comprehensive system and now it is largely available to companies of all types and sizes. It serves and supports a wide range of business functions like manufacturing, order entry, accounts receivable and payable, general ledger, purchasing, warehousing, transportation and human resources.

There are three levels of consulting for a comprehensive ERP project:

Systems architecture: The overall dataflow for the enterprise including the future dataflow plan is designed by the systems architect.

Technical consulting (primarily programming and tool configuration activity): Generally this involves extensive programming.

Business process consulting (primarily re-engineering): The business consultant learns the current business processes of an organization. It also evaluates the corresponding processes in the ERP system, which helps to configure the ERP system to the requirements of the organization.

Usually the ERP sellers permit the businesses to modify their software in order to meet needs of their customer. However, the most important consideration in ERP implementation is cost.

Notes

9.1.3 ERP Consultants Charge a High Fee

ERP consultants consolidate domain knowledge, communication skill and software expertise, which justifies their high cost. The contemporary ERP software involves many intricacies that require years to master. The ERP consultants invest significant amount of time and effort to decipher the process is commendable. The ERP Consultancy operates at the highest level of management often at the CEO level. An efficiently implemented ERP can achieve millions of rupees of saving for an organization. The merits of ERP consultants clearly justify the high cost of implementation.

Criteria	IFS	Marshal	Oracle	SAP	BaaN	People soft	J.D.Edwards
Completeness of functionality with in core package.	Yes, except project and advanced production scheduling.	Yes, except project and advanced production scheduling.	Yes, but maintenance modue is available through Maximo. Project scheduling and advanced scheduling are add ons.	Yes, except advanced production scheduling.	Yes, except project and advanced production scheduling.	Complete solution is not internal.	Yes, except project and advanced production scheduling
Project scheduling	Primavera link	Primavera link	Primavera link	internal	internal	Primavera link	No link
Advanced planning and scheduling	Proposed i2 Rhythm	No link	I1 Rhythm	Limited internal and i2 Rhythm	No link	Available	No link
Multi plant maintenance	Available	Available	Maximo link	Available	Not complete	Available	available
Localization	Planned	Available	Available	Available	Available	Available	Not available
Architecture	3 tier web thin client	3 tier web	3 tier web	3 tier	3 tier	3 tier	3 tier
Choice in OS	Unix,NT	NT	Unix,NT,OS 400	Unix,NT	Unix,NT	Unix,NT	Unix,NT,OS 400
Data base	Oracle	MS SQL	Oracle	Multiple	Multiple	DB2/400 SQL server oracle	multiple
Development tools	Rational rose	MS visual	Oracle designer	ABAP	Baan 4GL		ANSI C

ERP sales has peaked and the demand for ERP consultants is high in the developed world of North America and Europe and is ever growing in China, India, Russia, Philippines, Brazil, and other countries. The gap between the supply and demand also explains the remarkably high cost of ERP consultants.

9.1.4 Role of Vendor Comparison

The most exhaustive ERP product covering the widest range of functionalities is SAP. It is stated that the product is too inflexible rigid and too complex requiring steep learning curves, cumbersome screen navigations and a lot of business process changes than any other ERP solution.

Task How ERP helpful for vendor development and vendor management?

Notes

9.2 Consultants

Business consultants are highly skilled professionals who specialize in developing techniques and methodologies for dealing with implementation and with various problems that will crop-up during the implementation of the package. They are good administrators and control the whole process of implementation and post – implementation. The only problem with them is that they are very-very expensive.

The consultant firms inspect the various products, develop in-depth understanding of each product's strengths and weaknesses, worked by side of the ERP vendors. It confirms that vendor's package works and learns the techniques, found out the pitfalls and mistakes that could be avoided and thus creates a pool of experts, who handles the ERP implementation without failure.

Role of Consultants

The consultants play various roles in implementation. The responsibilities of consultant towards the organization going for ERP implementation are as follows:

1. The consultant should guarantee the success of the project and should be able to show the results to the satisfaction of the company management.
2. The consultant should be responsible for administrating, monitoring, and inspecting the activities of implementation. This is very important in the activities at scheduled time and maintain the quality on the package.
3. Consultants should add the value to the project as they have seen many projects and made or seen mistakes. They can avoid some mistakes and could add quality which save time, money and efforts.
4. The consultant shares their previous experience about the implementation of a package, which makes the implementation easier and value added. Thus, instead of trial and error based implementation, consultant helps by doing it right at first time.
5. Consultant should also know how to remain impartial while questioning current process in an effort to promote better business practices and implementing results.
6. Consultants are responsible for analyzing and clearly addressing customization issues, i.e., it should be distinguished between 'must have' and 'nice to have'. (requirements, needs and options).

Consultants need to position themselves in such a way as to balance their loyalty to the client and project. It is duty of the consultant to understand the total context and scope of the work and to know when to alter the company management about action and decision.

9.3 End-users

These are the people who will be using ERP system, once it is in place. These are the people who were doing the functions that are being automated or computerized by ERP. With implementation, nature of job will change. It is human nature to resist change and implementation changes the whole business in a very massive scale. Employee will fear that system will replace existing jobs. They are also afraid of training and learning, they have to do to use the new system. These are the people who will be directly affected by the implementation changes as they are working at operational level. Their job profile get change, job responsibilities undergoes drastic alterations. They are also forced to develop new skill sets.

Notes

If the problems that end users faced at the time of implementations or at post implementations phases are not addressed and alleviated well in advanced, it will cause trouble for the organization.

If the company makes the mind of its employees to accept this fact and assists in making the transformation, then the major obstacle in the path of an ERP package implementation is solved.

9.4 In-house Implementation: Pros and Cons

As designing and implementing a software package is not the business of most of the companies, the system that their in-house team develops are not having quality, scope, functionality or technology as compared to software created by software firms. Hence it is better for a company to concentrate on their business and leave the job of ERP implementation on software firms who are in that business. But to get maximum benefit – out of packaged solution, the company should participate fully during a package implementation.

The company should plan the participation of employees so every person could have an appropriate role in the implementation project so that, it has enough experts in-house once the implementation is over.

The people who are implementing ERP system should have the good knowledge of product along with following skills:

1. Knowledge of how to organize and run a project of this magnitude, i.e., good organizational skill, project management, team management skill and knowledge of scientific method of software project management
2. Enough experience in handling problem and issues that arise during the implementation e.g. problems like cost over runs, time overruns etc.
3. Good people skills: ERP implementation will face resistance from the employee i.e. will be ignorance about the product, fear of an un-employment, fear of training, fobia of technology etc. That's why it is very important that people in the implementation team are very good, diplomats, adapt at diffusing crises situations.
4. Good leadership skills: An ERP implementation involves many people, thus is necessary for vendors to adapt good communication and leadership skills. This is required for implementation with existing employees.
5. Excellent – training skills: As the team training and end user training are the important phases of implementation process, the excellent training should provided by the vendor.

As the end users are handling the whole systems, the success of an ERP implementation is in their hands. The training should be given perfectly before leaving the company by a ERP vendor.

Besides this the successful ERP implementation also depends on the post implementation (maintenance mode) scenario.

What happens if company itself goes for a ERP development or project?

As today's business trend is to reduce the manpower and focus on company's competitors, the responsibilities of ERP implementation taken by in-house resources is rightly justified.

If a company wants to plan in-house implementation, it might hire experts and have them on the company's rolls. This is expensive proposition as once the implementation is over, there is no need of keeping experts in the business.

Notes

In post implementation phase itself company trained the in – house people so that, they can help company in implementation efforts on other units of company and in providing training to the other employees using of system. This saves lot of money of company that would have been spent on hiring trainers.

Did u know? The ERP consultants invest significant amount of time and effort to decipher the process is commendable.

Case Study

Information System in Restaurant

A waiter takes an order at a table, and then enters it online via one of the six terminals located in the restaurant dining room. The order is routed to a printer in the appropriate preparation area: the cold item printer if it is a salad, the hot-item printer if it is a hot sandwich or the bar printer if it is a drink. A customer's meal check listing (bill) the items ordered and the respective prices are automatically generated. This ordering system eliminates the old three-carbon-copy guest check system as well as any problems caused by a waiter's handwriting. When the kitchen runs out of a food item, the cooks send out an 'out of stock' message, which will be displayed on the dining room terminals when waiters try to order that item. This gives the waiters faster feedback, enabling them to give better service to the customers.

Other system features aid management in the planning and control of their restaurant business. The system provides up-to-the-minute information on the food items ordered and breaks out percentages showing sales of each item versus total sales. This helps management plan menus according to customers' tastes. The system also compares the weekly sales totals versus food costs, allowing planning for tighter cost controls. In addition, whenever an order is voided, the reasons for the void are keyed in. This may help later in management decisions, especially if the voids consistently related to food or service.

Acceptance of the system by the users is exceptionally high since the waiters and waitresses were involved in the selection and design process. All potential users were asked to give their impressions and ideas about the various systems available before one was chosen.

Questions

1. In the light of the system, describe the decisions to be made in the area of strategic planning, managerial control and operational control? What information would you require to make such decisions?
2. What would make the system a more complete MIS rather than just doing transaction processing?
3. Explain the probable effects that making the system more formal would have on the customers and the management.

Source: Himadri Barman, *Centre for Management Studies,* Dibrugarh University, Dibrugarh 786 004, Assam.

9.5 Summary

- An IS Manager is required to supervise three key functions, the development of strategy (both company and IT), support for the end-user and the running of the IT (or DP) department. Strategy. Although extremely important it is a subject about which very little has been written.

Notes

- In the 1960s computers worked only in batch. They occupied a large room in the head office of a major company and worked on corporate applications. The only contact which the end-user had with the computer was the requirement to complete a data preparation document and forward this to the DP department. Of course they then had to sort out the erroneous output from the DP department. In the 1970s on-line systems were developed. These sought data input from end-users (on dumb terminals) but did not allow the end-user to do anything other than was allowed by the system design. The end-user had gained some control, however.
- They now had the ability to render a system unworkable in some cases. Hence it was essential to involve the end-user in the system design process.
- In the 1980s the PC came along. This now allowed the end-user a further sanction.
- The end-user could purchase an individual computer and develop an independent system or the end-user could demand an intelligent front end to a central system.
- Alternatively the end-user could resist the introduction of central systems by local disingenuity (for example if the central management wished to introduce a corporate approach to and standard for office automation this could be blocked). This enhanced user control has led to the gathering momentum of the client/server approach.

9.6 Keywords

CASE: Computer programs that are designed to support the analysis and development of computer systems. They make it easier to create, store, and share diagrams and data definitions. Some versions even generate code. There are two categories of CASE tools: software development and maintenance of existing systems.

DSS: System to use data collected by transaction-process-ing systems to evaluate business models and assist managers in making tactical decisions. There are three major components: data collection, analysis of models, and presentation.

End-user Development: Managers and workers are to develop their own small systems using database management systems, spreadsheets, and other high-level tools.

Outsourcing: The act of transferring ownership or management of MIS resources (hardware, software and personnel) to an outside MIS specialist.

9.7 Self Assessment

Fill in the blanks:

1. The ..... invest significant amount of time and effort to decipher the process is commendable.
2. The most exhaustive ERP product covering the widest range of functionalities is .....
3. Business consultants are ..... who specialize in developing techniques and methodologies for dealing with implementation.
4. Consultants are ..... and clearly addressing customization issues.
5. ..... are the people who were doing the functions that are being automated or computerized by ERP.

Notes

State whether the following statements are true or false:

6. Vendors are the people who have developed the ERP software's.
7. The vendor doesn't play any role from designing till implementation of the project.
8. The ERP Consultancy operates at the highest level of management often at the CEO level.
9. The most exhaustive ERP product does not cover the widest range of functionalities is SAP.
10. Consultants are responsible for analyzing and clearly addressing customization issues.

9.8 Review Questions

1. Why a company cannot develop an ERP system in-house?
2. Why a company cannot implement the ERP system in-house?
3. Who is an ERP vendor and explain its role?
4. Who are the consultant and what are their roles?
5. "The success of ERP implementation is in the hands of End-user." Discuss.
6. Explain the role of End-users in ERP implementation
7. Does ERP implementation fail? Why?
8. What are the drawbacks of in-house development of an ERP system
9. Why is the end-user training important?
10. What are the drawbacks of in-house development of ERP system?
11. Discuss the reasons for the failure of ERP.
12. Explain the importance of End-user Training in the ERP implementation life cycle.

Answers: Self Assessment

1. ERP consultants
2. SAP
3. highly skilled professionals
4. responsible for analyzing
5. End-users
6. True
7. False
8. True
9. False
10. True

9.9 Further Readings

Books

Alexis Leon, *ERP Demystified 2/E,* Tata McGraw-Hill, New Delhi.

Alexis Leon, *Enterprise Resource Planning,* Tata McGraw Hill, 2009.

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Unit 10: ERP Future Directions

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Objectives

After studying this unit, you will be able to:

- Know about new markets and new channels
- Discuss the faster implementation methodology
- Identify new business segment
- State the concept of web enabling

Introduction

ERP provides perfect solution in the Back-office practices. The areas such as, financial management, human resources and basic manufacturing ERP system has already proved its strength. ERP systems also solved the Y2K problem and provide the solution to the industry. This result in the increasing demand for the investments in the front office applications such as e-commerce, SCM and HR – customer self-services. As the demand raises, the top – five ERP vendor moves forward to the new technologies. The vendors like SAP, BAAN, PeopleSoft and J D Edwards refocus their energies into Front-office such as, customer management and SCM e.g. checkout and fuel significant business growth.

Traditionally, ERP applications provide multi module suites of business management, human – resources, accounting and payroll. ERP vendors started with IBM mainframe, ASI400 DEC or HP minicomputer platforms and then moved towards the client / server technology and UNIX platforms.

Notes

10.1 New Market

1. Supplementing direct sales with reseller channels
2. Software offerings to appeal on the basis of reduced functionality
3. Improving the implementation methodology for faster development
4. Removing the entry price to make it financially viable
5. Using the platforms such as MS Windows NT

10.2 New Channels

As all the vendors being forced to market their product in the world of small business, they made their software products more affordable by lowering the prices for each module and by ramping up the total costs by basing price on user licenses e.g. Oracle offerings the lower price software from companies such as platinum software and great plains software. JD Edward provides less expensive versions of the OneWorld suit.

10.3 Future Directions in ERP

The only constant is change. No more so than in the constantly evolving, high-speed world of technical innovation. Therefore, the question is: How will these inevitable changes affect the ERP market? In this unit, we will survey the industry landscape and find out what is on the horizon—keeping in mind that often what appears to loom large in the distance turns out to be a mirage. ERP industry watchers are agreed on at least one point: 'one-size-fits-all', across the board integration is no longer seen as the unwritten law. As revolutionary as the ERP concept was, and to a certain extent still is, given the number of companies yet to implement it, it is doubtful whether it can hold onto its overall position as the 'hottest' dominating technology in the face of competition from new cutting-edge technologies such as Internet commerce and EDI (Electronic Date Interchange), and competitive new business practices involving supply chain and customer self-service.

Major ERP Vendors and their Products:

Vendor	Product
SAP AG	R/3
Oracle Corporation	Oracle Applications
JD Edwards World Solutions Co.	OneWorld
PeopleSoft Inc.	PeopleSoft
Baan Co.	Baan IV _____

M H Lakdawala

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Notes

10.4 Faster Implementation Methodologies

All ERP vendors have suffered from the perception that their software is difficult and costly to implement. This perception has provided huge profits to the 'Big 6' accounting firms (now Big 5 with the merger of Price Waterhouse and Coppers SB Laybrand) that have generated billions in fees from their ERP software implementation 'practices.'

Even though only 10-15% of the implementations have taken years to complete and have eaten up millions of dollars of consulting costs, the fact remains that implementing ERP packages is difficult.

An ERP system may consist of dozens of modules that are deployed on a multinational basis to service hundreds of users from many different business departments.

There may also be a complete change of infrastructure—say from a mainframe to a UNIX platform—while a number of core business processes are being simultaneously reengineered.

ERP vendors have thus begun to focus their effort on making the implementation process easier by:

1. Providing more effective tools
2. Better methodologies to speed up the process,
3. Creating elite consulting teams to intensify resources when required, and
4. Using model-based approaches and opening up their systems for easier integration.

Example: SAP has introduced a program called Accelerated SAP (ASAP) that takes the knowledge gained from thousands of R/3 implementations to date and consolidates this expertise in a product called the Business Engineer.

This product helps implementation teams configure the SAP modules to conform to the processing style of some 100 business operating scenarios.

Methodologies such as ASAP help reduce SAP implementation times to less than six months in many cases.

Oracle recently introduced a similar program called Fast Forward, to help speed up implementations of Oracle Applications suites and nail down the costs up-front.

As to implement the whole business it has to go through reengineering process. This may cause the complete change in business model working previously and thus also find it difficult to implement. Some times only 10-15% of the implementation takes years to complete and by the times implementation cost may increase.

To make the implementation of packages more convenient, the ERP vendors are searching for faster implementation methodologies e.g. Accelerated SAP (ASAP) is a program introduced by SAP. This program takes the knowledge gained from R / 3 implementations and consolidates this expertise in a product called the Business engineer. This helps to configure the SAP modules to confirm to the processing style of same 100 business operating scenarios. This methodology reduces SAP implementation time to less than six months in many cases. Oracle also introduced a faster implementation methodology called Fast – Forward. This program speed up implementation of Oracle application suites and nail down the costs up front.

As there is dearth of skilled consultants, ERP systems implementation often becomes a difficult task. To achieve system implementations the ERP vendors also provide the consulting services with highly skilled consulting teams and charged with delivering fully trained experienced consultant on a worldwide basis e.g. Oracle's OracleOne or SAP's Platinum Consulting Services with highly skilled consulting teams providing their services along with new channel partners and implementation methodologies.

Notes

10.5 Application Platforms

The ERP vendors offer central platform management tools along with comprehensive suites of application modules. These application modules supports multinational deployment, year 2000 compliances and Euro (European currency) e.g. To centrally support R / 3 product uses popular platform management tools. The vendors such as Computer Associates (Unicenter TNG) and Tivoli (TME) offers these tools.

SAP is already ahead in this race; its R/3 product is one of the few that can be managed, centrally using popular platform management tools from vendors such as Computer Associates (UniCenter TNG) and Tivoh (TME),

10.6 New Business Segments

After establishing in business/enterprise environments, ERP vendors are trying to deliver specialized variants of their products to the business segments such as government, health care, retail environments and financial services.

Some vendors are offering their services in more specialized areas such as demand forecasting of sales automation and marketing and supply chain management. E.g. People Soft bought Red Pepper Software to improve its supply chain application, BAAN bought Aurum Software for its Aurum Customer Enterprise suit of CRM tools and also teamed up with Hyperion Solution to strengthen its financial module. Hyperion Software links to Hyperion's financial accounting, budgeting and reporting solutions to BAAN's distribution and manufacturing modules.

Task "According to the technology improvement in every field what is the future of ERP in today's scenario." Suggest

10.7 Web Enabling & Snapshot

To deliver the self-services and e-commerce capabilities, ERP vendors are being forced to move from client / server to browser / server architecture to web-enable their software. Vendor delivers java based application for web enabling software. e.g. BAAN is working to deliver a java based web interface to all its products and also focusing on the automation of supply chain relationship via internet, on e - commerce via Microsoft merchant server (Site Server) and on using Hyperion Software Corp.'s Spider – Man technology for report and alert distribution across the web. PeopleSoft delivers java based self service applets with its version PeopleSoft – 7. J D Edward is using java to its One World to be available either through a Windows client or a web browser. Oracle has used java to deliver its web employee customers and suppliers module.

In 1997, SAP released 25 web applications for its version 3.1 of the R / 3 and also previewed links to online catalogs for web based procurement. For their first generation of web enabled application, ERP vendors are all using Java rather than Microsoft's Activex. ERP vendors deliver their universal application on Java based web interface. This makes them to move away from proprietary technologies to more open tools.

E.g. SAP solutions and PeopleSoft offers tools for customerising their products ABAPG and PeopleTools. These tools are proprietary and make the implementation expensive, whereas many lower – tier software vendors invites their application front ends using the commercial tools like Power Builder VB, or Microsoft Access ERP vendors are not using these options, thus the customers have to pay a premium for ABAG and PeopleTools.

Notes

Oracle is also a tool vendor and uses Oracle Forms, Developer 2000 and Designer 2000 to develop its Oracle Application.

The emerging trends in the enterprise packaged applications are its integration with latest cutting – edge technology like sales force automation (SFA), customer relationship management (CRAM). As the internet based services like E–commerce are available, the new applications get diverted from Back-office and Front-office functioned items.

As with every other software market, ERP vendors are being forced to move from a client/server to browser/server architecture to Web-enable their software and thus, deliver self-service and electronic commerce capabilities.

BAAN is working to deliver a Java-based Web interface to all its products. The company is also focusing on the automation of supply-chain relationships via the Internet, on e-commerce via the Microsoft Merchant Server (now known as Site Server), and on using Hyperion Software Corp.'s Spider-Man technology for report and alert distribution across the Web.

PeopleSoft is set to deliver its Universal Applications—Java-based self-service applets—with its PeopleSoft 7. JD Edwards is also using Java to allow its OneWorld functionality to be available either through a Windows client or a Web browser. While Oracle has used Java to deliver its Oracle Web Employees, Oracle Web Customers, and Oracle Web Suppliers modules.

In 1997, SAP released 25 Web applications for version 3.1 of the R/3 and recently previewed links to online catalogs for Web-based procurement. Unlike the Microsoft-centric middle market applications, the ERP vendors are all using Java, rather than Microsoft's ActiveX, for their first generation of Web-enabled applications.

The move by the ERP vendors to embrace Java as a means to deliver and deploy their Web functionality is the first move away from proprietary technologies to more open tools.

One reason why implementing solutions from SAP and PeopleSoft can be expensive is because the tools for customizing their products—ABAP4 and People-Tools—are proprietary. Whereas many lower-tier software vendors have built their application front ends using popular commercial tools—such as PowerBuilder, Visual Basic, or MicrosoftAccess—the ERP vendors have not taken this route.

As a result, the customer will have to pay a premium for ABAP4 and PeopleTools programmers, instead of leveraging the PowerScript or Visual Basic expertise that they may already have in-house. Because Oracle is already a tool vendor, the company uses Oracle Forms, Developer 2000, and Designer 2000 to develop its Oracle Applications.

Did u know? ERP vendors offer central platform management tools along with comprehensive suites of application modules.

10.8 Business Models and Business Application Programming Interfaces (BAPIs)

SAP has attacked the notion that the R/3 system is not open by releasing the specifications for some 170 business application programming interfaces (BAPIs), which help third-party applications interact with R/3 directly.

BAPIs are simply, sets of methods that allow external applications to collaborate with specific R/3 business objects, such as customers, accounts, or employees.

The fact that the R/3 data is addressable through these callable methods, (BAPIs) gives the third party application vendors a lot of flexibility to build supporting applications for the R/3 system.

Notes

In a similar manner, BAAN provides an offering called OrgWare that is based on the use of a tightly integrated business-modeling tool, combined with business-specific templates that help to automatically configure the software to suit specific operational needs.

BAAN is currently in the process of enhancing this tool with new setup wizards to accelerate software implementation on the Windows NT platform.

Task BAAN is working to deliver a Java-based Web interface to all its products. Discuss the features of Java based application.

Case Study

Building the IT Infrastructure

Alfred is a do-it-yourself entrepreneur who built up his fortune in trading. He traded in anything and everything, and kept close control of every activity. That was how he had grown rich enough to indulge in his one dream — to build a college in his hometown. A college that would be at par to the ones in the better cities, the ones in which he could not study himself.

Work started a year back and the buildings were coming along well. He himself did not use computers much and became hooked to the Internet and e-mail only recently. He was determined to provide a PC with Internet connectivity to every students and faculty member. He was currently engrossed in plans for the 100-seater computer lab.

What was confusing him was the choice of Internet connectivity. He had about a dozen quotes in front of him. Recommendations ranged from 64 kbps ISDN all the way to 1 Gbps leased line to Guwahati, which was almost 200 km away. Prices ranged from slightly under a lakh all the way up to ₹ 25 lakhs and beyond. He did not understand most of the equipment quoted firewall, proxy server, cache appliance. Nor was he sure what the hidden costs were. Although it went against his very nature, he would have to identify a trustworthy consultant who would help him make sense of the whole thing.

Questions

1. In the context of the given case, what managerial issues need to be addressed by Alfred? Why is it important for managers to be tech savvy?
2. What is the importance of a 'systems consultant' to an organization? What skills should he/she possess?

10.9 Summary

- To solve the problems of "information-glut" arising from the evermore affordable information and communication technologies that provide for evermore high-capacity, fast, long-distance transmission, organizations would need to introduce methods for "selective dispersion of information" to their various parts.
- Work tasks would be grouped in organizational units created around a common program for information processing.
- Improvements in telecommunications will make it easier to control (which will be primarily a matter of information exchange) organizational units dispersed over different parts of the world.

Notes

- Advances in telecommunications (such as videophone), coupled with diminishing costs, would result in increased distance-communication.
- Indirect communication would be preferred for well-structured information for routinized, "preprogrammed" decision processes.
- Transaction processing systems are responsible for capturing, storing, and providing access to the basic data of the organisation.
- The goal is to capture the transaction data as soon as possible.
- Common collection methods include point-of sale services, process control, electronic data interchange, and electronic commerce websites.
- Because data is the foundation for all other decisions, TPS must maintain data integrity and minimize the threats to the data.

10.10 Keywords

Enterprise Network: A network that connects multiple subnetworks across an entire firm. Often, the networks use different protocols and different computer types, which complicates transmitting messages.

Online Analytical Processing (OLAP): A computer system designed to help managers retrieve and analyze data. The systems are optimized to rapidly integrate and retrieve data. The storage system is generally incompatible with transaction processing, so it is stored in a data warehouse.

UNIX: A popular operating system created by Bell Labs. It is designed to operate the same on hardware from several different vendors. Unfortunately, there are several varieties of UNIX, and software that operates on one version often must be modified to function on other machines.

10.11 Self Assessment

Fill in the blanks:

1. Oracle also introduced a faster implementation methodology called .....
2. BAPIs stands for .....
3. ..... is the most popular operating system in the world forcing all ERP vendors to offer their products on its platform.
4. The ERP vendors offer central platform management tools alongwith ..... of application modules.

State whether the following statements are true or false:

5. ERP vendors focusing on providing improved decision support applications.
6. PeopleSoft is going to include closer integration between PeopleSoft applications and both, the client based Congos Corp.
7. JD Edward provides most expensive versions of the OneWorld suit.
8. SAP has introduced a program called Accelerated SAP.
9. Vendor delivers java based application for web enabling software.
10. BAAN is not working to deliver a Java-based Web interface to all its products.

Notes

10.12 Review Questions

1. Explain why the ERP vendors are trying to improve their products and offering.
2. Explain faster implementation methodologies used in ERP implementation.
3. Write a short note on OLAP.
4. Which are the new markets and channels explained by ERP vendors?
5. Write a short note on Convergence on 'Windows NT'.
6. What is the impact of internet and www on the ERP products?
7. Write a short note on web enabling the software.
8. 'Business Model 4 BAPI'. Write short notes.
9. Write a note of faster implementation methodologies?
10. What do you mean by new business segment?

Answers: Self Assessment

1. Fast-forward
2. Business Application Programming Interfaces
3. Windows NT
4. comprehensive suites
5. True
6. True
7. False
8. True
9. True
10. False

10.13 Further Readings

Books

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Unit 11: ERP-II

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Objectives

After studying this unit, you will be able to:

- Discuss the concept of ERP-II
- State the added features in ERP-II
- Explain the open source ERP technologies
- Realise the ERP logistics package benefits

Introduction

"ERP is dead-long live ERP II" is the title of a path-breaking research note from GartnerGroup In this research note GartnerGroup envisions how enterprise resource planning (ERP) vendors will respond to market challenges and how ERP and ERP strategies will have evolved by 2005. GartnerGroup defines ERP II as a transformation of ERP into next-generation enterprise systems. Today the major vendors have adopted this concept into their ERP packages.

Notes

Research, however, do not respond to new business practices too hastily. This lag is an issue in inertia of information systems (IS) research delayed the emergence of ERP research until the late 1990s. The ERP research interest was fuelled by the unsuccessful ERP implementation projects and has only recently been consolidated into a strategic and managerial perspective on enterprise systems (ES) management.

For quite some time supply chain management (SCM) has been the driving force in challenging the industry to integrate and to collaborate with other businesses, and ES are instrumental in this transformation. New information technology (IT) has had a significant impact on SCM practices, and interest is now growing towards loose-coupled and network oriented perspectives.

11.1 Exploring ERP-II

ERP II is an important concept to industry and until now the research on this concept has neither been consistent nor conclusive as regards the content and status of this phenomenon.

In this unit the ERP II concept will be approached by evaluating the development of the ERP packages and the emerging business requirements. This will lead to an outline of a conceptual framework for ERP II. This study builds on existing ERP theory, analysis of the vendors' systems and current business practices. This suggests that the framework will be useful in the analysis and design of the complex enterprise systems in practice.

The ERP II concept is decomposed, expanded and the conceptual framework is outlined. Finally the paper discusses the research and business implications of next-generation enterprise systems and sum up further research into enterprise systems.

11.1.1 Enterprise Systems in Retrospect

The concept of ES has often been explained through the evolution of ERP. The concept of ES has evolved over almost 50 years driven by the changing business requirements, new technologies and software vendors' development capabilities.

The fundamental structure of ERP has its origin in the 1950s and 1960s with the introduction of computers into business. The first applications automated manual tasks such as bookkeeping, invoicing and reordering. The early inventory control systems (ICS) and bill of material (BOM) processors gradually turned into standardized material requirements planning (MRP). The legacy of the IBM's early COPICS specifications can be traced in the structure of the systems even today.

The development continued in the 1970s and 1980s with the MRP II and CIM concept. Even though the CIM ideas failed in many aspects, the research, e.g. on IS development (ISD) and enterprise models, provided the background for gradually integrating more areas into the scope and of the information systems. This development peaked in the early 1990s with the advent of the ERP systems – often embodied in SAP R/3 along with the other major vendors: JD Edwards, Baan Oracle, Peoplesoft, and SAP the so-called JBOPS. Although the ERP systems have other legacies like accounting, planning and control philosophy is rooted in manufacturing.

ERP is a standardized software packaged designed to integrate the internal value chain of an enterprise. An ERP system is based on an integrated database and consists of several modules aimed at specific business functions.

According to the American Production and Inventory Control Society (APICS) defines ERP as:

[…] a method for the effective planning and controlling of all the resources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service company.

This definition emphasizes the business purpose of the system.

Notes

Davenport's sequel on enterprise systems is an indicator of the changing business perspective on ERP and the ERP hype. In the late 1990s the ERP hype was primarily motivated by companies rushing to prepare for Y2K .sums up this first wave of experience from implementing ERP systems in a much cited paper on "putting the enterprise system into the enterprise", and points to the new potential business impact of ERP systems. The discussion evolved over the first enthusiastic expectation on integration, via the growing number of horror stories about failed or out-of-control projects, towards the renewed hype of expectations on e-business and SCM.

Summarize the early key drivers for adopting ERP systems as:

1. Legacy systems and Y2K system concerns;
2. Globalization of business;
3. Increasing national and international regulatory environment, e.g. the European Monetary Union;
4. BPR and the current focus on process standardization, e.g. ISO 9000;
5. Scaleable and flexible emerging client/server infrastructures; and
6. Trend towards collaboration among software vendors.

The research on ERP in the last millennium is well analyzed for instance through the works of. They review the ERP literature through an ERP lifecycle model reflecting the adoption process reviews several lifecycle models and concludes that the common denominator is the distinction between pre-implementation and post-implementation stages and the lack of an explicit usage stage. He observes that up to 30 per cent of the research deals with implementation issues.

Further summarize the differentiating factor for the complexity of ERP projects:

1. The number and variety of stakeholders in any implementation project;
2. The high cost of implementation and consultancy;
3. The integration of business functions;
4. The subsequent configuration of software representing core processes;
5. The management of change and political issues associated with BPR projects
6. The enhanced training and familiarization requirement.

This complexity has triggered two large strands of ERP implementation research and ERP success/failure research. The concepts of implementation, success and failure are even more complex, introduced an "ERP journey" and the idea of understanding ERP implementation as a business transformation enabled by ERP.

Another strand of ERP research that deals with the business transformation is the process-oriented research This strand emphasizes the ERP technology as an enabler of business process reengineering (BPR); it deals with issues of process orientation and the organizational change – both internally and as a second phase in the supply chain .elaborate on these strands and combine them into a multi-dimensional model of the transformation essentially encompassing people, business, technology, and process issues. The combination of implementation and usage is discussed in and the next section discusses the required business transformation.

11.1.2 New Business Requirements

SCM has become one of the most important new business concepts. Global competition and outsourcing have caused the fragmentation of the supply chain, and supply chain excellence is now a prerequisite for competitive advantage. Theoretically SCM emphasizes the management of the entire supply chain as one entity, and the practice of SCM is to extend the internal business processes into the supply chain thus developing an integrated supply chain.

Notes

The concept of SCM dates back to the late 1950s where research on system dynamics explored the systemic properties of enterprises collaborating in chains. Business dynamics dealt with delays and information flow and addressed contemporary problems like the "Bullwhip effect" which is still a significant issue.

There was no business implication of this research due to the immaturity of the available computers, but also the success of the emerging MRP systems postponed interest in this approach for decades. The concepts re-emerged at the beginning of the 1980s initially in operations and logistics research, and by the 1990s many businesses were implementing major structural changes in their supply chain.

SCM took a systems approach to planning and controlling the material and information flow from the raw material to the final customer, and therefore SCM was defined as:

1. The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole.
2. The strategic management discussions dominated the initial research agenda but the software industry responded to the new business requirement by producing a new breed of add-on or "bolt-on" software to ERP called Advanced Planning and Scheduling (APS) systems .APS was enabled by refining the mathematical programming models and in particular the genetic algorithms applied to solve the network problems of an entire supply chain. The APS systems facilitate the central management of the supply chain activities and processes in real time, essentially by extending the MRP/II planning concepts to encompass the entire supply chain, and as a result the systems in effect are SCM systems.
3. Although the SCM concept deals with the entire supply chain, the perspective of the upstream SCM and the downstream SCM differs.
4. Downstream, SCM deals primarily with demand management, order fulfillment, replenishment and collaborative relations with customers, e.g. collaborative planning, forecast and replenishment (CPFR). Some researchers even proposed demand chain management (DCM) as a new perspective .The management of market information became important and the software vendors targeted these new requirements with the customer relationship management (CRM) systems.
5. Upstream, SCM primarily deals with issues of managing the supplier networks. Issues like supplier relations, partnerships, competence development and technology transfer are barriers for developing the supply chain. Practices based in the just-in-time (JIT) philosophies were implemented in the supply chain and new concepts like vendor managed inventories (VMI) emerged. The traditional purchasing task became strategic sourcing and the new tools required were gathered under the supplier relation management (SRM) hat.
6. Managing information in an inter-organizational context has become critical and the emergence of the internet and the range of related e-business technologies created new opportunities and threats to supply chain managers.

11.2 What are the Added Features in ERP II?

ERP has a big challenger from its own community. Its successor ERP II has been talked about much. However there are also arguments that it is merely an extension of ERP. ERP and ERP II have lot of differences. The popular myth that ERP II is the extension of ERP is not true. The comparative features of ERP and ERP II will explain them clearly.

Notes

Some of the added features of ERP II are as follows:

Specific Coverage to Individual Elements

Enterprise resource planning did not cater much to the individual elements. On the contrary it was focused more to macro parameters like departments, process and procedures. Since the micro elements escaped attention there was no proper remedy for the defects and even if they were implemented they were not highly effective. ERP II has some comprehensive features that not concentrates on individual elements but synergizes them and makes the functioning of the concerned wholesome component more meaningful.

Applicable to all Industries

The concept of ERP enjoyed wide applicability in the manufacturing sector. In addition Retail and distribution segments were benefited. They were also applicable to all industries and segments; however the benefits were not worth the investments. Rather they were uncalled for. This is not to say that ERP was not suitable to other sectors. Infact ERP lacked the facilities that were demanded by these sectors. Naturally they were reluctant to accommodate ERP. ERP II has overcome this drawback and thereby has made it available to all the sectors irrespective of the nature of business or volume of transactions.

Covers more Functions

ERP was designed to ease the conventional functions in an organization. If there were some new core functions they did not come under the scope of ERP. ERP still helped in facilitating the business process however the outcome was not to the desired extent. This limitation seemed to be a major handicap of ERP especially with the rapid transformations in the organizational structure and functions.

ERP II has helped to remove this barrier by including maximum functions under its scope. It has not only facilitated in bring noncoventional ,core and supportive functions but also the best practices but also the best practices followed in the industry, other industries and the practices that were solely dedicated to the concerned industry,

Other Advantages

Some other advantages of ERPII include the manner in which it is employed in an organization and the facilities provided by the same. ERP is prone to make use of internet facilities. However they are not used to the maximum. On the contrary ERP makes a minimal use of them. However this is not the case with ERP-II. ERP II has been able to draw maximum benefits from internet. Its contemporaries Wireless ERP and WEB enabled ERP have helped in making this possible in addition to the special features of ERP.

The operation of ERP is more focused within the organization. It has a far reaching impact on external factors. On the contrary ERP II includes both internal and external factors. It remains internal even in the connection part. In the meanwhile every other area is given due importance when it comes to ERP II.

Task Discuss some value added features in ERP.

Notes

11.3 What the Future Holds for ERP?

Before speaking about the future of ERP it is important to remember the history of ERP in order to keep a track on the developments that happened gradually. ERP evolved from manufacturing resource planning (which originated from material resource planning).The functioning of ERP has gained much prominence and utility with the intervention of web enabled and open source technologies.

ERP II the latest advancement in ERP software deserves special mention. In this context it becomes important to analyze the direction in which ERP is geared to progress or will ERP diminish in the future etc…

Some of the points requiring attention are as follows:

1. ***Current Level:*** ERP has undoubtedly become an important business application to all industries. It has almost become a must for all organizations irrespective of the type of business manufacturing or service. If companies feel that coordination and enterprise communication are their only problems they don't have any other alternative but to go for ERP, provided they want to make profits and remove the existing setbacks.

   Needles to say ERP has helped companies in monetary and non-monetary aspects if they are keen in utilizing it to the core and take the necessary steps to overcome the setbacks. However ERP needs lot of improvement (this statement included the latest versions also). ERP is an effective application. It will be great if one can bring an ERP system that id devoid of the drawbacks from the existing ones. The latest intrusions namely open source and web enabled technologies has increased the effectiveness of the application. However they are not enough (technically speaking). ERP applications should be designed to make the maximum use of internet so that the user can access data from any part of the world just by a click of the mouse. This has further deepened the future of ERP. ERP's future is yet to reach saturation.

2. ***Market Forecasting:*** Formerly ERP was purely restricted to fortune 500 companies, in the sense only they could afford to invest on them. This put the small and Medium Industries at a large disadvantage. They were not able to make use of the application to gain the necessary benefits. ERP's future seemed to be dooming on them.

   However this drawback has been removed after the intervention of open source facilities. The concept of outsourcing has helped in removing the difficulties faced by small and medium enterprises. Hence a large potential for ERP still exists in the S.M.E. market.

   The ERP vendors can target this market effectively. However both the vendor and the companies in this segment have to remember that there are lot of competition in this sector and one is not likely to succeed unless he serves the best product.

3. ***The International Scenario, Employment and Education:*** ERP has thrown open opportunities for many companies to trade with foreign counter parts in the name of outsourcing, implementation and deployment of the existing ones. It has contributed lot to the economy .Academics also boast its own share of ERP relations.

It has promoted lot of employment and educational opportunities. India happens to be a key beneficiary in this aspect.

Conclusion

The future of ERP holds an undisputed demand not only in the national level but also at the global level. If the technology can be improvised to the desired ext

Notes

11.4 An Introduction into Open Source ERP Technologies

Open Source Technologies have made the job of ERP easier. It has helped the consumer in many ways other than cost. Lots of companies are increasingly using them.

Some of the features are as follows:

1. ***Influence of the Cost Factor:*** It is interesting to know the Price tag of Open Source ERP technologies. It is literally available at free of cost. All that the user has to do is to download the software and install it. An unbelievable fact is that even the source code comes freely. This in itself has encouraged lots of companies to go for ERP, as they are not burdened with investments. Of late companies don't necessarily go for ERP because their attitude towards spending on ERP has undergone a sea change in the sense they don't mind to pay as long as they think ERP is worth the costs. Open Source accounting ERP and open source ERP payment are famous solutions.
2. ***Influence on the Operational Expenses:*** Open Source ERP technologies largely influence operational expenses. The company is relieved from paying the extra sum for facilities provided in moving to a new system. Similarly the company need not incur additional expenditures for renewal and purchase of licenses as and when some components are added in the framework. This gradually reduces the monetary outlay that has to be otherwise incurred for every update. Open Source accounting ERP has helped to simplify the financial practices. Open source ERP payment has helped in facilitating easy disbursement of cash.
3. ***Absence of Vendors help:*** Unlike the usual ERP applications it is not possible to avail the services of a vendor as the company handles everything independently. This has many dimensions. Firstly the company enjoys a sole liability. Secondly a simple error when not rectified (or the in-house personnel does not know to) could prove to be a costly affair for the company. Above all the company gets to learn from mistakes and without any external assistance.
4. ***Litigations:*** Open source ERP has resulted in many lawsuit and incidental claims. There is still ambiguity in the copying aspects. The question of infringement and indemnification remains unanswered as seen from the previous cases.
5. ***Unsuitable for all Applications:*** Open source has a limit when it comes to the places where they can be put to use. They don't find applicability in all areas especially for conventional practices. It is not appropriate to introduce open source in those areas without changing the way the systems work. Infact it could be a risky option to do it. This drawback discourages many functions from being Open source friendly.

Who should Go for it?

A company can go for open source if is satisfied that its business modalities will be addressed. The point to be considered is will open source ERP cater to the particular business needs of the company. This decision is detrimental in making the companies chose open source ERP. Companies that are more dependent on external factors can resort to open source ERP technologies than those relying on internal factors.

Task "If companies feel that coordination and enterprise communication are their only problems they don't have any other alternative but to go for ERP, provided they want to make profits and remove the existing setbacks." Suggest

Notes

11.5 What are the Facilities Offered by Web-enabled ERP Services?

Web enabled ERP services have helped to remove many drawbacks of the earlier applications. This has gained momentum as it has made ERP function more meaningful and dynamic with the latest inclusions.

Some of the facilities offered by WEB ERP are as follows:

1. ***Dependability:*** Web enabled ERP services help the companies to keep track on what is going on. Since the entire system comes under the purview of internet it is not possible for the employees to engage in any sort of misappropriations funds or otherwise. In addition the errors could be easily deduced and corrected. This system not only helps the personnel in the company but also its stakeholders and well-wishers or anyone who would like to obtain information on the company. They can access the details anytime online.

2. ***Convenience in Reaching:*** Formerly when customers had to know the status of their order or any other query he must communicate to the marketing department. They will inurn speak to the concerned department trace the product or get clarifications in the case of technical query or any another information and then get back to them after confirming the required and relevant details. This process could take a few days and few weeks in the case of errors.

   With the intervention of WEB ERP all that the customer has to do is to speak to the person in charge. He then gets back to the customer within few minutes. On the other hand web enabled ERP has reduced that time to a few seconds. In addition the customer can access the details from his personal computer and need not even depend on the company for trivial information. ERP on the web has done away with all these.

   The C.E.O. can know the status of the company's business and problems by sitting anywhere in the world. Similarly any other person can obtain the desired information at the shortest possible span of time. This has thrown lot of issues on confidentiality especially in sensitive subjects like hospital details and financial information.

3. ***Easy to use:*** Web enabled applications makes the job of the employees easy. They don't have to rely on others before taking a decision for every petty issue. Infact it has helped them to work efficiently and in a relaxed manner. Besides the company the outsiders will be benefited lot as all the clarifications can be made online. Since they tend to be crisp the outsiders will not make mistakes in dealing with the company. The errors if any will be easily filtered in the online tracking system and hence the rectifications will be very quick. This would not have been possible without ERP on the web.

4. ***Integrating Technology and Manual Data in Public Domain:*** Web enabled applications have greatly reduced the limitations of manual data. These manual data became easily accessible after computerization and enterprise resource planning. However the data brought under public domain was still not satisfactory. Web ERP applications have helped to improve this feature by offering everything online.

Future

Web enabled ERP have been citied as one of the important reason for ERP's dominance in the days to come. This system needs more development apart from the present changes.

Notes

11.6 Benefits of ERP Logistics Package

11.6.1 Central Components

The process layer is the central component which reflects the transaction-based systems. ERP II is web based, open and componentized. This is different from being web enabled, and the ultimate ERP II concept may be implemented as a set of distributed web services.

ERP is the central component in the ERP II conceptual framework. The traditional ERP modules like financials, sales and distribution, logistics, manufacturing, and human resources are still the backbone of ERP along with additional modules like quality management, project management or maintenance.

ERP II systems are based on business process management (BPM). ERP has been based on "Best-practice" process reference models but ERP II systems build on the notion of the process as the central model entity including tools to design (or orchestrate) processes, to execute and evaluate processes (business activity monitoring).

BPM allows for a flexibility of ERP II as regards different business practices, but for specific segments that otherwise would require problematic customization, like apparel and footwear or the public sector, ERP II also has vertical solutions. Vertical solutions are sets of standardized pre-configured systems with "add-ons" to match specific requirements or partial models in CIMOSA terms.

11.6.2 Corporate Components

The analytical layer comprise the corporate components that enhance and extend central ERP functions by providing decision support for the management of relations and corporate issues. These components are not necessarily directly synchronized with the integrated database:

1. SCM systems support the planning and production of goods. For instance, SCM provides information such as where the product is to be produced, the procurement of parts and delivery schedules.
2. CRM systems facilitate the managing of a broad set of functions that primarily include the customer identification process and customer service management.
3. SRM is the vendor side analogy to CRM aimed at the effective management of the supplier base. SRM enables the enterprise to manage its supplier relations in their entire life-cycle.
4. Product lifecycle management (PLM) including product data management (PDM) enables enterprises to bring innovative and profitable products to market more effectively, especially in the evolving e-business environment. PLM enables extended enterprises to harness their innovation process through the effective management of the full product definition lifecycle.
5. Employee lifecycle management (ELM) is the integration of all aspects of information relation to an employee from hiring to retirement from the company. ELM enables enterprises to effectively manage their portfolio of competencies.
6. Corporate performance management (CPM) is an umbrella term that describes the methodologies, metrics, processes and systems used to monitor and manage the business performance of an enterprise. Thus CPM provides management with an overall perspective on the business.

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11.6.3 Collaborative Components

The e-business layer is the portal of ERP II. The collaborative components deal with communication and integration between the ERP II system and external actors:

1. Business to consumer (B2C) or e-commerce denotes commercial sales transactions either with businesses or with individual customers over the electronic medium, usually the internet. This does indeed require an extensive infrastructure of which the main features are a catalogue, online ordering facilities and status checking facilities. The ERP system serves as the transaction processing back end for the Internet-based front end.
2. Business to business (B2B) or e-procurement improves efficiency by automating and decentralizing the procurement process. The traditional procedures of sending Request for Quotes (RFQ) documents and obtaining invoices etc. are carried out over the web through purchasing mechanisms such as auctions or other electronic marketplace functions, including catalogues.
3. Business to employee (B2E) or an intranet provides the employee with an updated, personalized portal to the enterprise on his desktop. The perspectives of the intranet and knowledge management in combination increase with the ERP II concept.
4. EAI or extranet provides the ERP II system with a platform for integration with other systems inside or outside the corporation. EAI provides the support for automating processes across various IT platforms, systems and organizations.

Task What is the use of EAI (Enterprise Application Integration) in ERP-II? Discuss with the help of real life example.

11.6.4 The Adoption of Next-generation Enterprise Systems

The conceptual framework for ERP II is a theoretical model based on generalized observations and on an analysis of the past and the present of enterprise systems. The analysis focused on business requirements and the available technology, but the framework does not consider the actual business transformations. Therefore we need to consider the adoption of the technology.

A recent survey on ERP adoption in large Danish enterprises concluded that:

1. ERP has become a pervasive technology
2. ERP has become a contemporary technology
3. The ERP market has matured; and
4. The dominant ERP strategy is still the single vendor strategy.

The study was based on telephone interviews with ERP managers in 88.4 per cent of the top 500 enterprises in Denmark. 13.6 per cent of the enterprise had more than one ERP system. It provides a summary of the findings distributed on the top-five vendors, in-house developed ERP and other vendors. We assume that the five largest ERP vendors in Denmark accounting for 66.6 per cent of the installations all have incorporated part of the ERP II components in their recent releases.

Did u know? The early inventory control systems (ICS) and bill of material (BOM) processors gradually turned into standardized material requirements planning (MRP).

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Case Study

Quantum Corporation Streamlined its Supply Chain

Quantum Corporation (quantum.com) is a major U.S. manufacturer of hard-disk drives and other high-technology storage components. Quantum faced two key challenges in its manufacturing process.

The first challenge was streamlining its component supply process in order to reduce on-hand inventory. Quantum's traditional ordering process was labor-intensive, involving numerous phone calls and manual inventory checks. To ensure that production would not be interrupted, the process required high levels of inventory. Quantum needed a solution that would automate the ordering process to increase accuracy and efficiency, reduce needed inventory to 3 days' supply, and provide the company's purchasing agents with more time for non-transactional tasks.

Quantum's second challenge was to improve the quality of the components' data in its Material Requirements Planning (MRP) system. Incomplete and inaccurate data caused delays in production. Quantum's solution of manually reviewing reports to identify errors was labor intensive and occurred too late; problems in production were experienced before the reports were even reviewed. Quantum needed a technology solution that would enable to operate proactively to catch problems before they caused production delays.

The solution that Quantum chose to automate its component supply process was an inter-enterprise system that automatically e-mails reorders to suppliers. Initiated in 1999, the system uses an innovative event detection and notification solution from Categoric Software (categoric.com). It scans Quantum's databases twice daily, assessing material requirements from one application module against inventory levels tracked in another. Orders are automatically initiated and sent to suppliers as needed, allowing suppliers to make regular deliveries that match Quantum's production schedule. The system not only notifies suppliers of the quantity of components required in the immediate orders, but also gives the supplier a valuable window into amount of inventory on hand future weekly requirements.

The system also provided other improvements. It enabled Quantum to tap into multiple data sources to identify critical business events. To evaluate data quality, Quantum implemented Categoric Alerts to proactively catch any data errors or omissions in tis MRP database. The system's notifications are now sent whenever any critical MRP data fall outside the existing operational parameters.

The system has produced the desired results. For example, the estimated value of the improved ordering process using the new system is millions of dollars in inventory reductions each year. The buyers have reduced transaction tasks and costs, and both Quantum and its buyers get a lot more information with a lot less work. Before the implementation of Categoric Alerts, Quantum's and analysts would search massive reports for MRP data errors. Now that new system is implemented, exceptions are identified as they occur. This new process has freed the analysts from the drudgery of scanning reports and has greatly increased employee satisfaction.

Data integrity of the MRP increased from 10 percent to almost 100 percent, and Quantum is now able to quickly respond to changing customer demand. The system paid for itself in the first year.

Contd...

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Questions

1. Identify the internal and external parts of the supply chain that were enhanced with the system.
2. Enter categoric.com and find information about Categoric Alerts. Describe the capability of the product.
3. Explain how purchasing was improved.
4. Describe how Quantum's customers are being better served now.
5. Identify the EC solutions used in this case.

Source: Complied from an advertising supplement in CIO Magazine (November 1, 1999), from information at categoric.com (accessed May, 28, 2000), and from quantum.com (accessed June 10, 2003).

11.7 Summary

- ERP II is regarded as the "next generation" of ERP (enterprise resource planning) and offers several advantages over traditional ERP systems.
- ERP systems have historically been mostly limited to the manufacturing sector, primarily serving logistics, supply chain, and warehousing functions.
- ERP II expands the scope of ERP to offer solutions for a broader range of industries and sectors.
- An ERP II solution offers greater flexibility in the integration of functions between departments and even industries. And, generally speaking, an ERP II system is a much more "Web-friendly" application that makes better use of the Internet, especially as a means for support.
- ERP II encourages user participation, facilitating interaction between customers and vendors, which effectively eliminates the difficulties that resulted from limited communication.

11.8 Keywords

ERP-II: A method for the effective planning and controlling of all the resources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service company.

Information System: A collection of hardware, software, data, and people designed to collect, process, and distribute data throughout an organization.

Information Technology (IT): The hardware and software used to create an information system.

Manufacturing Resource Planning (MRP II): An integrated approach to manufacturing. Beginning with the desired production levels, we work backward to determine the processing time, materials, and labor needed at each step.

SCM: Supply Chain Management

11.9 Self Assessment

Fill in the blanks:

1. ..... is a standardized software packaged designed to integrate the internal value chain of an enterprise.
2. BPR stands for .....

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3. VMI stands for .....
4. SRM stands for .....

State whether the following statements are true or false:

5. Enterprise resource planning cater much to the individual elements.
6. ERP was designed to ease the conventional functions in an organization.
7. The operation of ERP is more focused within the organization.
8. ERP II the latest advancement in ERP software deserves special mention.
9. An ERP system is based on an integrated database and consists of several modules aimed at specific business functions.
10. ERP II the latest advancement in ERP software deserves special mention.

11.10 Review Questions

1. What do you mean by ERP-II?
2. Describe the added features in ERP-II.
3. Explain the facilities offered by web-enabled ERP services.
4. What are the benefits of ERP logistics package?
5. "The functioning of ERP has gained much prominence and utility with the intervention of web enabled and open source technologies". Explain
6. Differentiate between Open Source accounting ERP and open source ERP payment.
7. Describe "Open source ERP has resulted in many lawsuit and incidental claims."
8. "Web enabled ERP services have helped to remove many drawbacks of the earlier applications." Explain
9. What do you mean by business process management?
10. Write short note on "Collaborative components".

Answers: Self Assessment

1. ERP
2. Business Process Re-engineering
3. Vendor Managed Inventories
4. Supplier Relation Management
5. False
6. True
7. True
8. True
9. True
10. True

11.11 Further Readings

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Unit 12: Building and Deploying an Information System

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Objectives

After studying this unit, you will be able to:

- Understand information system and architecture
- Explain SDLC
- Describe software development cycle
- Discuss concept of software testing

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Introduction

Development of information system solutions to business problems is a responsibility of any business professional today. As a business end user he will have to initiate and provide inputs for development of effective information systems for his company. The business end user has the responsibility of using the system and continuously initiating improvements. As an IT Manager his responsibility will consist of managing the development efforts of Information System specialists.

The systems approach to problem solving uses a system orientation to the process of developing an information system. The activities are inter-related and require the involvement of every business end user in addition to the IS professionals.

The system approach involves:

1. Recognising and defining the problem or opportunity
2. Evaluating alternative system solutions
3. Selecting the 'Best fit' solution
4. Designing the selected solution
5. Implementing and evaluating the success of the designed system.

When a systems approach to problem solving is applied to the development of information system solutions to business problems, it is called information systems development or application development. However before we look at the application development we need to understand the information system architecture.

12.1 Information System Architecture

The information system architecture, according to Synnott (1987), is a conceptual framework for the organizational IT infrastructure. It is a plan for the structure and integration of the information resources in the organization. Synnott proposes a model for information system architecture, which comprises of two major parts. The centralised portion serves the entire organization and it includes the business architecture (information needs of the organization), the data architecture, and the communications architecture. The decentralized (upper) portion focuses on an organizational function or on some service or activity (e.g. human resources, computers, end-user computing, and systems). Each entity includes operational, managerial and strategic applications.

Types of Information system Architecture: One way to classify information system architecture is by the role the hardware plays. It is possible to distinguish two extreme cases: a mainframe environment and a PC environment. The combination of these two creates a third type of architecture, the distributed or networked environment.

Mainframe environment - in the mainframe environment, a mainframe computer does processing. The users work with passive (or "dumb") terminals, which are used to enter or change data and access information from the mainframe. This was the dominant architecture until the mid 1980s. Very few organizations use this type of architecture exclusively today. An extension of it is an architecture where PCs are used as smart terminals. Yet, the core of the system is the mainframe with its powerful storage and computational capabilities. The network computers (NCs) that were introduced in 1997 are redefining the role of the centralized computing environment.

PC Environment - In the PC configuration, only PCs form the hardware information architecture. They can be independent of each other, but normally the PCs are connected via electronic networks. This architecture is common for many small and medium-size organizations.

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Networked (distributed) environment - Distributed processing divides the processing work between two or more computers. The participating computers can be all mainframe, all midrange, all micros, or, as in most cases, a combination they can be in one location or in several. Cooperative processing is a type of distributed processing in which two or more geographically dispersed computers are teamed together to execute a specific task. Another important configuration of distributed processing is the client / server arrangement, where several computers share resources and are able to communicate with many other computers via LANs. When a distributed system covers the entire organization, it is referred to as an enterprise wide system and its parts are frequently connected by an intranet.

A distributed environment with both mainframe and PCs is very flexible and is commonly used by most medium and large-size organizations. This basic classification is analogous to a transportation, such as a train or a plane. In this case, several riders share the vehicle and use it at specified times and must obey several rules. This is like using a mainframe. Second, you can use your own car, which is like using a PC. Third, you can use both; for example, you can drive to the train station and take the train to work, or you can drive to the airport and take a plane to your vacation destination. This last arrangement, which is analogous to a distributed system, is flexible, providing the benefits of the other two options.

Thanks to communication networks and especially the Internet and intranets, networked computing is becoming the dominant architecture of most organizations. This architecture permits intra and inter-organizational cooperation in computing, accessibility to vast amounts of data, information, and knowledge, and high efficiency in the use of computing resources. The concept of networked computing drives today's new architecture.

The Internet, intranet and extranets are based on client/server architecture and enterprise wide computing, the newest architectural concepts. The principles of these concepts are briefly explained in this section.

Client/Server Architecture - A client/server arrangement divides networked computing units into two major categories: clients and servers, all of which are connected by LANs and possibly VANs. A client is a computer such as a PC or a workstation attached to a network, which is used to access shared network resources. A server is a machine that provides clients with these services.

Example: Servers are a database server that provides connection to another network, to commercial databases, or to a powerful processor. In some client / server systems there are additional computing units, referred to as middleware.

The purpose of client/server architecture is to maximize the use of computer resources. Client/server architecture provides a way for different computing devices to work together, each doing the job for which it is best suited. The role of each machine need not be fixed; a workstation, for example, can be a client in one task and a server in another. Another important element is sharing. The clients, which are usually inexpensive PCs, share more expensive devices, the servers.

There are several modules of client/server architecture. In the most traditional model, the mainframe acts as a database server providing data for analysis, done by spreadsheets, database management systems, and other 4GLs, for the PC clients.

Client/server architecture gives a company as many access points to data as there are PCs on the network. It also lets a company use more tools to process data and information. Client/server architecture has changed the way people work in organizations; for example, people are empowered to access databases at will.

Enterprise wide Computing - Client/server computing can be implemented in a small work area or in one department on a LAN. Its main benefit is the sharing of resources within that department. However, many users frequently need access to data, applications, services, electronic mail, and

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real-time flows of data, which are in different LANs or databases, so that they can improve their productivity and competitiveness. The solution is to deploy an enterprise wide client / server architecture, that is, to combine the two concepts to form a cohesive, flexible, and powerful computing environment.

12.2 Software Development Lifecycle

The systems approach to developing information system solutions involves a staged process known as systems development life cycle (SDLC). Information Systems Life Cycle covers the planning, construction, deployment and maintenance of an Information System. It covers the steps of investigation, analysis, design, and implementation and maintenance.

The investigation stage includes a preliminary study of proposed information system solutions to end user business problems known as a Feasibility Study.

12.2.1 Feasibility Study

Because the process of developing a major information system can be costly, the systems investigation stage frequently requires a preliminary study called a feasibility study. A feasibility study is a preliminary study which investigates the information needs of prospective users and determines the resource requirements, costs, benefits, and feasibility of a proposed project.

The goal of feasibility studies is to evaluate alternative systems and to propose the most feasible and desirable systems for development. The feasibility of a proposed system can be evaluated in terms of four major categories.

The focus of organizational feasibility is on how well a proposed information system supports the objectives of the organization and its strategic plan for information systems.

Economic feasibility is concerned with whether expected cost savings, increased revenue, increased profits, reductions in required investment, and other types of benefits will exceed the costs of developing and operating a proposed system.

Technical feasibility can be demonstrated if reliable hardware and software capable of meeting the needs of a proposed system can be acquired or developed by the business in the required time. Finally, operational feasibility is the willingness and ability of the management, employees, customers, suppliers, and others to operate, use, and support a proposed system.

Cost/Benefit Analysis

Feasibility studies typically involve cost/benefit analysis. If costs and benefits can be quantified, they are called tangible; if not, they are called intangible. Examples of tangible costs are the costs of hardware and software, employee salaries, and other quantifiable costs needed to develop and implement an IS solution. Intangible costs are difficult to quantify; they include the loss of customer goodwill or employee morale caused by errors and disruptions arising from the installation a new system.

Tangible benefits are favorable results, such as the decrease in payroll costs caused by a reduction in personnel or a decrease in inventory carrying costs caused by a reduction in inventory. Intangible benefits are harder to estimate. Benefits such as better customer service or faster and more accurate information for management fall into this category.

Analysis of the Present System

Before you design a new system, it is important to study the system that will be improved or replaced (if there is one). You need to analyze how this system uses hardware, software, network, and people resources to convert data resources, such as transactions data, into information

products, such as reports and displays. Then you should document how the information system activities of input, processing, output, storage, and control are accomplished.

12.2.2 Systems Analysis

This step of systems analysis is one of the most difficult. You may need to work as a team with systems analysts and other end users to determine your specific business information needs. Functional requirements are end user information requirements that are not linked to the hardware, software, network, data, and people resources that end users presently use or might use in the new system. Your main goal is to identify what should be done, not how to do it.

12.2.3 Systems Design

System analysis describes what a system, should do to meet the information needs of users. Systems design specifies how the system will accomplish this objective. Systems design process generates the system specifications that satisfy the functional requirements identified in the earlier phase.

12.2.4 Implementation

Once a new information system has been designed, it must be implemented. The systems implementation stage involves hardware and software acquisition, software development, testing of programs and procedures, development of documentation, and a variety of installation activities. It also involves the education and training of end users and specialists who will operate a new system.

Finally, implementation involves a transition process from the use of a present system to the operation of a new or improved application. Transition methods can soften the impact of introducing new technology into an organization. Thus, transition may involve operating both new and old systems in parallel for a trial period, or operation of a pilot system on a trial basis at one location. Phasing in the new system in one application or location at a time is another popular transition method. However, a plunge or immediate cutover to a new information system is also a widely used transition method.

12.2.5 Maintenance

Systems maintenance is the final stage of the information systems life cycle. It involves the monitoring, evaluation and modification of a system to make desirable or necessary improvements. This is a continuous phase and includes a post implementation review process to ensure that the newly implemented system is meeting the functional business requirements that were established for it when it was designed. Errors in the development of a system are corrected by the maintenance activity. Systems maintenance also includes modifying a system due to internal changes in a business or external changes in the business environment. For example, development of new products or services, or changes in the tax laws might require making changes to a company's marketing and accounting systems.

12.3 Software Development Models

Given the important role of software in business, great attention has been paid to designing effective processes for its development. Early attempts at standardizing a formal model for developing software date back to at least the 1960s. In response to the problems in managing large custom software development projects, the so-called "Waterfall" model of software development was introduced. This model identified the separate stages that all software projects

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should include, and gave guidance on the conditions that should be met in order that a project be allowed to proceed from one stage to the next. The aim of this model was to bring control and discipline to what had previously been a rather unstructured and chaotic process.

The waterfall model involved progressing through a series of different stages, including requirements definition, specification, planning, design, implementation, and integration. The emphasis was on preparing a detailed design specification up-front in development, and thereafter executing on this specification in an efficient manner.

While the waterfall model of development proved to be a successful response to the early problems that had plagued software development, increasing dissatisfaction was expressed with its results in the years that followed. The criticism was especially strong in environments where considerable uncertainty surrounded either the product's customer requirements and/or its needed technical solutions.

The problem lay in the assumptions embedded in the model, the biggest of which was that as long as the up-front work was performed correctly, there was little need to gain intermediate feedback on performance, or to have a process that was receptive to changing requirements. Consequently, these became the primary objectives for more "flexible" models of development – models with the ability to respond to the different types of uncertainty that software developers increasingly faced.

Over time, this view of software development as a process that could be pro-actively managed led to the development of other process models, each proposing to address shortfalls with the waterfall model. While most of these models had a common aim – a more flexible model of development – the details of their execution appeared to differ substantially. Beginning in the early 1980's, a host of more flexible models of development began to emerge, each seeking to address perceived shortfalls with the waterfall model.

The first types of models that emerged to supplant the waterfall model were based upon the use of one or more prototypes to be shown to customers at an early stage, thereby gaining feedback based upon a representation of the product, as opposed to a text specification. In the approach of prototyping model, use is made of a prototype early in development, typically as a way of informing decisions about the design of the user interface. The prototypes are thrown away after use – they are not an integral part of the product. The process that is subsequently used to detail the design is similar in nature to the waterfall model described above.

The next series of models that emerged from efforts to improve flexibility in development are characterized by the fact that they involve developing sub-sets of a product's functionality on an incremental basis. These are known as Rapid Development Models. The primary objective of the incremental delivery model is to reduce risk in large projects by delivering subsets of the planned functionality to customers earlier in development. Development is split into a number of sub-cycles each of which typically uses a mini-waterfall process, resulting in a complete subsystem that is delivered to customers.

The latest model is both incremental and iterative. This is called the spiral development model, which encompasses a feedback mechanism that allows it to

1. Re-work features in these intermediate versions in response to customer feedback
2. Re-schedule subsequent activities in light of the new information generated when each sub-cycle is completed.

The spiral development model combines the waterfall development model and the prototype approach, which is a series of partial implementations of the product. Advantages of the spiral development model include an early focus on reusing existing software components, the incorporation of software quality standards and the integration of hardware and software development cycles.

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Task "Systems maintenance is the final stage of the information systems life cycle." System maintenance stage involves

12.4 Requirement Analysis & Design Considerations

12.4.1 Requirement Analysis

This step of systems analysis is one of the most difficult. You need to work as a team with systems analysts and other end users to determine your specific business information needs. Systems analysis is an in-depth study of end user information needs that produces functional requirements which are used as the basis for the design of a new information system or implementation of packaged software.

An organizational analysis is an important first step in systems analysis. The members of a development team have to know something about the organization, its management structure, its people, its business activities, the environmental systems it must deal with, and its current information systems.

Based on the system analysis, software requirements specifications need to be identified. These are end user information requirements that are not linked to the hardware, software, network, data, and people resources that end users presently use or might use in the new system. The main goal is to identify what should be done, not how to do it. This will also help in preparing the user acceptance test plan.

Software Requirement Analysis activities include:

1. Identify the "customer" and work together to negotiate "product-level" requirements
2. Build an analysis by
   (a) Focusing on data
   (b) Defining function
   (c) Representing behavior
3. Prototype areas of uncertainty
4. Develop a specification that will guide design
5. Conduct formal technical reviews to validate the requirements
6. Develop a user Acceptance Test Plan.

Some of the key areas where functional requirements should be developed are indicated below:

User Interface Requirements

The input/output needs of end users that must be supported by the information system. These include sources, formats, content, volume, and frequency of each type of input and output.

Processing Requirement

Identify business rules required to convert input into output which includes calculations, decision rules, and other processing rules. Also identify the throughput, turnaround time, and response time needed for processing activities.

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Storage Requirements

Identify organization, content, and size of databases, types and frequency of updating and inquiries, and the length and rationale for record retention.

Control Requirements

Identify validation rules, security requirements, and adaptability requirements for the system input, processing, output, and storage functions.

Finally, the overall system definition needs to be refined to prepare detailed software specifications covering:

1. Information flow (DFD)
2. Interfaces
3. Functional requirements
4. Design requirements &constraints
5. Coding structures
6. Testing criteria

A Software Requirement Specifications (SRS) which is the basis for software development gets prepared at this stage.

12.4.2 Design Considerations

System analysis describes what a system, should do to meet the information needs of users. Systems design specifies how the system will accomplish this objective and generates the system specifications that satisfy the functional requirements identified in the earlier phase.

The design should be traceable to the analysis model. The design should "minimize the intellectual distance" between the software and the problem and should be structured to accommodate change. The design should be reviewed to minimize conceptual errors.

The overall structure of the software is the architecture of the software to be built.

It is a representation that enables a software engineer to:

1. Analyze the effectiveness of the design in meeting its stated requirements,
2. Consider architectural alternatives at a stage when making design changes is still relatively easy, and
3. Reduce the risks associated with the construction of the software.

The design phase translates the SRS into a workable solution and defines the following:

1. Database Design defines the database structures and the data dictionary.
2. Menu Design defines the alternate options and selection mechanisms
3. Input Design defines the user interfaces to capture the information. It covers two aspects - Input Form Design and Input Screen Design.

The input form is the basic input that is received from the external entity. In today's environment, depending on the application, it is possible to provide a screen to the external entity to input this information. However there are situations where such a thing is not feasible and hence an input

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form needs to be designed. The input screen enables the user to enter the required information into the system. The screen design should be based on certain guidelines, a few of which are listed below:

1. Simple screen - avoid cluttering
2. Consistent screen presentation - locate information in the same area
3. Easy navigation between screens - Use scrolling or calling another screen if required rather than going to the main menu
4. Provide status to the user - Use of user - friendly messages
5. Provide a facility to undo an action.

Output Design: Information is provided to the user in soft copy, a printed copy, a display on the screen or a Audio / Video output. The outputs design should serve the intended purpose and provide the information when required.

Program Design is a set of guidelines and a method for coding programs, which can be maintained easily. Structured design reduces the complexity by breaking the programs into smaller components.

A Software Design Document is generated at the end of this process. The Program specifications provide the basis for program coding.

12.5 Software Testing

Software testing is the most tedious, unpredictable and expensive phase in software development. To ease this it is necessary to supplement testing with Reviews. Software testing actually begins with design reviews and code walk-through. These are pre-implementation "tests" which can identify a significant percentage of faults at the initial stages. The cost and effort associated with this is also far less than computer based tests for the same purpose.

Testing and reviews have to be planned and executed at various stages of the system life cycle so as to find defects in requirements, design, documentation and code as early as possible.

Historically, testing has focused on executing the software to obtain confidence in its readiness for use and to demonstrate that it is working satisfactorily. Testing today, in addition to the above aspects recognizes that major errors are rooted in requirement & design due to misunderstanding, omissions and inconsistencies. Testing is undertaken at different stages of the system development process in terms of reviews, walkthroughs and code inspection and functional testing. The features of various types of testing are discussed below.

12.5.1 Testing Linked to Phases of Development

Unit Testing

In Unit testing the smallest testable component, which is termed as the 'Unit', is tested. It is tested for consistency with the program / process specifications. All important statements, branches, conditions & paths are tested for expected results. Though unit testing is the responsibility of the implementation programmer, the project leader should be aware of the unit test results. The unit test cases can be used during Integration testing.

Unit Test Plan, Test cases, Test data & defect log are important documents to be prepared and stored for future reference and analysis.

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Integration Testing

The software component of the system is assembled into a module and tested for

1. Data integrity
2. Configuration
3. Parameters

It also helps identify resource problems and ensures that the module works on the environment. Integration testing can be 'bottom-up' or a 'top-down' approach.

The 'bottom-up' approach combines one or more modules that perform a major function of the software system into a build which can be tested or demonstrated and tests the build. In the 'top-down' approach the top-level control is tested first and all modules that comprise a major function are integrated so as to demonstrate an operational function. Both the approaches are used in Integration test plans.

System Testing

Software is but one part of a system that includes hardware, network and users. The focus of System testing is on testing the complete integrated system with reference to the System Specifications. The tests address system characteristics such as performance, security and recovery.

Acceptance Testing

This is also known as validation / functional testing. Acceptance testing demonstrates that the software is operational and conforms to all functional and performance requirements documented in the Software Requirement Specifications. It verifies the operational flow and evaluates the fitness of the system on the field from the User's perspective.

Ideally the tests are executed by the users / requestors without the assistance of the developers. The testing team should approach testing from the ultimate user's viewpoint. The successful testing of the software instills confidence in the Users.

12.5.2 Planning for Testing

The Testing process as seen earlier starts from the definition phase and is a set of activities as indicated below.

1. Preparation of the Test Plan
2. Definition of the Test Design & Criteria
3. Identification of the Test cases & data set
4. Recording the results
5. Debugging and correction
6. Definition of the next testing cycle.

A test plan has to be prepared for each level of testing. The test plan defines the scope, approach, type and the Pass / Fail / suspension criteria. Various types of testing as indicated below can be planned:

1. Functional testing which focuses on the business requirements, similar to acceptance testing.

Notes

2. Regression testing which revalidates previously proven capabilities to assure their continued integrity when other components are modified.
3. Location based testing covers
   (a) Pre shipment (Alpha) by developer / user on the development environment
   (b) Post shipment (Beta) by user on the production environment
4. Exception testing which detects File errors, I/O errors, locking problems
5. Selective testing which would cover complex, error- prone, critical functions
6. Cross Platform Testing
7. Environment based - Parallel Run to simulate the live situation and compare results.

Testing should not be planned under the assumption that no errors will be found. Test items should cover invalid & unexpected input conditions as well as valid conditions.

The Test plan should identify the following:

1. Resources required
2. Tasks & Deliverables
3. Schedule
4. Features to be tested
5. Test items
6. Risks

The test plan has to be documented and reviewed so as to confirm the feasibility and completeness of the testing.

Task Discuss data flow diagram. How will you design an DFD of an application.

12.6 Deploying an Information System

Effective planning of investments in IT by business unit managers is a key ingredient in achieving strategic business success with IT. Planning is deciding what to do before you do it and is an important factor of success. The process of organizational planning consists of

1. Team building, modeling and consensus
2. Evaluating what has been accomplished and the resources acquired
3. Analyzing the business, economic, political and societal environment
4. Anticipating and evaluating the impact of future developments and opportunities
5. Building a shared vision and deciding a goal to be achieved
6. Identifying and action plan to achieve this goal

Information System planning is an important components of organizational planning. Strategic planning has four main objectives to be considered.

1. ***Business alignment:*** Aligning investment in IT with the organisation's business vision and strategic business rules.

Notes

2. ***Competitive advantage:*** Exploiting IT to create innovative and strategic business information systems for competitive advantage.
3. ***Resource Management:*** Developing plans for the efficient and effective management of an organisations information systems resources including the IS personnel, hardware, software, data and network resources.
4. ***Technology Architecture:*** Developing technology policies and designing information technology architecture for the organsation.

Planning for competitive advantage is very critical in to-days competitive and complex information technology environment. Strategic IS planning is therefore involves an evaluation of potential benefits and the risks a organizations phases when using IT for competitive advantage.

Tactical planning builds on the business / IT strategies developed in the strategic IS planning stage. Tactical planning produces project proposals for the development of new or improved IS that implement the IT architecture created during the strategic IS planning. These are evaluated and selected for development. A resource allocation plan is developed to specify the IS resources, financial commitments and organizations changes needed to implement IS development plan.

An organizations requires to evaluate and select hardware and software typically they require suppliers, present bits and proposals based on systems specifications developed during the design stage of systems development. Minimum acceptable performance and physical characteristics for hardware and software requirements are established and these are listed in formal documents called a request for proposal (RFP). A formal evaluation process reduces the possibility of buying inadequate or unnecessary computer hardware or software. The performance of hardware and software must be evaluated on various predefined evaluation factors.

Operational IS planning involves a detailed planning for the accomplishment of the new information systems development projects including the preparation of the operating budgets. Project planning is an important function which involves the development of guidelines / procedures, schedules for deployment, training of end users and co-ordination with the top management.

Other activities under implementation include system testing, documentation and training of both users and Information System personnel. The initial operation of a new computer based system is a challenge. It involves a conversion process in which the procedures, equipments, input / output media, and databases of an existing information systems need to be converted to the requirements of new systems. The people need to be reoriented and trained on the new system. The different approaches for this are parallel conversion, phased conversion, pilot conversion and plunge / direct cut over approach.

In parallel conversion both old and the new system are operated until both the IS team and the end users management agree to switch over to online operations. This helps in identifying errors and correcting them and also creating confidence in the users. A phased conversion allows a gradual implementation process to take place within an organizations. Similar benefits accrue from a pilot conversion where one department serves as a pilot site.

Once a system is fully implemented and being used by end users the maintenance function begins. Systems maintenance is the monitoring, evaluating, and modifying operational information system to make desirable or necessary improvements. The maintenance activity includes a post of implementation review process to ensure that newly implemented system meet the system development objectives. This includes periodic review or audit of a system to ensure that it is operating properly and meeting its objectives and for continually monitoring the systems for potential problems or necessary changes due to organizational / business environment.

Did u know? A client is a computer such as a PC or a workstation attached to a network, which is used to access shared network resources. A server is a machine that provides clients with these services.

Notes

Case Study

University Administration and Information Technology

A large university in extending its network and IT infrastructure to support all its academic & administrative functions.

Current network infrastructure is used for internal personnel, payroll, accounting, students registration, administration & financial functions. All the staff members should have a PC connected to the college network and all students and non lead. teaching staff have IT staffs training, especially in the use of word processing & spreadsheet softwares. Labs are also upgraded under the direction of computer centre. Since, the CSE Department is unhappy with the services provided by the computer centre, these departments have well developed labs of desktop PCs, Cabled & Networked for students. Staff in those department also have been networked using a separate cabling system. Because the HOD believes that with computing students there is danger that these knowledge will allow them a unauthorized excess to staff data traffic.

Questions

1. Principal of college is concerned that there is absence of strategic planning & control and is unhappy with the situation.
2. Advise the principal on a course of action.

Source: Management Information System by Dharmenda and Sangeeta Gupta

12.7 Summary

- The systems approach to problem solving uses a system orientation to the process of developing an information system.
- The activities are inter-related and require the involvement of every business end user in addition to the IS professionals.
- A distributed environment with both mainframe and PCs is very flexible and is commonly used by most medium and large-size organizations.
- This basic classification is analogous to the transportation such as a train or a plane.
- Information Systems Life Cycle covers the planning, construction, deployment and maintenance of an Information System. It covers the steps of investigation, analysis, design, and implementation and maintenance.

12.8 Keywords

Cost/Benefit Analysis: Assessment of a proposed project by comparing its projected costs with its projected benefits over time.

Data Flow Diagram: Diagram that depicts logical flow of data, using four standardized symbols to represent flow of data between processes and sub-processes in a business.

LAN: Network connecting personal computers and other equipment within a local area to help people share equipment, data and software.

System Maintenance: involves the monitoring, evaluation and modification of a system to make desirable or necessary improvements.

Notes

12.9 Self Assessment

Choose the appropriate answers:

1. Within the Waterfall model of systems development, which activities normally part of the 'system Implementation' phase?
   (a) Feasibility analysis.
   (b) Requirements determination.
   (c) Testing.
   (d) Systems changeover.
2. The activity "Project closedown review" is normally part of which phase of systems development?
   (a) Development.
   (b) Initiation.
   (c) Analysis and design.
   (d) Maintenance.
3. The activity "User Acceptance Testing" is normally part of which phase of systems development?
   (a) Maintenance.
   (b) Implementation.
   (c) Analysis and design.
   (d) Development.
4. The activity "Feasibility study" is normally part of which phase of systems development?
   (a) Implementation.
   (b) Initiation
   (c) Maintenance.
   (d) Development.
5. The activity "requirement determination" is normally part of which phase of systems development?
   (a) Development.
   (b) Implementation.
   (c) Initiation.
   (d) Analysis and design.
6. The activity "programme and test" is normally part of which phase of systems development?
   (a) Initiation.
   (b) Implementation.
   (c) Development.
   (d) Analysis and design.

Notes

7. Integration Testing is
   (a) Bottom-up testing
   (b) Top-down testing
   (c) Both
   (d) None
8. SDLC stands for
   (a) Software/System development life cycle
   (b) Software developer life cycle
   (c) Support development life cycle
   (D) None of these
9. SRS stands for
   (a) System requirement specification
   (b) Software required specimen
   (c) Software requirement specifications
   (d) None of these
10. ..... describes what a system, should do to meet the information needs of users.
   (a) Implementation
   (b) Testing
   (c) Planning
   (d) System design

Answers: Self Assessment

1. (b)	2. (d)	3. (b)	4. (b)
5. (d)	6. (c)	7. (c)	8. (a)
9. (c)	10. (d)		

12.10 Review Questions

1. What do you mean by information system architecture? Why are they important concerns for managers? How does it help in deploying an information system?
2. Explain the relevance of each stage of Software Development Life cycle.
3. How could you use the systems approach to problem solving as a way to solve a marketing problem? Identify a problem and trace the steps. Apply the same to a financial and human resources management problem.
4. Why do you think prototyping has become a popular way to develop new computer-based business systems? Does prototyping replace or supplement traditional information systems development? Explain.
5. Why is testing software important? What aspect is tested in Acceptance testing?
6. What are the challenges in implementing software systems in an organisation?

Notes

7. Study in detail the information needs of users in your department and prepare a document containing a detailed description of user information needs and the input, processing, output, storage and control capabilities required to meet those needs.
8. What do you mean by network environment?
9. How are information systems changing the management process? What specific managerial roles can information systems support?
10. How IT provides help in the design of organization?

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Unit 13: Case Study – ERP SAP Implementation

Notes

Case Study

SAP R/3 at Tata Steel

Tata Iron and Steel Company Limited (TISCO) made a steely resolution to remodel itself from a product-driven to a customer-driven enterprise of the Internet economy. It deployed an ERP, SAP R/3 to help its resolution bear fruit, and now enjoys exciting operational and cost benefits by Bhavish Sood.

"Post the introduction of the ERP solution, the results have been terrific. Tisco has spent close to ₹ 40 crores on its implementation and has saved ₹ 33 crores within a few months," said Ramesh C. Nadrajog, Vice President, Finance. "The manpower cost has reduced from over $200 per ton two years ago, to about $140 per ton in 2000.

The overdue outstanding has been brought down from ₹ 5,170 millions in 1999 to ₹ 4,033 million by June 2000. The inventory carrying cost has drastically deflated from ₹ 190 per ton to ₹ 155 per ton. To add to this, there have been significant costs savings through management of resources with the implementation of SAP."

Sounds almost Utopian doesn't it? But that's exactly the result of TISCO's ERP implementation completed within eight months. TISCO is Asia's first and India's largest integrated private sector steel company. It has a state-of-the-art 3.5 million tonne steel plant and is capable of meeting the most rigorous demands of its customers worldwide.

The company adopted ERP technology to take a lead in the competitive steel industry and through constant learning, innovation and refinement of its business operations, has transited seamlessly from a production-driven company to a customer-driven one. The existing technology was a simple replication of the manual system. Not only did it operate as individual islands of information but the technology had outlived its lifetime and was completely obsolete. The employees and management at TISCO faced a cumbersome task exchanging and retrieving information from the system.

Further, the reliability of information obtained was questionable because of inconsistency and duplication of data from different departments. Also there was no built-in integrity check for various data sources. Besides, several times the information against certain items was found missing.

An early response

Responding to changing customer needs started as early as 1991, with a study on cost competitiveness and a formal business plan, followed by ISO 9002 certification and benchmarking initiatives. Realizing the need to further support the re-engineered core processes and quickly align the business processes to radical changes in the market place, TISCO decided to go for a new robust solution.

Design

In 1998-99 a small cross-functional in-house team along with consultants from Arthur D. Little (Strategy Consultants) and IBM Global Services (BPR Consultants) redesigned the two core business processes: Order Generation & Fulfillment and the Marketing Development processes. This was done to improve customer focus, facilitating better credit control, and reduction of stocks.

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Choosing the Platform and Technology

The management at TISCO wanted the software to seamlessly integrate with its existing information system and further provide compatibility with its future implementations. After an in-depth study of functionality, cost, time, compatibility, esteem, operability, support, and future organizational requirements SAP fared on the top of the list of contenders.

The implementation of SAP was associated with certain strategic goals in mind. With this implementation, TISCO wanted to bring forth a culture of continuous learning and change. This would enable TISCO to achieve a world-class status for its products and services and strengthen its leadership position in the industry. Besides this, TISCO also wanted the software to result in quick decision-making, transparency, credibility of data, and improve responsiveness to customers across all areas.

The Real Challenge

B Muthuraman, MD (Designate), said, "Implementing any ERP system is a challenge for an organization because of the declining success rate of ERP implementations world-wide. At Tata Steel however the real challenge for us did not lie in successfully implementing SAP or in rolling it out to our 46-odd geographic locations across the country under a big bang approach in just eight months. The real challenge lay ahead in building a conducive environment where SAP will be embedded in the hearts and minds of the people and the customers of TISCO."

Mapping Technology to Business Processes

A road map was created to achieve the desired levels of success with ERP. All branches which had huge numbers of transactions and complexity, were identified as 'hubs.' And the smaller branches along with the consignment agents were defined as 'spokes,' which were attached to these branches. In January 1999 TISCO created a team called 'TEAM ASSET', an acronym for Achieve Success through SAP Enabled Transformation.

The TEAM ASSET had two simple axioms:

1. Go-Live date - 1st November 1999
2. There are only 24 hours a day

Preparatory task forces activities were conducted and core business processes were mapped to SAP modules.

A parallel activity called 'Change Management' was initiated within the company. The prime objective of 'Change Management' was to reach out to people involved non-directly in the project to apprise them of the developments taking place.

Tata Steel planned a 'big-bang' approach of going live with all the modules at the same time. Within eight months, on November 01, 1999, Tata Steel pulled off a big bang implementation of all SAP modules at one go across 46 countrywide locations. The deadline was successfully met.

The Result

The introduction of SAP solutions within Tata Steel has led to efficient business processes, enhanced customer service, reduced costs, improved productivity, accelerated transaction time, workflow management and reduction in the number of credit management errors. There have also been significant savings in manpower, inventory levels, and resource management.

TISCO can now update its customers daily and provide seamless services across the country, improving customer management. The availability of online information has facilitated

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quicker and reliable trend analysis for efficient decision-making. Besides, the streamlined business process reduces the levels of legacy system and also provides consistent business practices across locations and excellent audit trail of all transactions.

"Post the introduction of the SAP solution, the results have been terrific. The company has spent close to ₹ 40 crores on SAP implementation, and has already saved ₹ 33 crores," said Mr. Ramesh C. Nadrajog, Vice President (Finance). The manpower cost has reduced from over $ 200 per ton two years ago, to about $140 per ton in 2000. The overdue outstanding has been brought down from ₹ 5170 millions in 1999 to ₹ 4033 millions by June 2000. The inventory carrying cost has drastically deflated from ₹ 190 per ton to ₹ 155 per ton. To add to this, there have been significant costs savings through management of resources with the implementation of SAP.

With SAP's solution Tata Steel can now update their customers on a daily basis and provide seamless services across the country improving customer management. The availability of online information has facilitated quicker and reliable trend analysis for efficient decision-making. Besides the streamlined business process reduces the levels of legacy system and also provides consistent business practices across locations and excellent audit trail of all transactions. "Now I shudder to think how we were functioning so many years without a world-renowned ERP system. Along with the hard times we had, came the rewards of the success of implementation," remarked Mr. K. V. Srinivasan, Member, Team ASSET at TISCO.

Achieving Business Agility through SAP

Marching ahead, Web enabling of SAP R/3 is on the cards. On the surface, it means it would allow anyone to access our SAP R/3 over the Internet. But beneath it, the implications are tremendous, as it would result in sharing of information with enterprise accounts and key customers. The success in Marketing and Sales has prompted a re-visit of the existing system in the works and a detailed rollout is expected as below.

1. ***Phase I:*** To Extend SAP in Works with FI, CO, MM, PP & QM
2. ***Phase II:*** To implement SAP modules such as Asset Management & Budget management sub-modules of FICO, Plant maintenance, Human Resources, Production Optimizer (such as SAP APO)
3. ***Phase III:*** SEM (Strategic Enterprise Management)

The company also plans to adopt the mySAP Customer Relationship Management solution to enhance its customer relationships in the near term and eventually realize its dream of a becoming the most efficient and competitive company in the world in its vertical.

Questions

1. The cost-cutting measures seemed to have helped TISCO to a large extent. Apart from TOP, what are the other steps taken by TISCO for reducing costs?
2. The lowered production costs enabled TISCO to record a profit during 1999-2000, despite a depressed market and low margins. Do you think the low costs would help the company in the long run?

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Case Study

Oracle at Qualcomm CDMA Technology

The Company

Founded in 1985, Qualcomm, Inc. pioneered code division multiple access (CDMA), the foundation for third-generation (3G) communications devices, and continues to develop new voice, data and wireless Internet products and solutions. The company created Qualcomm CDMA Technologies (QCT) in 1995 to provide manufacturers with hardware, software, tools and training, and technical support for CDMA wireless products. Qualcomm CDMA Technologies is the largest provider of 3G chipsets and software technology in the world, with chipsets shipped to more than 50 customers and powering the majority of all 3G devices commercially available.

The Problem/Situation

As more and mote manufacturers worldwide I adopt Qualcomm's CDMA standard, the company's supply chain has become increasingly complex. QCT's manufacturing model means that chips are manufactured around the world and then delivered to customers worldwide. To support this complexity and anticipated growth, QCT decided to evaluate its supply chain applications to ensure they could continue to meet the company's needs.

QCT needed a cost-effective way to interact with its customers and suppliers. The applications QCT had been using were already heavily customized and the process of interacting with customers was manually based and too slow to be useful. The extensive customization made scaling the system prohibitively expensive and made upgrading very difficult. QCT evaluated alternatives to its legacy software and chose Oracle to manage complexity and make it easier for customers and suppliers to interact with the company.

The Solution & Implementation

Before evaluating alternatives to its legacy software, QCT first defined its strategy for improving both its relationship with customers and suppliers. The company committed to timely responses to customer requests for quotes, order commitments and status updates. QCT also decided to improve the visibility of its supply chain, improve flexibility and reduce lead-times. "The value proposition and the business case were so clear that we were only interested in finding the perfect fit. Oracle offered the only real solution to our needs," said Lisa Henderson, director of QCT information technology.

QCT implemented without customizations so that future upgrades will be fast and low-cost, and the out-of-the-box integration among the applications in Oracle E-Business Suite means QCT will be able to add more applications as needed without the cost of lengthy integration projects.

The Benefits

QCT has increased productivity by automating processes. For example, Oracle Procurement has eliminated manual processes .and the company has streamlined warehouse processes using the attribute based picking rules of Oracle Warehouse Management.

The company has also gained greater understanding and control of its supply chain. With its integrated Oracle applications, QCT has also reduced inventory throughout the supply

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chain and gains better information about supply and demand. In addition, QCT simulates supply forecasts much more effectively now that its applications are integrated.

With Oracle E-Business Suite Applications in place, QCT's customers have around-the-clock access to on-line collaboration systems. Internal workflow efficiencies have allowed QCT to respond more quickly when customers request quotes. Because applications for different functional areas are integrated, QCT can make faster, more accurate decisions about customer issues, such as credits. QCT is now in a stronger position to handle its expected growth. In summary, the Oracle solution equipped QCT with the ability to:

1. Enabled easier, more effective forecast simulation
2. Improved control over supply chain
3. Increased productivity in shipping and warehouse management

Questions

1. Analyse the situation presented in above case study.
2. Discuss how the supply chain management has improved after the implementation of ERP.

Notes

Unit 14: Case Study – ERP Application on Supply Chain

Case Study

Optimizing the Supply Chain: Baans' Perspective

This study aims to emphasize the importance of planning in the process of supply chain as there is scope for enormous savings by making supply chains effective. For this, ERP (Enterprise Resource Planning) applications are used to streamline and integrate business processes. But most of these applications have shortcomings such as sequential approach for planning, lack of constraint identification, lack of visibility, static lead times and level of details used for capacity planning. A new class of planning software called APS (Advanced Planning and Scheduling) refutes these problems and it works on popular constraint – based techniques.

Keywords: Enterprise Resource Planning, Advanced Planning and Scheduling, leadtimes, BaanSCS, Materials Requirement Schedule, Material Requirements, Planning Capacity Requirements.

Introduction

The intricate complexity of today's supply chains is staggering. Sales, supply, production, distribution – all must be deftly balanced and seamlessly integrated if one wants to compete in the global market place. However, these supply chains are far from efficient – billions of dollars in potential savings lie trapped in inefficient supply chains. Intelligent supply chain management represents the single greatest opportunity for increasing market share, cash flow and profits. It enables you to make informed decisions along the entire supply chain, from acquiring raw materials to manufacturing products to distributing finished goods to the consumer.

Companies seeking to re-engineer their supply chains have taken a variety of approaches. Many companies implement ERP (enterprise resource planning) applications, to solve this problem. These applications contain capabilities such as inventory management, material planning, order processing, procurement, shop – floor management and finance. ERP systems allow companies to streamline and integrate business processes by improving information flow and velocity, both within a company's supply chain, as well as, externally with trading partners.

Beyond ERP: Supply Chain Solutions

Planning is a fundamental process that occurs across the entire supply chain and impacts all aspects of the demand fulfillment process – from procuring raw materials and transforming them into a finished product, to delivering that product to customers. However, for most ERP systems, their planning environment has several shortcomings.

Traditional ERP systems use a sequential approach to derive a plan. First, a Master Production Schedule (MPS) is created, which provides the basis for Material Requirements Planning (MRP), and, after this step, attempts to perform Capacity Requirements Planning (CRP). Unfortunately, this approach considers material and capacity as independent variables at each stage that results in an infeasible plan. To resolve this, MRP's logic advocates iterating this sequence multiple times to adjust for changes made at each step. Soon these actions become very confusing due to the complexity of the planning problem and the scope of the product – mix being planned. Consequently, the planner starts planning with more slack to protect the feasibility of his plan.

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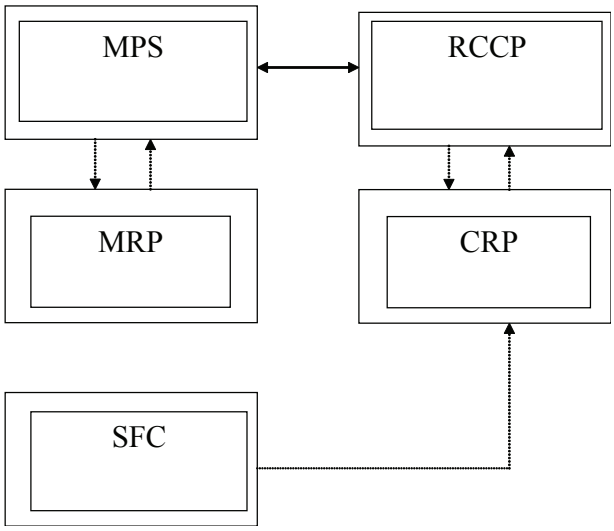

Figure 1: The Traditional ERP Planning Framework

The main shortfalls of the classical approaches are:

1. ***Lack of constraint identification and optimization:*** Planning the traditional approach assumes no material or capacity constraints. The resulting plan does not optimize the critical resources.
2. ***Lack of visibility:*** Current systems do not give the planner enough visibility into the consequences of their actions. As a result, final plans are either not feasible or do not optimize the critical resources within the manufacturing environment.
3. ***Division in distribution and manufacturing planning concepts:*** Even though DRP and MRP concepts are very similar, they are often implemented as different systems. In reality, supply chains often consist of closely connected manufacturing and distribution networks.
4. ***Excess inventory or shortages:*** Lead times are often static and manually assigned rather than dynamically calculated. This either creates excess inventory or shortages and a very reactive environment.
5. ***Inadequate details:*** The level of detail used for capacity planning is too rough for adequate decision making.

The APS Challenge

A new class of intelligent planning software application that solves the above - mentioned problems has emerged. This application class is called APS (Advanced Planning and Scheduling). APS systems manage complex manufacturing operations that involve large number of resources and operational steps in real time, as well as solve the above – mentioned planning problems. They use constraint technology to produce an intelligent and feasible production plan that reflects real – world manufacturing conditions (and constraints) in order to meet manufacturing goals such as improving due – date performance, cutting lead times, improving throughout and reducing inventory and operating expenses. Unlike the iterative planning logic of the traditional ERP system, APS systems simultaneously consider all constraints – material, capacity, operators, tools, etc., - and generate a feasible operating plan in a single pass. The resulting plans are optimized to meet the customer's delivery requirements and business objectives.

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Until recently, APS systems were provided by a different set of vendors than ERP vendors. Such systems have been very expensive to implement, costing a million dollars for a mid-size manufacturer to upwards of a tens of millions for a Fortune 500 company. Furthermore, such systems still need to be integrated with the in-house ERP systems, to execute the plans created by an APS system. The cost of purchasing, implementing and integrating an APS system has been expensive until now.

Baan's Advanced Planning Solution

Baan has developed its own APS system that can either be purchased fully integrated with the Baan ERP system, or as a stand-alone, to work with a different ERP system. Baan's APS solution, called BaanSCS Planner and BaanSCS Scheduler, leverages the popular constraint-based techniques and delivers the same capabilities as mentioned above, but with a dramatically lower cost of ownership. For Baan ERP users, the APS capability comes pre-integrated, allowing even a lower cost of ownership.

BaanSCS Planner complements the BaanERP planning capabilities, such that the combined planning solution provides a best-in-class planning environment that integrates the performance, constraints technology and simulation capabilities of BaanSCS Planner with the richness of the materials management concepts supported in Baan ERP planning system. Hence, constraint-based planning and simulation concepts can now be cost effectively and easily applied to mixed mode manufacturing environments, including Engineer-to-Order (ETO), Make-to-Order (MTO), Assemble-to-Order (ATO) or Make-to-Stock (MTS).

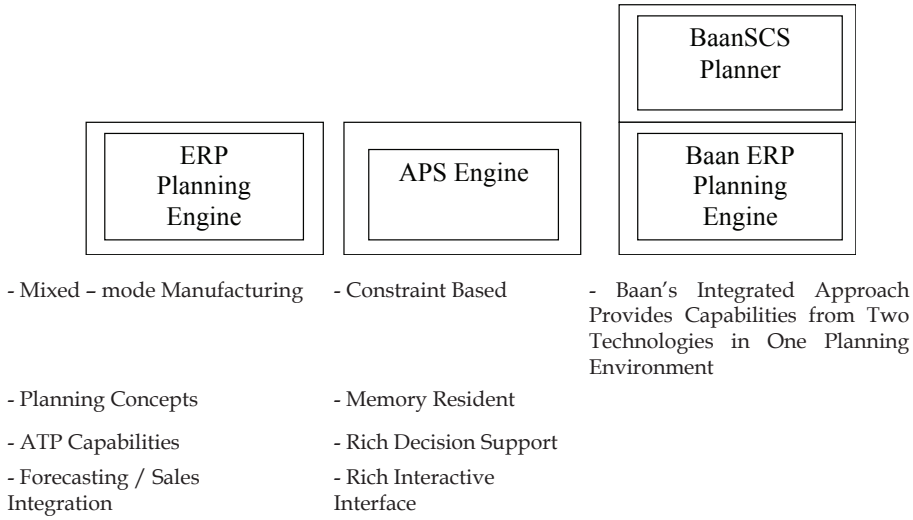

Figure 2: Baan's Approach Creates a Rich – Planning Environment

Key Capabilities of the BaanSCS Planner

BaanSCS Planner complements BaanERP's planning capabilities with its functional richness in the following areas:

1. Constraint-based Optimization with Bottleneck Detection
2. Full Integration with BaanERP
3. High Performance Planning Capabilities
4. Advanced Analysis Tools and User Interface
5. Advanced Simulation Environment

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Constraint-based Optimization with Bottleneck Detection

BaanSCS Planner synchronizes procurement, production and distribution activities across the supply chain in a manner that optimizes total throughput and minimizes inventory and cycle time.

Optimization is directly related to planning with constraints. In order to optimize the supply plan, the planning engine takes constraints and optimization objectives into account to generate a plan across the supply chain that will maximize plant thoughput and minimize manufacturing cycle times. It simultaneously considers both material and capacity constraints in order to synchronize production operations and sub – assemblies. BaanSCCS Planner Engine algorithm can be characterized as employing:

1. Memory resident (in – RAM) processing for speed
2. Constraint-based throughput optimization in accordance with the Theory of Constraints
3. A sorting engine which uses iterative backward – leveling / forward – compression phases to converge on an optimal solution
4. Rules – based resource allocation simulation

Parameters taken into account during a Planning Engine run include operation predecessor/ successor relationships, firm allocations, resource capacity, material availability, operation overlapping, set – up optimization rules, planning buffers and order priorities. The net result is an optimized operations plan across the supply chain. In doing so, the Planning Engine determines the details of how the product will be made and where it will be made.

BaanSCS Planner also contains net change engines. These Net Change Engines are specialized algorithms that optimize certain performance criteria, based on company business rules. They are event – driven engines that are invoked multiple times during the day as certain actions occur. For example, the Order Insertion Engine is the first of a series of net change engines to be introduced. Its purpose is to quickly insert new supply orders into the plan to provide coverage for new customer orders, and to support order promising.

High Performance Planning Capabilities

BaanSCS Planner has a memory – resident planning engine that is roughly 50 to 100 times faster than the traditional database – driven ERP systems planning engines. Hence the ability to respond to plan changes can be measured in seconds or minutes compared to hours in traditional ERP systems. Memory – resident planning technology also makes simulation and dynamic order promising capabilities feasible, and hence increases the richness of the planning environment.

Advanced Analysis Tools and User Interface

BaanSCS Planner's client-based decision support system provides a very rich set of graphical visualization and problem identification capabilities to assist the planner.

It has a performance tracking monitor that assesses the quality of a plan and alerts the planner to problems that need to be addressed. It focuses on planned future performance, and enables the planner to be proactive in managing potential problems before they get a chance to become real problems. Key analysis tools available in the monitor include:

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Delivery Performance: Displays details concerning delivery performance.

1. *Demand* – total customer demand, forecast, non – consumed forecast
2. *Customer Orders* – sales revenues, delivery performance percentage, average and max lateness
3. *End Supply Orders* – lateness of supply orders, average and max lateness
4. *Causes of Lateness* – ranking of top 10 most important constraints.

Resource Utilization Performance: Displays details concerning resource utilization.

1. *Capacity Utilization* – total capacity available, capacity used (hours and percentage), average and max
2. *Overload* – resources overloaded, periods overloaded, average and max
3. *Causes of Lateness* – ranking of top 10 most important resource constraints

Inventory Performance: Displays details concerning inventory performance

1. *Inventory Value* – average, min and max inventory value, variation
2. *Days Coverage* – average, min, max
3. *Problems* – periods with negative projected inventory balances, under safety stock
4. *Causes of Lateness* – ranking of top 10 most important raw material constraints.

Financial Performance: Displays details concerning financial performance

1. *Profitability* – revenue, expenses, total profit
2. *SYNC Indicators* – throughput, inventory, operating expenses, turnover, productivity
3. *Revenue* – sales, forecaste, total
4. *Expenses* – Operating, purchasing, total

In addition, BaanSCS Planner contains a number of key graphs. 'Lateness' is the problem planners spend most of their time on – identifying lateness, determining causes of lateness, and trying to prevent lateness in a proactive manner through better visualization of plans. The Order Lateness Graph is part of an overall sub – system that supports these activities. The objective is to minimize or eliminate expediting activities in the plant, and provide consistently high delivery service to customers.

The Supply Network Analysis Graph shows a time – phased network of supply orders, displayed as coloured blocks, which are associated with a particular customer order or end – level supply order. Its purpose is to identify causes of lateness – such as raw material, capacity, or both – through the use of block colours.

Effective planning and managing production resource utilization is one of the key responsibilities of the planner. The Resource Utilization Graph displays capacity utilization percentage over time for a given resource. Resources can be designated by the planner as either unconstrained, constrained within a time fence, or fully constrained. If unconstrained, the Planning Engine assumes infinite capacity. If constrained, the Planning Engine level - loads the resource based on available capacity. At the start of the planning process, the planner can view critical bottle neck resources in an unconstrained mode to determine if there is enough aggregate capacity to meet company production plan objectives. After the planner has leveled the plan, he or she can view in detail the orders loaded for a particular time period and manage variations in capacity utilization.

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The Detailed Resource Utilization Graph displays the capacity utilization percentage over time for a specific resource in a bar chart format. Detailed capacity analysis can be performed here, and there are options to drill – down or navigate to other screens to make adjustments to either the schedule or available capacity.

As the planner makes adjustments to the plan to resolve resource utilization problems, he or she must keep an eye on overall projected inventory levels. The Inventory Profile by Item Graph displays future inventory balances that can be expected as a result of selected planning policies such as minimum, maximum, and lot sizing parameters. Inventory can be viewed for one or more sites, and for multiple items or families of items at a time.

The Profitability Graph summarizes planned in – flows and out – flows of cash (i.e. operating revenues and expenses) and highlights potential problems. This graph is a valuable tool for overall cash and net profit management, and the information can be compared to the company's cash flow budget for the year.

Advanced Simulation Environment

BaanSCS Planner combines its graphical decision support capabilities with quick – memory resident processing to create a very rich simulation environment. This environment allows the planner to easily manipulate and manage 'scenarios'. For example, suppose the planner wants to evaluate the impact of accepting an unusually large customer order on the live production plan in terms of resource utilization, inventory levels and cash flow. The planner can easily set up a scenario, enter a new order, run the Planning Engine against it, and look at the appropriate graphical views to determine the results. The scenario can then be compared to the live 'Actual Plan.'

In another example, the planner wants to evaluate the different production plans that would result from different assumptions regarding the sales forecast.

The planner can create different scenarios, each one driven by different forecast assumptions (e.g. optimistic, pessimistic), then run the MRP / DRP and Planning Engineers to generate optimized plans. Multiple views can be attached to each scenario to allow graphical analysis.

All scenario modeling is net – change to deliver quick response. Virtually any parameter can be changed and there is no limit to the number of scenarios the user can create. After generating a new proposed plan, the planner evaluates the consequences of his actions along several dimensions, which gives him clear visibility on the consequences pertaining to – for instance – the stock levels, the financial impact and the customer services levels. The planner not only controls the planning problem (by means of a simulation tool), he will have a clear visibility of the consequences from initial raw material procurement to the final shipment.

Full Integration with BaanERP

Until now, integration efforts between APS and ERP systems have adopted a loose integration framework, since the tight integration has been difficult due to incompatibility in the process and data models. Hence, the total planning functionality available as a result of the integration between the two systems has been less than the sum of the functionality of the two products.

BaanSCS Planner has been designed to be compatible with BaanERP in data and process models and is fully integrated with BaanERP using messaging technology. This integration not only makes it possible for the BaanSCS Planner to complement existing BaanERP planning capabilities, it enhances the order – promising capabilities. Hence, customer

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service representatives can now confidently quote accurate delivery dates in seconds or determine the status of a customer order in real – time, based upon current production and inventory status. The following software capability illustrates the richness of the integrated BaanERP and BaanSCS Planner environment.

When a customer service representative processes a new order, it is desirable to have the planning system immediately determine the earliest possible delivery date the supply chain is capable of supporting. The Order Insertion Engine accomplishes this goal. Each time BaanSCS Planner receives a new customer order, an ATP check is made to determine if there is sufficient onhand inventory projected to meet the requirement. If not, the MRP / DRP Engine creates a new supply order – i.e. manufacturing, purchase, or distribution order – automatically. The Oder Insertion Engine then inserts it into the current plan taking into account existing constraints.

The objective of the Order Insertion Engine is to insert new orders into the plan in a way that guarantees delivery as close as possible to the customer's requested date, without causing additional lateness on orders already planned.

In order to provide flexibility to the user, orders can be inserted using one of the two models. The first mode is non – disruptive order insertion. It is intended to allow fast insertion of new orders, so it doesn't alter start and complete times of operations already planned. It promotes overall stability of the plan, but may not fully exploit potentially available slack time found throughout the planning horizon. The second mode is disruptive order insertion. The start and complete times of orders already planned may be altered as it exploits slack time in the plan to maximize timely delivery of new orders, particularly those identified as high priority orders. However, it does not postpone further orders that may already be late. And it will not delay any other orders beyond their customer requested due date. These modes are intended to stabilize the plan to some degree, while giving the planner flexibility to meet different business objectives.

Conclusion

BaanSCS Planner complements ERP systems' planning capabilities with its functional richness in the following areas:

1. Constraint-based Optimization with Bottleneck Detection
2. Full Integration with BaanERP
3. High Performance Planning Capabilities
4. Advanced Analysis Tools and User Interface
5. Advanced Simulation Environment

BaanSCS Planner is architected to coexist with any ERP system and comes without – of – the – box integration with BaanERP system. The integrated BaanERP and BaanSCS Planner environment will allow the Baan Company to deliver its promise of leveraging technology in a cost – effective manner to optimize a manufacturer's supply chain.