



BIJU PATNAIK INSTITUTE OF IT & MANAGEMENT STUDIES, BHUBANESWAR

NOTES ON FUNDAMENTAL OF IT & ERP

Module. I

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Role of IT in modern Business

Information technology (IT) has become a vital and integral part of every business plan. From multinational corporations who maintain mainframe systems and databases to small businesses that own a single computer, IT plays a role. The reasons for the omnipresent use of computer technology in business can best be determined by looking at how it is being used across the business world.

Communication Between Employees, Suppliers and Customers

For many companies, email is the principal means of communication between employees, suppliers and customers. Email was one of the early drivers of the Internet, providing a simple and inexpensive means to communicate. Over the years, a number of other communications tools have also evolved, allowing staff to communicate using live chat systems, online meeting tools and video-conferencing systems. Voice over internet protocol (VOIP) telephones and smart-phones offer even more high-tech ways for employees to communicate.

Inventory Management Systems

When it comes to managing inventory, organizations need to maintain enough stock to meet demand without investing in more than they require. Inventory management systems track the quantity of each item a company maintains, triggering an order of additional stock when the quantities fall below a pre-determined amount. These systems are best used when the inventory management system is connected to the point-of-sale (POS) system. The POS system ensures that each time an item is sold, one of that item is removed from the inventory count, creating a closed information loop between all departments.

Data Management Systems

The days of large file rooms, rows of filing cabinets and the mailing of documents is fading fast. Today, most companies store digital versions of documents on servers and storage devices. These documents become instantly available to everyone in the company, regardless of their geographical location. Companies are able to store and maintain a tremendous amount of historical data economically, and employees benefit from immediate access to the documents they need.

Management Information Systems

Storing data is only a benefit if that data can be used effectively. Progressive companies use that data as part of their strategic planning process as well as the tactical execution of that strategy. Management Information Systems (MIS) enable companies to track sales data, expenses and productivity levels. The information can be used to track profitability over time, maximize return on investment and identify areas of improvement.

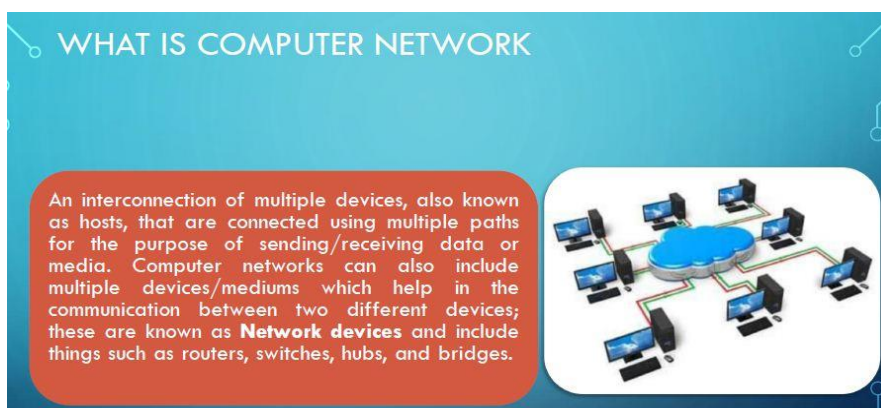
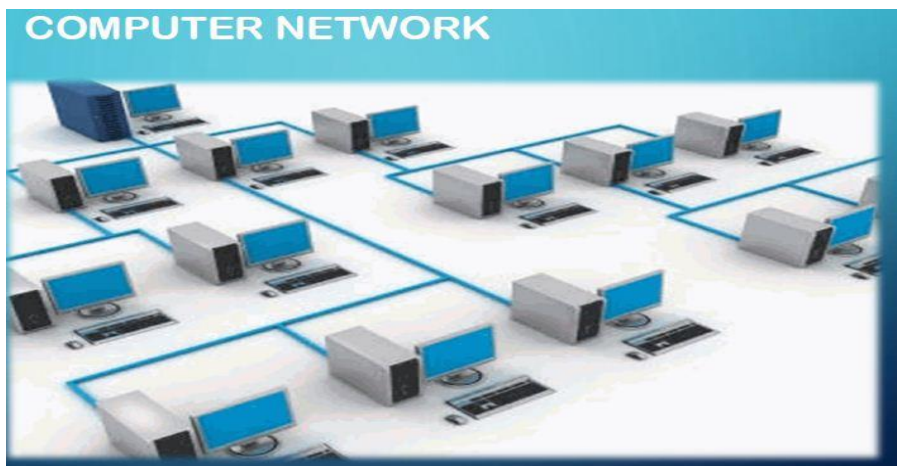
Managers can track sales on a daily basis, allowing them to immediately react to lower-than-expected numbers by boosting employee productivity or reducing the cost of an item.

Customer Relationship Management

Companies are using IT to improve the way they design and manage customer relationships. Customer Relationship Management (CRM) systems capture every interaction a company has with a customer, so that a more enriching experience is possible. If a customer calls a call center with an issue, the customer support representative will be able to see what the customer has purchased, view shipping information, call up the training manual for that item and effectively respond to the issue.

The entire interaction is stored in the CRM system, ready to be recalled if the customer calls again. The customer has a better, more focused experience and the company benefits from improved productivity.

Introduction to Computer Networks



CHARACTERISTICS OF A COMPUTER NETWORK

Share Resources from one computer to another

Create files and store them in one computer, access those files from the other computer(s) connected over the network

Connect a printer, scanner, or a fax machine to one computer within the network and let other computers of the network use the machines available over network

HARDWARE'S REQUIRED TO SETUP A COMPUTER NETWORK



Network Cables



Distributors



Routers

A router is a device like a switch that routes data packets based on their IP addresses.



Internal Network Cards



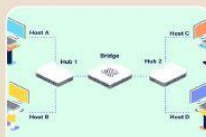
External Network Cards

HARDWARE'S REQUIRED TO SETUP A COMPUTER NETWORK



Hub

A hub is basically a multiport repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations



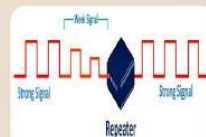
Bridge

A bridge operates at the data link layer. A bridge is a repeater, with add on the functionality of filtering content by reading the MAC addresses of source and destination



Switch

A switch is a multiport bridge with a buffer and a design that can boost its efficiency (a large number of ports imply less traffic) and performance. A switch is a data link layer device.



Repeater

A repeater is implemented in computer networks to expand the coverage area of the network, repropagate a weak or broken signal and/or service remote nodes.

Repeater – A repeater operates at the physical layer. Its job is to regenerate the signal over the same network before the signal becomes too weak or corrupted so as to extend the length to which the signal can be transmitted over the same network. An important point to be noted about repeaters is that they do not amplify the signal. When the signal becomes weak, they copy the signal bit by bit and regenerate it at the original strength. It is a 2 port device.

Hub – A hub is basically a multiport repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations. Hubs cannot filter data, so data packets are sent to all connected devices.

Bridge – A bridge operates at the data link layer. A bridge is a repeater, with add on the functionality of filtering content by reading the MAC addresses of source and destination. It is also used for interconnecting two LANs working on the same protocol. It has a single input and single output port, thus making it a 2 port device.

Switch – A switch is a multiport bridge with a buffer and a design that can boost its efficiency (a large number of ports imply less traffic) and performance. A switch is a data link layer device. The switch can perform error checking before forwarding data, which makes it very efficient as it does not forward packets that have errors and forward good packets selectively to the correct port only. In other words, the switch divides the collision domain of hosts, but broadcast domain remains the same.

Routers – A router is a device like a switch that routes data packets based on their IP addresses. The router is mainly a Network Layer device. Routers normally connect LANs and WANs together and have a dynamically updating routing table based on which they make decisions on routing the data packets. Router divide broadcast domains of hosts connected through it.

Gateway – A gateway, as the name suggests, is a passage to connect two networks together that may work upon different networking models. They basically work as the messenger agents that take data from one system, interpret it, and transfer it to another system. Gateways are also called protocol converters and can operate at any network layer. Gateways are generally more complex than switches or routers. Gateway is also called a protocol converter.

WHAT IS NETWORK TOPOLOGY?

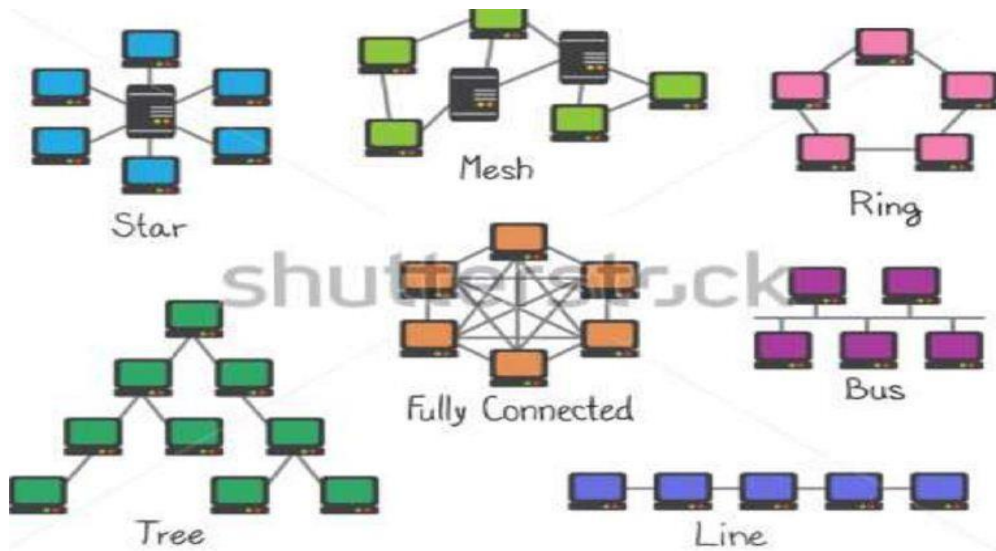
Types Of Topology

Based on geographical area covered

- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide Area Network (WAN)

Based on Architecture

- Bus Topology
- Star Topology
- Ring Topology
- Tree Topology
- Mesh Topology
- Hybrid Topology



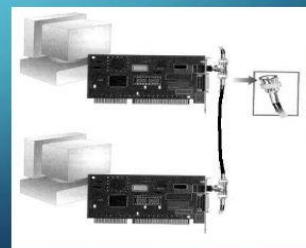
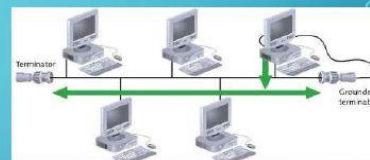
ADVANTAGES OF BUS TOPOLOGY

Works well for small networks.

Relatively inexpensive to implement.

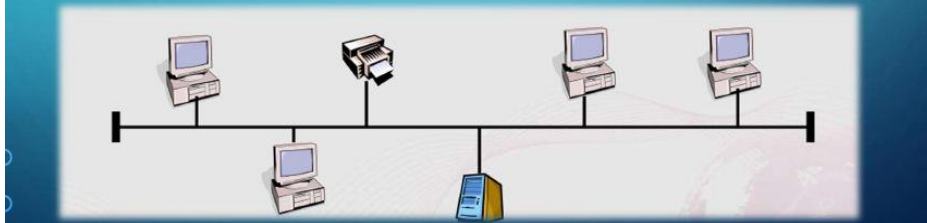
Easy to expand joining two cables together.

Used in small network.



BUS TOPOLOGY

A Bus topology consists of a single cable—called a bus—connecting all nodes on a network without intervening connectivity devices



DISADVANTAGES OF BUS TOPOLOGY

Management costs can be high

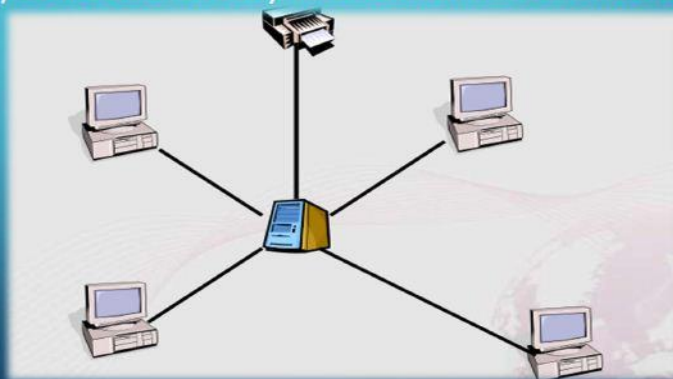
Cables fails then whole network fails.

Cables has a limited length



STAR TOPOLOGY

A star network is designed with each node (file server, workstation, peripheral) connected directly to a central network hub or server.



ADVANTAGES OF STAR TOPOLOGY

Good option for modern networks

Low startup costs

Easy to manage

Offers opportunities for expansion

Most popular topology in use wide variety of equipment available

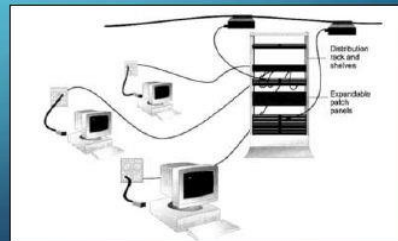
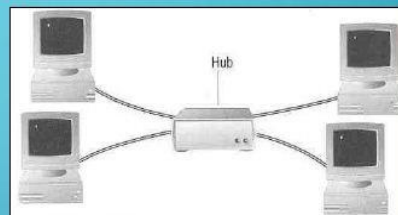


DISADVANTAGES OF STAR TOPOLOGY

Hub is a single point of failure

Requires more cable than the bus

Cost of installation is high.



ADVANTAGES OF RING TOPOLOGY

Easier to manage; easier to locate a defective node or cable problem

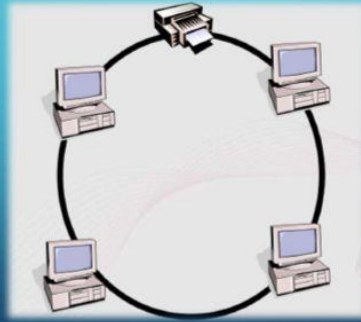
Well-suited for transmitting signals over long distances on a LAN

Handles high-volume network traffic



RING TOPOLOGY

A ring network is one where all workstations and other devices are connected in a continuous loop. There is no central server



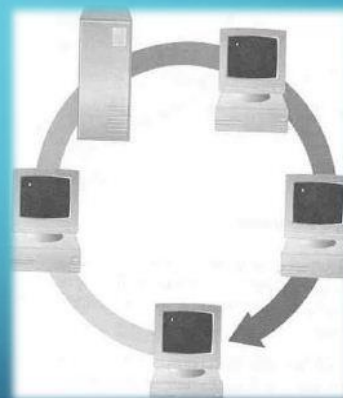
DISADVANTAGES OF RING TOPOLOGY

Expensive

Requires more cable and network equipment at the start

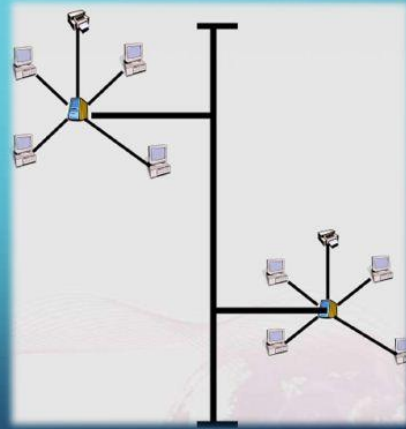
Not used as widely as bus topology

- Fewer equipment options
- Fewer options for expansion to high-speed communication



TREE TOPOLOGY

- It has a root node and all other nodes are connected to it forming a hierarchy. It is also called Hierarchical Topology.
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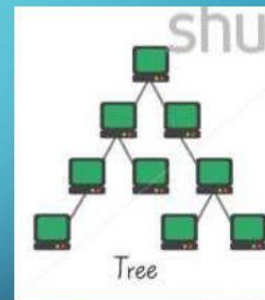


ADVANTAGES OF TREE TOPOLOGY

Extension of Bus and Star Topology.

Expansion of nodes is possible and easy.

Easily managed and maintained



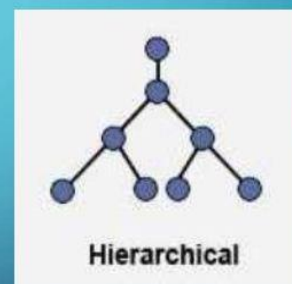
DISADVANTAGES OF TREE TOPOLOGY

Heavily cabled.

Costly.

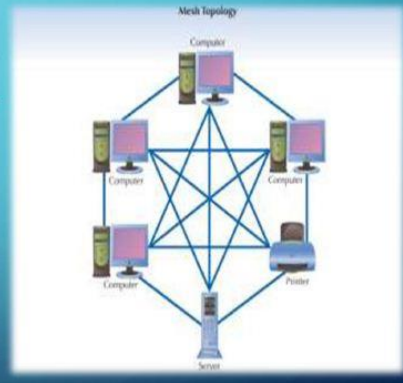
If more nodes are added maintenance is difficult.

Central hub fails, network fails



MESH TOPOLOGY

It is a point-to-point connection to other nodes or devices. Traffic is carried only between two devices or nodes to which it is connected. Mesh has $n(n-2)/2$ physical channels to link n devices

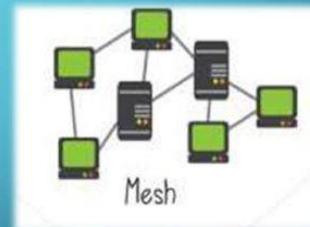


ADVANTAGES OF MESH TOPOLOGY

Each connection can carry its own data load.

Fault is diagnosed easily.

Provide security and privacy.

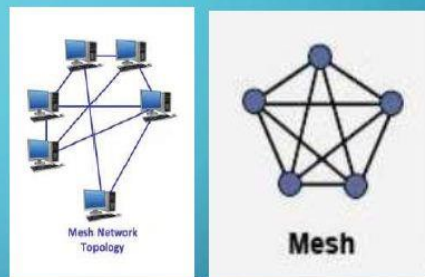


DISADVANTAGE OF MESH TOPOLOGY

Installation and configuration is difficult.

Cabling cost is more.

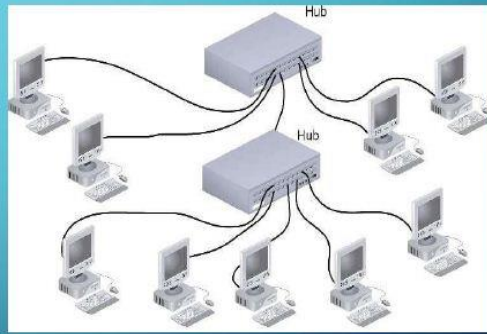
Bulk wiring is required.



HYBRID TOPOLOGY

It is the mixture of two or more topologies. Therefore it is called Hybrid topology. A hybrid topology combines characteristics of linear bus and star and/or ring topologies.

Star-Wired Bus



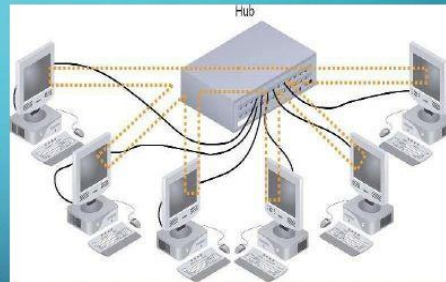
ADVANTAGES OF HYBRID TOPOLOGY

Reliable as error detecting and trouble shooting is easy.

Effective.

Scalable as size can be increased easily.

Flexible.

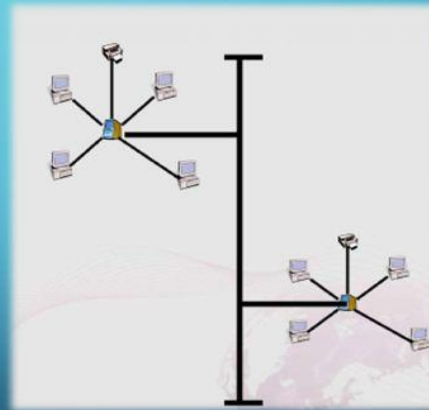


Star-Wired Ring

DISADVANTAGES OF HYBRID

Complex in design.

Costly



OSI MODEL

What Is the OSI Model

- ▶ The Open Systems Interconnection (OSI) model describes seven layers that computer systems use to communicate over a network. It was the first standard model for network communications, adopted by all major computer and telecommunication companies in the early 1980s
- ▶ The modern Internet is not based on OSI, but on the simpler TCP/IP model. However, the OSI 7-layer model is still widely used, as it helps visualize and communicate how networks operate, and helps isolate and troubleshoot networking problems.
- ▶ OSI was introduced in 1983 by representatives of the major computer and telecom companies, and was adopted by ISO as an international standard in 1984.

OSI Model Explained

7	Application Layer	Human-computer interaction layer, where applications can access the network services
6	Presentation Layer	Ensures that data is in a usable format and is where data encryption occurs
5	Session Layer	Maintains connections and is responsible for controlling ports and sessions
4	Transport Layer	Transmits data using transmission protocols including TCP and UDP
3	Network Layer	Decides which physical path the data will take
2	Data Link Layer	Defines the format of data on the network
1	Physical Layer	Transmits raw bit stream over the physical medium

Application Layer

- ▶ The application layer is used by end-user software such as web browsers and email clients. It provides protocols that allow software to send and receive information and present meaningful data to users. A few examples of application layer protocols are the Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), Post Office Protocol (POP), Simple Mail Transfer Protocol (SMTP), and Domain Name System (DNS).

Presentation Layer

- ▶ The presentation layer prepares data for the application layer. It defines how two devices should encode, encrypt, and compress data so it is received correctly on the other end. The presentation layer takes any data transmitted by the application layer and prepares it for transmission over the session layer.

Session Layer

- ▶ The session layer creates communication channels, called sessions, between devices. It is responsible for opening sessions, ensuring they remain open and functional while data is being transferred, and closing them when communication ends. The session layer can also set checkpoints during a data transfer—if the session is interrupted, devices can resume data transfer from the last checkpoint

Transport Layer

- ▶ The transport layer takes data transferred in the session layer and breaks it into “segments” on the transmitting end. It is responsible for reassembling the segments on the receiving end, turning it back into data that can be used by the session layer. The transport layer carries out flow control, sending data at a rate that matches the connection speed of the receiving device, and error control, checking if data was received incorrectly and if not, requesting it again.

Network Layer

- ▶ The network layer has two main functions. One is breaking up segments into network packets, and reassembling the packets on the receiving end. The other is routing packets by discovering the best path across a physical network. The network layer uses network addresses (typically Internet Protocol addresses) to route packets to a destination node.

Data Link Layer

- ▶ The data link layer establishes and terminates a connection between two physically-connected nodes on a network. It breaks up packets into frames and sends them from source to destination. This layer is composed of two parts—Logical Link Control (LLC), which identifies network protocols, performs error checking and synchronizes frames, and Media Access Control (MAC) which uses MAC addresses to connect devices and define permissions to transmit and receive data.

Physical Layer

- ▶ The physical layer is responsible for the physical cable or wireless connection between network nodes. It defines the connector, the electrical cable or wireless technology connecting the devices, and is responsible for transmission of the raw data, which is simply a series of 0s and 1s, while taking care of bit rate control.

Advantages of OSI Model

- ▶ **The OSI model helps users and operators of computer networks:**
 - Determine the required hardware and software to build their network.
 - Understand and communicate the process followed by components communicating across a network.
 - Perform troubleshooting, by identifying which network layer is causing an issue and focusing efforts on that layer.

INTERNET SECURITY

Virus:

Virus is a computer program or software that connect itself to another software or computer program to harm computer system. When the computer program runs attached with virus it perform some action such as deleting a file from the computer system. Virus can't be controlled by remote.

Worms:

Worms is also a computer program like virus but it does not modify the program. It replicate itself more and more to cause slow down the computer system. Worms can be controlled by remote.

TrojanHorse:

Trojan Horse does not replicate itself like virus and worms. It is a hidden piece of code which steal the important information of user. For example, Trojan horse software observe the e-mail ID and password while entering in web browser for logging.

Spyware

Spyware is a type of malware that perform certain tasks include watching and tracking of user actions and collecting personal data. Spyware programs generally install themselves on user computer and provides profit to the third party by collecting data of user without his awareness. Moreover, spyware steal passwords and personal information of the users by running in background in the system.

Ransomware

Ransomware is a type of malware that is designed to block user access from own system until a ransom fee is paid to ransomware creator. Ransomware is a lot dangerous than a regular malware and spread through phishing emails having infected attachments. Ransomware has emerged over the last few years and can attack individuals or organizations.

OUTLINE



- ❑ Introduction.
- ❑ Internet Security: What it is, and why we need it.
- ❑ Hackers: Who is he, Classes, Hacking Phases.
- ❑ Attacks exemples.
- ❑ What should I do to be safe online ?.
- ❑ Conclusion

INTRODUCTION:

- ❑ While the internet offers enormous advantages and opportunities, it also presents various security risks.
- ❑ It's where we access our banking records, credit card statements, tax returns and other highly sensitive personal information.
- ❑ Banks take extensive steps to protect the information transmitted and processed when banking online.
- ❑ But with all the good things the Internet offers us, it also opens the door to serious, potentially devastating threats.

INTERNET SECURITY: WHAT IT IS

- ❑ Generally, Internet security include browser security, the security of data entered through a Web form, and overall authentication and protection of data sent via Internet Protocol.
 - ❑ *We must secure our computers with technology in the same way that we secure the doors to our offices → Security*
 - ❑ *We must act in ways that protect us against the risks and threats that come with Internet use → Safety*

INTERNET SECURITY: WHY YOU NEED IT.



- Identifies your computer
- Where it is located

Request

Response

carries with it unwanted hidden software



Installed in your computer.
watches and records everything you
do online.
leaving your passwords.
and other personal and sensitive
information vulnerable

The criminals use in accessing :

- your private information.
- stealing your identity or your money.
- It can also be used to hijack your
computer for illegal purposes.

HACKERS: WHO IS A HACKER ?

Intelligent individuals
with excellent
computer skills with
the ability to create
and explore
computer's software
and Hardware

For some
hackers, hacking is a
hobby to see how
many computers they
can compromise



Their intention can
either be to gain
knowledge or to poke
around to do illegal
things

HACKERS

Hacking Phases :



Reconnaissance

Scanning

Gaining
Access

Maintaining
Access

Covering
Tracks

ATTACKS EXEMPLES.

PHISHING

'' Phishing is the attempt to acquire sensitive information such as usernames, passwords, and credit card details (and sometimes, indirectly, money) by masquerading as a trustworthy entity in an electronic communication ''



Hackers

Hacker Classes :



Black Hats

Individuals with extraordinary computing skills, Restoring to malicious or destructive activities and also known as Crackers



Grey Hats

Individuals who work both offensively and defensively at various times



White Hats

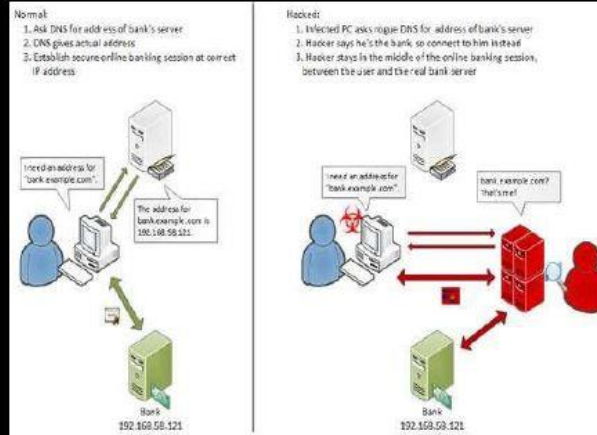
Individuals professing hacker skills and using them for defensive purposes and are also known as Security Analysts

ATTACKS EXEMPLES.

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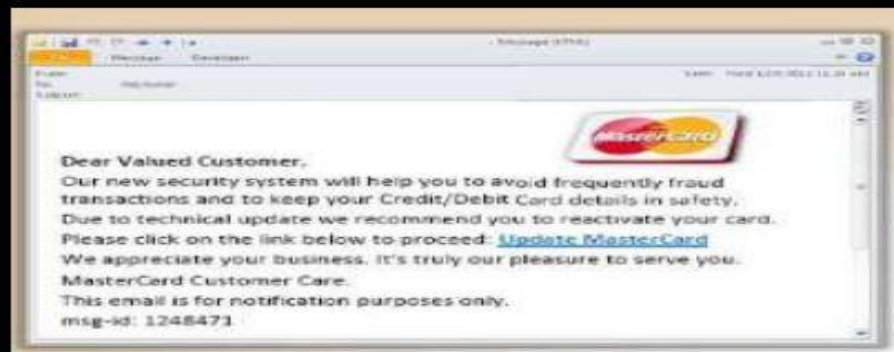
PHARMING

Is another technique used to steal confidential access code. It works by redirecting users to a rogue server



Attacks exemples.

Phishing



ATTACKS EXEMPLES.

SQL INJECTION

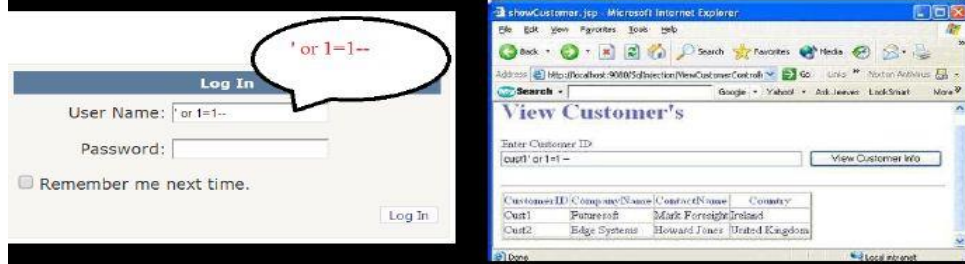
SQL injection is a technique used to take advantage of non validated input vulnerabilities to pass SQL commands through a web application for execution by a backend database



Attacks exemples.

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SQL INJECTION

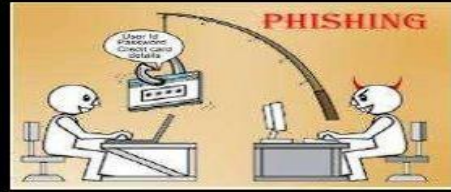


WHAT SHOULD I DO TO SAFE ONLINE?

WHAT SHOULD I DO TO BE SAFE ONLINE ?.

➤ To protect your **self**

- ❑ Keep your passwords private and create ones too strong that are hard to "crack"



- ❑ If you have received an Email encounter, you may have been the target of a common scam called 'phishing'.

WHAT SHOULD I DO TO BE SAFE ONLINE ?.

➤ To protect your **self**

- ❑ Be wary of publishing any information that identifies you, such as your phone number, photos of your home, your address, date of birth or full name.



networking

Online shopping and banking



- ❑ If you make purchases or do your banking online, make sure you protect your financial information
- ❑ Use 'https://'

WHAT SHOULD I DO TO BE SAFE ONLINE ?.

➤ To protect your **Computer**

Use Anti-virus Software: Anti-virus software can detect and destroy computer viruses before they cause damage



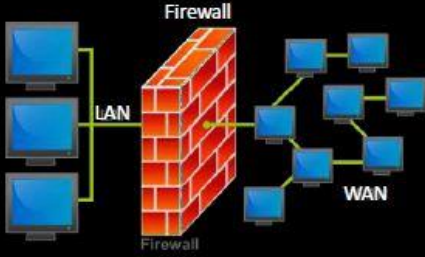
Use Anti-spyware Software: Use anti-spyware software so unknown people cannot lurk on your computer and potentially steal your information



WHAT SHOULD I DO TO BE SAFE ONLINE ?.

➤ To protect your **Computer**

Keep Your Computer Updated:
Install all security updates as soon as they are available
Automatic updates provide the best protection



Use a Firewall:
It is placed at the gateway between the two networks which is usually a private Network and a public network such as the internet

Database & Information Management

FILE ORGANIZATION

FILE ORGANIZATION CONCEPTS

Computer system uses hierarchies

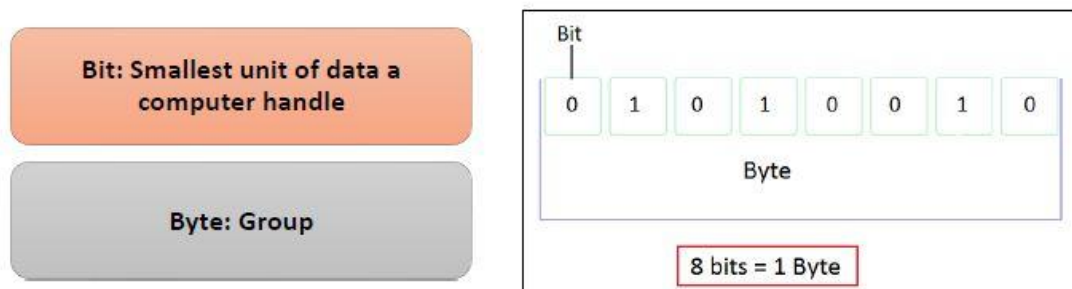
- **Bit: Smallest unit of data a computer handle**
- **Byte : Group of bits, represents a single character**
- **Field: Group of bytes put into a word**
- **Record: Group of related fields**
- **File: Group of records of same type**
- **Database : Group of related files**

So, by now I am sure you would have understood that in order to make effective business decisions; organizations require accurate and timely data availability through information systems. So, in order so that data is available in a timely manner and in an accurate fashion data, needs to be organized in information systems. So, today we will be discussing the various ways in which data is organized in information systems.

So, we will begin with the traditional mode of data arrangement and then we will talk about the various stages of evolution that it underwent. Computer system uses hierarchies; so the smallest unit of data; a computer can handle is called a bit and a group of bits represent a single character; so this is called a byte. So, a group of bits that represent a single character is called the byte and then a collection of bytes put into a word form a field.

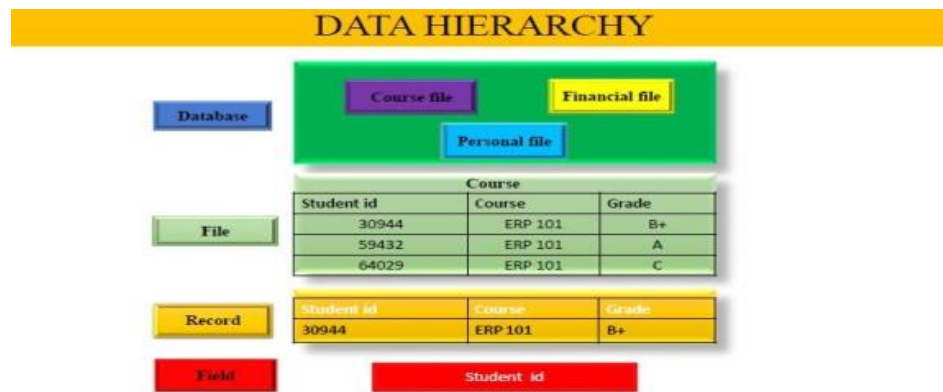
Similarly, group of related fields together form what is called a record. So, I will be explaining this entire hierarchy using a very pertinent example soon, but prior to that let us talk about what a group of records are called. So, a group of records of the same type form a file and finally, a group of related files form a database. Before moving on to the example let us understand what a record is.

FILE ORGANIZATION



A record describes an entity; an entity could be anything, it could be a person, it could be a place, it could be a thing about which we want to store some information. An attribute or a column represents each characteristic or quality that describes that particular entity.

So, for example, if we are talking about a student entity a certain you know attributes that could represent or explain the student could be courses that the student has taken or could be the grades that the student has obtained. So, courses and grades could be attributes pertaining to the entity, student.



So, with this let us move on to the example. So, this particular slide talks about the example and explains whatever we have just discussed. So, first we will begin with the field; so here in this particular example, there is a field called course and the course field represents all the courses that the student has taken.

So, a group of fields such as; you know there could be a lot of other fields for the student entity such as grades that the student has obtained, the address of the student, the local guardian of the student. So, there could be a lot of data; age of the student a lot of other data pertaining to a student entity that our student different attributes; multiple attributes or fields.

So collection of these fields together form what is called a record. So, at the next higher level we see a record represents a student, each record represents student entity and record contains information about each student; such as you know the course, the grade as we can see in this particular example. So, at the next higher level when we go up; we see a group of related records form a file.

So, here we see there are multiple records; so student the first student, the second student, the third student and all their details here. So, multiple records are grouped together in this particular file; so this file is called the course file. At the next higher level or the highest level; we have groups of files which are related to one another and all of them are of course related to the student entity. So, all of these files together form what is called the student database.

So, here in this particular example we see; course as a file, then we see personal details of the student as a file and we see financial details of the student in another file. So, these files are related to one another; for example, the course file could have information about the student such as the courses and the grades obtained by the student. Personal file could have data pertaining to the student such as his demographic background, his age, his say corresponding address, his permanent address and other details.

Financial record could have data pertaining to the student such as his average annual family income and other financial details. So, all of these files together form what is called the student database. So, this is all about the data hierarchy in which data is stored in a computer system.

PROBLEMS WITH THE TRADITIONAL FILES

Data redundancy and inconsistency

- Data redundancy:- presence of duplicate data in multiple files.
- Data inconsistency:- same attribute has different values.

Poor security

Lack of data sharing and availability

But

there

are certain problems with traditional files; as we see in the previous example we have seen that there could be a problem of data redundancy. So, if we go back to the previous slide; we see that you know there could be same data residing in multiple locations; so that could give rise to something called a data redundancy.

For example, the personal file could have information, could have you know financial information about the student such as his or her annual average family income right; the same detail could also be present in the financial file.

So, there is unnecessarily overlap of data and data; same data is stored in two different locations, this also leads to a wastage of a lot of storage space. So, that is one major problem and the next problem related to traditional file system is called the problem of data inconsistency. So, what do we mean by this? So, if one particular data; the same data is stored in multiple locations, there is a problem of inconsistency or discrepancy.

We will understand this through to a very simple examples. In this particular example of a student you know database what could happen is; so the course file could have a particular column or attribute which contains the role number of the student. So, the header of that particular column would be roll number; whereas the same student or the same details, the roll numbers of the students could also be there in the personal file as well as in the financial file.

But in the personal file; the header could be roll ID. So, though we see the same data present in two different files; in one file, it is mentioned as roll number, in the other file that is roll ID. So, there is a clear case of discrepancy here or inconsistency; so this is a major problem.

Another example where we see a scenario of inconsistency is you know in case of say; we take the example of a garment store or a departmental store which deals in garments. So, this particular store would be having a multiple files in its database; there could be a file related to sales, there could be another file related to distribution, there could be a third file related to manufacturing related information about different garments and in these files you know there could be a difference in nomenclature between say different garment sizes.

So, it could; the garment size XL could be represented at as XL somewhere and it could be represented as extra large in another place. So, that is again a clear case of; so it could be excel

somewhere and it could be extra large somewhere else. So, this is again an example of a data discrepancy or data inconsistency which is present in traditional file system.

PROBLEMS WITH THE TRADITIONAL FILES

Data redundancy and inconsistency

- Data redundancy:- presence of duplicate data in multiple files.
- Data inconsistency:- same attribute has different values.

Poor security

Lack of data sharing and availability

So, all of these happen because there is poor security as there is no central management of databases; what can happen is there is absolute lack of security, anybody can access the files, anybody unauthorized can use and can manipulate the files and all of these again lead to problem of data sharing and data availability. So, these are the problems with traditional file systems.

THE DATABASE APPROACH TO DATA MANAGEMENT

DATABASE : Collection of data organized to serve many applications by centralizing data and controlling redundant data.

DATABASE MANAGEMENT SYSTEM

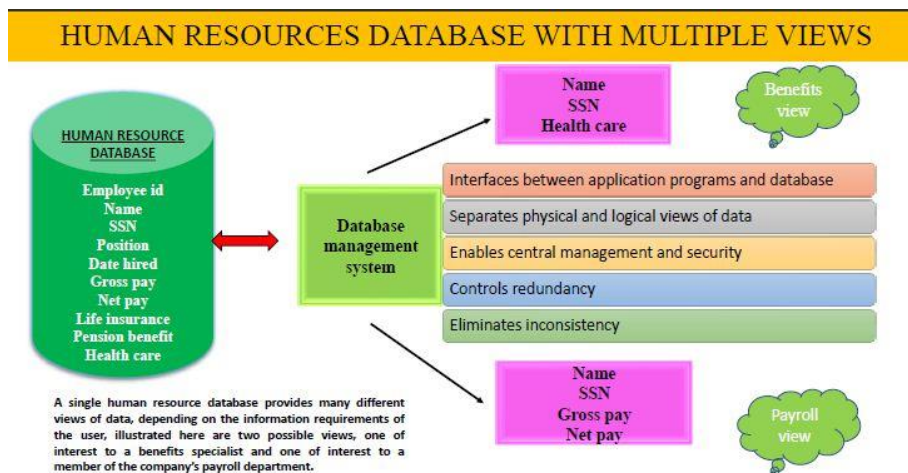
- Interfaces between application programs and database
- Separates logical and physical views of data

Solves problems of traditional file environment

- Controls redundancy
- Eliminates inconsistency
- Enables central management and security

Now, all of these problems or many of these problems were overcome with the database approach to data management. So, we will quickly understand what this means. To begin with what is a database? A database is a collection of data organized to serve many applications by centralizing data and controlling redundant data. So, that is all about the database and then a database management system interfaces between application programs and the database; at the same time it separates the logical view and the physical views of data.

So, what are these two? What do these two terms mean; logical view and physical view of data? Logical view of data means the way the data is actually visible or the way the data appears to a business person or an end user, but physical view means the way in which the data is actually stored right; so this is the difference between the two. Now, we will see this with the help of a very simple example.



So, this is an example of a human resources database which has multiple views. So, in this particular human resources database; we see that here there is a human resources database which has details about employees such as employee ID, name, social security number, position, date hired, gross pay and a lot of other details.

Now, there are two clear applications here; one is the benefits application and the second is the payroll application. So, the person who is involved or the end user who is involved with the benefits application need not have access to pay details or other details of the employee.

So, this person; the benefits person need not have a view of all the different you know records or different attributes that are present in the human resources database. Similarly, a person who is involved with payroll need not have much idea about what is there in the healthcare system of the particular employee right.

So, these are two distinct views; the benefits view and the payrolls view or we could call them two different applications and these two applications are visible to two different end users. Now, in between we have the database management system which plays the role of an interface between the human resources database on one hand and the applications on the other hand.

Now, here we see that the database management system that is there in the center; interfaces between the application programs and the database. Second, separates the physical and the logical views of data; as we see, the logical views are visible to the benefits personal and to the payroll personnel, but they need not see how the data is actually stored. So, now this DBMS enable central management and security, it also controls redundancy and eliminates inconsistency because there is hardly any overlap of data.

So, this is how a database management system helps eliminate many of the problems that are present within traditional file systems.

Relational DBMS

Relational DBMS-

- Represent data as two-dimensional tables called relations or files
- Each table contains data on entity and attributes
- Examples: Microsoft access, oracle database, MySQL, Microsoft SQL server
- Table: grid of columns and rows

Rows(tuples): records for different entities

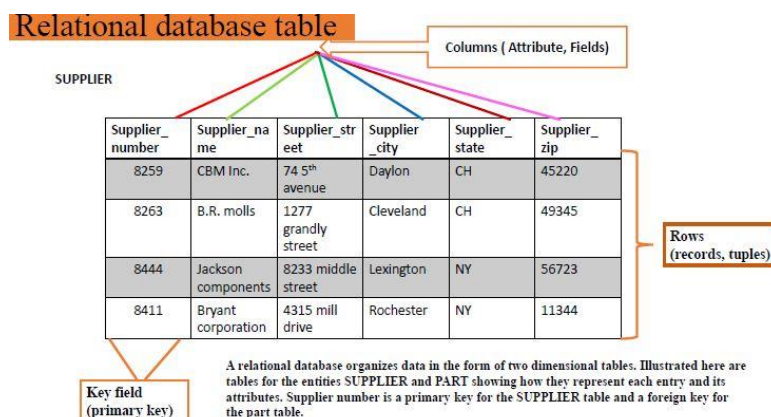
- Fields(columns): represents attributes for entity
- Primary key: field in table used for key fields or unique identification
- Foreign key: primary key used in second table as look-up field to identify records from original table

So, moving ahead; you know database management systems underwent another period of evolution and then we saw relational database management systems. So, relational database management systems as we see; represent data as two dimensional tables called relations or files and these files or relations have some sort of a relationship between them as the name suggests; so, each table contains data on entity and attributes.

Some very popular examples of relational database management systems are Microsoft Access which is extremely popular, it is used for desktop applications, Oracle Database, MySQL which is an open source DBMS and we have Microsoft SQL Servers; these are some of the very popular ones.

Now, what is a table? Very important; a table is nothing, but a grid of columns and rows. What are rows? As we saw with files; rows represent records for different entities and rows are also called tuples technically. Fields also called columns or attributes represent an attribute for an entity. Then we come to something very important which is called a primary key.

A primary key is a field in a table used for key fields or unique identification; what this means is a primary key is used as a unique identifier of a particular table. So, if there are multiple students in the student table; then roll number could be a primary key because it will uniquely identify each student. I will come to foreign key, but prior to that let us see this entire thing that I just discussed with the help of an example.



So, here we see a table; this particular table pertains to entity supplier and here we have various attributes. So, here we see different columns or attributes for multiple suppliers. So, we have supplier number, name, street, supplier city, supplier state and supplier zip and these are all records pertaining to multiple suppliers. Now, this field called the supplier number is the primary key because it uniquely identifies each supplier.

Relational database table

PART

Part_number	Part_name	Unit_price	Supplier_number
137	Door latch	22.00	8259
145	Side mirror	12.00	8444
150	Door molding	6.00	8263
152	Door lock	31.00	8259
155	compressor	54.00	8263
178	Door handle	10.00	8444

Primary key

Foreign key

So, along with the supplier table; we also have another table called the parts table. So, the part table has information about different parts that are supplied by the suppliers. So, for the part table; part number is the unique identifier therefore, it is the primary key and supplier number here; this attribute supplier number is present in the previous table here; it was the primary key; this is the parent table the supplier.

And in the child table that the related table that is part; supplier number is called a foreign key. Why this is called a foreign key is because this particular attribute that is supplier number in the part table is used to lookup or match the supplier number in the supplier table.

So, this particular lookup column is called the foreign key. So, foreign key here is the primary key used in the first table that is used in the second table as a lookup field to identify records from the original table; as you see here, I hope this concept is clear.

Now, here I have also very briefly talk about something called referential integrity. What this means is; in this particular you know these two tables that is the supplier and the part; the supplier number is the foreign key for the part table , but as you know the primary table that is the; that is the parent table here supplier number is the primary key.

So, there cannot be any supplier number here in the part table that does not have a; you know that cannot be matched with a record or an entry in the previous table, the parent table that is the supplier table. So, every supplier number that is there in the part table should be present in the supplier table that is the concept of referential integrity constraint. I hope this concept is clear.

Operations of a relational DBMS

Three basic operations used to develop useful sets of data.

- **SELECT:** creates subset of data of all records that meet stated criteria.
- **JOIN:** combines relational tables to provide user with more information than available in individual tables.
- **PROJECT:** creates subset of columns in table, creating tables with only the information specified.

So, let us move ahead; operations of a relational database management system, there are three primary operations that are used to develop useful sets of data. So, we have the select operation, then we have the join operation and thirdly we have the project operation. So, select operation creates subset of data of all records that meet certain state and criteria or conditions. So, I will explain each of these with an example to help you understand better.

The next one; the next second operation is called the join operation. So, the join operation combines relational tables to provide users with more information than is available in the individual tables. And the third operation called the project operation create subsets of columns in table; creating tables with only the information specified.

The three basic operations of a relational DBMS

PART				SUPPLIER					
Part_Number	Part_Name	Unit_Price	Supplier_Number	Supplier_Number	Supplier_Name	Supplier_Street	Supplier_City	Supplier_State	Supplier_Zip
137	Door Latch	22.00	8259	8259	CBM, Inc.	74 5 th avenue	Dayton	OH	45220
145	Side Mirror	12.00	8444	8261	B.R. molls	1277 grandly street	Cleveland	OH	49345
150	Door Molding	6.00	8263	8263	Jackson components	8233 middle street	Lexington	KY	56723
152	Door Lock	31.00	8259	8444	Bryant corporatio	4315 mill drive	Rochester	NY	11344
155	Compressor	54.00	8267						
178	Door Handel	10.00	8259						

Select Part_Number 137 or 150			
Part_number	Part_name	Supplier_Number	Supplier_Name
137	Door Latch	8259	CBM, Inc.
150	Door Molding	8263	Jackson components

Join by supplier_Number.			
Part_number	Part_name	Supplier_Number	Supplier_Name
137	Door Latch	8259	CBM, Inc.
150	Door Molding	8263	Jackson components

Project selected columns			
Part_number	Part_name	Supplier_Number	Supplier_Name
137	Door Latch	8259	CBM, Inc.
150	Door Molding	8263	Jackson components

Find suppliers for parts 137 or 150

The select, project, and join operations enable data from two different tables to be combined and only selected attributes to be displayed.

So, now let us go ahead and see with an example. So, here we see first we have the part table here; so here we see the first operation that is the select operation. So, from the part table; we would want to select only part number all the details from the part table for only the part numbers 137 or 150; not for the others. So, what will happen is, this select operation here will select only the part number 137 and 150 and display their details, fine.

Now, coming to the second operation that is join; join operation is used to map the two tables, the supplier table and the part table. And what it will do is it is going to match with the help of the lookup field that we saw before thus that is the supplier number. With the help of the supplier number, it is going to match the two tables and it is going to create a huge table which has only two records; that is 137 and 150 part number and has multiple attributes; huge number of attributes.

So, all of these attributes of both the tables that is the part number, part name, unit price, supplier number, supplier name, street, city, state and zip; all of this information will be there in the join operation.

Now, post the join operation comes the third operation that is the project operation. So, now what we want to do is; we only want to find suppliers for parts 137 and or 150. So, we want to find the suppliers only and not their other details such as; you know city, zip etcetera right.

So, the project operation is only going to give you certain selected attributes from that huge joint table. So, here we have only part number, part name, supplier number and supplier name; fine, I hope the three operations are clear to you.

Capabilities of DBMS

- Data manipulation language: used to add, change, delete, retrieve data from database
 - structure query language (SQL)
 - Microsoft access user tools
- Many DBMS have report generation capabilities for creating polished reports.

So, let us move ahead; now capabilities of database management systems. So, database management systems are; have a lot of capabilities as we have seen before we; there is something called data manipulation language.

So, data manipulation languages are used to add, change, delete, retrieve data from databases right. And very popular data manipulation languages are structured query language, as well as Microsoft Access user tools.

So, structured query language is used to you know perform addition operations, change you know modification operations, deletion, retrieval of data from databases, from different DBMSs such as MySQL such as MS Sequel server, such as Oracle; all of them use such structured query language.

And Microsoft Access is an inbuilt; you know package that you see along with the entire office package. So, in the office package; you have Excel, you have Word; along with that you also have Microsoft Access right. So, Microsoft Access is an in is inbuilt with your office package and there you have tools for all of these; changing, deleting, retrieving and adding data from the database.

So, another very important capability of a database management system is report generation. So, DBMSs not only help you manipulate the data; they also help you to create very beautiful, polished reports out of the databases right.

So, and these reports that are generated are actually you know they represent certain calculations on the data that is present in the databases. At the same time, these reports can have some; you know they can have some graphs, they can have some charts which are actually used to give you a very beautiful graphical and pictorial representation of data. So, as we know you know a picture speaks a thousand words.

So, when you represent data in form of a; in form of say a graph or a chart, it represents the data much better then storing data in databases right. So, reports would help you; you know make the data much more vibrant and make them much easier for the users to understand. So, these are the different capabilities of DBMSS.

Example of an SQL query

- SELECT: lists the desired fields that have to be included in the query.
- FROM: lists the tables from where the data has to be drawn.
- WHERE: specifies the values of the fields that have to be included or the conditions that have to be met to include the field.

```
SELECT PART- part number, PART- part name, SUPPLIER- supplier number  
SUPPLIER. supplier name  
FROM PART, SUPPLIER  
WHERE PART, supplier number= SUPPLIER. supplier number AND  
Part number= 137 OR part number=150  
Illustrated here are the SQL statements for a query to selected suppliers for  
Parts 137 or 150
```

Moving ahead, example of an SQL query. So, an SQL query as we saw prior to this that SQL queries are part of data manipulation language. So, here we will see; what we will just get the flavor of an SQL query right. So, an SQL query here will be used to perform the exact three operations that we have seen some time back; such as the selection operation, the join operation and finally the projection operation.

So, and that will happen through an SQL query here. So, SQL query has three basic parts; the 'selection', the 'from', and the 'where'; these are very important; so, let us quickly understand what these mean.

So, selection operation lists the desired fields that have to be included in the query right; the desired fields. The 'from' clause here lists the tables from where the data has to be drawn. So, if there are two tables that are involved say, supplier and part, the 'from' operation or the 'from' clause will talk about those two tables and the third clause here is the 'where' clause.

So, the where clause is very important because it specifies the values of the fields that have to be included or the conditions that have to be met to include the field. Let us see with an example; here we have a very simple illustrative example of an SQL query.

So, this exactly does what we had seen few slides back the three operations right. The selection operation where we had selected say part number 137 and 150 and then we had joined it with the supplier database and eventually we had projected only four fields; that is the supplier number, supplier name, the part number and the part name right.

So, we see this; select, this is the first clause; part dot part number. So, part represents the table name and again part dot part name; so these two are from part table; then supplier dot supplier name number and supplier dot supplier name from the supplier table. So, all of these attributes come from; this is the 'from' clause; the second clause, the part table and the supplier table. And thirdly the 'where' clause where we actually do the matching or we do the; we call it the lookup or the mapping; right.

So, where part not supplier number would match with supplier dot supplier number right only where this mapping would happen or this matching would happen and where part number is 137 or 150. So, this will give you the exact you know all this entire SQL query will perform the exact operations that the three operations we have seen in the previous slide performed.

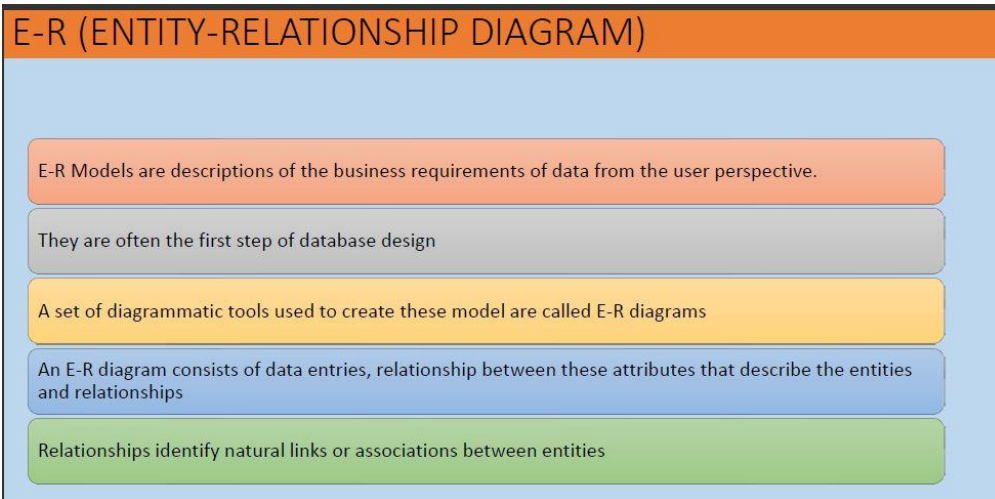
So, selection then joining and finally, the projection right. So, this is an example of a simple SQL query.

So, today we have spoken about databases and how they are used in information management. I have primarily followed two books and taken some references from there; Laudon; MIS by Laudon and Laudon, and Managing Information Systems in Business, Government and Society by Prof. Rahul De. So, in the next session, we will be taking up; we will be discussing data warehouses and how they can; how an organization can derive business intelligence from data warehouses.

So, thank you for now!

Foundations of Business Analytics

Data Warehouses & Business Intelligence



So, let us proceed. In order to you know design a database in an organization. Organizations do require the business requirements of the data. So, because databases are generally used in large organizations or small organizations, which have some specific business requirements. Though a database is a very technical concept the designing of database has certain business requirements behind it only then will it be able to suit the context of the organization.

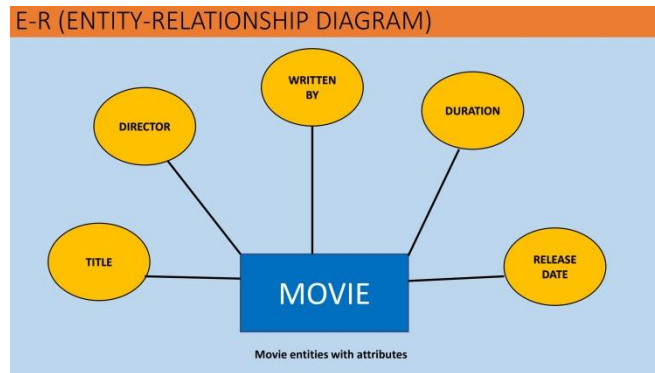
Therefore, today we are going to discuss about entity relationship diagrams or entity relationship models. E- R models as they are called are descriptions of the business requirements of data from the user perspective. Often they are the first step in database design.

Since database design is a very technical concept, in order to derive more business value out of the database and in order to make the database suited to the context of the organization. It is very important to prepare these entity relationship models from the perspective of the end user. And, they are often the first step in database design.

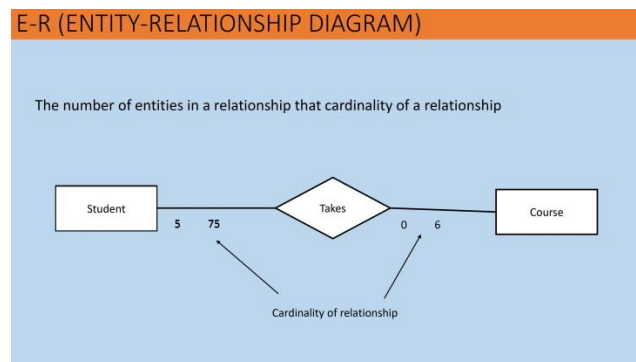
So, a set of diagrammatic tools that are used to create these models are called entity relationship diagrams. An E-R diagram consists of data entities, relationships between these entities, and attributes that describe the entities and the relationships.

So, in the previous lecture we had spoken about entities. And, we had discussed that entities are could be anything, they could be a person a thing, a place, about which we want to store data. An attributes are those features that describe these entities. So, we had; when we had spoken about the context of a 'student' entity, we had discussed attributes such as the course, the grades, the demographic background of the student, etc.

Now, relationships identify natural links or associations between these entities. So, we will see this with the help of an example.



Here, in the previous lecture we had spoken more about student entity and we had said that this entity could be anything. So, today we will talk about movie as an entity. So, a movie entity with its attributes. So, here we see different attributes such as the title of the movie, the director, the writer, duration release date; we could have N number of other attributes such as you know the box office collection, the music director and so on. All of these are characteristics or attributes of the entity movie.



Moving ahead see in this particular you know diagram here, we talk about two entities; one is a student. A student entity and the other is the course entity. So, here we have two entities and we are trying to find out the relationship between these two entities. So, here in this particular example a student opts for a course or a student takes a course.

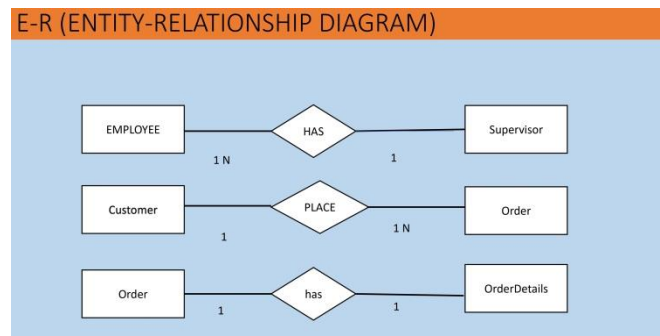
Therefore, takes here is the relationship between student and course entity. Now, here we see 2 numbers. So, what are these 2 numbers? What do they represent? Right. The number of entities in a relationship represent the cardinality of a relationship. So, this is a very important concept called cardinality, which talks about the number of entities that are party to a relationship. In this particular example we see student takes a course right.

So, here we have 5 and 75. These represent the cardinality of the relationship, which means the minimum number of students and the maximum number of students that can take a particular course.

So, a minimum of 5 to a maximum of 75 students can take a particular course. Why a minimum of 5? That depends upon the university, because many universities say that you know if there is a less than a minimum enrolment of 5, then the course will be dropped. So, here we have assumed that the minimum number of students required to enrol for a course is 5. So, 5 to 75.

Similarly, each student can take 0 to a maximum of 6 number of courses again that depends entirely on the universities rules and regulations. So, university may permit a student to take 0

no courses in a particular semester or a max up to a maximum of 6 courses in a particular semester. So, this is what represents the cardinality of the relationship.



Moving ahead, so, this particular slide talks about different examples of relationships and cardinalities for E-R diagrams. So, here we see in the first example employee has an supervisor. So, has is the relationship between the employee and the supervisor. So, here a minimum of 1 to a maximum of many number of employees have 1 supervisor.

So, 1 N here means minimum of 1 to maximum of N number. So, many number of employees can have 1 supervisor. Similarly, 1 customer places 1 to many number of orders. So, each customer can place 1 or many number of orders in any particular company.

And, thirdly a third example talks about order. So, 1 order will have only 1 order details. So, it is a 1 to 1 relationship here. So, these are certain examples. Now, when we try to do design a database in an organization prior to that, considering the different entities that would be party to the database, an entity relationship model is prepared, considering all the different entities their attributes and their relationships.

So, this is used, this is designed from the end users perspective and has the business requirements in mind, eventually this would be utilized in designing the database.

NORMALIZATION

Streamlining complex groupings of data to minimize redundant data elements

Roll No	Name	Dept.	HoD	Dept. Contact No
101	Sachin	Electrical	Prof. X	1234567
102	Rahul	Mechanical	Prof. Y	4567899
103	Saurav	Electronics	Prof. Z	6789048
104	Virat	Mechanical	Prof. Y	4567899
105	Dhoni	Electrical	Prof. X	1234567
106	Anil	Mechanical	Prof. Y	4567899

Let us move ahead. So, we will talk about a very interesting concept called normalization, which is a very important feature in reducing redundancy in databases. Because, earlier in the previous session we had spoken about the presence of redundancy in databases, we had said that you know in databases there could be redundancy data could be there could be an overlap of data, the same data could be present in multiple locations. So, that would create a problem.

Therefore, normalization is the concept of streamlining complex groupings of data to minimize redundant elements. Here, we take a very simple example of a table in any engineering college; in the first year we see that students take up some core courses. So, these courses are taken by students from different departments. Say in this particular example, this is the students table for engineering mechanics, which is a core first year subject in any engineering curriculum.

So, here in this particular table, we have data about say multiple course students, here we see roll number 1 is Sachin from Electrical Engineering Professor X is the H of HOD of the Department Electrical Engineering and the department contact number is this. Similarly, we have 100 and 2 for Rahul from Mechanical Department with the respective HODs name and the department contact number.

Similarly, for Saurav and again we see 104; Virat department is again Mechanical Engineering; same Professor X is the HOD and the department's contact number is again the same.

So, here we see a pattern right. We see that, there is a lot of repetition or what we call redundancy. Here, we see electrical engineering Professor X and the department contact number is getting repeated again here.

Similarly, mechanical engineering details are getting repeated thrice. So, if there is a huge table there would be a lot of repetition, a lot of redundancy and lot of overlap that would result in a lot of space wastage. We do not want that creates unnecessary confusion unnecessary wastage of space and you know storage space is money right.

So, how do we try to tackle this particular problem? Here comes the concept of normalization, which is streamlining complex data groupings to minimize redundant data elements. So, let us see how this can be improved through normalization.

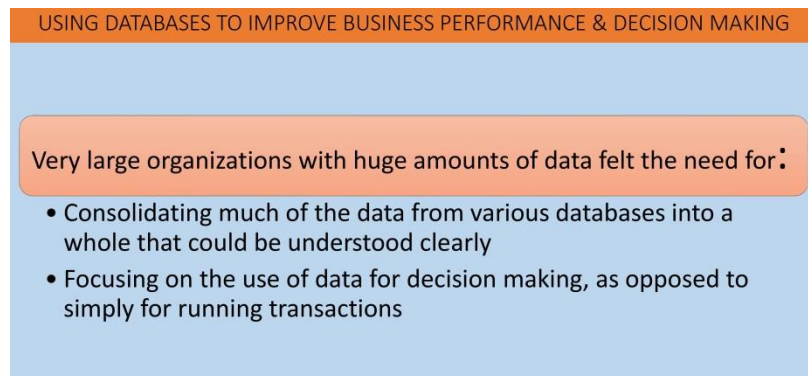
NORMALIZATION							
Students Engg. Mechanics				Department			
Roll No	Name	Dept.id		Dept.id	Dept.	HoD	Dept. Contact no
101	Sachin	001		001	Electrical	Prof. X	1234567
102	Rahul	002		002	Mechanical	Prof. Y	4567899
103	Saurav	003		003	Electronics	Prof. Z	6789048
104	Virat	002					
105	Dhoni	001					
106	Anil	002					

In order to normalize that one particular table that was the previous table that we saw is now split into 2 smaller tables. One table which has the details of the students for the engineering mechanics course and the third column here is this the Department Id. Department Id is also present in the department table, in the department table department Id is the primary key which we had discussed again in the previous lecture.

So, this each of these Ids represent a particular Department with the HODs name and the Department Contact Number. So, here we simply put the Department Id and we get rid of all the redundancies. So, here we maintain two tables; one for student engineering student for

engineering mechanics and the other for the department. So, unnecessary redundancy on repetition of data is eliminated in this process.

So, this is a method of normalization in very simple terms I have explained it here, though you know technically there are a lot of complexities involved such as first normal form, second normal form, I did not go into all of those details. Rather for a course like MIS it is important to understand, the concept of normalization and the purpose of normalization in an organization. Rather than all the trivial technical details right.

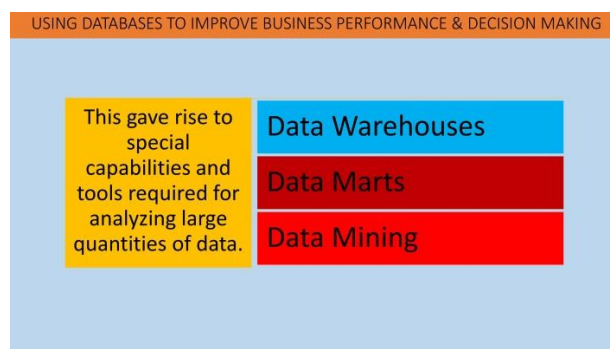


So, moving ahead, we are now going to focus more on using databases to improve business performance and decision making. We see that, today organizations have huge amounts of data.

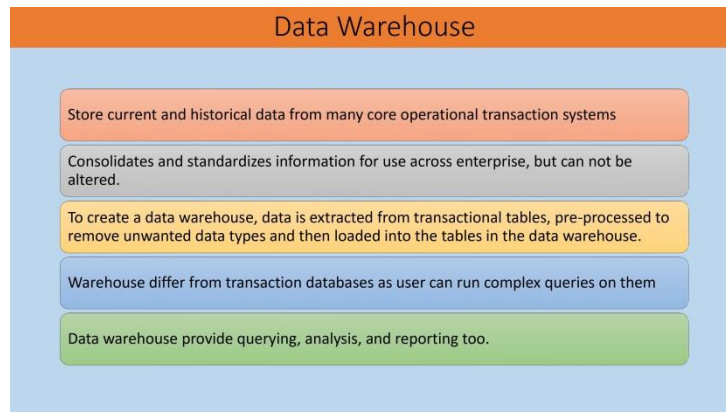
And, over a period of time as organizations are becoming larger, they have multiple databases we having a lot of data and it is difficult to maintain all of these databases at the same time, it is also difficult to perform analytics on data from multiple databases or to query multiple databases to fit some relevant data. Therefore, very large organizations with huge amounts of data felt the need for primarily two things.

First consolidating much of the data from various databases into a whole that could be understood clearly. Secondly, focus on the use of data for decision making as opposed to simply for running transactions. Prior to this data was stored in databases transactional data was stored in databases and they were used primarily only for recording data, storing data, and that is it nothing beyond that.

But, over a period of time as more and more data got stored and collected, there came to be a need for analyzing the data, for decision making rather than simply running transactions. So, these two needs actually drove a bigger need and we will talk about that.



These two needs give rise to special capabilities and tools required for analyzing large quantities of data. So, what are these tools and capabilities data warehouses data marts and data mining. So, the rest of this particular module is dedicated to data warehouses, data marts and data mining. We will try to understand the concepts and we will try to understand certain other details.

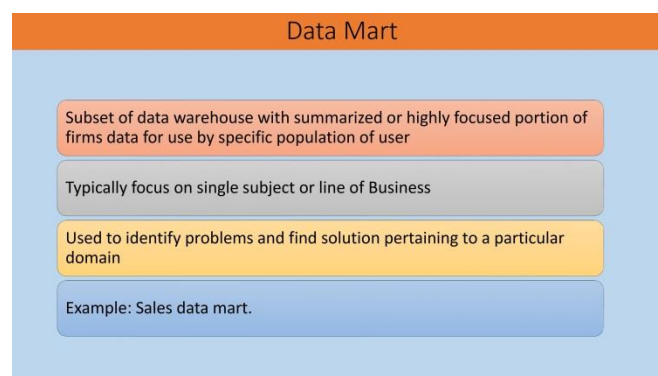


So, proceeding ahead, what are data warehouses? Data warehouses store current and historical data from many core operational transactional system. So, we have just mentioned that there are large organizations have multiple transactional data bases. So, a data warehouse stores current as well as a lot of historical data from the core operational transactional systems, it consolidates and standardizes information for use across enterprise.

So, from all the multiple data bases across the enterprise data is consolidated and stored in the data warehouse. But, here there is a word of caution data in a data warehouse can never be altered or modified.

To create a data warehouse from multiple databases, data is extracted from transactional tables – ‘pre-processed’ to remove unwanted data types and then loaded into tables in the data warehouse. So, three steps extraction of data from relevant transactional databases pre processing of data and then loading the data into tables, this entire process is called ETL or extraction transformation loading. So, data is then loaded into the data warehouse. Warehouses differ from transactional databases as users can run complex queries on them.

So, data warehouses also provide certain features such as querying, analysis and reporting tools. So, you can query them you can analyze them and you can report create reports or generate reports.



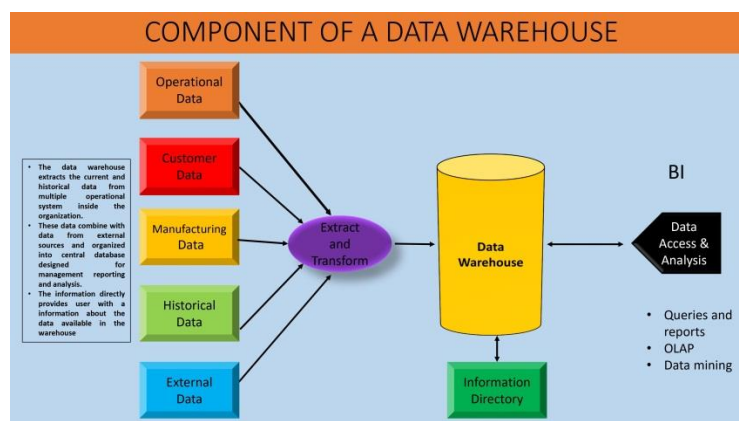
So, these are the purposes of data warehouse data mart is another separate concept which is again very important data mart is a subset of a data warehouse. With summarized or highly focused portion of firm's data for use by specific population of users. What this means is data warehouse could have data from multiple databases and multiple domains. But data mart is a very focused specific subset of data warehouse which has highly summarized and focused portion of firms data for a specific use by a specific population of users.

It typically used focuses on single subject or a single line of business. It is used to identify problems and find solutions pertaining to a particular domain. So, I think you would agree with me that, if data is there in multiple you know from multiple domains is there in a data warehouse, it might be very difficult to scrutinize the data and to find out identify problems, to resolve those problems and find solutions.

Therefore, data mart is a specific subset which contains data pertaining to only one particular domain. Therefore, it is very it is much easier to delve deeper and to analyze the data in the data mart to find problems pertaining to a particular domain.

So, and a very you know there are a lot of examples. So, here we are talking about a sales data mart. So, though our organization has multiple you know data, repositories in a or data belonging to multiple domains in a data warehouse, a sales data mart pertains only to sales. It does not have data pertaining to distribution; it will not have data pertaining to warehousing, or manufacturing, but only to sales.

So, if you want to find any problems with sales, you can look deeper into the sales data mart and try to analyze it to find problems there. So, this is the concept of a data mart and this is how it differs from a data warehouse? Moving ahead a components of a data warehouse.



So, earlier we mentioned that the data warehouse has data from multiple databases. So, a core operational databases within the organization such as operational database, customer database here, and manufacturing database that we see, these are the current data. And, these are all internal data sources pertaining to inside of an organization. Along with these data sources core transactional data sources, historical data is also maintained.

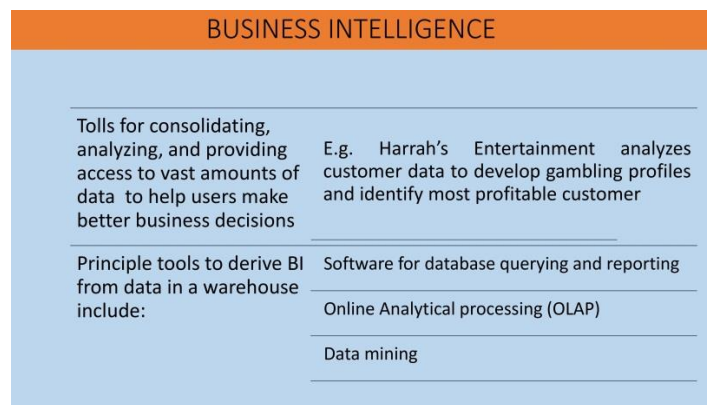
So, in historical data is also maintained in a particular database and that also forms a part of internal data source. Along with this there is a lot of data that resides in external data sources. By external data sources we could mean maybe share market data, it could mean industry data, it could mean a competitor data. So, all of these this data is now together extracted from the multiple databases and transformed and then loaded into the data warehouse.

So, again we will talk about E-T and L extraction transformation and loading. So, it is loaded into the data warehouse. Now, data warehouse has an information directory, which provides users with information about the data available in the warehouse. So, information as the term directory suggests it gives you a information about data that is there in the data warehouse.

Now, data from all of these systems selected data, resides in the data warehouse and if you have to derive BI. Here, we are speaking about BI. So, if you have to derive BI, which is business intelligence, you have to perform certain operations or from on the data from the data warehouse.

So, data is accessed and analyzed using certain tools and features here to derive business intelligence from the data in the data warehouse. So, these tools and features are primarily querying and reporting tools OLAP which stands for online analytical processing, we will discuss this soon and thirdly data mining.

So, these three tools and techniques help an organization; derive business intelligence out of data in the data warehouse. I hope this concept is clear.

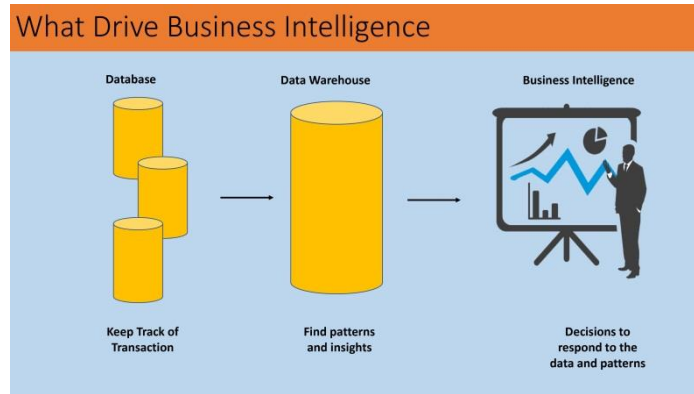


So, moving ahead; what is business intelligence? Tools for consolidating, analyzing and providing access to vast amounts of data to help users make better business decisions is 'what is business intelligence'. So, here we have taken an example, Harrah's Entertainment, there is a chain of casinos which are there in Las Vegas in the United States.

So, casinos as you know people engage in gambling there. So, you would be you know surprised to know, that in the world of gambling also, data warehouses and bi play a very important role. So, Harrah's Entertainment, analyzes customer's data to develop gambling profiles and identify most profitable customers.

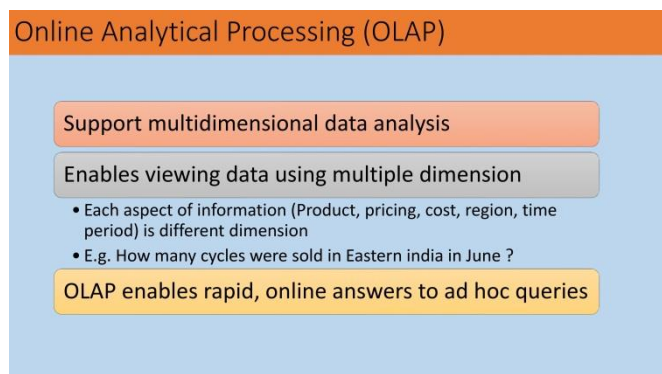
So, once they identify the most profitable customers through bi they would be able to drive their strategies accordingly. So, this is how Harrah's entertainment in the far world of gambling uses business intelligence (BI), you know and data warehousing to serve their customers better.

A principle tool to derive BI from data in a warehouse, we have described this earlier also; so, software for database querying and reporting – OLAP and data mining; ok.



So, let us proceed. What drives business intelligence? Again this is highlighting whatever we had discussed few minutes back. So, here databases there are multiple databases in organizations that keep track of transactions. We had earlier discussed that we do have a current transactional databases, we have historical databases, we have internal as well as external databases or data sources. So, all of the data is extracted transferred and then loaded transformed and then loaded into the data warehouse.

Now, data warehouse has tools for querying, reporting, performing OLAP and data mining in order to find very important patterns and insights. So, once you find patterns and insights out of the data by all of these tools that we have discussed, you derive business intelligence that is decision to respond to the data and patterns. So, business intelligence helps you make better business decisions out of the data that resides in the data warehouse.



All right. So, moving ahead, what is online analytical processing or OLAP in short? So, we have discussed about OLAP before I want to highlight the concept of OLAP now in this particular slide. OLAP supports multi dimensional data analysis. So, earlier we said data resides in a data warehouse, and data warehouse has you know you can perform analysis on the data in the data warehouse using certain tools and techniques and one of them is OLAP. So, OLAP or online analytical processing supports multi dimensional data analysis.

So, what do we mean by dimensions? What are dimensions? OLAP enables viewing data using multiple dimensions. Now, a dimension is each aspect of information. So, for example, you may have a lot of information in an organization, but dimension represents each aspect of that information.

So, aspect could be the product, pricing, cost, region, time, period; all of these are examples of different dimensions. So, the data could be split based on any of these dimensions or based on

multiple dimensions. So, two or more dimensions data could be split based on that. So, here there is a concept called slicing and dicing the data.

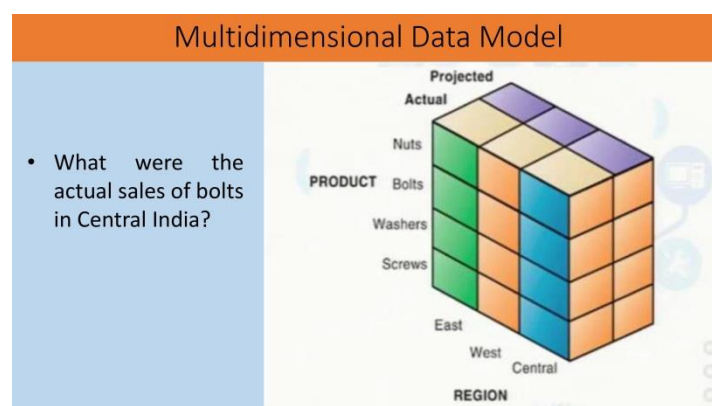
So, OLAP basically helps an organization slice and dice the data based on the organizations requirements. Now, when you try to slice and dice the data, if you have a huge data, you know having 3 2 3 or more number of dimensions, you can split it up into smaller you know smaller data of smaller chunks based on the based on the number of dimensions. So, basically if there is a huge data set, you slice and dice it into smaller chunks based on the dimensions. So, each of these are examples of dimensions.

Now, talking further about dimensions here is an example. Now, how many cycles were sold in Eastern India in June?. So, if you have data pertaining to say you know a particular chunk of data, you can slice it based on multiple dimensions. Here, we have three dimensions.

So, I hope you can understand, what are the three dimensions? So, the three dimensions clearly are product that is cycle. So, what is this, what is the product here that is the first dimension that is cycle?

The second dimension is the region, that is Eastern India, that we are talking about there could be other regions, but here we are talking about Eastern India. And, the third dimension is time period right. So, we are now slicing and dicing the huge chunk of data based on 3 dimensions; the first one is product, the second one is region, and the third dimension is the time period. OLAP enables rapid, online answers to ad hoc queries.

So, if there are ad hoc queries OLAP will help you give rapid answers to those ad hoc queries.



Now, we will see this with an example, multi dimensional data model. So, here we see a data model wherein there is data again pertaining to three dimensions as we had discussed. So, here the three dimensions are product which has four categories, nuts, bolts, washers and screws, region again east zone, west zone, and central zone and this the third dimension is sales.

So, the projected and the actual sales. Now, if somebody were to ask you, what were the actual sales of bolts in Central India?. So, what you would do is basically slice and dice this huge chunk of data, based on the three dimensions that is sales, bolts and sales product and the region.

And, what you would end up getting is so, central India bolts and this particular chunk of data you would get, this particular chunk or cube of data. So, this is how OLAP helps in slicing and dicing the data based on multiple dimensions or is used for multi dimensional data analysis.

Data Maning



W. Edwards Deming

Why data mining? Because data mining we had discussed is one of the important tools that is used to derive business intelligence from data that is stored in the data warehouse.

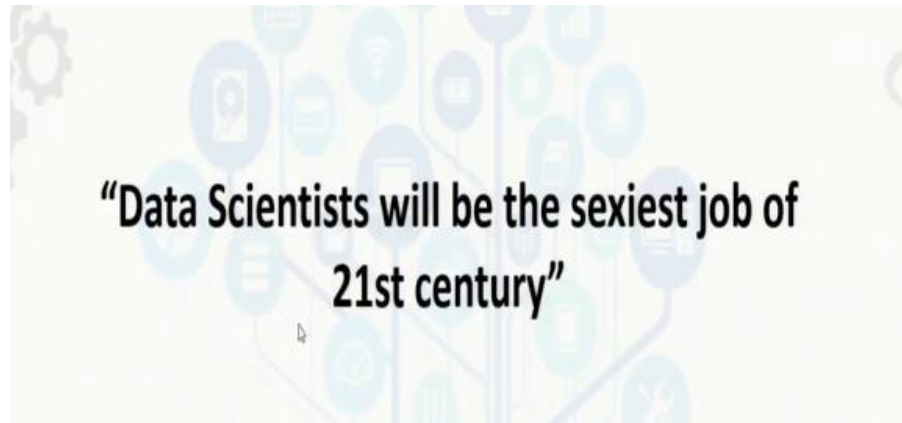
So, this speaks all about you know why data is required in organizations, in god we trust all others must bring data was mentioned by W. Edwards Deming and who is he? He is a great engineer statistician professor and a management guru. So without data nobody will trust you. So, the world is all about data and data is supposed to be the gold today.

“There is a striking correlation between an organization’s analytics sophistication and its competitive performance”

10 insights: A first look at the new intelligent enterprise survey on winning the data, MIT Sloan Management Review, Vol 52, Nov 1, 2010

So, moving ahead, this is an insight from MIT Sloan Management Review which came in 2010, 10 years back, which says that there is a striking correlation between an organization’s analytic sophistication and its competitive performance which is very obvious in today’s date.

Because you know every organization is producing huge chunks of data. So, if you do not have the sophistication or the capability to analyze that data and use it for deriving your strategies or making your business decisions, you will lag behind your competitors. So, if you have better sophistication ah in analyzing your organizational data that will obviously need to better competitive performance of your organization. So, this is very true in today's date.



Harvard Business Review 2012, so this is very important for all the aspiring managers who would want to be data scientists in future ah. So, 21st century is going to be all about data science.

Why mine data ?

- Huge amounts of data being collected and warehoused
 - Walmart records 20 million items in transactions per day
 - Health care transactions: multi-gigabyte database
- Source of competitive advantage

So, all of these you know make us think why is there so much of hype about data mining? Why do people mine data today why did not they then there was nobody spoke so much about data mining say 15 years back. So the reason lies here, a huge amounts of data are being collected and warehoused everywhere around us.

Earlier nobody thought about you know collecting so much of data, we did not have the technical sophistication the storage space the processing power to handle so much of data, but today we do have. So for example, Walmart collects and you know records 20 million items in transactions per day 20 million Walmart alone, health care transactions produce multi gigabytes of data.

So and of course, you would realize that in the; you know in the times of covid-19, analysing healthcare analytics has become so very crucial, so very important. Because without healthcare analytics we would not be able to predict trends, we would not be able to find clusters of you know you know red zones which are highly susceptible to the corona virus.

So, healthcare analytics is not only used in covid-19 scenario which is a pandemic, it was also very popular you know it was used a lot for multiple diseases. Because huge amounts of data are being you know collected on the fly healthcare data being collected on the fly and being analyzed on the fly. Today all of us wear smart watches. So, smart watches collect data on human being about you know your health related data continuously and stores it somewhere right, stores it and you can analyze that data.

So, that is why since huge amounts of data is being collected and warehoused, therefore why not mind that data because data is gold right. So as gold is you know there is a gold mining similarly data mining would actually help you in you know in coming up with insights which are not at all less precious than gold today right, they are not less precious than gold.

Moreover mining of data has become very important, because data is a source of competitive advantage for every firm; firms have a lot of data. So, if you analyze your data better and if you helped it you know make data will help you make better decisions data will help you come up with better strategies and all of that would give you a source of competitive advantage over your competitors.

What is data mining and KDD?

- Knowledge discovery in databases (KDD) is non-trivial process of **identifying valid**, potentially **useful, understandable** and ultimately **actionable patterns** in data
- Data mining is a step in the KDD process of applying data analytics and discovery algorithm

So, moving ahead we have often heard about the term data mining, but are we aware of its actual exact meaning. Along with that today we will also discuss another very important term called KDD Knowledge Discovery in Databases, we will also try to understand what the difference between the two terms is.

So, what is the difference between data mining and KDD? Knowledge discovery in databases is the non trivial process of identifying valid here; I would be highlighting a few points valid potentially useful understandable and ultimately actionable patterns in data.

So, KDD is the non trivial process which means it is a very significant process of identifying valid. So, why did we highlight valid, because there could be a lot of you know patterns that you could get from data. Because as we mentioned the data is getting collected on the fly huge amounts of data.

So, there could be a lot of patterns which are irrelevant to you they are not valid they are not relevant. For example, you know if I say that there is a relationship between the number of trees in my neighbourhood and the number of pens I possess.

So, you know my limited understanding tells me that there is it could not be a relevant pattern, I cannot derive much insight or value out of this pattern. So, patterns that are derived should be valid or relevant potentially useful which is which is why we actually go ahead and mine data.

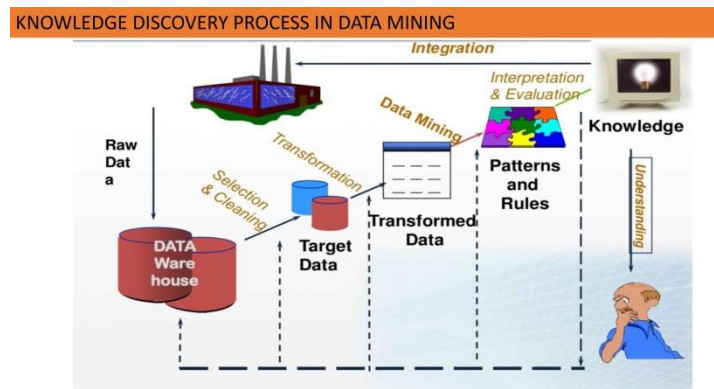
So, they should be potentially useful understandable why, because there could be a lot of patterns which are not easy to understand and even a more important not actionable right.

So, if you come up with an insight or if you come up with the pattern based on which you cannot take any action, it is just a pattern but you know it is its it is a pattern out of which it an organization cannot take any action; then that is not knowledge discovery in database. So, that does not amount to it.

So, what should happen is ideally, the pattern that we find out should be valid or relevant of course useful understandable. So, that you know the data analysts or the business persons are able to understand the pattern and they are able to take some action based on the pattern. That is you either take some business strategy out of the pattern or you make a decision out of that pattern.

For example, if you get a pattern that you know there are there are a group of users for a telecom provider who are at a high risk of churning or who are at a high risk of switching to another provider. You can take an action based on that, you can either give him some incentives or you can try to you know give him some lucrative offers to retain him or if you think the customer is of extremely low value you can let him go.

So, here we have a pattern or we have a finding or an insight based on which we can take some action. Therefore, it is very important to be able to take some action based on the pattern that we derive. Now data mining is just a step it is very important why I highlight, this it is just a step in the KDD process of applying data analytics and discovery algorithms. So KDD is a huge process, out of that data mining is only a step of finding some patterns. So, what are the other steps let us have a look.



So, here this schematic diagram will explain everything about data knowledge discovery in databases and where data mining stands. So, here we see a small factory it is it could be a factory or it could be a departmental store, it could be any departmental store that we see around us. Wherein there are huge amounts of data being produced every day transactional data storage data warehousing data distribution data a lot of data being stored every day.

Now, that raw data from the from the store departmental store gets transfer extracted transferred and loaded from the multiple databases of the departmental store as we had discussed in the previous lecture, all of them now get loaded into the data warehouse.

So, from the data warehouse the next step is selection and cleaning of data. Selection because there could be a lot of data that you collect from the departmental store, but not all of the data would be relevant to you; earlier also we had said that the data should be relevant.

So, you select only the relevant data that is suited to you and you then clean the data. So, what is data cleaning? Data cleaning also amounts to you know it is a part of pre processing of data, wherein you take certain actions such as you know you may want to remove some outliers, if your data has a lot of outliers or you may you know if your outliers is that the presence of outliers could be skewing the data. So, you would want to eliminate the outliers or you could be having a lot of missing data incomplete data. So, you may want to take care of that or tackle that problem by either dropping some of the records that has missing data or taking an average of some of the records of the records ah, you know which the attribute which is having missing data and then filling the missing cells.

Or you; there are; there are multiple ways in which missing data is handled that itself is a; you know could take 3-4 lectures but we are not getting into that. So, since our post selection of data is cleaned as we have discussed and the selected cleaned data is called the target data.

So, the target data is the data on which the transformation operation is then performed. So, what is this operation called transformation, it is another very important operation in which you know data is transformed from one format to another.

There are a lot of you know and let me give you some examples. So, for example, you could have data in Fahrenheit. So, temperature data in Fahrenheit, but prior to analysis you would want to change it to Celsius, so that is one way of transformation. Similarly, say you have two attributes, but you do not want to use those two attributes for your analysis, rather you would want to use a third attribute which is derived out of these two attributes. So, the third attribute is called a derived attribute and the derived attribute or the transformed new attribute is going to be used in your analysis.

For example, I may have, you know GDP data of a kind of multiple countries and there the population, but I would want to use GDP per capita; as my; you know a variable. So, what I would do is input variable. So, what I would do is I would you know use these two attributes GDP and the population and find a new attribute called GDP per capita which is the derived attribute that I will use in my further analysis.

So, there are a lot of other examples such as logarithmic transformation which is used for data sets, maybe you know which are which are of distributions which are highly skewed to reduce the skewness prior to data mining.

So these are certain examples of transformation, there are a lot of other examples of transformation. But they are very context specific and I would not want to discuss all of them here because they are beyond the scope. Now, post transformation the transformed data is then mined. So, here we see that out of this entire process that we see here datamining is just one step, it is just one step. It is one step it is the particular step of finding patterns and rules in the data. So now the transformed data is fed to some algorithms are run on the transformed data and you do identify some patterns and rules out of the data.

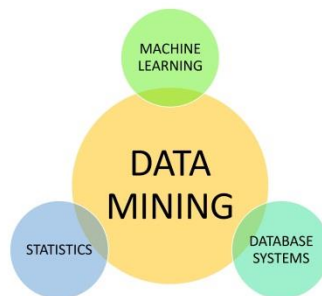
Post which once you find out the patterns or rules or the outputs of the algorithm, the output is interpreted and evaluated to derive knowledge. So, finding the output is not enough the data analyst has the rule of interpreting and evaluating the output to derive knowledge out of it.

Post the knowledge it is very important to understand how this knowledge can be useful for the organization. So this is the step where finally understanding and integration happens or the

knowledge that you derive out of the entire out of the process is now transformed to something that is actionable.

And that actionable output or knowledge is now sent to back to your departmental store, so that it can add some value to the departmental store. This entire process is called knowledge discovery in databases and data mining once again I would like to reiterate is only a step. I hope the process of KDD and the role that data mining has in the KDD process is now clear all right.

DATA MINING IS MULTIDISCIPLINARY



So, let us move ahead and here this particular slide talks about the fact that data mining is multidisciplinary. So, data mining draws from different disciplines as we see of course database systems play a very important role, we saw the entire data is stored in databases and then sent to you know data warehouses; from where we are actually using the data for data mining. Statistics and machine learning both play a very important role in analyzing the data to come up with outputs. So, of course, data mining is multidisciplinary and draws from different disciplines moving ahead.

Data Mining Application

- **Customer Segmentation**

- Propensity to Buy
- Profitability Modeling & Profiling
- Customer Attrition
- Channel Optimization
- Fraud detection

What are my Market Segments
who are my customers by
segment ?



Let us see some very interesting applications of data mining in the business context. Customer segmentation, in marketing very important role played by data mining. So, what are my market segments and who are my customers by segment? So, you find out your market segments and then you find your customers who reside in each of those segments, post which what you do is personalize customer relationships.

Data Mining Application

- Customer Segmentation
- **Propensity to Buy**
- Profitability Modeling & Profiling
- Customer Attrition
- Channel Optimization
- Fraud detection

Which customer are good candidates for our new long distance calling plan?



Personalize customer relationships.
Higher satisfaction = Higher retention

So, if you know who are your customers by segments you could give them appropriate strategies. Propensity to buy is another area where data mining has a very important role, which customers are good candidates for our new long distance calling plants very important for telecom a telecom sector. So, targeting customers based on their needs, that is what you need to do.

Data Mining Application

- Customer Segmentation
- Propensity to Buy
- **Profitability Modeling & Profiling**
- Customer Attrition
- Channel Optimization
- Fraud detection

What is the life time profitability of my customer?



Increase high value customers based on current & future profitability

Profitability Modelling and Profiling, so what is the lifetime profitability of your customers of my customer. So, once I understand the lifetime profitability of my customers, I would be able to increase high value customers based on current and future profitability. And if I see there are some low value customers I may either try to convert them to high value customers or if I you know if I see that you know there is no value I may actually let them go.

Data Mining Application

- Customer Segmentation
- Propensity to Buy
- Profitability Modeling & Profiling
- **Customer Attrition**
- Channel Optimization
- Fraud detection

Which of my most valuable customers are at risk of leaving?



Prevent loss of high value customers and let go of lower value customer

Another very important application is in predicting customer attrition or churn. So, who are my most valuable customers; who are at a risk of leaving? If I can understand this I can try to prevent the loss of high care value customers and let go of lower value customers.

Data Mining Application

- Customer Segmentation
- Propensity to Buy
- Profitability Modeling & Profiling
- Customer Attrition
- Channel Optimization
- Fraud detection

What is the best channel to reach market segment?



Interact w/customer based on their preference

Channel optimization; what is the best channel to reach my customers in each market segment? So, this is again very important. Finally fraud detection, so data mining there is a huge section of data mining that is dedicated to fraud detection.

Data Mining Application

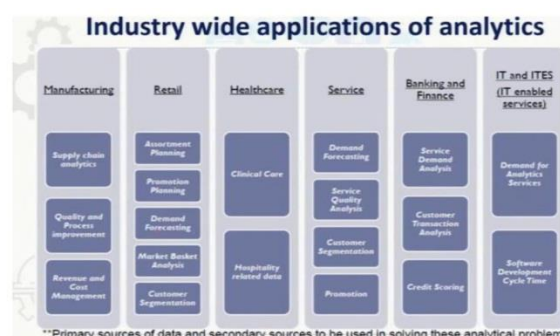
- Customer Segmentation
- Propensity to Buy
- Profitability Modeling & Profiling
- Customer Attrition
- Channel Optimization
- Fraud detection

How can I tell which transactions are likely to be fraudulent?

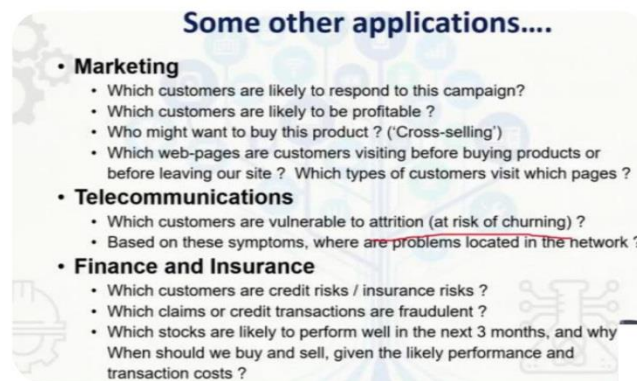


Detect and prevent fraud to minimize loss

So, we see fraud an all-around right in marketing; there is fraud in finance; there is fraud. So, you know fraud detection and data mining go hand in hand. So, how can I tell which transactions are likely to be fraudulent. So, if I can predict transactions that are likely to be fraudulent in future, I could take a lot of measures to detect and prevent the fraud in order to minimize loss. So, if there is fraud of course, there is a lot of loss to the organization. So, it is very important to try to detect the fraud a priori, so that measures can be taken to prevent the fraud.



So these are certain applications, now here industry wide applications of analytics. Here we see that in every domain manufacturing retail healthcare service banking and finance, IT ITES, everywhere analytics and data mining play a very important role.



Moving ahead here there are some other applications which I would really like to focus on in marketing. Which customers are likely to respond to a particular campaign? So, if you know that you can so in the world of digital marketing this is very important today, because every organization is into digital marketing.

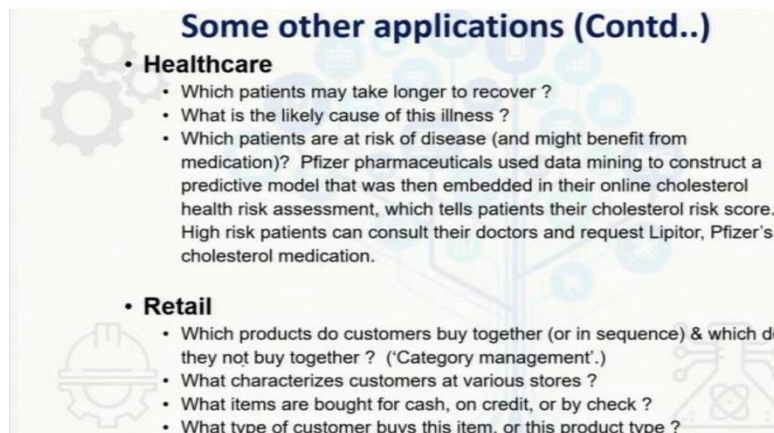
So, if you would be able to predict the customers that are likely to respond to a campaign, not only in digital marketing in the world of physical marketing also you can target the campaigns accordingly.

Which customers are likely to be profitable of course very important to know? Whom might want to buy a particular product? So, if you want to cross sell or sell or up sell. So, either you want to sell some complementary products to a customer who has bought a to a certain product or you would want to sell some higher value product. If you can predict you can target accordingly, so that helps in you know wasting a lot of calls or you know a lot of money on targeting a customers who might not be interested at all right.

Similarly in you know there are a lot of other applications of data mining and analysis analytics in marketing. In telecom of course, we had already discussed which customers are vulnerable to attrition or at a risk of churning. So, this would help us in identifying them and in order to devise strategies to prevent them from churning, based on these symptoms where our problems located in the network.

So, if they are there is a section of you know of zone a particular zone or a particular region, where customers are churning more we would be able to identify that you know the look into deeper into that particular region and check out the network problems that could lead to the churn ah.

In finance and insurance again analytics has a very important role. So, which customers are credit risks or insurance risks? So, you may then decide whether you would want to you know let us the customer take a policy or take let the customer take a credit based on the risks which claims or credit transactions are fraudulent very important right. Similarly there are a lot of other examples in finance and insurance.



Some other applications (Contd..)

- **Healthcare**
 - Which patients may take longer to recover ?
 - What is the likely cause of this illness ?
 - Which patients are at risk of disease (and might benefit from medication)? Pfizer pharmaceuticals used data mining to construct a predictive model that was then embedded in their online cholesterol health risk assessment, which tells patients their cholesterol risk score. High risk patients can consult their doctors and request Lipitor, Pfizer's cholesterol medication.
- **Retail**
 - Which products do customers buy together (or in sequence) & which do they not buy together ? ('Category management'.)
 - What characterizes customers at various stores ?
 - What items are bought for cash, on credit, or by check ?
 - What type of customer buys this item, or this product type ?

Health care we have discussed that you know in the world of covid 19 healthcare analytics plays a very important role. Otherwise also in the world of healthcare analytics has a major role to play. So, which patients may take longer to recover; what is the likely cause of a particular illness; which patients are at risk of disease?

So for example, Pfizer pharmaceuticals use data mining to construct a predictive model that was then embedded in their online cholesterol health assessment risk assessment, which tells patient patients their cholesterol risk score. So, once you know your riskm score you can take measures as to not eat that egg that you would like to eat every day ok.

So, jokes apart coming back in retail ah. So, ah analytics help or the mind data mining would help you find out which products do customers buy together or which products they do not. So, this would again help you come up with strategies. So, I will discuss this in detail in my in one of my subsequent lectures. So, what can you do if you find out that certain products are purchased together and certain products are not?

Now what characterises customers at various stores ah. You know what type of customers buy certain items or product type, which items are generally bought with cash which are bought on credit cards on credit or which are bought by cheque. So, if you know such if you have such insights from data you can take measures a priori which would help you minimize a losses later.



Data Mining Applications (Contd..)

- **Quality Control**
 - Which shipments are high-risk and need to be inspected ?
- **Customer Support**
 - Which tasks schedule (ordering) is optimal (or good enough) ?
 - Which customer service representative should I assign to a task ?
 - What documents or people are likely to be helpful to the customer in solving their problem ?

Quality control very important, because all organizations today take measures to control quality of their products or shipments very true for E commerce companies today. So, if you know that you know especially in the marketplace model, where many a times you know the marketplace provider has to keep a tab on the quality of the product that is shipped by the supplier. So, for the marketplace provider it is a lot of you know consumption of resources in terms of manpower time etcetera, to inspect each particular shipment for quality.

Therefore if analytics could predict in some way shipments which are at high risk, then companies could actually you know try to check only those high risk and medium risk shipments and maybe you know not check the low risk shipments. So, this would save a lot of resources in terms of time, money, manpower, etc. And again in customer control customer support everywhere there are a lot of examples here I think you can go through them.

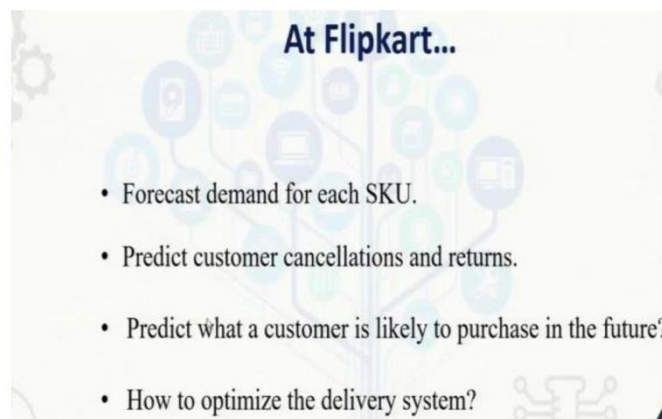
So, here also data mining and data analytics play a very important role. So, here we have extensively discussed a lot of areas in business where data mining and analytics play a very important role.



Moving ahead some real life applications, the earlier ones were also real life, but these are you know this is taken from a particular website. So, here you know this is a website called big basket which is a very popular online grocery delivery you know platform in Indian context. So, they have this feature called a smart basket, which is a feature it is a collection of products that you spend on most or you know so what you know buy most.

What happens is when you are trying to shop grocery from this particular forum or platform and you would want to maybe you know you have shopped for you are a regular here. So, one particular day you miss out some products that you regularly shop in general.

So, this will give you this will prompt you and this will this will use analytics to say that here to find out that you know this particular product is something that you shop regularly, but today you have missed it out. So it will give you a prompt, so that if you have actually forgotten you may quickly want to include that in your basket.



Similarly, in other; Flipkart is another very popular E-commerce company in India, home-grown Indian E-commerce company. So, in Flipkart, analytics again plays a very important role. So, you can forecast demand for each SKU in advance, so that would help you warehouse and manage inventory better. You can predict customer cancellations and returns this is very important because, E commerce companies in general lose a lot on product cancellations and returns.

So, research suggests that 30 percent of products ordered or purchased are returned to E commerce vendors. So, if you can predict customer cancellations and returns you may take measures to minimize or to reduce those cancellations and returns and that would help you prevent losses.

Also it would you can try and you know at Flipkart analytics is used to predict what a customer is likely to purchase in the future. So if you know that you can store accordingly, you can recommend those products to the customer. So, that there is a higher probability that the customer actually purchases.

Again you know at Flipkart that the entire delivery system is optimized using analytics. So, that helps in saving time that helps in better scheduling and that helps keep your delivery persons

happy, because delivery personnel's have a very role to very important role to play for any commerce vendor. So, if they are happy your customers would be happy and your business would d be happy at the end of the day all right.



So, finally, this is a; this is called the Diaper-beer syndrome. So, this is an area where analytics or data mining predicted something that was out of the blue that nobody had thought of before and this is an area this is a classical case of the rule of data mining in business.

So, this explained you know that you know when you have a lot of data you can come up with patterns which are unthinkable and but actually happens and that can help you in deriving huge benefits. So, it is part of folklore of data processing retail chain put all it is checkout counter data into a giant digital warehouse and set the disk drive spinning.

Out popped the most unexpected correlations it was it was not at all expected was unthinkable, but it popped out. Sales of diaper and beer what turned out is that your young fathers would make a late night run to the departmental store to pick up pampers and get some bud light while they were there.

So this let me explain this a little more. So, evidently when data from departmental stores in the in a particular region were was analyzed, it was found that especially or specifically on Friday evenings late night when young fathers would visit departmental stores, they would buy diapers and beer together.

So, this is an; this is; this was an; this was a pattern which was unexpected absolutely; unexpected some way you know, you may even think; it as a spurious correlation. But what turns out is there is there is a reason behind this or it is part of a folklore of course but it is very important to know the reason behind this.

So, it was made you know people take a lot of guesses, but in my opinion the most possible reason could be that a young mothers wanted to party on Friday evenings leaving the young fathers to babysit. And while babysitting they would definitely have to purchase diapers and along with it to entertain themselves they would purchase some beer. So, this was a incredible insight or unexpected insight unexpected correlation that happened from and that came from data analytics.

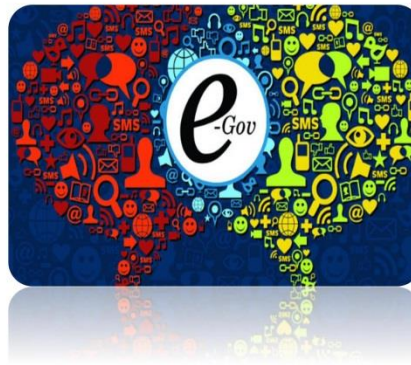
And based on this, it was found that these two products – beer and diapers, were purchased together and this drove a lot of marketers to device a lot of strategies for store layout in certain departmental stores; we will discuss those strategies in the subsequent lectures; all right; thank you!

So, in this session, we have discussed knowledge discovery in databases, and what data mining is; the definition of both the terms, the difference between the two, and we have also discussed a lot of applications of data mining in the context of business. In the next lecture, we will talk more about the various categories of data analytics and the various techniques of data analytics with their appropriate applications; ok.

Modern Trend in E-Governance

Definition of e-Governance

- Electronic governance or e-governance implies government functioning with the application of ICT (Information and Communications Technology). Hence e-Governance is basically a move towards SMART governance implying: simple, moral, accountable, responsive and transparent governance.



What is SMART Governance?

Simple — implies simplification of rules and regulations of the government and avoiding complex processes with the application of ICTs and therefore, providing a user-friendly government.

Moral — meaning the emergence of a new system in the administrative and political machinery with technology interventions to improve the efficiency of various government agencies.

Accountable — develop effective information management systems and other performance measurement mechanisms to ensure the accountability of public service functionaries.

Responsive — Speed up processes by streamlining them, hence making the system more responsive.

Transparent — providing information in the public domain like websites or various portals hence making functions and processes of the government transparent.



Interactions in e-Governance

G2C (Government to Citizens) — Interaction between the government and the citizens.

- This enables citizens to benefit from the efficient delivery of a large range of public services.
- Expands the accessibility and availability of government services and also improves the quality of services
- The primary aim is to make the government citizen-friendly

G2B (Government to Business):

- It enables the business community to interact with the government by using e-governance tools.
- The objective is to cut red-tapism which will save time and reduce operational costs. This will also create a more transparent business environment when dealing with the government.
- The G2B initiatives help in services such as licensing, procurement, permits and revenue collection.

G2G (Government to Government)

- Enables seamless interaction between various government entities.
- This kind of interaction can be between various departments and agencies within government or between two governments like the union and state governments or between state governments.
- The primary aim is to increase efficiency, performance and output

G2E (Government to Employees)

- This kind of interaction is between the government and its employees.
- ICT tools help in making these interactions fast and efficient and thus increases the satisfaction levels of employees.

Advantages of e-Governance

- Improves delivery and efficiency of government service
- Improved government interactions with business and industry
- Citizen empowerment through access to information
- More efficient government management
- Less corruption in the administration
- Increased transparency in administration
- Greater convenience to citizens and businesses
- Cost reductions and revenue growth
- Increased legitimacy of government

Advantages of e-Governance (Cond...)

- Flattens organizational structure (less hierarchic)
- Reduces paperwork and red-tapism in the administrative process which results in better planning and coordination between different levels of government
- Improved relations between the public authorities and civil society
- Re-structuring of administrative processes

e-Governance Initiatives (Cond..)

- A National Task Force on Information Technology and Software Development was set-up in 1998.
- The Ministry of Information Technology was created at the Centre in 1999.
- A 12-point agenda was listed for e-Governance for implementation in all the central ministries and departments.
- Information Technology Act (2000) was enacted. This Act was amended in 2008.
- The first National Conference of States' IT Ministers was organised in the year 2000, for arriving at a Common Action Plan to promote IT in India.

e-Governance Initiatives

Government set-up NISG (National Institute for Smart Government).

The state governments launched e-Governance projects like e-Seva (Andhra Pradesh), Bhoomi (Karnataka), and so on.

The National e-Governance Plan (NeGP) was launched. It consists of 31 Mission Mode Projects (MMPs) and 8 support components.

The National Policy on Information Technology (NPIT) was adopted in 2012

The National e-Governance (NeGP)

The National e-Governance Plan (NeGP), provides a holistic view of e-Governance initiatives across the country.

Around this idea, a massive countrywide infrastructure reaching down to the remotest of villages is evolving, and large-scale digitization of records is taking place to enable easy, reliable access to the internet.

The Government has proposed to implement —e-Kranti: National e-Governance Plan (NeGP) 2.0|| under the Digital India programme

e-Kranti – Electronic Delivery of Services

e-Kranti is an essential pillar of the Digital India initiative

Considering the critical need for e-Governance, mobile governance and good governance in the country, the approach and key components of e-Kranti have been approved by the government

The e-Kranti framework addresses the electronic delivery of services through a portfolio of mission mode projects that cut across several government departments.

Mission Mode Project

A mission mode project (MMP) is an individual project within the National e-Governance Plan (NeGP) that focuses on one aspect of electronic governance, such as banking, land records or commercial taxes, etc.

Within NeGP, —mission mode|| means that these projects have clearly defined objectives, scopes and implementation timelines.

NeGP comprises 31 mission mode projects (MMPs); these are classified as state, central and integrated projects.

Mission Mode Projects		
Central MMPs	State MMPs	Integrated MMPs
- Banking - Central Excise & Customs - Income Tax (IT) - Insurance - MCA21 - Passport - Immigration, Visa and Foreigners Registration/Tracking - Pension - e-Office - Posts - UID	- Agriculture - Commercial Taxes - e-District - Employment Exchange - Land Records/ULRP - Municipalities - e-Panchayats - Police (CTRG) - Road Transport - Treasury Computerisation - PDS - Education - Health	- CSC - e-Biz - e-Courts - e-Procurement - ESI for all India - National e-governance Service Delivery Gateway - India Portal



BIJU PATNAIK INSTITUTE OF IT & MANAGEMENT STUDIES, BHUBANESWAR

MODULE-II: MANAGEMENT INFORMATION SYSTEM

PREPARED BY: P. K ROUT ASST. PROF(IT), BIITM

What is an Information System ?

Information System

- Set of interrelated components
- Collect, process, store, and distribute information
- Support decision making, coordination, and control



Information vs. data

- Data are streams of raw facts
- Information is data shaped into meaningful form
- Information Is an ordered set of data that you can understand and act on.

What is MIS?

Management Information Systems helps firms in **realizing maximum profits on their investments**. The whole system is designed with the aim of **enhancing profits, exercising better control and performance planning at all levels**.

Elements of how a system is set in MIS:

- Input: Captures raw data from organization or external environment
- Process: Converts raw data into meaningful form
- Output: Transfers processed information to people or activities that use it
- Feedback: Output is returned to appropriate members of organization to help evaluate or correct input stage

Nature of MIS

Management Information Systems (MIS) can be simply referred to as a system or process that facilitates the smooth working of the organization. The nature of MIS is truly multifold because it plays a bigger role in business decisions, from costs to employee management. Here are the major features that portray the nature of

MIS:

- MIS is utilised by every level of a management.
- It clarifies and focuses on the strategic goals and objectives for the management.
- MIS provides an effective system to analyse costs and revenues and further reviews effectively and efficiently to bring a balanced in finances and costs
- MIS is maintained either through manual systems or automated systems or a combination of both.
- It also plays a incremental role in identifying, locating, measuring, tackling and limiting risks.
- It lays down a framework of rules and regulations for the management to bring a clear and concise communication between employees.
- MIS provides an objective system of collecting, assessing and aggregating information for a business.

Scope of MIS

Information Systems is growing at a fast pace to become one of the most promising career fields in today's world. With everything happening digitally, the demand for MIS professionals is increasing more than ever. MIS involves performing a number of task simultaneously such as-

1. Processing data
2. Initiating transactions
3. Responding to inquiries
4. Producing reports and its summaries
5. Manage the data created within the structure of a particular business

Objectives of MIS

The scope of MIS also involves understanding the objectives of MIS. mentioned below are the various objectives of MIS for your reference.

- **Gathering Data**– MIS professionals work on gathering data which might be useful and relevant in the decision-making process for **various internal and external sources of the organization**.
- **Data Processing**- The gathered data needs to be processed in a systematic way so as to be of some help to the management. The data is processed into information which is used for **planning, controlling, organizing and**

directing functionalities at different levels of the organization. Data processing means sorting data, making calculations with data etc.

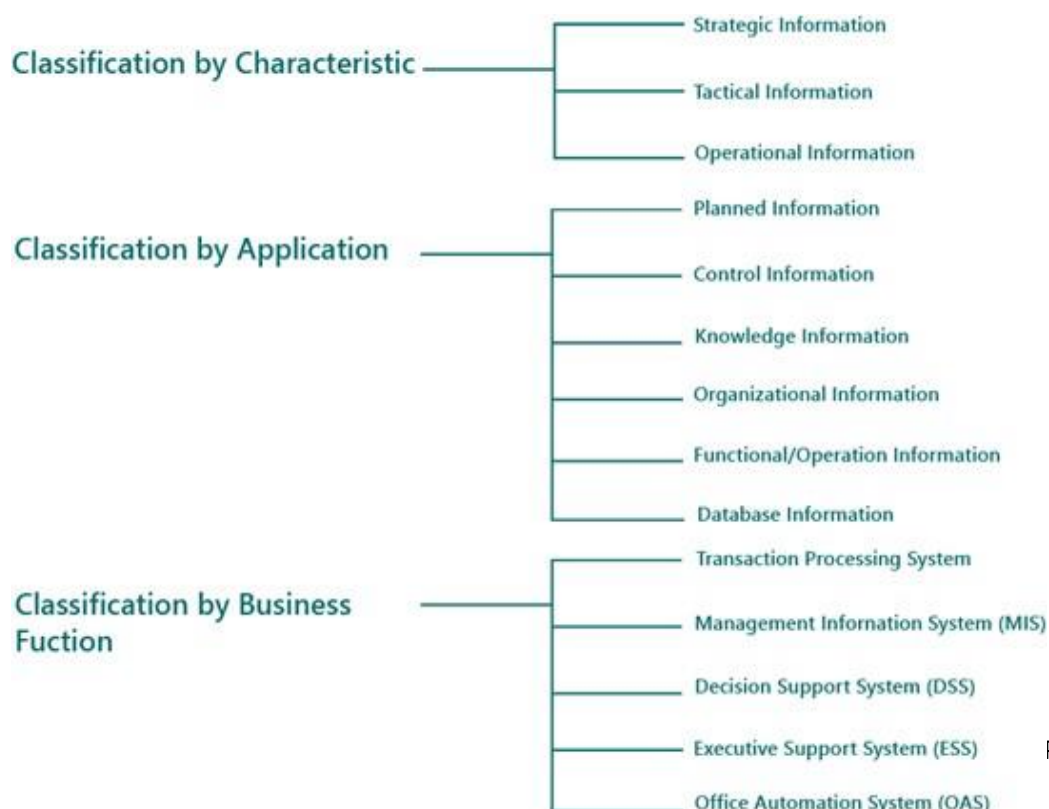
- **Information Storage**— It means storing information in a safe manner so as to make it available for any future use.

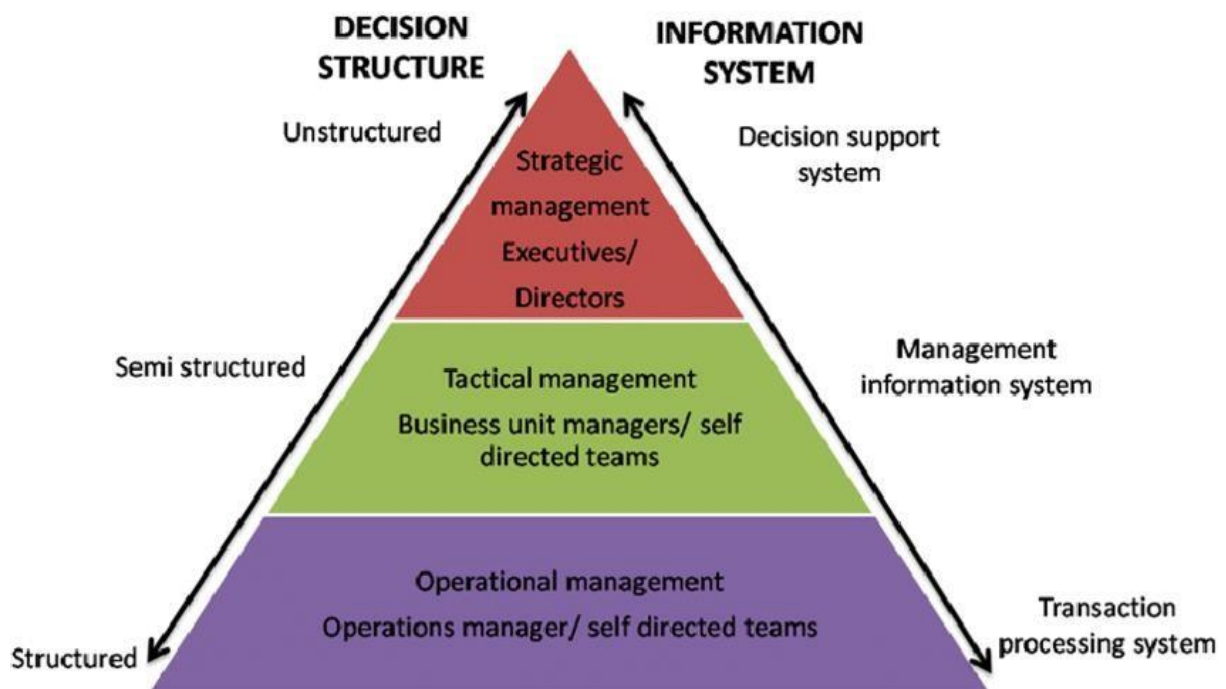
Characteristics of MIS

The scope of MIS cannot be realised fully without understanding the characteristics of MIS. mentioned below, for your reference, are the various characteristics of MIS.

- MIS is based on **strategic, operational and tactical information** of managers of an organization.
- It relies completely on **existing corporate data and data flows**.
- It is an **inflexible work**.
- Creates a linkage between **different subsystems** within the organization itself.
- Allows **easy flow of information**.
- Provides a **holistic view** of the dynamics and structure of the organization.
- MIS is based on **long term planning**.

Classification of MIS





Classification as per Information Characteristics

- **Strategic Information:** Strategic information deals with an objective of a house with long-term policy decisions as well as checks provided these objectives are met up to their level or not. For example, acquiring the new plant, the new product, diversification of chain, etc, comes under strategic information.
- **Tactical Information:** Tactical information deals with the information needed to rule over business resources, like budgeting, bracket control, improvement level, stock level, productivity level, etc.
- **Operational Information:** Operational information deals with plant/business level information as well as is used to handle proper conduction of specific operational tasks as planned/intended. Various operators specific, machine-specific as well as shift particular jobs for quality authority checks come under this category.

Classification as per Business Function



Transaction Processing System

- TPS processes transactions and produces reports. It refers to the automation of basic, repetitive processing that supports business operations. It does not afford any information to the user for his/her decision-making.
- TPS uses data and produces data as proposed in the coming after or as a result of the diagram. Previously, TPS was invited as the administration Information System. Data processing was used by manual processes or with simple machines prior to the invention of computers. The TPS domain is located at the bottom of an organization's management hierarchy.

Management Information System (MIS):

- As MIS is a well-known information system to organize the information, which processes data and converts it into meaningful information.
- A supervision information system uses TPS for its data inputs. The information generated by the information system may live used for sources of operations, strategic and long-range planning. Short-term planning, supervision control, and other managerial problem solving encompass processing in assist of a wide range of organizational functions & management processes.
- MIS is capable of providing analysis, planning & decision developing support. Marketing, manufacturing, human resources, finance, and accounting are some of the functional areas of a company.

Decision Support System (DSS):

- A decision help system (DSS) is an information system a formal request to be considered for a position or to be allowed to do or have something. That assists decision-making. DSS be inclined with planning, analyzing alternatives, and trial and error search for the solution. The elements of the decision support system include a database & software. Finance, Production, and marketing are some of the main application areas of DSS
- Based on how information is processed, DSS can be distinguished from MIS. MIS processes data to restyle it into information. DSS processes information to support the decision creating process of a manager.

Executive Support System (ESS)

Executive Support System (ESS) is a reference of the management information system, which is a special kind of DSS; An ESS is specially

tailored for the ownership of the chief executive of an association to support his decision- making. It includes various types of decision-making but it is more specific and adult-oriented.

Functional information system (MMIS,HRIS,FMIS, Food &Inventory Management Information system)

Information Systems for Marketing (MKIS or MMIS)

CONCEPT COVER

- Information system for marketing (MKIS)
- Business Processes and Subsystems for Marketing

And, in here we will cover the basic features related to information systems for marketing which we abbreviate as MKIS, and the associated business processes and subsystems related to marketing.

Information system for marketing (MKIS)

- The role of this type of information system is to help the managers identify key customers.
- It can be also used to generate reports on sales based on
 - ✓ Time,
 - ✓ Region, and so on.

The role of any marketing information system is to help the marketing managers in identifying the key customers that is the primary role of any

marketing information system which will help managers to identify key customers. It can also be used to generate various reports related to sales activities based on some time period, based on the sales achieved in a particular region and so on.

Information system for marketing (MKIS)

- If a customer is identified as a potential source of revenue, their loyalty can be appreciated in the form of;
 - ✓ Personalized after-sales service,
 - ✓ Discount, new offering, or
 - ✓ prioritizing their order

In marketing, if a customer is identified as a potential source of revenue, then their loyalty can be appreciated in the form of; personalized after sales service, various kinds of discounts are giving to those loyal customers, whenever a new product or service comes into the market those customers are approached first with different kinds of new offerings and whenever these loyal customers they place order on to the firms marketing people always try to ensure that those orders are given priority while fulfilling those orders. So, order fulfillment of this loyal customers they get a priority, and hence the organization is somewhat more responsive towards this type of customers.

Information system for marketing (MKIS)

- Customer satisfaction is key success of business today, and so it becomes important to identify the target market accurately.
- Most business with similar offerings try to differentiate themselves through the experience they create for customer.

Customer satisfaction is the key to the success of any business in today's environment, and it becomes imperative for any marketing manager to identify the target market in an accurate manner, because the effort that should be directed towards satisfying the customers must be in a focused manner.

Most businesses today with similar offerings try to differentiate themselves through the experience they create for customers, because offerings are more or less similar. So, why should customers they would preferred to buy from a particular firm?

The marketing managers they create a different kind of experience for their loyal customers and thereby try to retain them. The customer satisfaction is achieved through the very good experiences that this customers enjoys.

Information system for marketing (MKIS)

- Marketing information system help with market segmentation
 - So that the appropriate marketing activities can be targeted at the relevant segment
- Very few firm today produce products for the mass market

Marketing information system thereby helps managers in segmenting the whole market. So, market segmentation, identification of key customers, these are the primary activities of marketing. And, marketing information system helps marketing managers in achieving these goals.

And, market segmentation I have already said is necessary because the appropriate marketing activities can then be targeted at the relevant segment. Very few firms today they produce products for the mass market.

Information system for marketing (MKIS)

- Marketing information system processes data such as;
 - ✓ Sales figures,
 - ✓ Past trends, and
 - ✓ Government policies to get the useful information that can be utilized by the manager for taking decisions.

Marketing information system processes data related to sales figures, past trends of sales, and government policies to get the useful information that can be utilized by these marketing managers for taking the right kind of decisions.

Information system for marketing (MKIS)

- When you buy an item from a retail store, your billing data is fed into the system
- ✓ Manager can,
- ✓ Take a look at the consolidated statements of such data and
- ✓ Draw conclusion about the products that are in demand

When a customer buys an item from a retail store, his or her billing data is fed into this marketing information system. Marketing managers can then take a look at the consolidated statements of such data and thereby draw conclusions about the products that are in demand. So, that analysis is being facilitated by marketing information system.

Information system for marketing (MKIS)

- If a discount scheme was offered, managers can understand the impact that the scheme has on sales
- Similarly, the performance of sales team in the store can also be evaluated based on.
 - The data from the marketing information system

If a discount scheme was offered, managers can understand the impact

that the scheme had on sales. The sales data which is being captured in the marketing information system will reveal the impact of discount. Similarly, the performance of the sales team in the store can also be evaluated based on, the data which is obtained from the marketing information system.

Information system for marketing (MKIS)

- ❖ Marketing is concerned with:
 - Identification of the customer group for an organization's products or services,
 - Determination of what these customer group need,
 - Planning and enabling development of the identified products/ services to meet those needs, and
 - Advertising the promoting these product and services.

Marketing function is concerned with identification of the customer group for an organizations products or services. Because, the effort that the marketing managers want to put in they want put in a focused effort, and for that particular customer group which has been identified they would like to know; what are the requirements of that particular customer group.

So, determination of what these customer group need is another important activities associated with the marketing function and marketing information systems. They capture all these data and help the managers in carrying out planning and they enable development of the dissatisfied of the identified products and services to meet those needs. Marketing information system also help them in advertising and promoting their products and services.

Information system for marketing (MKIS)

- A “market information system” is defined as, A system in which marketing data is
 - ✓ Formally gathered ,
 - ✓ Stored
 - ✓ Analyzed and
 - ✓ Distributed to the marketing manager in accordance with their information need on a regular basis (Jobber 2007)

So, a “marketing information system” is defined as a “system in which marketing data is formally gathered, stored, analyzed and then distributed to marketing managers in accordance with their information needs on a regular basis”. This is the formal definition given by Jobber in 2007.

Once again, I repeat a marketing information system is defined as a system in which marketing data; that means, data related to sales and marketing is formally gathered that is collected, stored, analyzed and then distributed to marketing managers in accordance with their information needs on a regular basis.

Information system for marketing (MKIS)

- Marketing information is gathered continuously from sources inside and outside an organization or store

And, the marketing information which is being collected and distributed after say structuring and arranging and then analyzing, this marketing information is gathered or collected on a continuous basis, not only from sources inside the organization, but also from all outside sources.

So, outside an organization or a store is another dimension, from where the data or information related to marketing is being captured in the system, is not only the internal sources, but also the outside sources, the data is captured from both the sources.

Information system for marketing (MKIS)

- An overall “marketing information system can be defined as,
- ✓ “A set structure of procedures and methods for the regular and planned collection, analysis and presentation of information for use in making marketing decision” (Kotler et al. 2006)

So, an overall “marketing information system” have been defined by Kotler, Philip Kotler you know is a very famous author and the marketing consultant he basically defines marketing information system as “a set structure of procedures and methods for the regular and planned collection, analysis and presentation of information for use in making marketing decisions”, this is the formal definition of a marketing information systems.

So, here in from this definition you see that, there must be a set structure of procedures and methods to collect the marketing related data or sales related data on a regular basis is not only collection, but also we have to analyze those data, the system has to analyze those data and present that data as well as information in a comprehensible manner to the marketing managers. So, that they can use it for taking decisions related to marketing.

Information system for marketing (MKIS)

- MKIS helps to monitor the degree of the marketing success
- It helps the managers to ensure that the objectives of the operations function is also achieved

Marketing information system also helps marketing managers to monitor the degree of the marketing success, whether a particular marketing effort has resulted in some success or not can also be monitored through this marketing information system. This system helps the managers to ensure that the objectives of the operations function is also achieved.

Because see, all these are related marketing without operations function or operations function without marketing is just meaningless, is all an integrated approach. So, marketing functions also helps the operations managers the marketing information system is tightly integrated with the operations information system to see that the organization can met its objectives.

Information system for marketing (MKIS)

- ❖ Relevance of MIKS:
 - When companies diversity into new markets, both
 - ✓ The companies and
 - ✓ customer's point of view
 - Are needed to be handled by the marketing manager
 - Therefore, there would be greater need for marketing information

Now, let us look into the relevance of marketing information system. When the companies they try to diversify into new markets, both these companies and the customers point of view are needed to be handled by the marketing managers. Your marketing managers are not only bothered about the companies view point, but the customer's perspective is also very important for them.

And, all these relevant information is captured in the marketing information system and the managers can access those data or information. Therefore, there would be greater need for marketing information, when companies undertake effort to diversify into new markets.



Information system for marketing
(MKIS)

- ❖ Relevance of MKIS
 - Marketing managers should be aware of
 - ✓ The drivers behind consumers' preference for a particular brand
 - They should know about the points
 - ✓ That distinguish their brands from that of the rivals
 - This awareness is possible only with the help of a well-designed effective MKIS

Marketing managers should be aware of the drivers behind the customer's preference for a particular brand and the associated matrix are computed and captured in the marketing information system.

Marketing managers should know why and how a particular brand is different from that of the rivals, what are those factors that differentiate a particular brand from other brands that is a very important question, and that is being answered through the marketing information system because that system has got all the relevant data.

So, write at that point in time, when a marketing information system is designed and developed marketing managers must specify these requirements properly; that means, in order to know why the brand of that particular

company is different from the brand of the competitors, marketing managers should tell that I want these data elements to be captured in the system and these data elements will be collected through this relevant processes. So, those process details and the required input must be clearly specified by the marketing managers at the time of designing marketing information system.

Information system for marketing (MKIS)

- ❖ Relevance of MKIS
 - Marketing managers should also be aware of
 - ✓ The response of the consumers towards different strategic implementations, and
 - ✓ Technological, developments adopted by the competitors with respect to non-price grounds of competitions

Marketing managers should also be aware of the response of the customers or consumers towards different strategic implementation, the long term plans which a company is trying to implement or has implemented how the customer perceives those plans or those implementations marketing manager should know about it. They should also be aware of the technological developments which are adopted or deployed by the competitors with respect to non-price grounds of competition.

Mark the term non-price grounds of competition, because the price may be more or less same. And, what are those other things, what are the other strategies, what are that new technological developments that the competitors have put in place to win the market, that must be known by the marketing managers and captured in the system. So, that in future planning future market planning this input will become very handy.

Information system for marketing (MKIS)

- ❖ Relevance of MKIS
 - An effective MKIS is designed to,
 - ❑ Gather,
 - ❑ Integrate
 - ❑ Process, and
 - ❑ Distribute
 - ✓ Such information comprehensively from all sources, including that from marketing research

So, an effective marketing information system is designed to gather, integrate, process, and distribute such information in a comprehensive manner from all sources, including that from market research.

Information system for marketing (MKIS)

- Marketing information system consists of several subsystems
 - ❖ Each of these subsystems,
 - ✓ Perform a specific task, and
 - ✓ Supplies specific information to the marketing managers

Now, let us come to the different subsystems that are there within a marketing information system. Each of these subsystems they perform a specific task and supplies specific information to the marketing managers.

Information system for marketing (MKIS)

- ❖ Some of the subsystems
- ✓ Use advanced analytical models to provide
- Information about the present environment, as well as
- The likely future scenario

Some of the subsystems, they use advanced analytical models to provide information about the present environment, as well as the likely future scenarios, this has given rise to development of decision support systems for marketing. And, we will talk about decision support systems, their characteristics, their design features, their critical success factors when we will come to the 10th week we will describe in details about this.

Information system for marketing (MKIS)

- ❖ Subsystems of MKIS
- ✓ Marketing intelligence subsystem
- ✓ Market research subsystem
- ✓ Promotion and advertising subsystem

So, if we look at the various subsystems of marketing information system, then we will find that primarily marketing intelligence subsystem, market research subsystem, promotion and advertising subsystem they are very important.

Information system for marketing (MKIS)

- ❖ Marketing intelligence subsystem
 - It is the main sources used by managers for
 - ✓ Obtaining daily information of the external environment
 - ✓ Hence, assists marketing managers to react to the changing scenario in a rapid manner

So, let us first look into marketing intelligence subsystem, what is this marketing intelligence subsystem? It is the main source used by marketing managers, for obtaining information on a daily basis, information about external environment. So, marketing managers they obtain daily information of the external environment from the marketing intelligence subsystem. Thereby, this subsystem assists marketing managers to react to the changing scenario in a rapid manner.

Information system for marketing (MKIS)

- ❖ Marketing intelligence subsystem
 - It filters data and store critical information related to
 - ✓ Competitor's transaction data, and
 - ✓ Market- related intelligence data
 - This subsystem works as a key information provider for other subsystems in KMIS

Marketing intelligence subsystem filters data and stores critical information related to competitor's transaction data and market-related intelligence data. Mark this two important information type of information; competitor's transaction data and market-related intelligence data.

This subsystem works as a key information provider for the other subsystems, which are there in a marketing information system. So, it is at the heart, there are various subsystems with in a marketing information system and marketing intelligence subsystem is at the code or at the heart. It also feeds information to other subsystems.



And, the different sources of marketing intelligence we have already mentioned is not only the marketing managers and the sales forces.



But also various middlemen, they provide lot of intelligence data in between middlemen, the specialist. And in every organization, there is a department which is specially meant for collecting information related to markets and that department or section is known as marketing information section. And most of the marketing intelligence data is being fed into the system by this marketing information section. In the next module, we will talk about the other subsystems related to this marketing information system.

Information Systems for Marketing (MKIS)

- ❖ Marketing Research Subsystem
 - The subsystem gathers data on
 - ✓ Consumers,
 - ✓ Markets and
 - ✓ Competitors form the open market
 - By conducting survey

The marketing research subsystem gathers data on consumers, markets, and competitors from the open market. And how do they gather this data? They conduct surveys. So, by conducting surveys the marketing research subsystem gathers data on consumers, markets and competitors from the open market.

Information Systems for Marketing (MKIS)

- ❖ Marketing Research Subsystem
 - It is used to collect primary and secondary data, and display the result in the forms of reports
 - It collects and analyzes key data bout the,
 - ✓ Marketing process of the organization, as well as
 - ✓ The scenario of the market and competition

Marketing research subsystem is used to collect primary as well as secondary data. And this subsystem displays the results in the form of reports. It collects and analyzes key data about, the marketing process of the organization, as well as the scenario of the market and the competitive scenario

Information Systems for Marketing (MKIS)

- ❖ Marketing Research Subsystem
 - Areas of Marketing research:
 - ✓ Product Research
 - ✓ Advertising Research
 - ✓ Consumer Research

So, areas of marketing research, if we talk about that, then this kind of subsystem they capture data arriving from or originating from product research, advertising research and consumer research.

Information Systems for Marketing (MKIS)

- ❖ Marketing Research Subsystem
 - Areas of Marketing Research
 - ✓ Sales Research
 - ✓ Corporate Research
 - ✓ Competitor Research

Besides those 3 relevant data which originate from research activities pertaining to sales, corporate and competitor research. All these data collected by the marketing research subsystem.

Information Systems for Marketing (MKIS)

- ❖ Marketing Research Subsystem
 - Marketing Research process:
 - ✓ Define the problem and research objectives
 - ✓ Develop the research plan collect the information
 - ✓ Analyse the information
 - ✓ Present the findings

If you look at the marketing research process, then the various activities which are performed. If we list them, we will find that we have to define the problem and the research objectives are the first step.

Next, the research plan needs to be developed, then the relevant information is collected that information is then analyzed and the findings are then presented. And today, the trend is that those presentations are in the form of graphs, charts, pictures, which the marketing managers can easily comprehend.

Information Systems for Marketing (MKIS)

- ❖ Promotion and advertising subsystem
 - For example, integrating an advertising campaign with order online and offline advertising initiatives may generally provide the best overall result
 - Self-service kiosks may cut labor costs for retailers and thereby, reduce the customers' check-out times

Now, coming to promotion and advertising subsystem. Marketing managers they need to find out the best ways to distribute their products and services through a combination of electronic, mobile and physical channels.

Information Systems for Marketing (MKIS)

- ❖ Promotion and advertising subsystem
 - For example, integrating an advertising campaign with order online and offline advertising initiatives may generally provide the best overall result
 - Self-service kiosks may cut labor costs for retailers and thereby, reduce the customers' check-out times

For example, integrating an advertising campaign with other online and offline advertising initiatives may generally provide the best overall results. Self- service kiosks may cut labour costs for retailers and thereby reduce the customer's checkout times.

Information Systems for Marketing (MKIS)

- ❖ Promotion and advertising subsystem
 - The promotion and advertising subsystem is often the most elaborated in the marketing information system, since it supports both
 - ✓ Personal selling, and
 - ✓ Advertising

The promotion and advertising subsystem is often the most elaborated activity related system, in the marketing in MKIS in Marketing Information System, because this subsystem supports both personal selling and also advertising.

Information Systems for Marketing (MKIS)

❖ Promotion and advertising subsystem

- Media selection packages assist in selecting a mix of avenues to persuade the potential purchaser, including
 - ✓ Direct mail
 - ✓ Television
 - ✓ Print media, and
 - ✓ The electronic media such as the internet and the web in particular
- ❑ The effectiveness of the selected media mix is monitored and its composition is continually adjusted

Media selection packages assist in selecting a mix of avenues to persuade the potential purchaser, and this particular subsystem helps in doing that. The potential purchasers may include all the segments which have been identified already and those segments they get the information from the system through direct mail. Information is being given to television channel, print media, and the electronic media such as the internet and the web in particular.

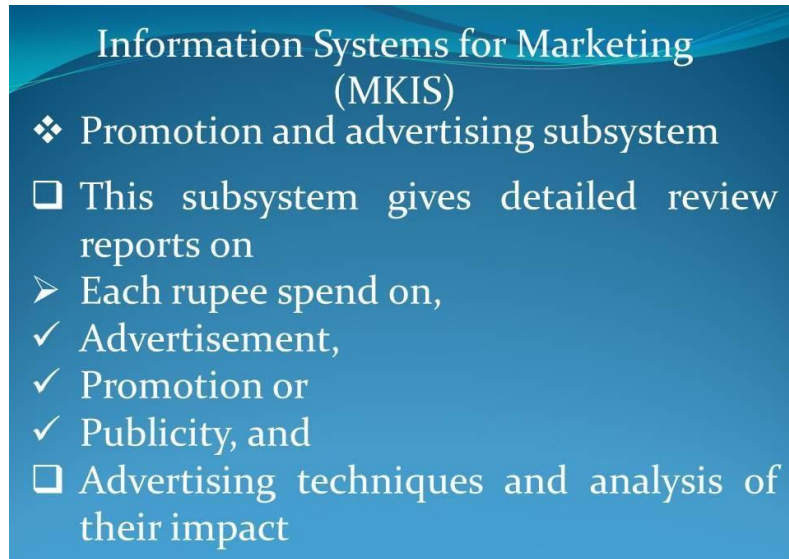
The effectiveness of the selected media mix is monitored and the composition is continually adjusted. And this is possible, if we have an effective promotion and advertising subsystem. So, design of this subsystem, maintenance of this subsystem is very important.

Information Systems for Marketing (MKIS)

❖ Promotion and advertising subsystem

- ❑ This subsystem,
 - Given information about the success of each medium of communication and.
 - Helps the marketing department to formulate communication strategies
 - ✓ Based on the information of return on investment on each medium of communication

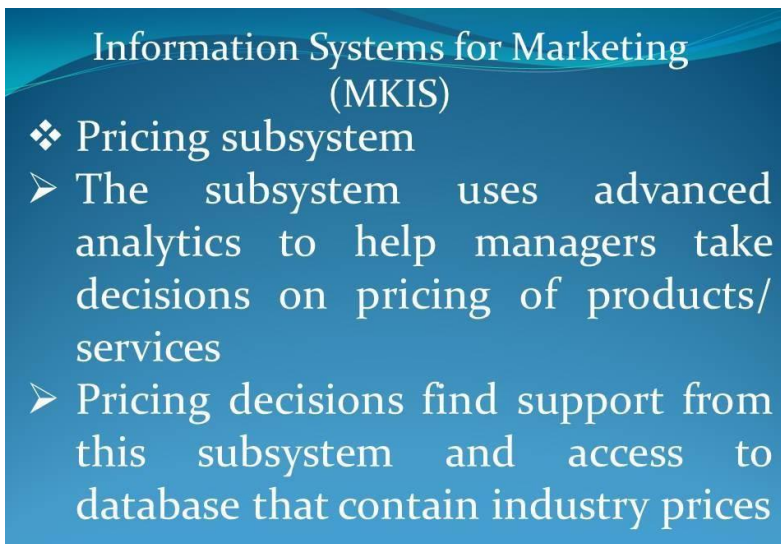
This subsystem gives information about the success of each medium of communication and helps marketing department to formulate communication strategies, based on the information of return on investment on each medium of communication.



Information Systems for Marketing
(MKIS)

- ❖ Promotion and advertising subsystem
 - ❑ This subsystem gives detailed review reports on
 - Each rupee spend on,
 - ✓ Advertisement,
 - ✓ Promotion or
 - ✓ Publicity, and
 - ❑ Advertising techniques and analysis of their impact

Promotion and advertising subsystem, gives detailed review reports on each rupee spent on advertisement, promotion or publicity as well as advertising techniques and analysis of their impact.



Information Systems for Marketing
(MKIS)

- ❖ Pricing subsystem
 - The subsystem uses advanced analytics to help managers take decisions on pricing of products/ services
 - Pricing decisions find support from this subsystem and access to database that contain industry prices

Now, let us talk about the pricing subsystem. This also another very important subsystem in the overall framework of MKIS. The pricing subsystem uses advanced analytical models to help managers take decisions on pricing of products or services. Pricing decisions find support from the pricing subsystems and access to databases that contain industry prices.

Means one of the relevant information that is captured in the pricing system is for similar products or for similar offerings service offerings also, what is the price that is being charged by my competitors. Because I must first know that for similar product offerings or service offerings what is the price that is being quoted by my competitors. This is one.

The other important input that the pricing subsystem must capture is that what is the lowest possible price that I can quote because if the company puts below a particular price, then there can be legal complications. Then, the other information that the pricing subsystem requires is that what is the effect of the demand for a product when say variables like quality of the product, price quoted, as well as the expenditure on advertising they are varied.

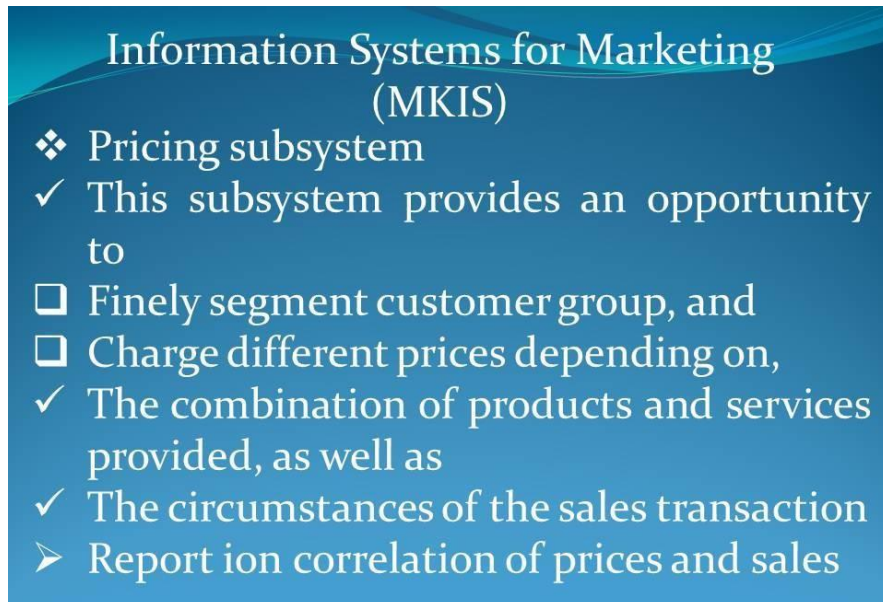
Because the pricing subsystem assumes that one of the factors among the price advertising and quality may play a very important role. So, what do they do? Among these 3 variables, let us say, they will try to first keep price or say quality and price constant and they will try to see that what is the effect of bearing the advertising expenditure; how demand gets affected by that.

Next, if they vary the price keeping the quality and advertising expenditure same, ok; what is the effect of demand for that product? And similarly, when price and advertising expenditure is kept constant the quality of the product is varied, what is the effect of the product demand? Then, they will find out they will form some relationship they will find out the relevant indices and the constant associated with that from this given data.

And finally, they will try to find out the weightages that should be associated with each of these variables, price, say quality, say advertising expenditure in finding out the total demand for the product. And, they will vary that those input variables within certain ranges and try to do some sensitivity analysis and then depending on the objective of the company they will finalize the price.

Various decision support systems are available in the market to help pricing decisions. And this decision support systems they are embedded inside marketing information system to help marketing managers, get a

primary idea about the price that can be fixed for a product. Upon getting that primary information, the marketing managers will apply their experience, intuition, as well as judgment in determining the final price for the product.



Information Systems for Marketing
(MKIS)

- ❖ Pricing subsystem
 - ✓ This subsystem provides an opportunity to
 - ❑ Finely segment customer group, and
 - ❑ Charge different prices depending on,
 - ✓ The combination of products and services provided, as well as
 - ✓ The circumstances of the sales transaction
 - Report ion correlation of prices and sales

So, the pricing subsystem provides an opportunity to timely segment customer groups and charge different prices, because the price may not be the same for all the customer groups.

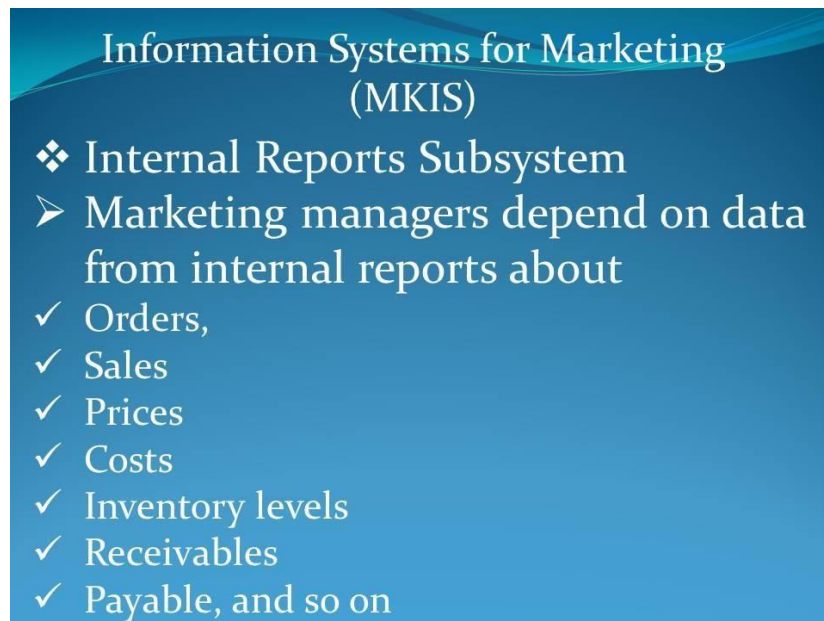
And this differences in prices mainly depends on the combination of the products and services offered to a particular segment as well as the circumstances under which a particular sales transaction has will is going to take place or has taken place. And from this kind of subsystem it is possible for the marketing managers to establish a correlation between the price and sales.



Information Systems for Marketing
(MKIS)

- ❖ Internal Reports Subsystem
 - It records various data from different departments of a company which is regarded as a major source of information.

Then, we have the internal reports subsystem as part of marketing information system. The internal report subsystem records various data from different departments within a company. And this internal source is a major source of information.



Information Systems for Marketing
(MKIS)

- ❖ Internal Reports Subsystem
- Marketing managers depend on data from internal reports about
 - ✓ Orders,
 - ✓ Sales
 - ✓ Prices
 - ✓ Costs
 - ✓ Inventory levels
 - ✓ Receivables
 - ✓ Payable, and so on

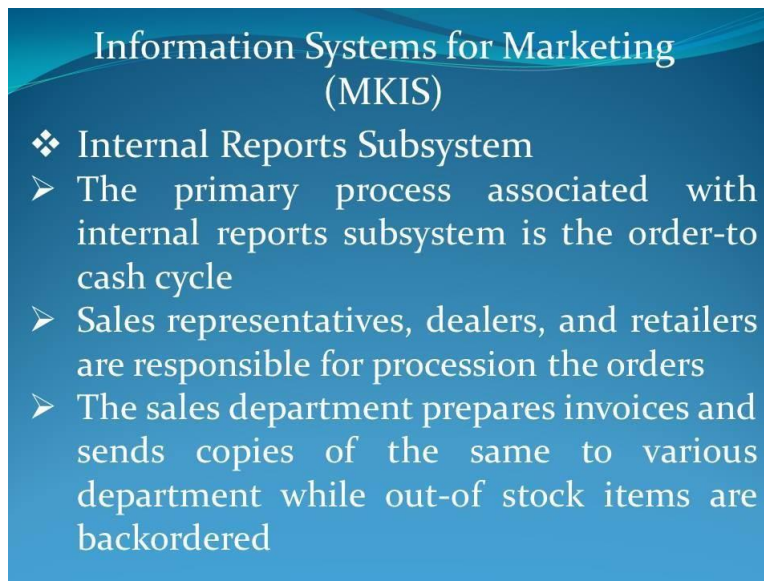
Marketing managers depend on internal reports related to order data, the mode of fulfilment of those orders, the processing time involved in fulfilling those orders. Data related to overall sales, prices of the products or services, cost of the products and services, the inventory level that was maintained by the organization, for a given level of responsiveness; the amount of receivables and also the total volume of payables.

All this information, they are collected like say account receivables will give them what is the total amount of money that need to be collected from the different customers to which the product has been sold.

Accounts payable system will supply information related to the total volume of money that need to be paid to different suppliers from which materials have been or products have been procured.

So, data on receivables, data on or report on payables that stock levels that have been maintained, the prices cost for the products, the sales volume report on the sales volume, reports related to order processing, order fulfilment, the order value. All these reports are collected in this subsystem

and this is being utilized by the overall marketing information system to help managers in taking the right kind of marketing decisions.



**Information Systems for Marketing
(MKIS)**

- ❖ **Internal Reports Subsystem**
 - The primary process associated with internal reports subsystem is the order-to cash cycle
 - Sales representatives, dealers, and retailers are responsible for processing the orders
 - The sales department prepares invoices and sends copies of the same to various department while out-of stock items are backordered

The primary process associated with internal reports subsystem is the order- to-cash cycle. Order-to-cash cycle means, from the starting point is receipt of an order from a customer, and this business process ends when cash is collected from the customer. From receipt of an order from a customer, till the organization recovers or collects the cash after delivery of the products or services, these entire span.

Sales representatives, dealers, as well as retailers all of them are responsible for processing the orders. The sales department prepares invoices and sends copies of those invoices to various departments depending on the information and the agreement between the customer and the company items which are out-of-stock maybe backordered.

So, that also in information is being captured by the internal report subsystem; because next time the marketing managers would not like to see that they do not have those items in stock. Accordingly, they will try to rationalize or improve the ordering subsystem such that the safety stock, the reorder level and the reorder quantity in the material subsystem is being taken care of in the right manner.

Information Systems for Marketing (MKIS)

- ❖ Internal Reports Subsystem
 - Shipped items are accompanied by shipping and billing documents that are sent to various departments
 - Companies need to perform these steps quickly and accurately because customers favor firms that can promise timely delivery

Internal reports subsystem also capture data related to shipping and billing documents that are sent to various departments when a product is shipped to the customer from the warehouse.

And companies, they need to perform all the steps quickly and accurately because customers, they favour those firms that can promise timely delivery. This will of course, depend upon the overall business strategy of the firm whether the firm wants to be responsive or they would like to be efficient in terms of minimizing the cost. But somewhat a balance has to be maintained if they have to survive in the long run.

Information Systems for Marketing (MKIS)

- ❖ Internal Reports Subsystem
 - Today many companies organize information in databases customer databases, product databases, Salesperson databases, and so forth-and then combine data from different databases
 - The customer database contains every customer's name, address past transaction demographics, and psychographics (activities interest and opinion)

Today, many companies they organize information in databases, customer databases, product databases, salesperson databases, and so forth and then this combine this data from different databases. And this is this has been made very easily possible because of this integrated enterprise resource planning systems.

The customer database contains all the attributes related to a customer including customer's name, address, past transactions, demographics, and psychographics; meaning all the activities interests and opinions of the customers are captured.



Information Systems for Marketing
(MKIS)

- ❖ Internal Reports Subsystem
 - Sales data presented in a graphic format, provide regular sales trend information and highlight whether certain customer types need to be targeted or focused.

Sales data presented in a graphic format provide regular sales trend information and that is also needed for the purpose of sales forecasting. And this sales trend it basically highlights whether certain customer types, they need to be targeted in a more concentrated manner or focused manner.

Information Systems for Marketing (MKIS)

❖ Internal Reports Subsystem

- ❑ Price information by product line and comparison with competitors help managers to monitor market trends;
- ✓ Analyzed by customer type, the subsystem helps to check price trends in customer groups
- ✓ Customer profitability analysis help identify high-profit and high growth customers and target marketing efforts in order to retain and develop these accounts

Price information by product line and comparison with customers' comparison with your rivals help managers to monitor market trends. Analyzed by customer type this subsystems help to check price trends within customer groups.

Customer profitability analysis help identify mark high-profit and high-growth customers that particular segment is identified and target marketing efforts in order to retain and develop these accounts. If marketing managers must focus, must target, all their effort for those particular customers which generate high- profit and high-growth for the organization.

Information Systems for Marketing (MKIS)

❖ Internal Reports Subsystem

- Stock level data and trends in key accounts or distributors, focus on whether different outlets need support

The return on effort has to be maximized. Stock level data and trends in key accounts or distributors, focus on whether different outlets need support.

Information Systems for Marketing (MKIS)

- ❖ Internal Reports Subsystem
 - Market support information
 - ❑ Coordinate the effects of marketing promotions through,
 - ✓ Advertising.
 - ✓ Direct marketing
 - ✓ Trade incentive,
 - ✓ Consumer competitions and on
 - ❑ And help to determine whether discussion are being made effectively.

Market support information coordinates the effects of marketing promotions through advertising, direct marketing, trade incentives, consumer competitors, and so on. And helps to determine whether decisions are being made effectively.

Information Systems for Marketing (MKIS)

- ❖ Internal Reports Subsystem
 - ✓ Competitive information and reviewing competitor's promotions and communications
 - ✓ To see if the company is doing it better or worse than competitors can improve market targets

Competitive information and reviewing competitors' promotions and communications to see if the company is doing it better or worse than competitors, that is also very important to improve market targets.

Information Systems for Marketing (MKIS)

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Information Systems for Finance and Accounting (FMIS)

CONCEPTS COVERED

- Information systems for Finance and Accounting
- Business Process and Subsystems for Finance and Accounting

In here, along with the features of the finance and accounting management information systems. We will be also discussing about the major business processes and the subsystems for the finance and accounting function.

Information systems for Finance and Accounting

- The finance function is responsible for
 - ✓ Managing the organization's financial assets such as
 - ✓ Cash
 - ✓ Stocks
 - ✓ Bonds, and
 - ✓ Other investments
 - ❑ In order to maximize the return on those finance assets

The finance function is responsible for managing the organizations financial assets; for example, cash, stocks, bonds and other investments with the purpose of maximizing the return on this financial assets. And in order to do that, the finance functions particularly the financial managers need various type of information from both internal and external sources. Internal to the organization and the external environment which you know influences the performance of the organization.

And MIS for finance and accounting provides financial managers with all the required information to take proper decisions at the right time, in a right manner.

Information systems for Finance and Accounting

- The finance function is also in charge of managing the capitalization of the firm
- In order to determine whether the firm is getting the best return on its investments, the finance function must obtain a considerable amount of information from sources external to the firm

The finance function also manages the capitalization of the firm. And in order to determine whether the firm is getting the best return on its investments, the finance function must obtain considerable amount of information from sources which are external to the firm. And this kind of information is captured and maintained in the finance and management; finance information systems for finance and accounting.

Information systems for Finance and Accounting

- The accounting function is responsible for maintaining and managing on organization's financial records
 - ✓ Receipts
 - ✓ Expenditure
 - ✓ Depreciation
 - ✓ Payroll, and so on

The accounting function is primarily responsible for maintaining and as well as managing organizational financial records. For example, all the receipts, expenditure details, depreciation, payroll and such kind of data is being maintained by this accounting information system.

Information systems for Finance and Accounting

- ❖ Strategic information required for:
 - ✓ Methods of financing
 - ✓ Planning for Long-term Profits
 - ✓ Pricing Policies
 - ✓ Tax Planning
 - ✓ Design of the Firm's portfolio of investments

Now, in order to perform effectively, all the finance and accounting functions, the type of information which are required can be classified into strategic, tactical; as well as operational. Strategic information; that means, those information's which are required for long range planning which are important for taking financial decisions are the methods of financing.

Planning for long term profits, information required for determining the pricing policies. Strategic information is required for tax planning as well as design of the firm's portfolio of investments.

Information systems for Finance and Accounting

- ❖ Tactical information required for:
 - ✓ Preparation of short-term budgets
 - ✓ Variation between Budget and Expenses
 - ✓ Monitoring Outstanding Payment/ Receipts
 - ✓ Monitoring Credit and Payment Status
 - ✓ Monitoring cost increases and Pricing
 - ✓ Knowing the Impact of Taxation on Pricing

Tactical information which are required for preparation of short term budgets; to determine the variation between the budget and the expenses incurred. Monitoring outstanding payments or receipts, monitoring credit and payment status, monitoring cost increases and pricing details, knowing the impact of taxation on pricing; all these are examples of tactical information which is being maintained by the finance and accounting system.

Information systems for Finance and Accounting

- ❖ Operational information required for:
 - ✓ Periodic finance Report
 - ✓ Dissemination Budget Status to all functional Managers
 - ✓ Tax Returns
 - ✓ Share Transfer
 - ✓ Preparing profit and Loss Account
 - ✓ Tracking Payments and Receipts
 - ✓ Maintaining Payroll and Provident fund (PF) Accounts

The finance and accounting management information system also maintain operational information which are required to generate periodic financial report, disseminating the status of budget to all the functional managers. Information related to tax returns, share transfer, generate profit and loss account, tracking payments and receipts, maintaining payroll and provident fund accounts; all these are being maintained by MIS for finance and accounting system.

Information systems for Finance and Accounting

- The financial management information system (FMIS) finds extensive application in managing the financial matters of an organization
- An FMIS allows manager to evaluate the sources of funds that would be best suited for the firm, those that beat the least risk, and those that reaps the most gain/ profit.

The financial management information system acronymed as FMIS finds wide application in managing the financial matters of an organization. The finance

and management information system allows managers to evaluate the various sources of funds which will be the; which will be best suited for the firm, those sources of funds which bear the least risk and those sources of funds that reaps the most gain or profit.

This is possible if we can design a very effective and efficient finance and management; financial management information system.

Information systems for Finance and Accounting

- The FIMS can also be used to decide how much money should be raised for equity and how much from debt
- Such a system has wide application in banks
- It helps to manage all the important daily transactional data from withdrawals to demand draft creation
- It also processes these data and converts them into useful information, and helps to store the information securely

The financial management information system can also be used to find out how much money should be raised from equity and how much money should be raised from debt. And this kind of systems have wide applicability in banks.

The system also helps managers to manage all the important transactional data which are generated on a daily basis, from withdrawals to demand draft creation. The system also processes this data and converts them into useful information and this information is also stored in the system, in a secured manner.

Information systems for Finance and Accounting

- ❖ General Ledger (GL) Accounting:
 - It is a place to record all the business transactions occurring across the organization
 - Acts as a repository of all accounting transactions
 - ❑ All functions, namely AR, AP and FA affect the general ledger in terms of passing accounting transaction
 - ❑ Similarly other function like inventory and production also pass accounting entire to the general ledger

Now, let us look at the major subsystems that are there, in any information systems which supports finance and accounting functions. So, when we look into that; the first thing that comes to our mind is the subsystem required for general ledger accounting. This system records all the business transactions that occur across the entire organization.

The subsystem acts as a storehouse of all accounting transactions. And general ledger supports all functions; namely accounts receivable, accounts payable and management of financial assets. And all these functions, in turn affect the general ledger in terms of passing accounting transactions. Likewise, other related functions like management of inventory, production management; these functions also generate various types of accounting entries which are captured and maintained in the general ledger subsystem.

Information systems for Finance and Accounting

- ❖ General Ledger (GL) Accounting:
 - ❑ Provides reliable and relevant financial statements timely:
 - Financial statements like
 - ✓ Profit and loss Account
 - ✓ Balance sheet
 - ✓ Financial Ratios
 - ✓ Budget versus Actual
 - ✓ Cash flows
 - ✓ Current month / quarter year information analysis with respect to corresponding prior period , and so on

So, general ledger accounting provides reliable and relevant financial statements at; in a timely manner. And the statements cover profit and loss account, balance sheet, various kinds of financial ratios, lot of variance analysis and reports which depict the difference between the budget and the actual expenditure that has been incurred. Cash flow statements and lot of analysis related to current month or current quarter or year.

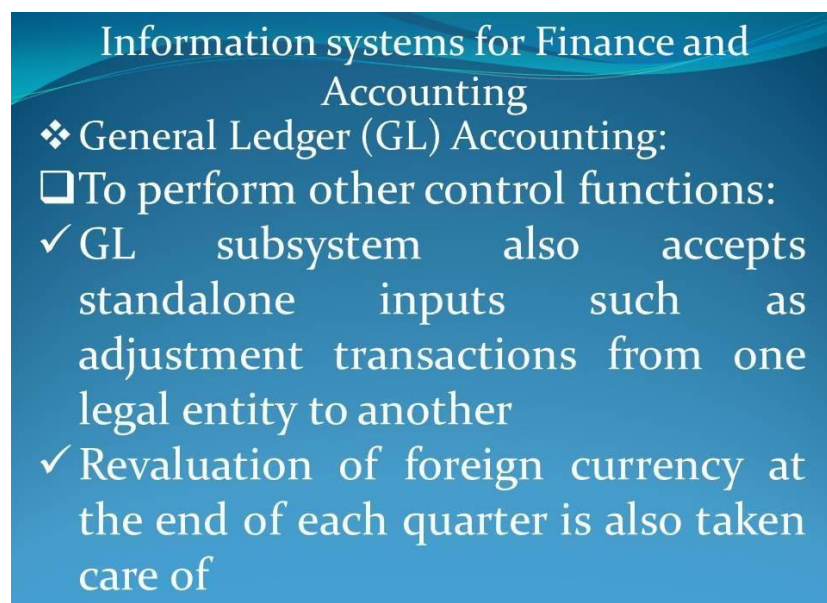
And these reports are mainly with respect to corresponding prior period or even you know we can go back further and generate various kinds of financial analysis with respect to those period data.

Information systems for Finance and Accounting

- ❖ General Ledger (GL) Accounting:
 - The GL subsystem can produce the financial statements at any point of time for the decision-maker
 - To consolidate financial statements of multiple units at different locations
 - ✓ Records all the transactions of various units (organizations may have several units or entities) at different locations
 - ✓ Generate periodic financial statements at the corporate level

The general ledger subsystem can produce financial statements at any point of time for the decision makers; that means, the system maintains these things in a perpetual manner. This subsystem consolidates financial statements of various or multiple units of the firm which are located at different locations.

This subsystem records all the transactions which are generated in various units, at different locations; because many organizations might have several units located in a dispersed manner. And transactions which are generated in all these units are recorded in the general ledgers subsystem and it also at the end of a particular period or even on a perpetual basis, the consolidation takes place. So, at the corporate level; financial statements which are required on a periodic basis can be generated from this particular subsystem.



Information systems for Finance and Accounting

- ❖ General Ledger (GL) Accounting:
 - ❑ To perform other control functions:
 - ✓ GL subsystem also accepts standalone inputs such as adjustment transactions from one legal entity to another
 - ✓ Revaluation of foreign currency at the end of each quarter is also taken care of

The general ledger accounting subsystem performs other control functions; for example, the general ledger subsystem accepts standalone inputs such as various adjustment transactions from one legal entity to another. This subsystem also helps in revaluation of foreign currency at the end of each quarter.

Information systems for Finance and Accounting

- ❖ Accounts payables (AP) and Accounts Receivables (AR):
 - It is a place where the data pertaining to vendor payments is recorded, along with cash and money received from the customers

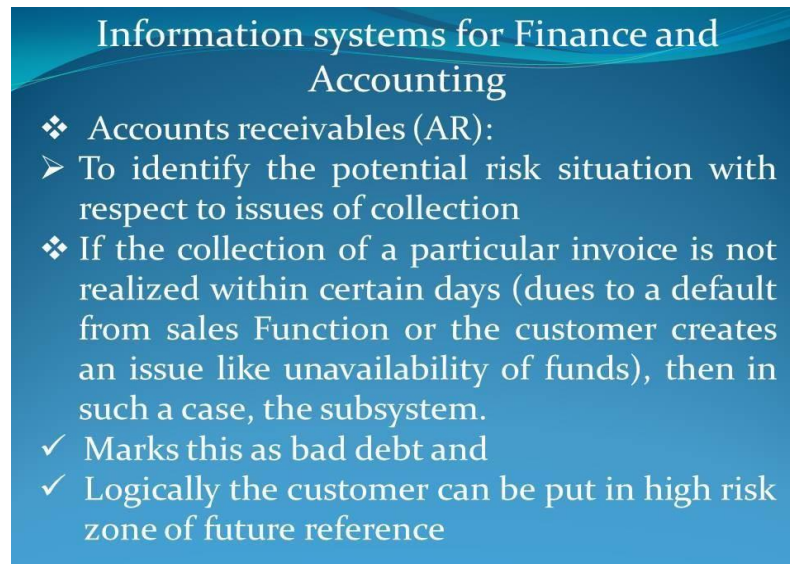
Now, let us come to the accounts payable and accounts receivable function and the various kind of information support which are required for performing these functions in an effective manner. So, in accounts payables and account receivables; mainly data related to all supplier payments is recorded along with all the cash and money received from the customers or which are due from the customers are maintained in AR and AP subsystems.

Information systems for Finance and Accounting

- ❖ Accounts receivables (AR):
 - To ensure proper and prompt billing of the goods sent to customer
 - To accurately prompt the outstanding dues, preferably in accordance with the age (total number of days by which it is outstanding from the due data)

First, let us discuss about account receivables function. Here the FMIS that is Financial Management Information Systems helps the financial managers to ensure proper and prompt billing of the goods that are sent to the customer.

This subsystem accurately prompt the outstanding dues; preferably in accordance with the age; that means, the total number of days by which it is outstanding from the due date. This particular activity is also known as dunning and various kinds of dunning statements may be generated from the systems and sent to the customers from which the organizations need to collect money.



Information systems for Finance and Accounting

- ❖ Accounts receivables (AR):
 - To identify the potential risk situation with respect to issues of collection
- ❖ If the collection of a particular invoice is not realized within certain days (dues to a default from sales Function or the customer creates an issue like unavailability of funds), then in such a case, the subsystem.
 - ✓ Marks this as bad debt and
 - ✓ Logically the customer can be put in high risk zone of future reference

The accounts receivable subsystem helps financial managers to identify the potential risk situation with respect to various issues related to the collection of dues from the customer.

If the collection of a particular invoice is not realized within certain days and this failure in realization may be due to a default from the sales function or the customer might say that I do not have funds available with me and various such issues. Then, under such circumstances; the subsystem may mark that particular transaction or that invoice as a bad debt, hence it is very difficult to collect that money.

And this logically, these particular customers can be marked or can be put in a high risk zone for future reference. Organizations might not want to supply or to fulfill his orders in future; credit rating of that particular customer might go down.

Information systems for Finance and Accounting

❖ Accounts receivables (AR):

- ❑ To manage the customer's credit notes
- Credit note is passed on the customer's account when
- ✓ Wrong invoice is made, or
- ✓ Customers has returned the goods

Accounts receivable function also pertains to management of customers credit notes. The subsystem helps financial managers in generating or passing credit note on to the customer's account, when wrong invoice is made or the customer might have returned the goods supplied to him; because those goods may be defective ones or may not be according to the customers likings.

And the organization has made a rule that if the customers do not like it or it does not match his specifications or needs and wants, they can return them. And the system generates a credit note and passes it on to the customer's account.

Information systems for Finance and Accounting

❖ Accounts receivables (AR):

- To assist in the organization's collection efforts
- ✓ Collection is one of the most important activities for any organization and At function plays an important role in sending reminders to the customers for payments

The accounts receivable subsystem thereby assist in the organizations collection efforts and collection of dues is one of the most important activity for any organization function. An accounts receivable function plays an important role in sending reminders to the customers for payments, these reminders are also known as dunning notices.

Information systems for Finance and Accounting

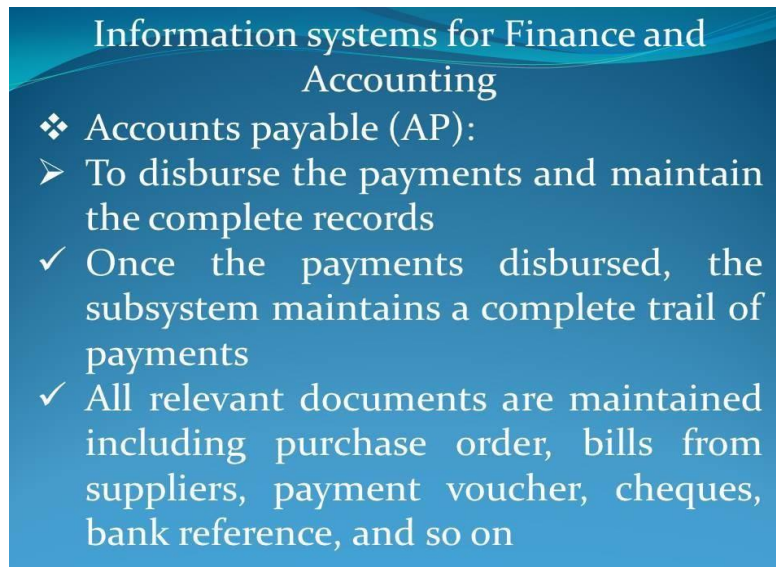
- ❖ Accounts receivables (AR):
 - ❑ To provide detailed customer history and sales analysis data for computing the credit limit
 - To assist in the cash management function
 - ✓ The subsystem helps AR function to coordinate with cash management team to reconcile the bank statements

Accounts receivable subsystems provide detailed history of customers' payment. It also helps in analyzing sales data and thereby the customer's credit limit in the system can be updated. The subsystem assists in the cash management function, the subsystem helps account receivable function to coordinate with cash management team to reconcile the bank statements.

Information systems for Finance and Accounting

- ❖ Accounts payable (AP):
 - ❑ To accurately record the liabilities
 - ✓ The subsystem records the liability of goods or raw materials or services purchased from suppliers to know the expected outflow
 - ✓ Liability is booked on the basis of receipt of actual bills from the suppliers

On the other hand, the account payable subsystem records the liabilities of the organization. Liability related to goods or raw materials or services purchased from suppliers are maintained in the system and financial managers, they need what is the total amount of liability because they need to know the expected cash outflow. Liability is booked on the basis of receipt of actual bills from the suppliers.



Information systems for Finance and Accounting

- ❖ Accounts payable (AP):
 - To disburse the payments and maintain the complete records
 - ✓ Once the payments disbursed, the subsystem maintains a complete trail of payments
 - ✓ All relevant documents are maintained including purchase order, bills from suppliers, payment voucher, cheques, bank reference, and so on

Accounts payable subsystem maintains in disbursing the payments and maintaining the complete records of all these type of transactions. Once the payment is disbursed, the subsystem can maintain a complete history, complete trail of all the payments that have taken place. All relevant documents are maintained in the subsystem including purchase orders, bills from the suppliers, payment vouchers, cheques, bank references and related transactions.

Information systems for Finance and Accounting

- ❖ Accounts payable (AP):
 - To coordinate with cash management team
 - ✓ The subsystem provides all relevant information In bank reconciliation
 - ✓ The subsystem helps in preparing cash flow statements taking into account all the payments

The accounts payable subsystem coordinates with cash management team, the subsystem provides all related information which are required for bank reconciliation in preparing cash flow statements and related other statement generation.

Information systems for Finance and Accounting

- ❖ Accounts payable (AP):
 - To take rejection of materials into account
 - ✓ Based on rejection of raw material from suppliers, a proper adjustment document (Debit note) is sent to the suppliers' account to reduce the liability, herby decreasing the amount of payment

Accounts payable subsystem takes care of the rejection of materials. Because based on this rejection of material from suppliers, a proper adjustment document; that is debit note is sent to the suppliers account to reduce the organizations liability, thereby decreasing the amount of payment.

Information systems for Finance and Accounting

- ❖ Accounts payable (AP):
 - Deals with all payment-related issues covering
 - ✓ Payments to the suppliers,
 - ✓ Staff payments
 - ✓ Travel expenses
 - ✓ Incidental expenses for office work, and
 - ✓ Payments to consultants and other professionals

So, accounts payable subsystem deals with all payment related issues, covering payment to the suppliers, payments to the staff. All expenses incurred because of the travels that has been you know undertaken by the company executives or the employees. All incidental expenses that are been carried out for office work and payments to consultants and other professionals.

Information systems for Finance and Accounting

- Asset Accounting
 - ❖ The subsystem provides
 - ✓ Support for procurement of capital equipment
 - ✓ Support for monitoring movements of fixed assets
 - ✓ Support for the sale of fixed assets
 - ✓ Support for maintaining fixed asset register which is a statutory requirement
 - ✓ Support for calculating depreciation

Then, we come to asset accounting subsystem; we will not go into the details of all, but mainly this subsystem provides support for procurement of capital equipment. It provides support for monitoring movement of fixed assets, the subsystems support the sale of fixed assets, provides support for maintaining fixed asset register which is a statutory requirement. And this subsystem also supports calculation of depreciation of several equipment's.

Information systems for Finance and Accounting

- ❖ Financial and accounting information systems also provides
- ✓ Support for managing the cash and bank-related processes
- ✓ Support for monitoring the organization's regulatory requirements
- ✓ Overhead cost control
- ✓ Activity Based Costing
- ✓ Profitability Analysis
- ✓ Business planning and Budgeting

So, the financial and accountings systems also provide support for managing the cash and bank related processes. The FMIS provides support for monitoring the organizations regulatory requirements, provides support for overhead cost control, the system supports for; you know provide support for activity based costing.

It provides support for profitability analysis and the subsystem provides support for business planning and budgeting. So, this is entire scope of financial and accounting information systems.

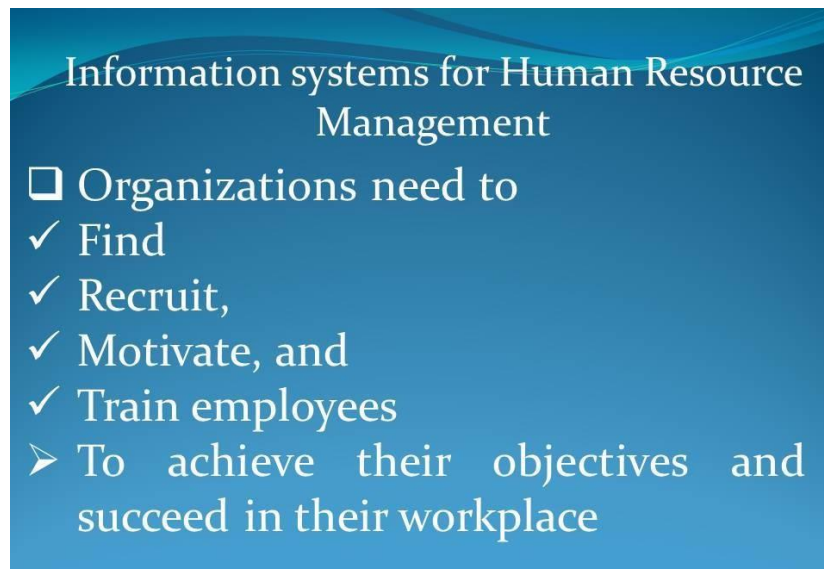
Information Systems for Human Resource Management

CONCEPTS COVERED

- Information systems for Human Resources management (HRM)
- Associated Business Process and Subsystems for HRM

Today we will be dealing with 'human resource information systems'. And the concepts that will be covered will be related to not only the HRM information

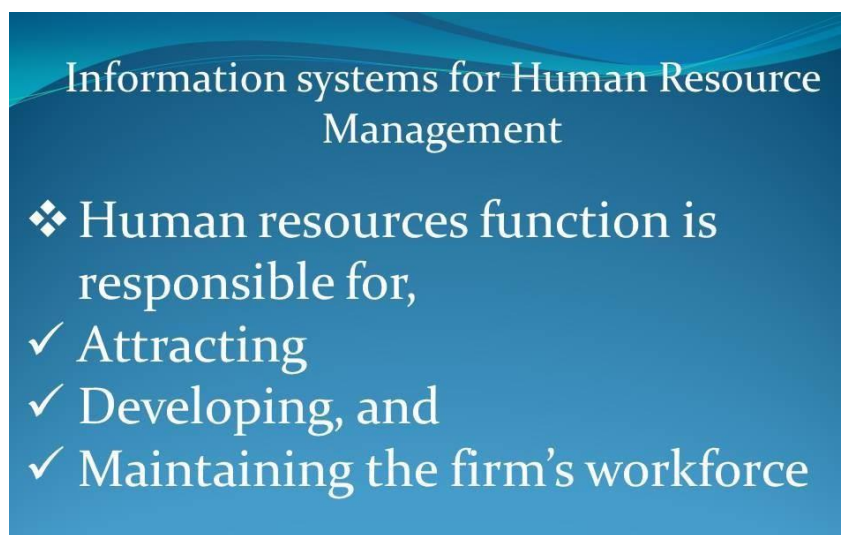
systems for HRM but associated business processes and subsystems for HRM function.



Information systems for Human Resource Management

- ❑ Organizations need to
 - ✓ Find
 - ✓ Recruit,
 - ✓ Motivate, and
 - ✓ Train employees
- To achieve their objectives and succeed in their workplace

Organizations need to find, recruit, motivate and train employees to achieve their objectives, so that they become successful in their workplace and thereby contribute towards fulfillment of corporate objective.



Information systems for Human Resource Management

- ❖ Human resources function is responsible for,
 - ✓ Attracting
 - ✓ Developing, and
 - ✓ Maintaining the firm's workforce

The human resources function is primarily responsible for attracting, developing and maintaining the firm's workforce. Besides many other functions, but these are the prime responsibilities. And information systems

for HRM help, helps HR managers in performing these tasks in an efficient and effective manner.

Information systems for Human Resource Management

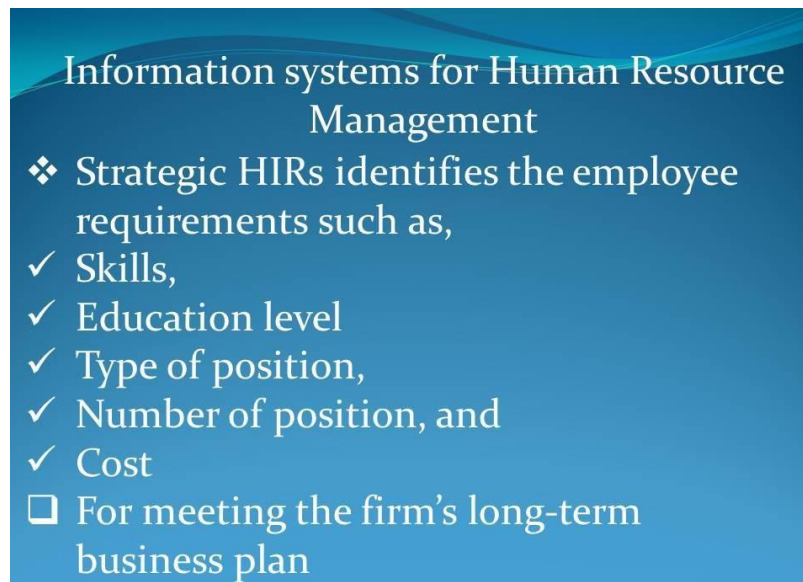
- In order to retain high performers, it is necessary to know,
 - ❑ How people feel about their
 - ✓ Work environments
 - ✓ Their compensations, and
 - ✓ Growth prospects
- In addition, maintenance of workplace health and safety is a prime requirement

In order to retain high performers, it is necessary for the HR managers to know: how employees feel about their work environment; how do they feel about the compensations that they receive? And what is the perception in their mind about their growth prospects. In addition to all this, the HR function needs to maintain the workplace in a healthy and safe manner. And for that they require lot of information which is being maintained by HR information systems.

Information System for Human Resource Management

- Human Resource information System (HRIS) Support activities Such as
 - ✓ Identifying potential employee
 - ✓ Maintaining complete records on existing employee, and
 - ✓ Creating programs to develop employee's talents and skills.

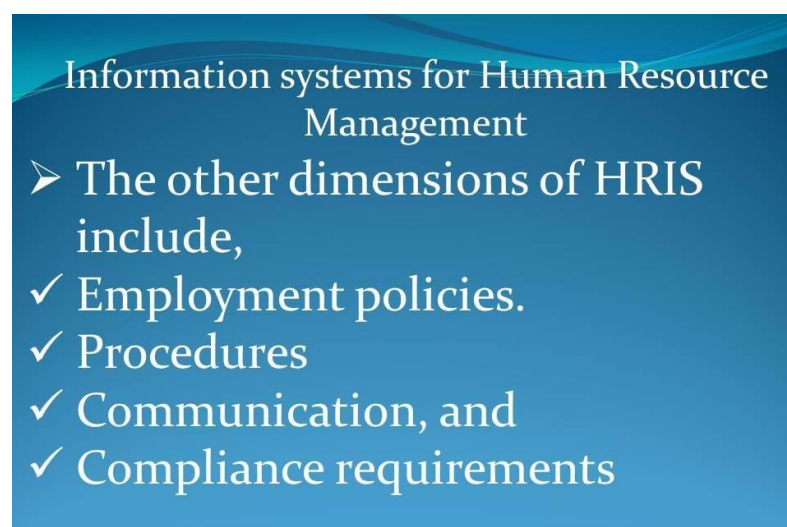
HR Information Systems acronymed as HRIS support activities; for example, identifying potential employees, maintaining complete records on not only existing employees but also employees who have left the organization; and they are also responsible for creating programs to develop employees' talents and skills.



Information systems for Human Resource Management

- ❖ Strategic HRIS identifies the employee requirements such as,
 - ✓ Skills,
 - ✓ Education level
 - ✓ Type of position,
 - ✓ Number of position, and
 - ✓ Cost
- ❑ For meeting the firm's long-term business plan

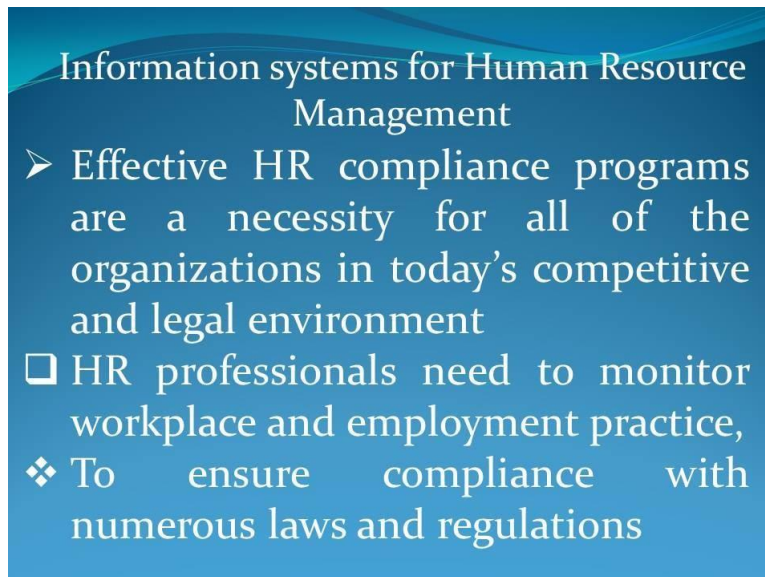
Strategic HRIS; that means that particular function of the HR which deals with identifying employees' requirements such as, skills, education level, type of position, the number of positions that need to be filled up or created, and cost related information in order that the firm achieves its long term business plans.



Information systems for Human Resource Management

- The other dimensions of HRIS include,
 - ✓ Employment policies.
 - ✓ Procedures
 - ✓ Communication, and
 - ✓ Compliance requirements

The other dimensions of the strategic HR and the required information to support that include; employment policies, the different procedures, varieties of communications that need to be generated. And the HR managers also need to know the various kinds of information which must be maintained for enabling them to meet the compliance requirements

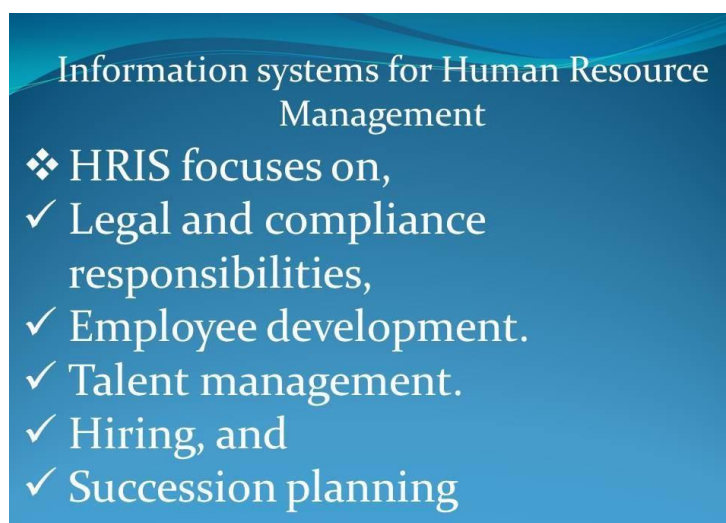


Information systems for Human Resource Management

- Effective HR compliance programs are a necessity for all of the organizations in today's competitive and legal environment
- ❑ HR professionals need to monitor workplace and employment practice,
- ❖ To ensure compliance with numerous laws and regulations

Today effective HR compliance programs are a necessity for all of the organizations; because the environment has become highly competitive and, there are lot of legal restrictions that must be maintained.

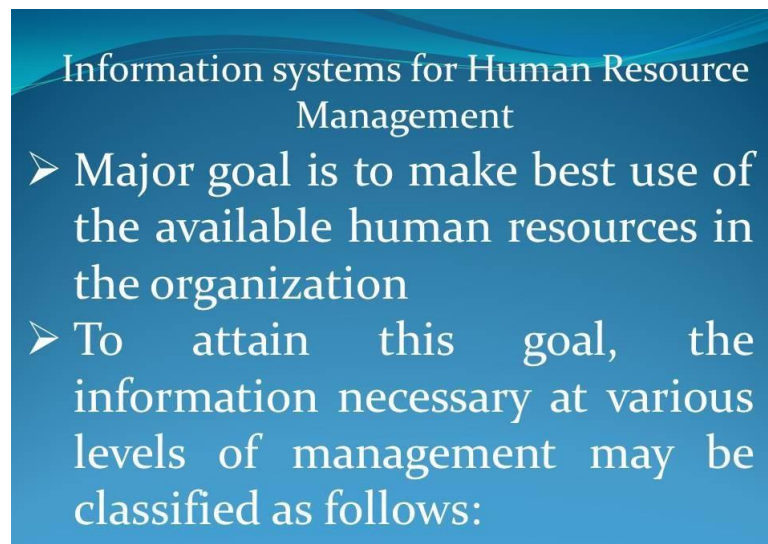
HR professionals need to monitor workplace and employment practices. In order that they can comply with the numerous laws and regulations that must be maintained by the organization.



Information systems for Human Resource Management

- ❖ HRIS focuses on,
- ✓ Legal and compliance responsibilities,
- ✓ Employee development.
- ✓ Talent management.
- ✓ Hiring, and
- ✓ Succession planning

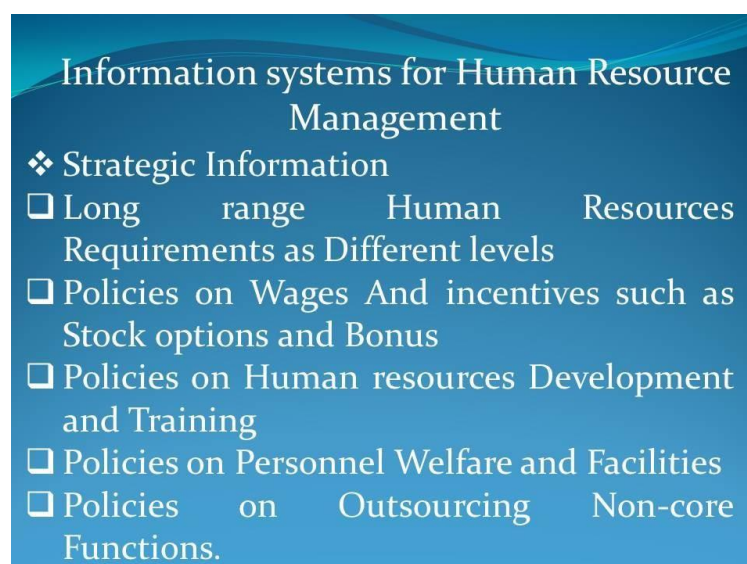
So, in summary, human resource information system focuses on legal and compliance responsibilities, development of employees, management of talents; the HRIS also supports hiring as well as succession planning activities.



Information systems for Human Resource Management

- Major goal is to make best use of the available human resources in the organization
- To attain this goal, the information necessary at various levels of management may be classified as follows:

The major goal of any HR management is to make the best use of the available human resources in the organization. And to attain this goal, the various information necessary at different levels of management.



Information systems for Human Resource Management

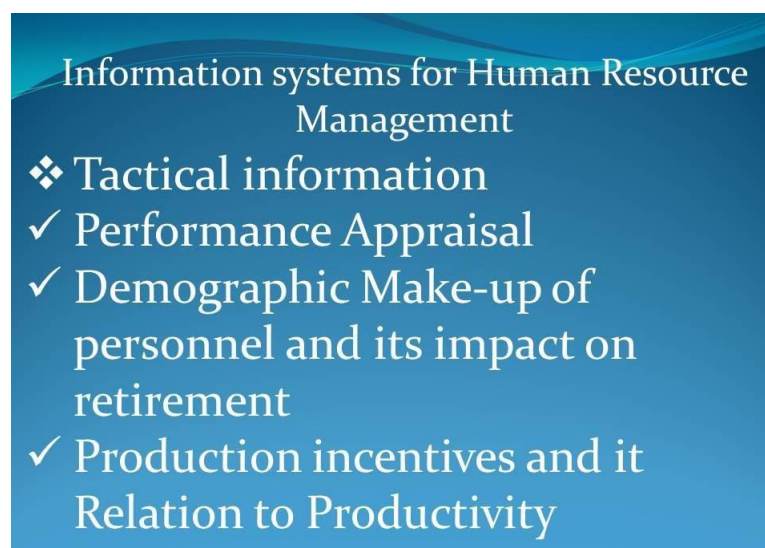
- ❖ Strategic Information
 - ☐ Long range Human Resources Requirements as Different levels
 - ☐ Policies on Wages And incentives such as Stock options and Bonus
 - ☐ Policies on Human resources Development and Training
 - ☐ Policies on Personnel Welfare and Facilities
 - ☐ Policies on Outsourcing Non-core Functions.

May be classified as strategic information under that; what we require; is the long range human resource requirements at different levels. We also need to

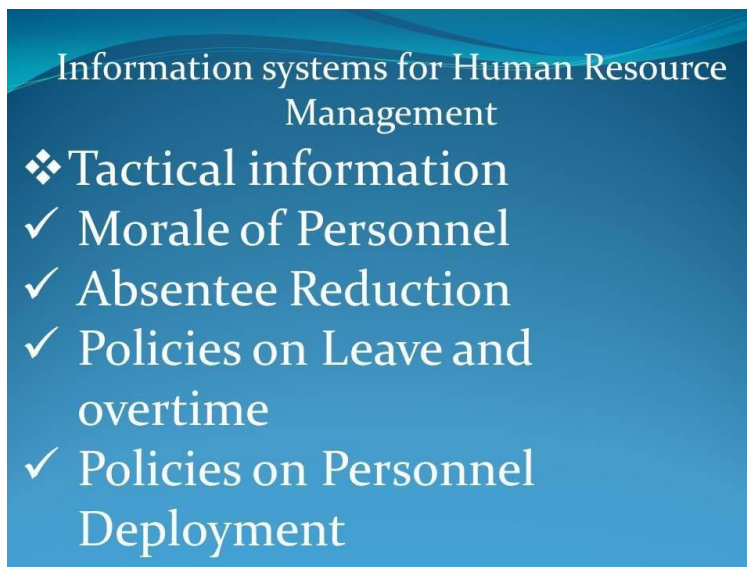
know the different policies on wages; as well as incentives related to stock options, bonuses which are basically you know given to the high performing employees, in order that they can be retained in the organizations for over a long period of time.

The HR managers they need to generate and deploy policies on human resources development and training. Policies on personnel welfare and the different kind of facilities that need to be provided to the employees. All these information have got implications over a long range, and the various kinds of information that is required are maintained by HRIS.

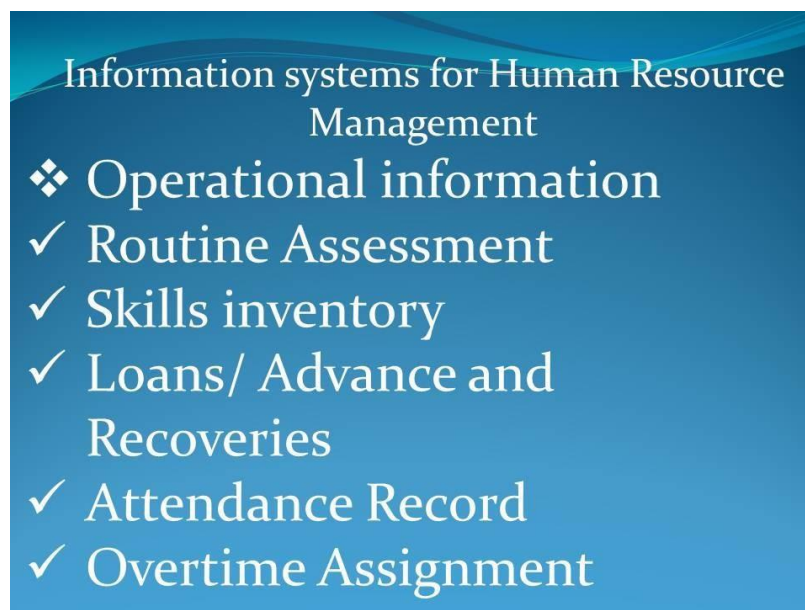
The HRIS, system also helps HR managers in deciding, what are those activities which can be offloaded onto outsourcing service providers? And these are mainly non-core functions or non-core activities that need to be outsourced. And hence policies on outsourcing non-core functions have to be generated and maintained for proper deployment. And this is being done by or supported by information systems for human resources management.



HRIS also provides tactical information required for performance appraisal of employees to find out demographic makeup of personnel and its impact on retirement. The various kinds of production incentives and its relation to productivity need to be studied and maintained in the system.



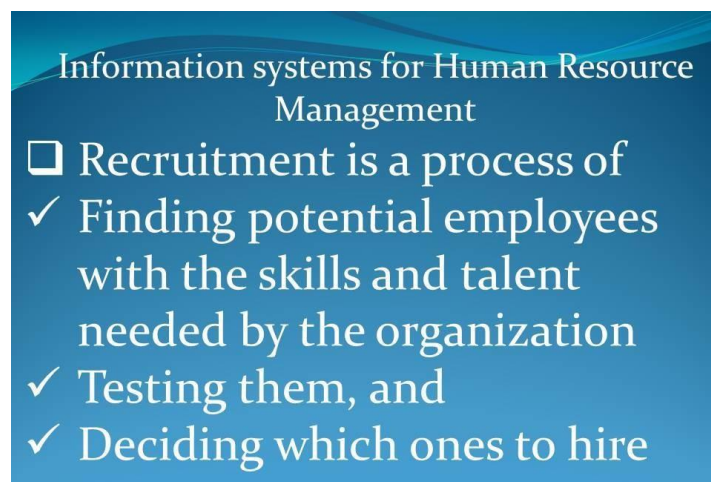
Tactical information related to human resource management also comprises maintenance of information related to morale of personnel or employees; employee morale. It also requires information to reduce the level of absentees; the subsystem maintains policies on leave and overtime. And HRIS also supports HR managers to generate policies on personnel deployment.



The operational information provided by the human resource information systems, help HR managers in their routine assessment of employees performance. In building skills inventory; that means they required to maintain data on each and every employees with respect to the different skill sets that each of these employees have. So that whenever a new project or a new assignment or a new requirement comes up in the organization, the right kind

of employees with the right skill set can be put in for that particular project or for that particular work or assignment.

Operational information, in terms of the various loans taken by the employees, the advances given to them and the recoveries that have been affected in their; through their salaries or other means; attendance record of employees, overtime assignment given to employees and performed by them; all this information; these are all operational information which are maintained in HRIS.



HRIS supports recruitment of employees. Now, this recruitment process is very important because it helps HR managers in finding potential employees with the skills and talent needed by the organization. Is not only identifying those potential employees; but to conduct interviews and test their abilities, their skill set and then decide who are those employees, who should be hired by the organization.

Information systems for Human Resource Management

- ❑ Recruitment
 - Most organizations receive lot of applications for a job but might still have difficulty in finding the right person
 - With millions of resumes available online (for e.g., LinkedIn),
- ❑ To find appropriate candidates on the “web”, usually with the help of specialized search engines

What happens is that, most organizations they receive lot of applications for a job, but still may find it very difficult to find the right person. With millions of resumes available online today; for example, in LinkedIn you know lots of applications are there. Companies they try to find the appropriate candidates on the web, usually with the help of specialized search engines..

So, there is now application of artificial intelligence in finding out those kind of employees who have placed their applications, now put in their applications in you know websites like websites or LinkedIn and many other sources. Whether their skill sets match the organizations requirements or not and once that is found out, then only these potential employees may be called for the interview.

So, majority of the workload is being taken away by the search engines. A lot of applications of artificial intelligence is now coming out for helping HR managers in the recruitment process. And those kind of algorithms are also built in HRIS which are now embedded inside ERPS.

Information systems for Human Resource Management

❑ Recruitment

- Companies also advertise thousands of jobs on the Web
- Online recruiting can reach more candidates, which may bring better applicants at a lower cost compared to traditional record methods.

Companies they advertise thousands of jobs on the web and in the process, online recruiting can reach more candidates which may bring in better applicants at a lower cost compared to traditional recruitment methods.

Information systems for Human Resource Management

❑ Recruitment

- HIRS is connected to online job portals and through these job portals,
- ✓ HRIS downloads and shortlists candidates (-via- screening and testing) for likely suitable positions in the organization
- ❖ The subsystem also helps in work force planning and in managing bench

HRIS is connected to online job portals and through these job portals, HRIS downloads and shortlist candidates via screening and testing for likely suitable positions in the organization. Thereby, recruitment subsystems within the HRIS helps in workforce planning and management of workbench.

Information systems for Human Resource Management

❑ Recruitment

- Once recruited, the employees become part of the corporate HR talent pool, which needs to be maintained and developed
- Several activities are supported by IT through the following subsystem

Once recruited, the employees they become part of the corporate HR talent pool and their details need to be maintained and developed in HRI, through the HRIS. Several activities are supported by information technology through the following subsystems, which are a part of HRIS.

Information systems for Human Resource Management

❖ Performance Evaluation

- This subsystem maintains important measures of performance for each employee so that the performance of the employee can be rated

One of the important subsystem is the performance evaluation subsystem. Performance evaluation subsystem maintains important measures of performance for each employee, so that their performance can be rated accordingly.

Information systems for Human Resource Management

- ❖ Performance Evaluation
 - Corporate managers can then analyses employees' performance with the help of intelligent system,
 - ✓ Which provide systematic interpretation of performance over time

Corporate managers can then analyze the performances of these employees with the help of intelligent systems. And this business intelligence systems may also provide systematic interpretation of the performance of the employees over time, and which can significantly influence the growth, prospect and promotion related decisions of all these employees.

Information systems for Human Resource Management

- ❖ Performance Evaluation
 - The high performers can then be rewarded and the low level performers can be taken care of by appropriate training and development, or transfers in some of the cases
 - This type of information is very important for taking decisions on career planning of employees

The high performers based on this performance appraisal or performance evaluation can be rewarded. And the low level performers can be taken care of by appropriate training, right kind of development measures and maybe in some cases transfers or even layoffs. This type of information is thereby very important for taking decisions on career planning of employee.

Training and Development subsystem

- ❑ Training and Development
 - Employee training and development are important activities of the HR department
 - Major issues include,
 - ✓ Planning of classes, and
 - ✓ Tailoring specific training programs to meet the needs of the organization and the employees

Employee training and development are one of the most important activities of any HR function and the major issues include planning of the scheduled classes and tailoring specific training programs to meet the needs of the organization as well as the needs of the employees.

Training and Development subsystem

- ❑ Training and Development
 - HR department may build a career development plan for each of the employees

So, the training and development subsystem helps HR managers to build career development plan for each and every employee.

Training and Development subsystem

- ❑ Training and Development
 - HRIS may support the,
 - ✓ Planning,
 - ✓ Monitoring, and
 - ✓ Control of training and development related activities
 - by using workflow applications

This particular subsystem in HRIS rather supports planning, monitoring and control of training and development related activities using workflow applications and these workflow applications are embedded inside the training and development subsystem.

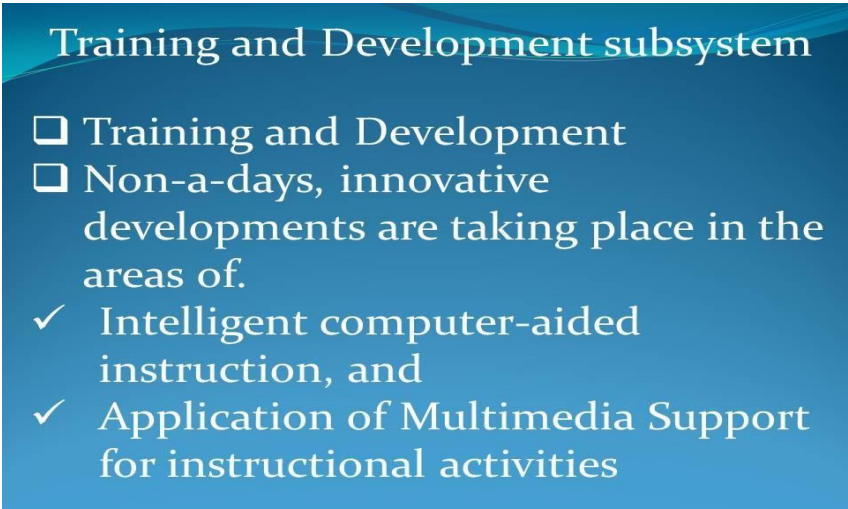
Training and Development subsystem

- ❑ Training and Development
 - This subsystem gives detailed information about,
 - ✓ Training needs of Employees
 - ✓ Details of trainers
 - ✓ Training modules and content
 - ✓ Training feedback
 - ✓ Measure of training effectiveness

The training and development subsystem gives detailed information about the training needs of employees. The training needs of the employees are first identified through their performance appraisals and also as part of the activities related to maintaining skills inventory data set and sometimes the different functional managers may specify certain special training requirements for executing some new projects or developing some new products. And those training needs are very important, because that skill set may not be readily available inside the organization.

The training and development subsystems they also maintain detailed information related to the trainers; that means, all those employees or the requisite persons who will be delivering those training.

This subsystem also maintains data related to the training modules, the different course outlines, the coverage and content of these courses. Besides maintaining the employees feedback related to that various training programs that have been imparted onto them. This subsystem also captures and maintains different measures which are deployed for finding out the effectiveness of training.



Training and Development subsystem

- ☐ Training and Development
- ☐ Non-a-days, innovative developments are taking place in the areas of.
- ✓ Intelligent computer-aided instruction, and
- ✓ Application of Multimedia Support for instructional activities

Now a day's innovative developments are taking place in the areas of intelligent computer aided instruction and application of multimedia support for instructional activities. So, all these details are being captured and maintained in the training and development subsystems of HRIS

Training and Development subsystem

❑ Training and Development

- For example, companies conduct much of their corporate trainings over their intranet or-via-the Web
- Use of learning Management System

For example, through the subsystems companies conduct much of their corporate trainings over the intranet or via the web. This subsystem are also interfaced with the various learning management systems like Moodle and others and I will talk about learning management system in details in subsequent modules.

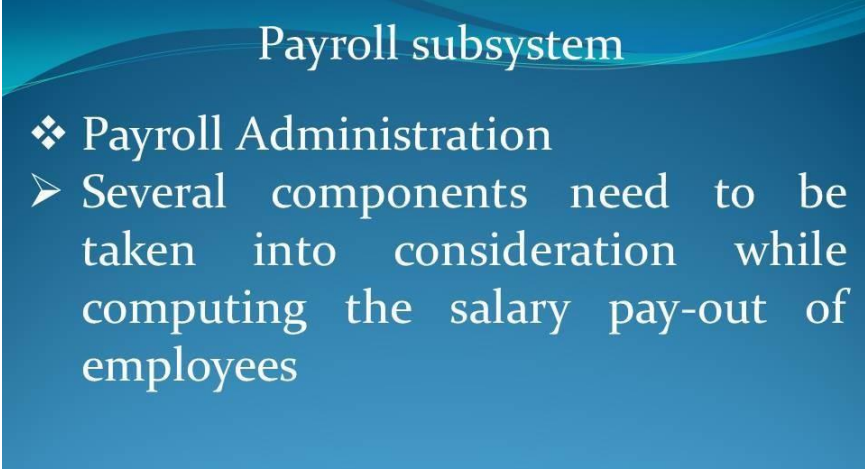
But this interface has already been established in various organizations between interface between the training and development subsystem and the learning management systems.

Payroll subsystem

- ❖ Payroll Administration
 - This subsystem provides support for payroll preparation
 - The process is typically automated meaning that
 - ✓ Pay checks are printed, and
 - ✓ Money is transferred electronically into the employee's bank accounts

Next important subsystem related to HRIS is the sub system, which supports administration of payroll. The subsystems supports preparation of payroll and then distribution of paychecks printing and distribution of paychecks. Normally

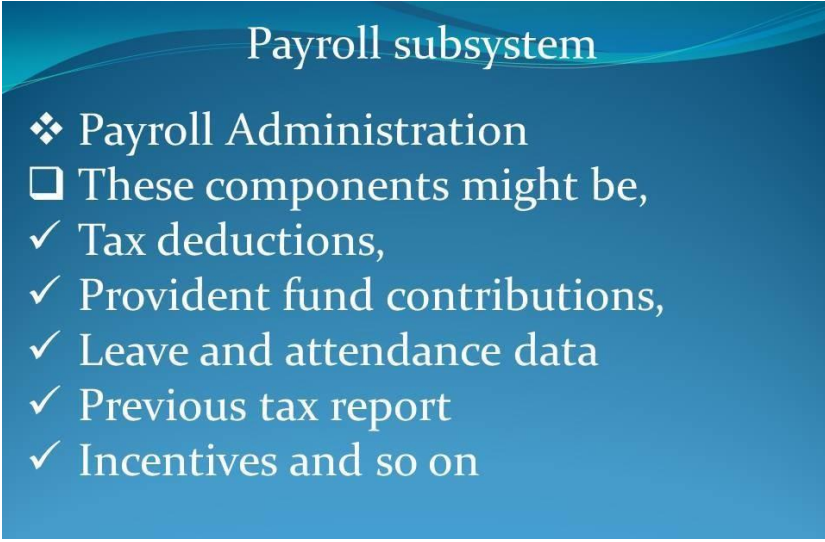
this process business process is typically automated, whereby pay checks are printed and money is transferred electronically into the employees bank accounts.

A blue rectangular slide with a wavy top edge. The title "Payroll subsystem" is centered at the top in white. Below it, the text "❖ Payroll Administration" is followed by a bullet point "➤ Several components need to be taken into consideration while computing the salary pay-out of employees".

Payroll subsystem

- ❖ Payroll Administration
 - Several components need to be taken into consideration while computing the salary pay-out of employees

Several components need to be taken into consideration while computing the salary payout of employees and the payroll administration subsystem helps in doing that.

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Payroll subsystem

- ❖ Payroll Administration
 - ❑ These components might be,
 - ✓ Tax deductions,
 - ✓ Provident fund contributions,
 - ✓ Leave and attendance data
 - ✓ Previous tax report
 - ✓ Incentives and so on

So, what are the components that the system needs to maintain, their tax deductions, contributions to provident fund, data related to leave and attendance of employees, previous tax reports, the various kinds of incentives that have been paid on to the employees and so on.

Payroll subsystem

❖ Payroll Administration

- This module helps manage the payment process by,
 - Gathering data on all those components as mentioned earlier

So, this payroll administration subsystem this particular module helps to manage the payment process by gathering data on all those components as we have mentioned earlier.

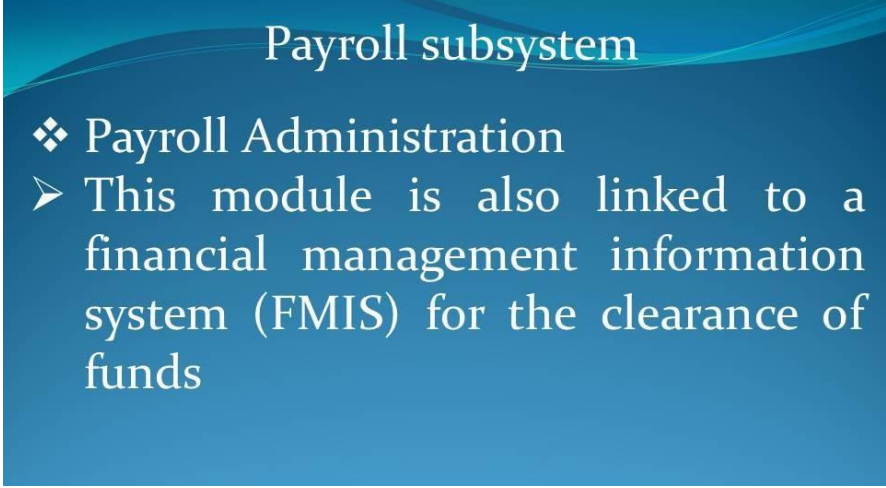
Payroll subsystem

❖ Payroll Administration

- ✓ This subsystem draws data from other modules such as,
 - The performance appraisal module
 - Attendance module, and so on,
 - Which are integrated to generate the net payable amount
 - This module is also linked to a financial management information system for the clearance of funds

This payroll administration subsystem draws data from other modules, because this subsystem is linked with other subsystems that we have just now discussed like say performance evaluation system. So, it draws related information or data from the performance appraisal module, attendance module to compute the net payable amount.

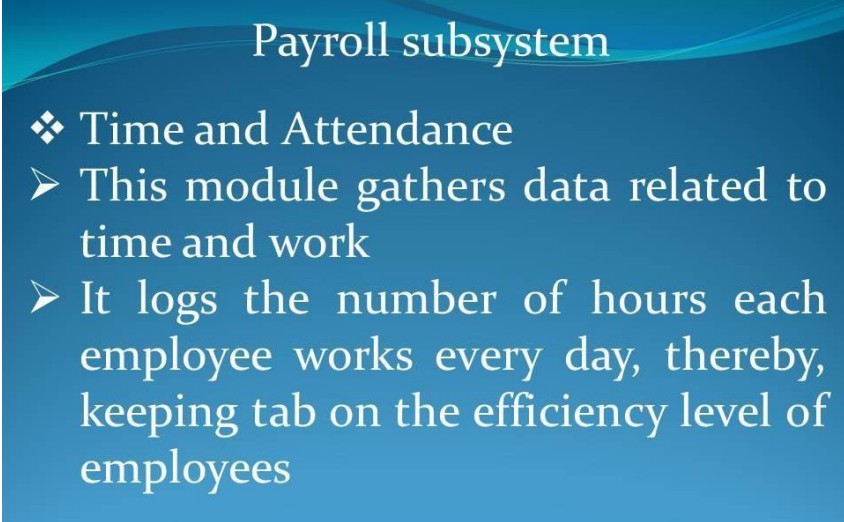
All the subsystems are integrated or interlinked with each other and this payroll administration subsystem is also linked to financial management information systems for clearance of funds.

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Payroll subsystem

- ❖ Payroll Administration
 - This module is also linked to a financial management information system (FMIS) for the clearance of funds

This is very important; this module is linked to financial management information systems for the clearance of funds.

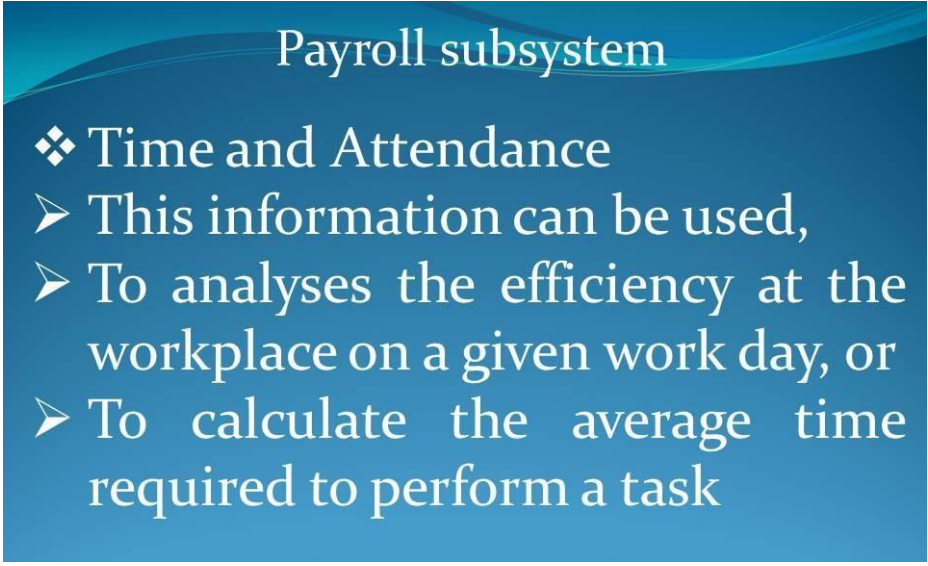
A blue rectangular slide with a wavy top edge. The title 'Payroll subsystem' is centered at the top in white. Below it, there is a list of two items: '❖ Time and Attendance' and '➤ This module gathers data related to time and work' and '➤ It logs the number of hours each employee works every day, thereby, keeping tab on the efficiency level of employees'.

Payroll subsystem

- ❖ Time and Attendance
 - This module gathers data related to time and work
 - It logs the number of hours each employee works every day, thereby, keeping tab on the efficiency level of employees

Then we also need to know about another subsystem related to payroll which is the time and attendance subsystem or time and attendance module, which gathers data related to the time and work done by the employees.

This module logs the number of hours each employee works every day, thereby keeping a control or a tab on the efficiency levels of these employees.

A blue rectangular slide with a wavy top edge. The title 'Payroll subsystem' is at the top in white. Below it, '❖ Time and Attendance' is written in white. Underneath, there are three bullet points, each starting with a white right-pointing arrow: '➤ This information can be used,', '➤ To analyses the efficiency at the workplace on a given work day, or', and '➤ To calculate the average time required to perform a task'.

Payroll subsystem

- ❖ Time and Attendance
 - This information can be used,
 - To analyses the efficiency at the workplace on a given work day, or
 - To calculate the average time required to perform a task

And that information may be used to analyze the efficiency at the workplace on a given work day or to calculate the average time required to perform a particular task.

Payroll subsystem

- ❖ Benefits Administration
 - A major component of compensation is benefits
 - Some of the benefits offered to the employees such as insurance or medical claims vary with the employee's job category
 - This module can link this information to work out which benefit can be availed by which employee in a particular grade

Then another very important module which is related sometimes comes embedded inside the payroll subsystem or interfaced with the payroll system is a Benefit Administration module.

A major component of compensation is benefits that are received by the employees, some of the benefits offered to the employees who are working in the organizations. For example, insurance or say medical claims and these benefits they vary with the employee's job category. That means, corresponding to the level at which the employee is working, these benefits, they also vary.

And the benefits administration module can link this information or help in finding out which benefit can be availed by which employee in a particular grade. Because in a particular grade employees may not be eligible for all the benefits, for a particular grade employees are entitled to certain benefits and even within that each of one of the each of these benefits the amount that they receive money value of that will also vary depending on the grade in which the employee is working.

Payroll subsystem

- ❖ Benefits Administration
 - Employees' contributions to their organizations are rewarded by,
 - ✓ Salaries/wages,
 - ✓ Bonuses, and
 - ✓ Other benefits (these benefits include those for health as well as contributions for pensions)

Benefits administration system also captures all the rewards that each and every employee receives depending on their contribution in the organization. So, employees contributions to their organizations are rewarded by mainly salaries or the wages that they receive, the bonuses that they get and other benefits that include health and medical benefits as well as the contributions that the organizations make for their or make in their pension funds.

Payroll subsystem

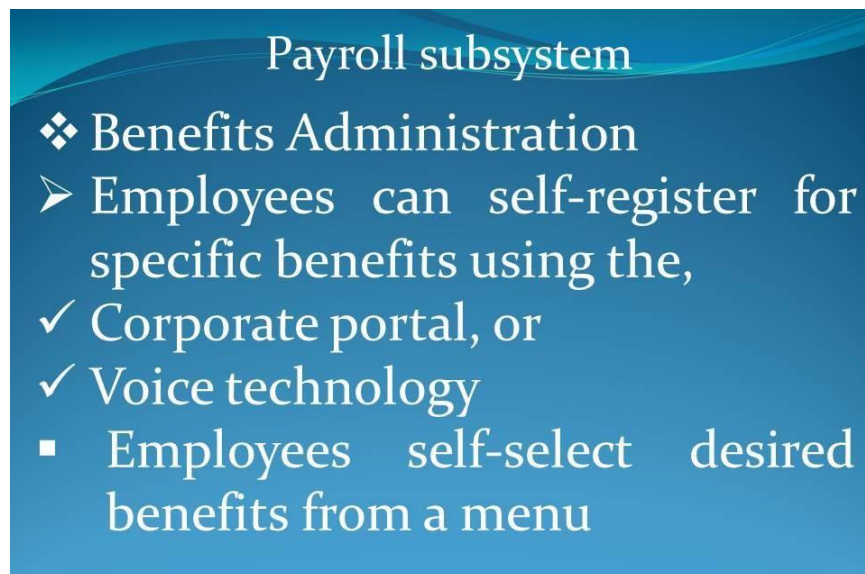
- ❖ Benefits Administration
 - Providing flexibility in selecting benefits is viewed as a competitive advantage in large organizations – this can be supported by this subsystem
 - Some companies have automated benefits enrolments

And sometimes organizations they provide a lot of flexibility to their employees in selecting the benefits that they want and thereby all this thing is decided by the employees.

Because the organization might say that a particular employee may be entitled to this much percentage of their basic pay for the total benefits that they will receive and then they ask they provide a menu to the employees and then

they ask you select what kind of benefits you want and with respect to each type of benefit how much amount should be given.

So, this is sometimes viewed as a competitive advantage particularly in large organizations and this is all supported by the benefits administration sub module.

A blue rectangular slide with a wavy top edge. The title 'Payroll subsystem' is at the top in white. Below it, '❖ Benefits Administration' is in white. Then '➤ Employees can self-register for specific benefits using the,' is in white. This is followed by two checked items: '✓ Corporate portal, or' and '✓ Voice technology' in white. Finally, a square bullet point '▪ Employees self-select desired benefits from a menu' is in white.

Payroll subsystem

- ❖ Benefits Administration
 - Employees can self-register for specific benefits using the,
 - ✓ Corporate portal, or
 - ✓ Voice technology
 - Employees self-select desired benefits from a menu

Most companies today have automated benefits enrollments, employees can self-register that already said through a menu they can select specific benefits and these can be deployed using corporate portal or even some companies they have deployed voice technology in registering the specific benefits that employees they want.

So, employees basically self-select the desired benefits from a menu and many employees perceive this flexibility as an advantage given to them. Thereby some kind of loyalty is generated from among these employees because the employees they can save a lot of tax by appropriately selecting or framing this benefit package.

Payroll subsystem

❖ Benefits Administration

- This subsystem specifies the value of each benefit and the available benefits balance of each employee
- Some companies use intelligent agents to assist the employees and to monitor their actions

This subsystem specifies the value of each benefit and the available benefits balance of each employee. And many companies today use intelligent agents software developed through the algorithms which pertain to business intelligence to assist the employees in selecting their benefits. And this intelligent agents, they monitor these actions.

Payroll subsystem

❖ Employee self-service Module

- This module allows employees to access data on their salary deductions, leave, and attendance
- It reduces the need for employees to continually approach the HR department to avail such data

Then we talk about the employee self-service module which allow the employees to access data on their salary, the various kinds of deductions that have been made leave and attendance.

They themselves can see and their queries are satisfied through this particular self service module. So, this module reduces the need for employees to continually approach the HR department to avail such data and satisfy their queries.

Employee relationship subsystem

- ❖ Employee relationship management
 - Companies are developing employee relationship management application with a view to manage their employee in a better manner
 - A typical such application is a call-center for the employees' problems

Then we talk about the Employee Relationship Subsystem, companies today are developing employee relationship management applications with a view to manage their employees in a better manner. A typical such application is a call center for the employee problems.

Manufacturing / Production information system.

Manufacturing information system is a complete set of tool for managing the flow of manufacturing production data throughout the enterprise. This IS was designed to provide tools for both IT and operations personnel who would deliver services to anyone in the plant.

Manufacturing consists of many different disciplinary areas including product engineering, facility design and scheduling, fabrications, and quality control management.

Each of them can be dramatically improved by using information systems. A manufacturing system takes material, equipment, data management and information systems technology as the input and uses manufacturing and information

processes to generate better final product as output. The manufacturing designed around the transaction process of raw materials into usable components or materials. These systems are value added processes such as materials processing or support systems such as scheduling.

Decision Support System

Introduction to Decision Support Systems (DSS)

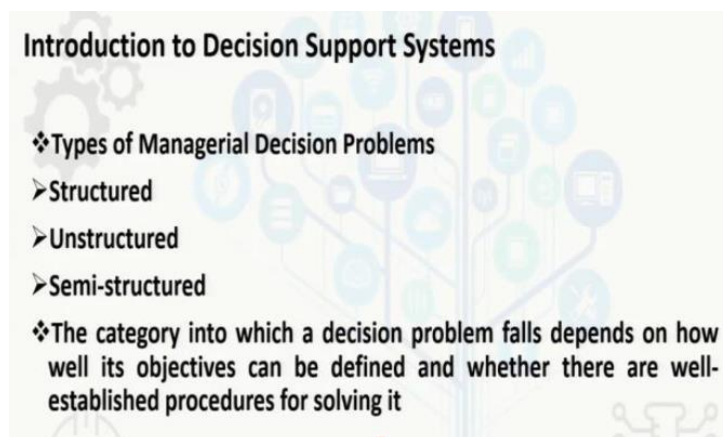
- ❖ Man-Computer interactive system
- ❖ Aid management in making decisions
- ❖ Combines Computer's ability to process databases and models with manager's ability to draw on his experience and exercise his judgement

So, what is decision support system? Decision support systems are primarily man computer interactive systems, which aid management in making decisions. So, there is an interaction between man and computer. So, in decision support systems we combine computers ability to process databases and models with manager's ability to draw on his experience and exercise his judgment.

So, manager's ability to draw on experience and judgment is combined with the computer's ability to process database and models in any decision support system.

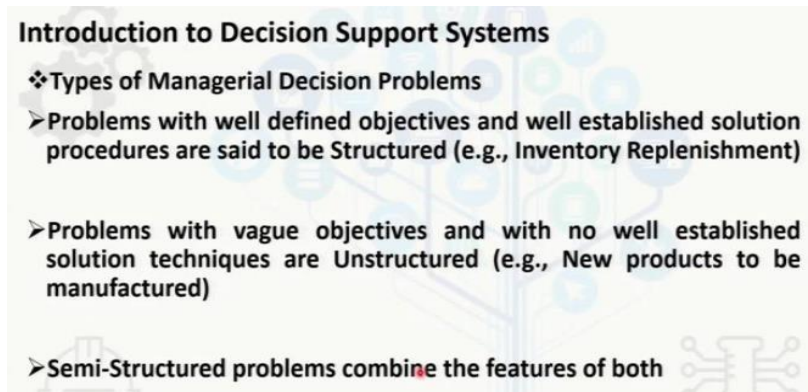


basically, the scope of this discussion in this module is limited to the role played by decision support systems in solving managerial decision problems, we will talk something about the basic components of a DSS. And, we will talk about the basic steps involved in design of a DSS.



Before we go into the details of decision support systems. We need to know, what are the different types of managerial decision problems? And, first of all what is decision making? So, decision making basically refers to choosing one among the several alternatives that exist to solve a particular problem that the managers are facing. The managers they try to find out the best alternative among the possible alternatives, but sometimes and in most cases, they are more bothered about finding an effective solution rather than finding an efficient solution. The managerial decision problems can be classified into structured, unstructured, and semi structured problems. And, the category into which a decision problem falls will depend on how well, it is objectives

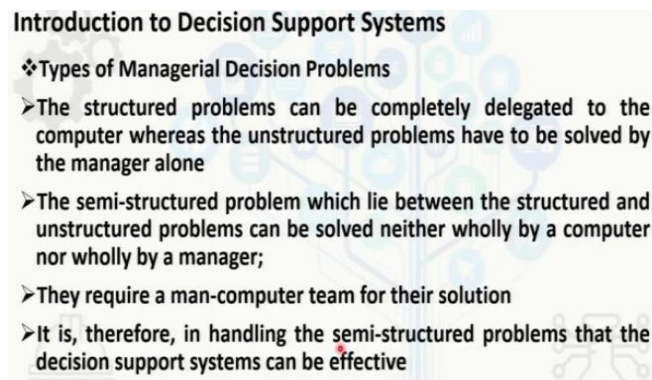
can be defined and whether there exist well established procedures for solving such kind of problems. Problems where there is well defined objective as well as well established procedures exist or solving those problem are known as structured decision problems. So, structured decision problems are those where we have a very well-defined objective or well-defined objectives. And, well established solution procedures for solving them



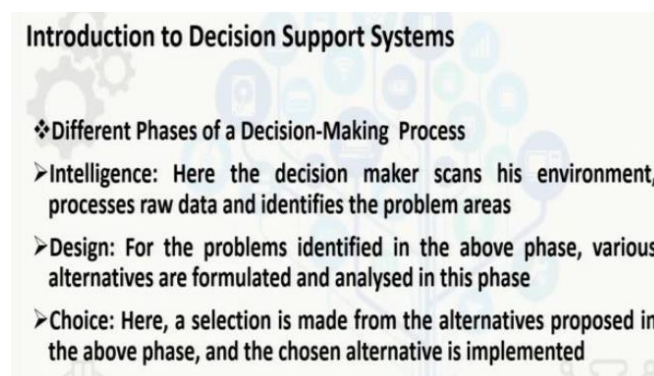
And unstructured problems, unstructured decision problems are those where the objectives are vague and there exists no well-established solutions' techniques; they are unstructured decision problems; so, problems with vague objectives and with no well-established solution techniques, for example, new products development

New products to be manufactured in a portfolio of new product completely unstructured one, but look at the inventory replenishment problem in an organization, here the objective is very well defined and the procedure is well set. Whenever the stock level of any product falls below a pre specified quantity, which is known as the reorder level a new order has to be generated and placed onto the solution, placed onto the suppliers, in terms of purchase orders. And, the quantity, which is specified as order quantity, there are various well, established procedures for computing that. Semi structured problems lie in between structured decision problems and unstructured ones. Sometimes semi structured problems combine the features of both, in semi structured problems, we may have a well-defined objective, but there exists no established solution procedures for solving them, or sometimes there exists several solution procedures. But, the objective cannot be set rightly, very difficult to set specific objectives for the problem at hand. And, it is those class

of problems that is the semi structured problems, which are candidates for getting solved through decision support systems. So, DSS is primarily meant for solving semi structured problems.



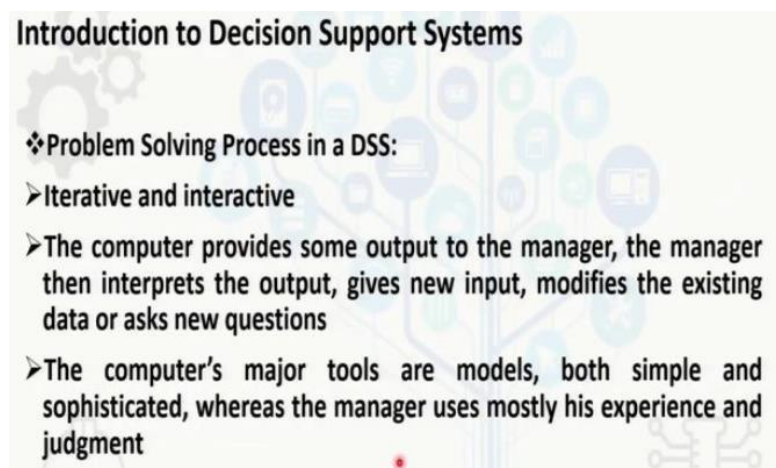
You see the structured problems where the objective is very specific and established well solution procedures are there. May be completely delegated to the computer whereas, the unstructured problems. For example, generation of a strategy, there computer is of no help, new products that need to be manufactured or developed, completely unstructured and this kind of problems need to be solved by the manager alone. The semi structured problem that lie between the structured and unstructured ones cannot be solved wholly by a computer or by a manager alone. They require an interaction between the manager and the computer. And, hence there is a need for a man computer team to interact with each other to generate solution for this class of problems. And, it is therefore, in handling the semi structured problems, decision support systems are widely used, where the emphasis is on generating effective solutions rather than trying to find out efficient solutions



Let us now talk about the different phases of a decision-making process. Primarily there are 3phases; the intelligence phase, the design phase, and the

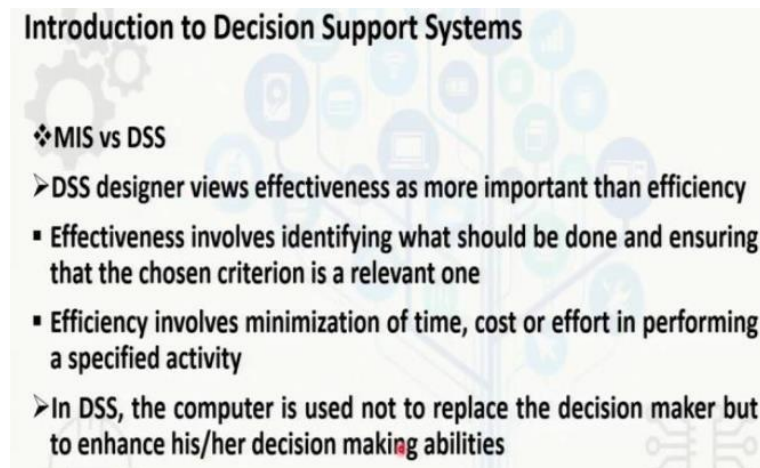
choice phase. In the intelligence phase the decision maker or the manager, scans the overall business environment, or the surrounding environment, which influences the business, processes raw data, and then identify a particular problem or identify the problem areas. In the design phase what we see is that for the problems that have been identified in the intelligence phase. Managers try to find out or formulate various alternatives to solve that problem. So, these various alternatives that exist are analysed in detail during the design phase. And, in the choice phase a selection is made from the proposed alternatives and the chosen alternative is implemented. We need to know these phases because that will help us in the design of decision support systems.

So, manager's ability to draw on experience and judgment is combined with the computer's ability to process database and models in any decision support system.



If, we look at the problem-solving process in a decision support system, we find that mainly the process is iterative as well as interactive. What happens is that, the computer provides some output to the manager based on the different inputs that the manager has already provided. The manager then interprets those output. After, his interpretation he may provide new input to the system, or he may modify the existing data, or the manager might ask new questions a part of the output that should be generated from the system. So, in here the computers major tools are the models. These models may be both simple and sophisticated whereas, the manager uses mostly his experience and judgment. So, right in the beginning we said that it is an interaction between the manager and the computer. Is not only interactive, it is iterative, because the process

may have to be repeated several times in order to get an effective solution which is satisfactory for the management group

A presentation slide titled "Introduction to Decision Support Systems". The slide features a background with faint icons of gears, a lightbulb, and a network of nodes. The content is organized into a list with diamond and right-pointing arrow symbols.

Introduction to Decision Support Systems

- ❖ MIS vs DSS
 - DSS designer views effectiveness as more important than efficiency
 - Effectiveness involves identifying what should be done and ensuring that the chosen criterion is a relevant one
 - Efficiency involves minimization of time, cost or effort in performing a specified activity
 - In DSS, the computer is used not to replace the decision maker but to enhance his/her decision making abilities

Let us talk about the difference between management information system and decision support system. DSS designer views effectiveness as more important than efficiency.

Effectiveness involves identifying, what should be done and ensuring that the chosen criteria is a relevant one. That means, in an effective solution, we first question that whether the chosen objective is the right one or not, whether the manager is doing the right job that is the first thing.

Choosing the right objective is the most important thing in trying to find out an effective solution. Having chosen the right objective or a relevant objective, then we try to find out a satisfying solution for the same. Whereas, efficiency involves some kind of an optimization approach, finding the best solution approach, involving minimization of time, cost, or minimization of effort, in performing a specified activity. In DSS, the computer is used not to replace the decision maker, but to enhance the manager's decision making abilities.

Introduction to Decision Support Systems

❖ MIS vs DSS

- In DSS, the manager plays a very active role, using his/her experience and judgment wherever necessary, and controls as well as directs the computer in its tasks

In decision support system the manager plays a very active role, using his or her experience and judgment wherever necessary, and controls as well as directs the computer in its tasks. Because, in various iterations sometimes new inputs are being provided by the managers sometimes there are modification of data.

Introduction to Decision Support Systems

❖ Range of Capabilities of a DSS

- Not all DSS need to include models in order to be effective
- A DSS can provide simple data retrieval facilities and yet be useful in aiding decision making .

Not all DSS need to include models in order to be effective. Models are important components of DSS, but there are many simple decision support systems wherein the models are not necessary. Decision support systems can be simple data retrieval facilities and yet they may be highly useful in aiding decision making.

Introduction to Decision Support Systems

❖ Range of Capabilities of a DSS

➤ The range of facilities offered by DSS can be listed as:

- Retrieving information
- Providing mechanism for adhoc data analysis
- Providing pre-specified aggregation of data in the form of reports
- Estimating the consequences of proposed decisions
- Proposing decisions

So, when we talk about the range of capabilities of a decision support system, we can list them as retrieving information from the database, providing mechanisms for ad HOC data analysis that can be also a DSS. DSS can provide pre specified aggregation of data and generate various forms of reports. DSS can estimate the consequences of proposed decisions or it can propose various decisions new rules by analysing the data.

Introduction to Decision Support Systems

❖ Need for DSS Approach

➤ Problem is semi-structured

- All the parameters of the problem are not clearly defined
- The parameters are firmed up as one proceeds through the solution process

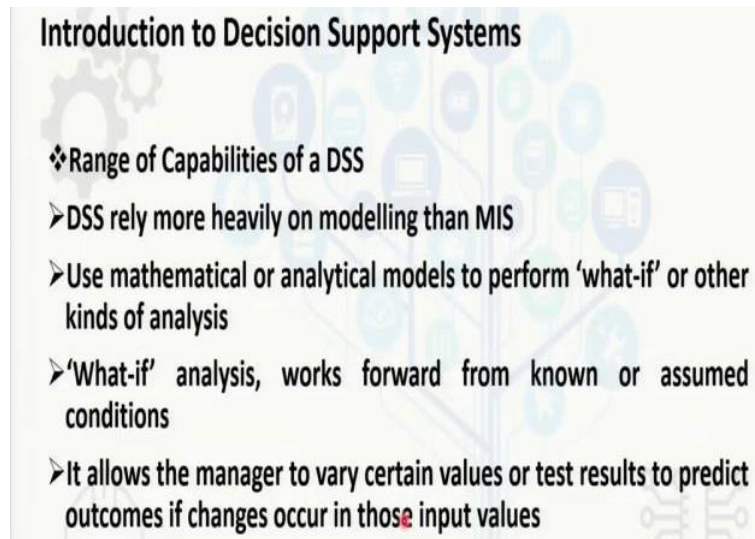
➤ Inputs are dynamic in nature

- The input data for the problem are not fixed
- These data change from time to time
- For example, incorporation of new customer or change in demand from customer

So, the need for decision support systems arises particularly in cases, where the problem is semi structured. Means the parameters of the problem may not be clearly defined and in semi structured problem another important thing

happens is that the parameters governing the problems are firmed up as one proceeds, through the solution process.

DSS is also used widely in cases, where the inputs for a given problem are dynamic in nature. That means, the inputs that are required for solving the problem are not fixed, this data change from time over time this pattern of data changes, for example, incorporation of new customer or change in demand from the customer.



So, whenever the demand changes a fresh set of input comes in. Decision support systems rely more heavily on modelling than management information systems. Sometimes the models may be very simple, simple mathematical analytical models. We can use a spreadsheet to perform, what if or other kinds of such analysis through a spreadsheet. So, what are those 'what-if' type of analysis, that we perform every day on a daily basis through excel.

'What-if' analysis works in the forward direction from some given condition or assumed conditions. It allows the manager to vary or change certain input values or test results to determine or predict outcomes whenever some changes occur in the input values of those inputs.

Introduction to Decision Support Systems

❖ Range of Capabilities of a DSS

- What happens if we raise product prices by 10 percent or increase the advertising budget by Rs. 10 lakhs?
- *Sensitivity analysis* models ask *what-if* questions repeatedly to predict a range of outcomes when one or more input variables are changed multiple times

For example, here we have given 2 examples what happens? If we raise prices of a product by 10 percent or increase the advertising budget by rupees say 10 lakhs, what happens to the profit or what happens to the total revenue? If the price is increased by 10 percent or advertising budget is raised by 10 lakhs. So, sensitivity analysis models ask, what if questions repeatedly to predict a range of outcomes.

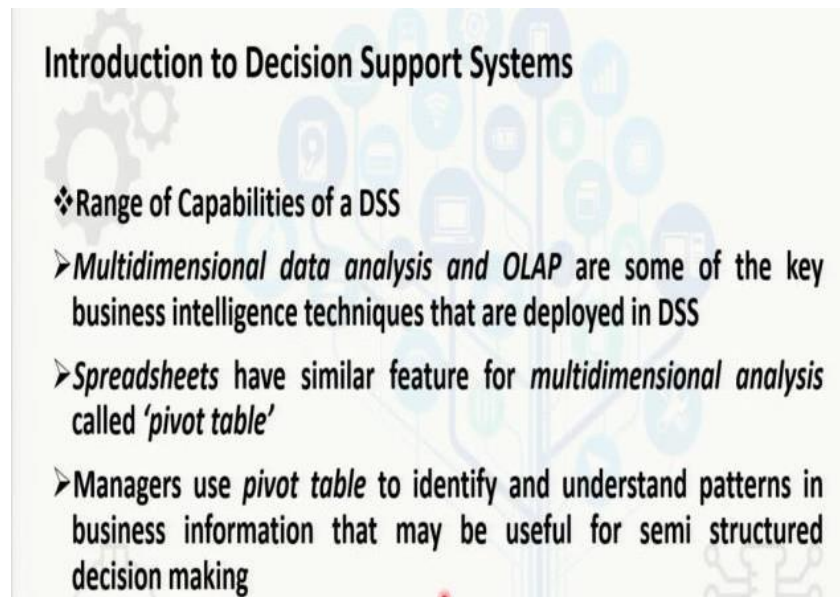
Introduction to Decision Support Systems

❖ Range of Capabilities of a DSS

- *Backward Sensitivity analysis* helps decision makers with goal seeking.
- For example, if the user wants to sell one million product units next year, how much must he or she should reduce the price of the product?

When one or more input variables are changed multiple times? Backward sensitivity analysis helps decision makers with goal seeking. For example, if the

user wants to sell one million product units next year, how much he or she should reduce the price of the product? So, the goal is specified. Now, you try to see what should be the values for the input variables. This also can be accomplished through the use of simple spreadsheet models, using that goal seek function.



Multi-dimensional data analysis and OLAP tools are also some of the key business intelligence techniques that are of late deployed in decision support systems. And multi-dimensional analysis through excel spreadsheets take the help of this pivot table, pivot analysis. Managers they use this pivot table to identify and understand patterns in business information that may be useful for solving semi structured problems.

Introduction to Decision Support Systems

❖ Range of Capabilities of a DSS

- In the past, much of this modelling was done with spreadsheets and small stand-alone databases.
- Today these capabilities are incorporated into large enterprise BI systems where they are able to analyse data from large corporate databases

In the past, much of this modelling was done with spreadsheets and small standalone databases. But, today these capabilities are incorporated into large enterprise business intelligence systems, where they are able to analyse data from large corporate databases.

Introduction to Decision Support Systems

❖ There are several other problems for which decision support systems have been reported to have been successfully employed

- Some of these problems are
 - ✓ Decisions on merger of companies
 - ✓ Budget planning
 - ✓ Portfolio management in banks
 - ✓ Corporate planning and
 - ✓ Capacity planning in production

There are many other problem areas for which decision support systems have been reported to have been successfully employed. For example, some of these problems are when the managers they have to take decisions related to merger of different companies. So, problems related to acquisition and merger of companies are mostly semi structured and lot of decision support systems have been deployed for solving such kind of problems.

Budget planning, portfolio management in banks, corporate planning, as well as capacity planning in production are some of the examples, where decision support systems have been successfully deployed and have found lot of popularity.

1.Role of MIS in Banking Industry

A bank is understood as a place where the financial services such as checking/savings and providing credit to the customers are offered. The scope of this service in today's world is expanded to a "Financial Services Super Shoppe" where the banks have become an instrument in providing financial assistance to some activities as a policy or by regulation or for meeting sociology-economic obligations. In banking also, the concept of the financial product has come in.

The customers choose a bank mainly on the following three factors:

I. The ease of doing business.

II. The quality of personnel and service.

III. The range of the financial services.

The factors outrank the factors such as the location, interest rates, layout, banking hours, etc. The bank has a broad range of customers like individuals, institutions, trusts, business organizations, Government, and local bodies. The banks deal with some transactions, which also vary widely regarding length and complexity. The bank customer, like any other service industry, is interested in getting final results quickly. The unique service in banking mostly means solving the customers' problems in the financial matters, and the single most widely used measure of quick service is the elapsed time of transaction execution. For example, the time is taken for crediting the amount, withdrawal of cash, the sanction of a loan or credit facility, etc. are the norms of deciding an excellent service. The MIS in banking industry revolves around this aspect. The customer of the bank would like to know the status of the account very fast to make decisions on withdrawals or payments. He is interested in obtaining the loan assistance for his particular need with a reasonable rate of interest. Some customers would be interested in tax consulting and tax planning. Mother group of customers would be interested in investment guidance for investing in stocks and securities. To avoid the inconvenience of going to some places for payment of small amounts, customers need service at the counter to pay electricity bills, telephone bills, taxes and duties to the local bodies and the Government. Hence, the MIS is to be designed to identify, decide and develop a service strategy for offering a distinctive service to the broad range of customers seeking a variety of service demands. The following points should be taken care of while designing an MIS for a bank:

1) Customer database

- **The service expectations and perceptions revolve around the following factors:**

- Customer — individuals, company, institutions, etc.
- Operator — housewife, employee, the officer of the organization. The range of service — savings, credit checking and payment, other financial services.
- Class of customers — income group, corporate bodies, etc.
- Working hours — morning, afternoon, evening, etc.

The management of the bank should create a customer database and analyze the needs of the customers from time to time to create suitable service package.

2) Service to the account holders the customers (account holders) need constant advice on the status and its operations. Most of the customers use their account for routine payments affecting the balance. Many times, the account holds a large amount and it is not transacted for any purpose.

The MIS should give following reports to the management:

- The non-moving account.
- The account was having the balance of more than, say Rs.50,000.
- The account was going down below minimum balance.
- The regular payments not made.
- The routine credits not arrived.
- The defaults on loan repayment.
- The delays on crediting cheque amounts.
- A sudden rise and fall in the account movement.
- The account holders were giving 80% business to take personal care of their service expectations and perceptions (the CRM perspective).
- Based on these reports, the management of the bank should alert or warn the customer to act on his account to correct the situation. The personal and individual account holders need such a service badly as they have to manage their domestic or business activities in a tight money situation. The MIS built around such demands would help not only the bank manager but also the account holder.

3) Service for business promotions The bank finances can be utilized in some ways to increase the banking operations by offering credit to the right kind of customers. It is, therefore, necessary to study the trend in the business industry and solicit the customers from the upcoming and growing business sector. The MIS should concentrate on data collection from various sources to analyze and conclude the future corporate strategy. Such information will help the banker to move out to talk to the customer to obtain business for the bank. Such support will also reduce the risk of the account going into the red and bad debt.

4) The index monitoring system One more feature of the MIS is to monitor the variety of indices and ratios related to banking operations, which are internal to the banking business. Some of these ratios fulfill the legal needs like the Cash Reserve Ratio (CRR)/ Statutory Liquidity Ratio (SLR); some meet the policy needs like the priority sector ratio to total advances and so on. It is necessary to build the MIS applications to support the bank manager in making decisions to keep different norms and ratios within the acceptable limits. He should also get support through Decision Support Service to handle the problem of not meeting these legal standards.

5) Human resource upgrade there is a lot of human aspect in the banking operations. With computerization, the service may become faster or quicker, but still, it requires a human touch and skill. It is, therefore, necessary to upgrade the expertise and knowledge of the bank employees to offer proper service to the customers. The financial world changes so fast that retaining a client base is a challenge. The financial service business is becoming competitive and offering an excellent, distinctive service is the only solution to improve the business prospects. The service has to be more aggressive for particular problem solving of the customers. The MIS should identify such needs and offer help to the management in designing training courses for the employees to improve their knowledge about banking and the financial world. In the banking industry, the traditional methods of real performance are at odds with good service. An excellent financial performance may not necessarily mean a good service quality. The customers of the bank expect the service to be delivered in a smooth, problem-free, efficient and timely manner. The managers in the bank have the service as well as the financial goals to achieve. It is, therefore, necessary to set the internal standards, accuracy, responsiveness and timeliness. The systems and the resources provided to meet these standards need monitoring, and the MIS will provide feedback on these standards so they can be regulated and controlled. For example, a multinational bank has set standards on satisfying the queries in the first phone call, cheque clearance time, waiting time, etc. It has set eighty-one separate 'Quality Indicators' for the Bank Card business and so on. The MIS

measures these standards and gives feedback on achievement or non-achievement.

2. MIS in the Hospitality Industry

MIS application in the hospitality industry is very vital. Without a proper system in all aspects of its operation, reaching to guest needs, adapting to trends and other changes in the industry, maximization of profit, and all others will be difficult and is challenging. Consistency might be overlooked and information needed might not be enough to make decisions. These will then result to a mismanaged business, which, in the long run, may cause to bankruptcy.

As MIS represents to approach a company takes to gather information used to make business decisions, this is also the same with the hospitality industry. It needs a system to gather and disseminate information pertinent to running the organization. Computerized systems shorten the lead time for information transfer. It allows hotels to send information in near real time capacity to individuals who need it.

Because hotel administration includes several different responsibilities, MIS can help them track both financial and operational information at one point, allowing managers to measure the hotel's effectiveness and efficiency all the way from the sales and marketing to room rentals, housekeeping, food service maintenance and facilities management. This then allows hotel managers to the following important things to consider:

- Determine how well they sell rooms.
- Know the profit from each night.
- Determine the cost of ancillary services.
- Identify the staff needed to run the company

MIS applications in hotels can then be summarized below:

- Guest profile
- Occupancy rate
- Future projections

- Monitoring expectations
- Needs for communications
- Guest database

Information Systems Used in the Industry

To manage hotel's occupancy rate, reservation system, room availability, guest's records, and other aspects pertaining to selling of hotel facilities, information system are available for their use. These systems are available in the market in which a hotel needs to purchase a license to use them.

- 1. Gatessoft's Genesis Hotel PMS** : This is a property management system that handles hotel information from reservation, sales, marketing, housekeeping, and all other permanent information that help provides easy hotel and guest transactions.
- 2. Lodging Touch Property Management System** this information system as used by some hotel is divided into various modules. It can interact with the travel front office, group sales, guest history, account receivable, as well as travel agencies and yield management. Users can search field such as their name, address, and confirmation numbers.
- 3. ParagonAS/400 front Office System** This claims a flexible system that provides information in order to achieve optimal standards. It provides information and feedback to measure financial impact and quality. It helps users improve their guest service, make their internal operation efficient, as well as provide them control over their financial data integrity.

It has the following feature where users can benefit from:

- a) Reservation
- b) Flexible rate configuration and maximum room occupancy resulting to optimal return on rooms
- c) Access on room available by type
- d) Provision of confirmation letters and pre-printed registration cards

- e) With hotel configurable field to capture additional guest information.
- f) Available to maintain wait lists
- g) With flexible package configuration

3.Application of MIS in Hospitals

The front-end applications –

a. Patient database –

- i . Handling the queries on the existing patients and the patients treated and discharged.
- ii. Queries can also come from the visitor, a doctor or other employees of the hospital.

b. Medical server database –

- i. Name, address, telephones etc. of all medical staff.
- ii. Hospitals, work times and the locations on the week days for the contact.
- iii. Service centers like the laboratories, the blood banks, the especial clinics etc. in the town for providing the support services.

c.Resource planning and control –

- i. An online query facility for answering the number of queries on the availability, scheduling and re – scheduling of the resources and the facilities.
- ii. For judging the usage of the facilities and to put them in the proper use.

d. Medical case history database –

- i. Knowledge database on the case history for the guidance and the research.
- ii. Monitoring the effect of the drugs to judge the efficacy in terms of the patient's response.
- iii. Analyze the health care demand.

The back-office applications

a. Core applications are:-

- i. Manpower and personnel planning.

- ii. Payroll and employee related applications.
- iii. Hospital billing and the recovery.
- iv. An inventory control procurement, the planning and the control.
- v. The expiry date management.
- vi. Resource utilization and the analysis.
- vii. Financial accounting.
- viii. Capital budgeting and the expense control.
- ix. Maintenance of the service facilities.

b. Critical control application –

- i. Patients waiting time and the service cycle.
- ii. Not using the critical resources.
- iii. Stock outs of the critical drugs.
- iv. Analysis of the delays in terms of the duration and the causes.
- v. New trends in the service demands and the service performance in such cases.

4. Application of MIS in Manufacturing sector Definition of Manufacturing Sector

Agglomeration of industries engaged in chemical, mechanical, or physical transformation of materials, substances, or components into consumer or industrial goods.

Transaction Process System

A transaction process system (TPS) is an information processing system for business transactions involving the collection, modification and retrieval of all transaction data. Characteristics of a TPS include performance, reliability and consistency.

Functional aspects of TPS in Toyota as

- Import management system
- Stores management system
- Sales system

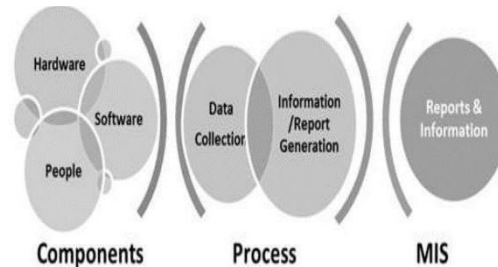


Management Information Systems

MIS is a system which provides information support for decision making. It provides data and information for business and strategic planning for middle and top management level respectively.

MIS in Manufacturing sector

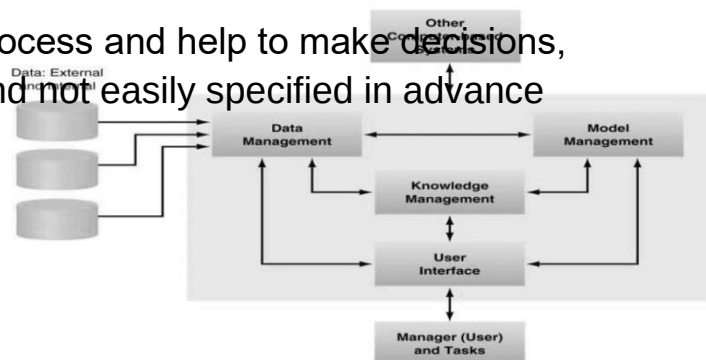
- Production management
- Personnel management
- Financial management
- Material management
- Marketing management



Decision Support System

A DSS is a computer-based information system that supports business or organizational decision making activities.

- A DSS is a collection of integrated software applications and hardware that form the backbone of an organization's decision making process and help to make decisions, which may be rapidly changing and not easily specified in advance



Decision Support System in Toyota

Toyota uses Warehouse Management System as its Decision Support System. It is used due to the fact that knowledge generated of it is used in decision making process.

It primarily aims to:

- Control the movement and storage of materials within a warehouse.
- Process the associated transactions , including shipping, receiving, put away and picking.

Toyota Warehouse System combined with the logistics equipment of Toyota Material Handling Company, they are able to provide customers with optimized logistics solutions at their worksite.



**BIJU PATNAIK INSTITUTE OF IT & MANAGEMENT STUDIES,
BHUBANESWAR
MODULE-II: MANAGEMENT INFORMATION SYSTEM**

PREPARED BY: P. K ROUT ASST. PROF(IT), BIITM

ERP Overview- Defining ERP.....

- **Enterprise:** Any organization that has a set of common goals
 - **Resource:** Assets of the enterprise in the form of Man, Machine, Material
 - **Planning:** Planning for effective utilization of resources
- ERP is **integrated** information system built on a **Centralized database** and **common computing platform** helps in effective usage of enterprise's resources **facilitates the flow of information** between all business functions of the enterprise

Now, ERP overview defining ERP we started with like what is an ERP. So, this will explain what it is basically. So, E is for enterprise; is any organization that has a set of common goals. So, that is what an enterprise is, resource is assets of the enterprise in the form of man, machine and material. You can add data to that because we are now saying data is another resource. Planning, for effective utilization of resources. So, we need planning for effective utilization of resources.

So, any enterprise; so its you see the word ERP; so, says enterprise, the resource and we are planning. So, that is what all this product is doing, its managing the resource and planning for it. So, **ERP the definition classic definition is an integrated information system built on a centralized database. So, it is not individual software machine's, PC's etc.; its built on a centralized database and common computing platform.**

And of course, it is accessed by from all over the place through in from individual machines and it helps in effective usage of enterprises resources, facilitates the flow of information between all business functions of the enterprise. So, this is the key thing; effective usage of enterprise resource is one, the second is the last part; facilitates the flow of information between all business functions of the

enterprise. And that is exactly why we are saying that ERP is one of the base one of the platform for the entire MIS system.

Because, unless you are able to integrate your different business functions on a common platform such that the information flows across all functionalities, you cannot have any proper MIS not possible.

So, MIS all MIS actually starts with an system; ERP is one of the such system. ERP not necessarily is the only system, there can be other systems also where different functionalities of your enterprise get connected on a single platform and you can share information across all the functionalities.

So, there is no wall as far as information flow is concerned there is no wall. So, one data entered at the security gate, when a goods comes in when a material comes in to a factory; a security watchman receives the material; sees the document the challan and then enters in his system that supplier so and so, material such and such, quantity such and such received on the date, time. He just enters these few data. Immediately across the organization everywhere this information is can be seen.

It flows is not really the light way of saying technically, it does not flow anywhere, it does not actually move, but of course, the intent the data gets captured in a central database and the central database is accessed by all functionalities. So, if you are a finance person are most important here the purchase person, the materials persons the stores the in charges stores or even the production guy. Suppose the production in charge is waiting for urgently for that material.

So, he is tracking it on his system; has it come, has it come, has it come. So, as soon as that watchman the security person enters that he will this when he sees the quantity for the material that what is a shop floor man is doing is searching quantity x and the name of this product whatever it is. Say it is called product x, what is the quantity available? Till now it was 0 morning, now 100 quantity gets supplied; the watchman enters 100, now he sees 100 immediately, real time.

So, he knows that 100 material has come. So, he immediately calls up the stores person, your material has come please bring into the stores immediately and send

it to my shop floor my production is waiting. I have to deliver this material by end of the day.

So, give it to me as soon as Possible: ASAP; the stores person also sees on his screen yes the material has come. So, he gets it, he contacts the quality guy; the quality guy also person sees on his screen that this material has come and it is waiting for quality inspection.

So, he immediately goes to the stores, sees the material, does the quality inspection and then puts his comments; and whether he accepts all or reject some; quality check, etc. So, let us assume, he accepts all; all are good quality. So, he passes that quantity, quality check; as soon as it becomes quality check in the system, the material becomes free to be issued to the shop floor. Till now it was not free; till the quality inspection is over, it was kept blocked that you cannot issue it.

These all being done by the ERP system, the software is doing it at the base bottom; you are only just entering some data. So, quality person enters yes 100 quantity passed, immediately that log gets released.

Now, the production person can issue the material from the stores; send his man with the trolley. He goes picks up those 100 quantity, brings his shop floor and he continues with his manufacturing operation; completes his order what we are supposed to and he is delivers it by the end of the day.

Now, the sales person, the sales guy what is he doing here? What is his role? What he is doing his customer is waiting for that material. So, he is also watching his screen he says oh yes the material has come and then in the production has got it and the final end of the day production has finished, it has gone to the finish good store. And so, now, he can issue an invoice to send it down, dispatch it to the customer. So, everybody is getting whatever information he needs and all from that system.

And, everybody nobody's talking to him, we are just on your screen your login you know yes whatever is my interest information I need its available, that is the beauty of the strength, the power or beauty of an enterprise resource planning software. So, several times in my discussion following similar examples will come

up, but I try to give you at the beginning itself the overall basic concept of what is the power of an ERP. So, that is why ERP is such an important thing.

So, below in the picture it shows of course, the various entities how they are connected. So, vendors, inbound logistics; I was talking manufacturing, transportation, distribution, customer, consumer, everybody is linked to ERP.

ERP Overview - Defining ERP

Enterprise resource planning (ERP) is a method of efficiently utilizing People, hardware and software to increase productivity and profit.

Thus simplifying a company's business processes.

ERP may include many software applications or a single (but more complex) software package that smoothly disseminates data required by two or more unique business departments.

So, ERP defining continuing on the definition is a method of efficiently utilizing people hardware and software to increase productivity and profit. Thus, simplifying a company's business processes. ERP may include many software applications of on a; or a single but more complex software package that smoothly disseminates data required by two or more unique business departments. This is exactly what I was talking about to you in the previous slide.

The many departments are involved from the stores, security stores, purchase the, manufacturing, sales and they are all you know connected by this one particular software. And, all of these be helping to build efficiency into the system and when you build efficiency it is increasing your productivity and profit.

ERP Overview – Why ERP

The need for enterprise resource planning (ERP) software grew with big business' mandate for a centralized solution to manage all information system requirements. An ERP may consist of many different business modules, including:

- Manufacturing/ planning
- Human resources/ payroll
- Sales
- Material / inventory purchase
- Supply chain/ partner
- Finance and Accounting

Why ERP? Again continuing the need for enterprise resource planning software grew with big businesses mandate for centralized solution to manage all information system requirements. So, I have been repeatedly saying, why it is a need; a basic thing of the base of foundation of this information system requirement. So, it has to be centralized solution.

So, everything has to be you know collected at a centralized server from where everybody can view their requirement. So, an ERP may consist of many, different business modules including like, these are the components – manufacturing, planning, human resources, payroll, sales, materials, inventory, purchase, supply chain, partners, finance and accounting, etc.

So, any you name you name any function and these are available in the best of class ERP softwares like SAP, Oracle etcetera. So, you it could be a including like environment health and safety; I have not included all of those, but everything is there; supply chain, customer CRM, CRM everything is included into our ERP, modern ERP systems and softwares.

Need of ERP & Characteristics

ERP Overview – Why ERP

The three major Drivers:

- From Department to Enterprise
- From Function to Process (e.g. Order to Cash)
- From Function Silos To Integrated information system

Why continuing on why ERP; so, the three major drivers from shift from a department level to enterprise. So now, we are talking about the company as a whole. We are not talking about a finance department or a materials department or a purchase department or a sales department or a manufacturing department; it is a company, enterprise. So, it is all everybody's on a central database. So, it is becoming virtual.

So, instead of physically you are seeing of course, in a building when you enter. So, this is the finance department or that is a manufacturing shop floor we know it is always you can visible the whole half the thing is a shop floor the, those warehouses for example, your stores. So, we can physically you know see, but here in a system we convert that entire physical system into a logical system.

So, that is what IT and software does. So, what do you see physically now is becoming logical and virtual. So, there is you do not see anything physically separate things because in the software scale whatever you are allowed to see in a screen you see on your screen and from function to processes.

So, we call say accounts function or a finance function or a manufacturing is a function sales as a function. But, when you talk about process then it cuts across various functions. For example, a process is cupboard process known as order to cash, means from a sales order to a cash.

So, you receive his order from someone to deliver a product right. So, you create a sales order against that sales order you manufacture something. Once you manufacture something, you deliver it to your customer; once you deliver it to your customer you raise an invoice. Once you raise an invoice and the material is

accepted by your customer then the customer releases your payment so, you get cash.

So, how it started? The first function was the sales, the sales department got an order that is the sales function then they release it to planning. So, planning is a planning function as part of production planning.

So, once the planning department, then tells the production manufacturing person to manufacture it and they break it up into various components what is required which is the bill of material. So, the production department does the manufacturing and for manufacturing the production department needs material.

So, it goes to the material department to get the material from the vendor, suppliers. So, that is a materials function material management or purchasing then once then you need of course, quality check at every stage production. So, that is quality management then you have of course, plant maintenance because machines have to be maintained. So, that is also a module separate functionality, maintenance department we are the maintenance department

And then finally, when it is delivered it goes to the stores again that is part of materials management and then from there it is now shipped to the customer. So, one the shipping etcetera billing again is a sales function. Now, for doing all these operations of buying things etcetera getting material from the vendor, running the factory, energy, power, paying salaries to the labor you need money, cash. So, money is given by the finance departments; so, that is the finance or the accounts department that is the finance function.

And, then when this yours customer gets the material, he pays; once he pays that money comes into your company's bank account. So, that is again a finance function because it is an accounts receivable. So, the account once you generated invoice it becomes an account receivable that is in the accounts receivable book it will show that I am expecting so much money to come from such and such customer. And finally, where it comes you get cash; so, that is again a finance function.

So, you can see there are so many functions involved starting from sales and ending with finance; in between manufacturing, quality, plant maintenance, materials management, again sales and overall there was always finance. And, then there was always an HR because HR is always involved in your factory; employees and their payroll, etc.; is managed by training, etc.; managed by HR. So, HR is always there.

So, HR and finance are really they cut across again the whole thing, they are at the base and then you have individual functions; **functional and pillars and that is known as a process orientation.**

So, from a function to process orientation order to cash; so, from **functional silos to integrated information system.** So, what I was talking about; so, long is that from functional silos means with boundary walls you have broken up all the boundary walls, now we have an integrated information system.

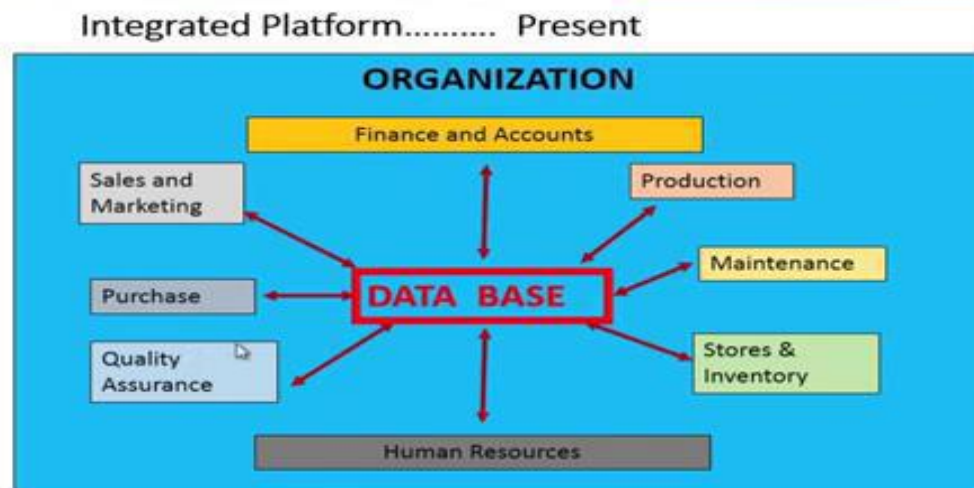
So, from the sales to sales or sales to finance, in between there were so many other functions; I was talking manufacturing, maintenance, quality, etc. It was all integrated because information was flowing automatically and everybody knew what is happening when from their own screen. Because, whenever you do a transaction; you hit a key enter etcetera that data is getting in updated into your database, central database. And, the central database is throwing up reports and information depending on which function is going to use it.



Now, stand alone solutions just have the history before ERP, if an organization I was stuck on the like finance and accounts, sales and marketing purchase then you have quality assurance here.

then you have finance and accounts and then you have production, maintenance and stores and inventory and then a HR is of course, there here covering all. So, this was worked thought the history maybe 30-40 years back; most of them he is to work an isolated manner. And, everybody was generating their own data set of data and then it was either manually moved.

If you I do not think you have what about something called a floppy disk, you have not seen, but we have seen in early 80's, 70'ss and 80's floppy disk is used to be used to transfer data. Then later on it came CD, but those are on an outdated because now everything moves data flows through your fiber optic cables. And, this is what we have today that is a central database.



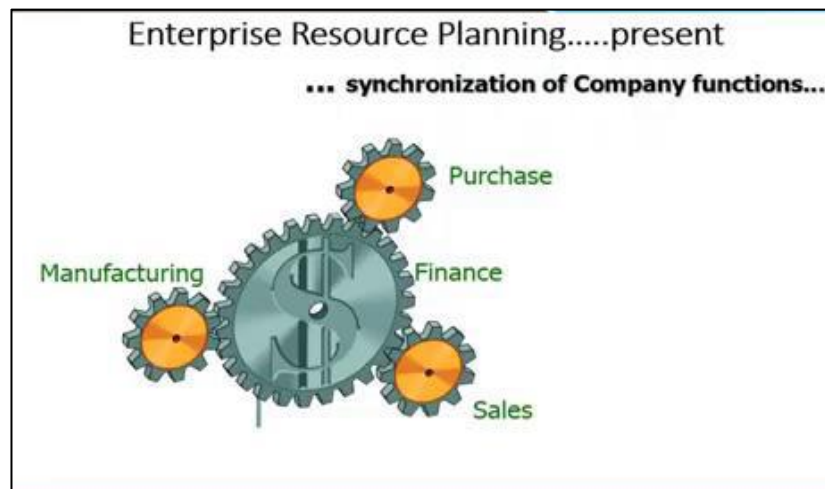
And, all

departments and functions are connected to the database and everything is get stored in the central database and everybody accepts. So, the accesses the data. So, everybody is accessing the same set of data. So, there is no question of any mistakes or different data being given to different department. So, since that data is common unique in a central database whatever here is here is being seen by everybody; everybody sees the same data.

If the quantity was produced 100 by say production here and they say we produced 100 today then everybody concerned people for example, sales and

marketing they will see yes 100 of that quantity was produced. Finance and accounts will know yes 100 of that quantity will was produced. Stores and inventory team will also know that yes 100 of that quantity will be was produced today.

So, everybody sees that same figure. So, no question of different information being you know with its common sales will say production so, yes I produced 100. Sales will say no you did not produce, I need not get when I went to the stores I saw only 90. So, all those things are now passed, they are forgotten; we do not now talk in those languages anymore.



So, here is synchronization of company function like I was talking finance is at the center purchase. Now, what it shows by this by simple you can see by the picture the gear wheel; if one of the wheel is rotated, every all other gears are wheels also moving. What it means that mean manufacturing say is rotated; that means, I create I produce 100 quantity. What is happening? Finance is also impacted because for that 100 such amount of money was spent because so much material was consumed.

So, accounts money gets dividend from certain accounts from material account. So, much material was consumed. Sales, gets impacted because they come to see 100 of finished product in the stock. So, their stock which was probably 50 previously you know 100 gets added. So, instead of 50 now they see 150.

Purchase for them they see that so much material was consumed; so, that much of material stock level has come down, has got reduced in their inventory.

So, in the stores department they need to replace those material for further production because the production is going on every day. So, they need to replace those material that has to be. So, they have to place fresh order to the vendor that replaced so much of material because that has much has been consumed today.

So, one action one data point from one any one department will trigger make every departments values change. So, that is why I am showing this figure with wheels if I if you just rotate one of the wheels all the wheels will also rotate. So, they are getting impacted. So, nobody is isolated, you are integrated. So, one action by you any one department will impact immediately other departments. So, that is what builds in transparency to the system.

So, so, it is also against I had some other connotations like if you do a mistake, an error then everybody else will also come to know the error. Suppose, instead of 100 when you are entering the data, how much did you produce? 100; say you add one more 0 by mistake; instead of 100, you type 1000. The entire company will come to know that a 1000 material has been produced.

But you actually produced 100; we actually consume material for 100; net quantity, etc.; and the sales also will, know that; but what will happen; the purchase will see in the view; material for 1000 quantity has been consumed. So, they will immediately trigger bigger purchase order to the vendor. So, much material 10 times more materials got consumed, supply me immediately more.

The sales person will see that I had 50, now I have got 1050 material, ex stock what do I do it so many material? I need only 150. So, he will start looking for new orders, new customers. So, if you can push the sale and after a day or 2 people will realize that was the whole thing was a mistake. But, maybe by that time some damage has been done maybe purchase department has released some purchase order to the vendor to supply more material and maybe the vendor has also supplied that material.

So, that is another problem with integrated systems, if you do a mistake; the mistake also gets you know spread out everywhere. So, you cannot isolate your mistake, you did a mistake previous day he had entered something in your note book, register and you realize maybe next day that was mistake you cut it and change it; not much of damage done. But, in an integrated system it spreads out everywhere.

Now, just imagine if the company was global, worldwide see the extent of damage; the worldwide does the information will get spread out that this particular the wrong information and then recovering from that mistake becomes another big challenge. So, bigger the organization, bigger the problem.

**Enterprise Resource Planning– present
.... Synchronization of Company function.....**

Question- when, manufacturing happens, how do purchase, sales and finance get impacted?

An integrated suite of business applications, which....

- Closely links, monitors, and controls primary enterprise resources like manpower, machine, material, methods, market and money
- Enables corporates to readily change their processes to adapt to the ever changing business scenario
- Provides expertise in industry specific business process

So, for everything there is I mean there are lot of advantages pluses, but there are also you know some things which you have to take care of that is why you need adequate training. So, everybody needs very training. So, enterprise resource planning one of the thing we complicated thing about implementation is proper training for all employees. So, that is why many employees give that resistance to ERP because they know they have to learn a lot of things.

And, if they do a mistake, just once you press an 'enter' on your computer keyboard; done; the information goes out to everywhere. Synchronization of company functions; it is a question when manufacturing happens how do purchase, sales and finance get impacted? I have already explained that in the previous slide. But, you can also you know do some more reading and thinking.

An integrated suite of business applications which closely links, monitors and controls primary enterprise resources like manpower, machine, materials,

methods market and money. So, that is again another major thing what the ERP is actually delivering. It enables corporates to readily change their processes to adapt to the ever changing business scenario and provides expertise in industry specific business processes.

Now, here this needs a bit more explanation that is these ERP softwares they come with what we say is loaded with industry best practices. Now, what it means that this SAP is implemented same SAP product is implemented in say let us let us talk about say automobile companies. So, let us talk about some big automobile companies like General Motors, Mercedes, BMW, Toyota, Honda etcetera across the world they are also using SAP most of them.

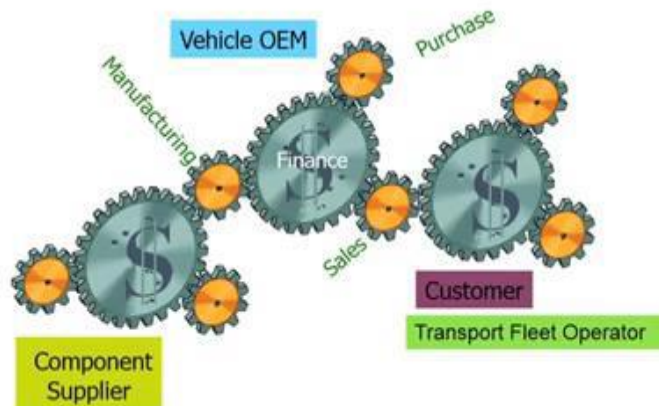
Now, when we have an Indian company auto company say for example, Maruti also wants to use SAP they want to implement, now if the SAP product is always evolving. So, they are capturing the best business processes which are being used by those large successful automobile companies like say for example, Toyota and Mercedes. Now, when a Maruti buys a SAP and wants to implement then SAP will tell Maruti see here use this particular business process.

Because your process is not what I am saying and what I am saying is a business process which is being used in Toyota and you know how successful Toyota is. So, if you use those processes you can also perform better. So, that is what is known as the best practices. So, it provides expertise in industry specific business processes. So, this is another major feature of ERP product or SAP product.

But just be aware you must be conscious or aware of the fact that these products get enriched everyday by the experiences gained in large successful multinational companies. And, whenever we buy that same product here in India and other countries we get that advantage of that particular knowledge. So, that particularly whatever knowledge is acquired in those successful companies also get transferred or transmitted to us when we buy or use this same software.

And, that is why no wonder these softwares are sometimes you know quite expensive because bring in lot of additional value.

ERP... and extended to the complete value chain...



And, this these are the informations which you will not get anywhere. This is another view of the ERP which is extending it to the complete value chain. So, you have at one end on the right here the customer and say this is an example of a vehicle OEM like say for example, Tata Motors or Maruti or Tata Motors making trucks. So, at the one end you have the customers say transport fleet operator and the other dimension on the left you have your component supplier.

And in between in the center is of course, said the vehicle the truck manufacturer say we can take a name Ashok Leyland or Tata Motors. So, and everybody their large customers and their vendors are also very large, they also have their own ERP systems. So, not only Tata Motors has SAP he say transport fleet operator or say some state transport corporation they also have SAP, they are buying a lot of buses. For example, Maharashtra Road State Road Transport Corporation.

And, say a battery supplier say Tata Motors is making so many thousands of trucks and so they need batteries. The batteries being supplied by Exide for example and Exide have their own SAP. So, all these ERP systems can get connected. So, when you release a purchase order from say release a purchase order for bus from Maharashtra State Transport Corporation through the ERP it is creating a purchase order on Tata Motors; deliver 100 buses, that immediately flows into the Tata Motors SAP system as a sales order, that sales order from MSRTC for 100 buses.

Now, that when they do their planning, they do the MRP we will talk about later Material Requirement Planning, the bill of material is exploded. And, then 100 trucks you need 100 batteries see that again through that it creates a sales order for 100 batteries on Exide Corporation or Exide limited. See in the Exide limited system in the ERP they receive a purchase order or they receive a sales order for 100 batteries.

So, you see where bus order triggered from a state transport corporation on a real time basis in online that 100 batteries order comes to Exide all instantaneously. It does not take any time; no and no human intervention. The system is taking care of the whole thing because the systems are all connected. So, that is again another you know strength beauty whatever you say about for things like ERP and integrated information system.

Problems with information silos

- ✓ Duplication of Data and chance of making mistakes
- ✓ No integration between different Systems
- ✓ No online updation of information
- ✓ No real time availability in information
- ✓ Multiple data entry, increase possibility of making mistakes
- ✓ Different naming conventions in different departments

Now, the problem with information silos these are some of the standard problems we have with information silos. Duplication of data, I had said mentioned earlier change chances are making mistakes. No integration between systems, no online updation of information, no real time availability of information, multiple data entry increases, possibility again of making mistakes because you have to enter data several places same data you can you know humans can make mistakes.

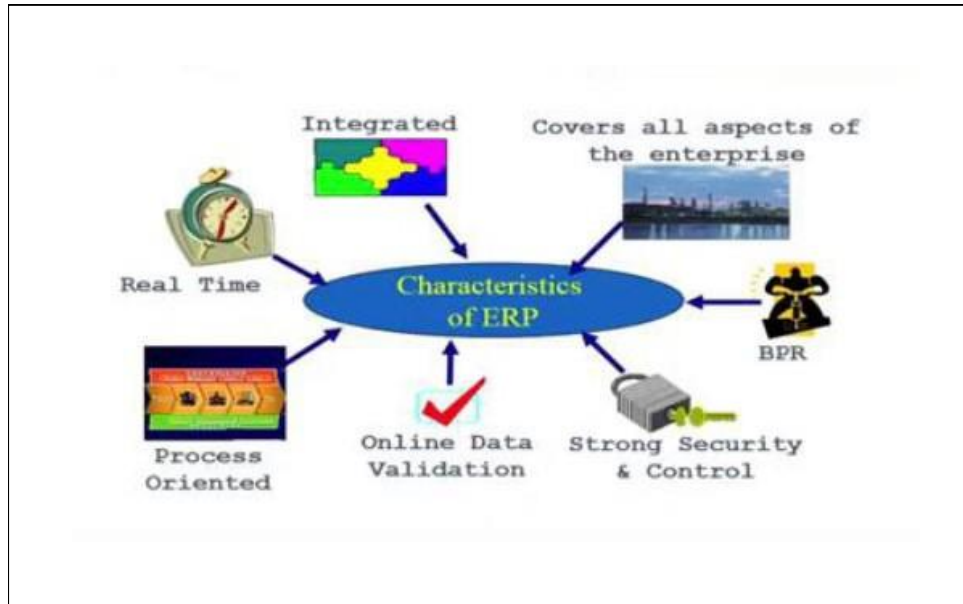
So, if you best is to may enter data only at one place. So, that you can avoid all these problems and different naming conventions in different departments; as a same material which is used in multiple departments can have different

nomenclature. Sometimes these things happen when things are not integrated system. So, ERP again it is all about integration, the whole software is an integrated software.

ERPs bring Central Database and Integrated Information System



ERP brings central database an integrated inference system, I think we have discussed all these that ERP data we say the center and all the other functions is surrounding, it maintenance plant maintenance, quality management, human resource, procurement, production planning, sales and distribution, finance and controlling, warehouse and transportation. You name it all the functionalities, they are all connected to the central ERP database and that is how the whole system works.



And, these are the some of the features of the characteristics of ERP, it is integrated I have already discussed. It covers all aspects of the enterprise I have discussed. BPR I also partly discussed, BPR is nothing, but Business Process Reengineering that is when I was talking about those Toyota best practice Toyota of Mercedes etcetera. And, when you buy a use an ERP, SAP since Toyota is also using SAP you can get whatever processes have been developed by Toyota into yours business processes, not the physical car making process.

But the business processes, you can get those best practices also implemented in your organization. Real time we have discussed real time here we have already discussed the beauty of real time, process orientation we have discussed that how things are all process oriented; not my functions or departments, but process. Online data validation that is a typical advantage of any central database software, where when you enter something value it can get validated and many fields can get online data validation.

So, that your chances of making mistakes again is further reduced because now you are using a software, a sophisticated software, very expensive software. So, they use lot of data validation. Strong security and control, now in any IT system security is a major concern. So, it has to be you know virus and all that stuff then hacking and these ERP software's have got very good security and control.

Evolution of ERP

ERP - Evolution and Benefits, Role of Manager in implementing ERP issues and Benefits from ERP implementation

So, continuing on our journey with ERP Enterprise Resource Planning now we will talk about Evolution and Benefits. I will give you a brief history of the product because ERP is a very integral part of the information system, Management Information System. So, a bit of history and then we will also talk little bit about benefits because that is what you primarily need to understand why ERP and what are the benefits etcetera.

There are several benefits and I already told you little bit about various aspects and that it is multidimensional, it has a very vast exposure, very vast scope and it touches upon every aspects and life of an enterprise. So, it is very broad-spectrum application I would say.

Understanding all the benefits will be difficult in this duration, but you must basically understand what are the major benefits so that as a manager and I see you as potential future IT managers, when you will join working in an MIS function, you will be able to you know sell your ideas on ERP to your customers and to your business counter parts.

When you are working on a organization in an IT department, your business managers, production manager, finance manager, purchase manager and other function heads will

be your customers and you will have to tell them about the features and advantages of ERP/ SAP and what benefits the organization will get by investing in this technology.

You will be selling the idea of SAP to them and once they get convinced, and head of finance department gets convinced based on the various benefits of the product, the CFO will convince the CEO to go for this investment so, it is very important that you learn and understand what the various major benefits of SAP are

ERP Evolution- MRP

ERP systems evolved from MRP (Material Requirement Planning) systems of 60's and 70's

Advantages

- Provides information on which items to buy or manufacture, how much quantity and on which date

Disadvantages

- Did not look at available capacity while planning
- Could not replan quickly
- Not integrated with other organizational processes.

The evolution of ERP - ERP started with something called MRP. MRP is nothing but Materials Requirement Planning. It started from the manufacturing sector, but nowadays ERP is everywhere in all sectors like financial sector, health sector, service sector, banking everywhere ERP is being used.

It started with the materials requirement planning and was used by the manufacturing sector and in my discussion, session will refer to an automobile industry because all of us see cars we and understand the product and have some idea of a car factory. It is very easy to explain things based on the automobile industry scenario.

It started in early 60's and 70's. Advantages were it provided an information on which items to buy or manufacture of how much quantity and on which date. You need to understand something known as a Bill of Material (BOM). I will be using this term – Bill of Material very often in this class.

Any material you take say for example, a Car. A car has got components. It has got 4 wheels for example, 4 wheels, a gear box, an engine, battery, then all the electrical items, steering wheel, seats, the body, the windows, the glass screens, front wind-shield, back

wind-shield, the mirrors, radiator, cooler, suspension system and so many other components like carburetor etcetera. All of these materials will be a part of the bill of material of a car.

So, what does a MRP do? When you get an order for say 100 cars, it expands that bill of material using the software called MRP and then, it will tell you that for making 100 cars you need say 400 wheels (or 500 wheels, if we consider the Stepney) for example and similarly it will give the numbers of each of the BoM items that will be required to manufacture 100 cars.

So, the MRP software will tell you to order for 500 wheels, 200 wipers, 100 batteries,

100 gear boxes, 100 engines etcetera. Thus for making 100 cars all the components will

be shown to you in the report and it (the report) will say that you have to get these many material.

Apparently this looks simple, but we know the material components are actually in thousands in a car, ranging from very small plastic components to electrical switches, dash boards, meters I mean, so many items that it is not possible for a person to remember and recall all the items without doing a mistake. This is done by this software known as MRP software. Advantage is that a complicated manual task is automated.

Disadvantage of MRP was that did not look at available capacity while doing the material planning. When you are planning to make 100 cars, you need to know how much time it will take. So, there is an important factor of time. It does not take any consideration of the capacity of the machine It assumes that the machines have got infinite capacities. It will tell you the time you will take to produce car, using the standard time and not consider any capacity constraint.

Suppose, there was a change in the order quantity but it cannot replan quickly. Suppose in a order of 100 cars, the customer tells instead of 100 give me only 80 cars. You have to replan or in another case it could be 120 cars. Re-planning in between for a change in order quantity was not possible in this original software and it was also not integrated with other organizational process like finance and materials department. So, that was the original MRP used to be called MRP 1. Then came the MRP 2 Closed Loop

MRP. The advantage was it was capable of doing feasibility check of the plans. It is a manual feasibility check of the MRP plan output (report) whether it is feasible or not to deliver within the target date and you could also replan any changes. The extra quantity requirement for additional order could be captured and re-planned. It would provide alerts and triggers if the new plan was not feasible. Suppose there is a shortage of material so, the plan will not be feasible. In such cases it will throw some alerts to tell you that there is a shortage of material, and you need to order more raw materials or components in order to complete the increased order quantity of cars.

Disadvantage of Closed Loop MRP was it was not integrated with other organizational functions like Sales, Finance, and Quality department. Integration part was missing. So, it was only integrated for Bill of Material, Stores and Purchase but not with any other functional departments like sales or finance or quality.

ERP Evolution – Closed Loop MRP

Closed Loop MRP was the next evolution after MRP which partially solved some of the MRP issues.

Advantage

- Does a manual feasibility check of MRP plan
- Provides alerts/ triggers if the plan is not feasible.

Disadvantages

- Could not replan quickly
- Not integrated with other organizational processes

From Closed Loop MRP the next one was MRP 2. MRP 2 was a bit more advanced and much stronger compared to MRP 1 and closed loop MRP in terms of functionality. These systems were well integrated with several organizational business process and had multiple modules. So, it was now really becoming one of the first ERP system.

ERP Evolution –MRP 2

MRP 2 systems were much more stronger compared to MRP/ closed Loop MRP in terms of functionality. These systems were well integrated with several organizational business processes and had multiple modules.

Advantages.

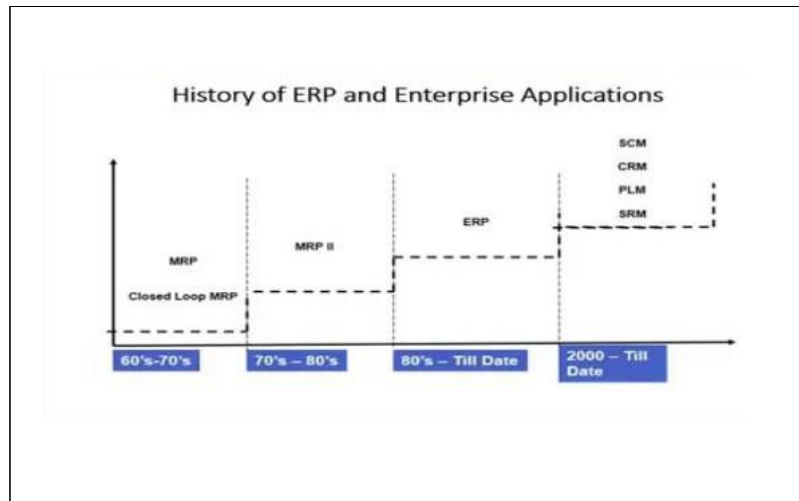
- Include processes for Sales planning, Demand management etc.
- Helped in several supply chain execution processes (like Purchase and Production order execution, sales execution etc.)

Disadvantages

- Not fully integrated with all organization process (like :HR)

MRP 2 included processes for sales planning, demand management etcetera. Many integration effects started coming in and helped in several supply chain execution processes like purchase and production order execution, sales execution etcetera. Disadvantage was that it was not fully integrated with all

organizational processes like Quality, Plant Maintenance, and HR etcetera. So, it was a beginning of you can say ERP as MRP 2 started seeing lot of integration.



History of ERP by year. We really started having the ERP since the 1980's and then from 2000 onward, we have got additional platforms, like Supply Chain Management, Customer Relationship Management, Product Life Cycle Management and Supplier Relationships Management. Again we will touch upon these later for each of them because these are very important ingredients and extension of ERP. They are also linked to ERP and they are sort of sitting on top of ERP.

ERP- some Early History of few Leading ERPs

- 1972: five engineers (IBM) in Mannheim, Germany started the company SAP, with the idea of producing and marketing standard software for integrated business solutions
- 1975: Richard Lawson, Bill Lawson, and John Cerullo started Lawson software, a pre-packaged enterprise technology solutions as an alternative to customized business software applications.
- 1977: Jack Thompson (J), Dan Gregory (D), and Ed Mc Vaney (ED) formed JD Edwards. (Merged with Oracle ERP)
- 1978: Jan Baan begins the Baan corporation that offered leading Baan ERP for several years. It is currently known as Infor
- 1987: PeopleSoft was founded by Dave Duffield and Ken Morris. JD Edwards and PeopleSoft have been taken over by Oracle and merged with Oracle ERP

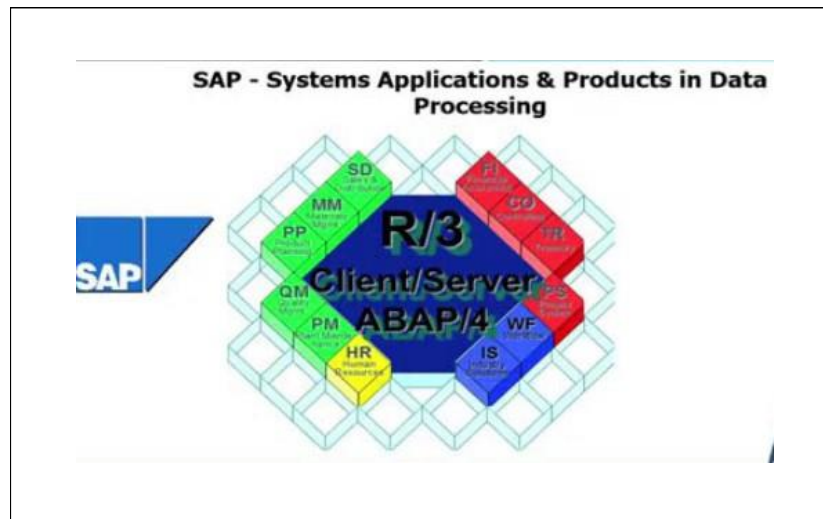
Some early history of few leading ERPs. In 1972, five engineers from IBM in Mannheim, Germany started the company SAP, with the idea of producing and marketing standard software for integrated business solutions. That is the history of SAP's birth and SAP became the most popular ERP product. Today it is being used by most industries and most of the Fortune 500 companies use SAP. In 1975, Richard Lawson, Bill Lawson and John Cerullo started Lawson software, prepackaged

enterprise technology solutions as an alternative to customized business softwares. This was known as Lawson product. In 1977 a product called JD Edwards came to the market. This was later on merged with Oracle ERP.

In 1978, Jan Baan, of Baan Corporation from Holland developed a very popular ERP especially for use in the steel plant segment. Baan software is now known as Infor. In 1987, a very popular HR ERP package known as PeopleSoft was developed and its HR module was very strong. It was very popular for HR applications and was founded by Duffield and Ken Morris.

PeopleSoft along with JD Edwards have been taken over by Oracle Corporation. Oracle also merged another very popular CRM software called Siebel and with so

many take overs, Oracle became next nearest challenger to SAP's popularity. So, we really have two very large ERP product one is SAP and the other is Oracle ERP and the third one is Infor which is number three in the world.



SAP R-3 full form is **Systems Applications and Products in Data Processing**. It is called R-3 because it is a 3 tier architecture which I will explain later in next slide. Client- Server is the architecture and **ABAP 4 is the technical language** (software language) like we talk about Java and dot-net etcetera. The software language used to develop SAP product is known as **Advanced Business Application Processing (ABAP 4)**.

These are the modules you see here **SD (sales and distribution)**. We use these acronyms very often for sales and distribution, **MM (materials management)**, **PP (production planning)**, **QM (quality management)**, and **PM (plant management)**, **HR (Human resources)** and, then we have industry solutions which I will talk about later. **WF (Work Flow)**, **PS (Project systems)**, **TR (treasury)**, **CO (controlling)**, **FI (financial accounting)** etc. These are all most of the functionalities used in any business environment.

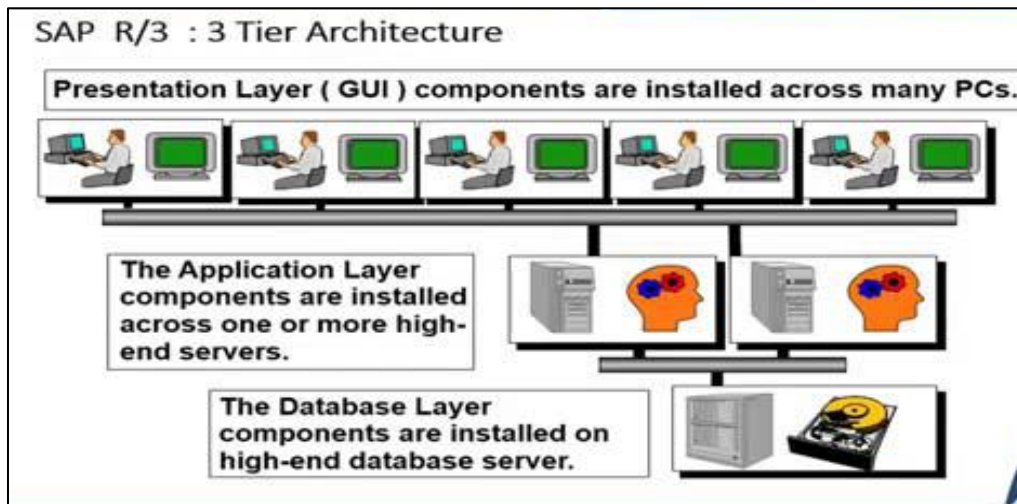
Industry Solution - SAP develops specific solutions for particular industries for example, the print media. When they use SAP, they need some very specific thing

because in the print media business major revenue comes from advertisements and these sales quantities are different from sales of any material or physical product. When they sell media advertisement space for example, they sell by column centimetres. So, the length and width of that column and the length or the number of words you put in the advertisement is used to price the advertisement item. That is a product for them and they sell by so many square centimetre or something like that. This is not a very common thing. It is very typical of a media industry and hence there is a Media Solution. Similarly, we have industry solution for Oil and Gas (petroleum) industry.

They use very different business processes and nomenclatures which is not very common with other industry. So, they have to be very specific. There is something called a Footwear and Apparel industry solution like for shoes and shirts and pants. They again sell by various different products names etcetera, brands, by size, colour I mean infinite number of combinations. So, they need again a specific software solution to handle such complexities in their sales and accounting functionalities.

For these industries SAP develops specific product which are used by only those industries and they are not used by other industries. Best Practices in SAP - An automobile industry, is very generic manufacturing industry and the business processes for most automobile industries would largely be common. Such industries do not need Industry solution as discussed above. SAP product gets continuously developed with lot of best practices as more and more large global automobile industries install the SAP software. Others who install SAP later can get advantage of these business best practices and get advantage from that. Car companies like Mercedes, BMW, Toyota, General Motors use SAP and we can learn from their experience. Whenever, an Indian automobile industry use SAP they can get the advantage from the experience gained by SAP from these large

and successful car companies of the world.



This is the 3 tier architecture. On the top is the Presentation layer (Desktop or Laptop) that is where the user is sitting where the GUI is the graphical user interface is being used by the actual user to access SAP screens and after that you have the Application layer (the servers) where all the transaction is taking place and all the calculation are being done.

And at the lowest level is your Database layer that is where the servers are storing all the data. So, whatever data is getting created, all transaction data, and master data everything is stored in that Data Base layer. This is a central database layer from where everything is accessed by the user from the presentation layer. This is why it is called 3 tier as there are 3 levels of the IT hardware - Servers in two layers and desktop - laptops on the top layer.

Business process benefits clients expect from an ERP project - We started with this and now we go ahead with actual business benefits. The number one benefit which is showed in red is inventory reduction.

Business Process benefits clients expect from an ERP project

- Inventory reductions
- Global process/ product management
- Integrated supply chain management
- Leverage purchasing and vendor management
- Order cycle time/ customer service improvement
- Reduced information systems cost on an ongoing basis

The first advantage which you get is inventory reduction. In any manufacturing industry, the major working capital requirement is for inventory. Inventory blocks up 70 to 80 percent of working capital requirement. Focus of the finance department is how to reduce inventory.

When I purchase a raw material, the idea should be to convert into the finish good as soon as possible and ship it out and send it to the customer. Inventory must move across my organization fast. Inventory comes in, gets manufactured, gets utilized, gets into the finished product and then goes out of the factory to the customer.

For example, in this COVID times, you might have seen that many car factories are not selling many units. So, there is a stockpile. In the factory stock yard one can see that lot of cars are standing. This is inventory blocked and it is not generating cash. So, your money is blocked in the unsold inventory.

In such times, the industries should stop buying raw materials and components because otherwise they will keep coming in, but finished cars are not being sold. This will result in a stockpile of car and of half-finished or raw materials and other inventory. All your money is getting blocked up in unused inventory.

So, you will run short of working capital, then you will have to go to the banks to borrow money and borrowing money is expensive. So, one of the major advantages of ERP project is how they optimize everything to reduce inventory.

Global process/ product management: - The global process I was talking about is one of

those best practices which we can learn from various other successful companies and also if you are a multinational organization for example. If your's is an European or an US company, they have certain business processes and from here in India you can start your operations by adopting these business processes of your parent company.

You can get all your global processes from your parent company because you are now connected through the software which is a common software. The process they are using you will also be able to use them. This is a big advantage pf being a part of any multinational company.

Integrated supply chain *management*. - We will talk more when we discuss about supply chain management. From a supplier to a manufacture and to the customer everything is getting integrated and I have shown you a picture about those interconnected gear wheels (example of Tata motors or any vehicle manufacturer, truck manufacturer), where you have the State Transport Corporation (Customer) on one side, the bus manufacturer (e.g. Tata Motors) in the middle and the battery supplier for example, one of the Vendors (Exide Ltd.) is on the other side but they are all integrated.

When one order is released by a state transport corporation for 100 quantity buses, the entire thing gets communicated down to the lowest level to the battery supplier (OEM supplier) for 100 batteries automatically as their information systems are integrated.

Leverages purchasing and vendor management. - ERP is leveraging the purchasing and vendor management because everything is integrated and automated. You just you run an MRP program and the bill of material will explode and it will create purchase orders for all the bought out components.

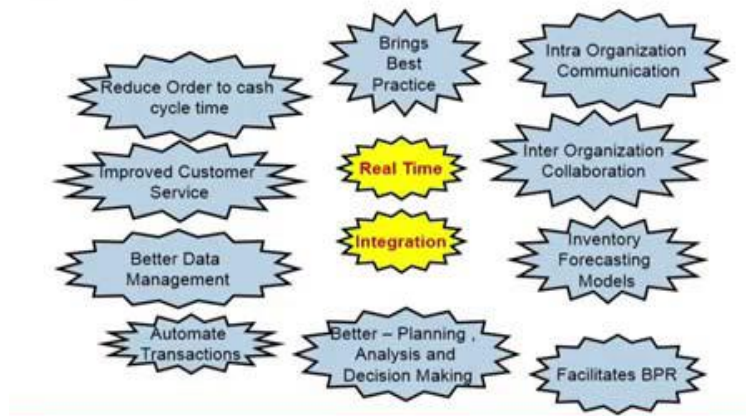
Order Cycle time / Customer Service improvement. - Since things are online and real time, we save lot of time. When we save lot of time means we can produce faster so, this lead to increasing productivity. If I can make things faster, my customer gets his material faster.

My customer service is improved because my order cycle time is reduced. When the customer gives me an order, I can deliver it to him in a very short period of time or in a lesser period of time than what I used to do pre ERP (before ERP). So, even if there is an improvement of 10 percent or 20 percent of productivity and time, the customer will be very happy because he is getting his things faster.

Reduced information system costs on an ongoing basis. - With advent of ERP you can get rid of many other local softwares because previously every department is to run their own software. Now once you install an ERP like SAP you can replace all of this software or most of these softwares by a single software. Although initially SAP is expensive, but overall finally, in the long run it will reduce your information system cost because software maintenance is a costly affair.

When you have to maintain may be 50 softwares, it is complicated, but when you have to maintain 1 big software, that is much easier then maintaining 50 different software supplied by different vendors for example. So, you have to have different vendor management contracts, but here it is just talking about a single vendor SAP.

ERP Benefits



ERP benefits - At the centre you can see Real Time and Integration. That is what we are talking about many times and these are main benefits. The other major benefits are: Best practices which we have already talked about; reduction in the order to cash cycle time.

It helps in increasing productivity. It is improving customer service and customer satisfaction. Customer, as soon as it gives an order, it gets its material in a faster time and also gets continuous communication. Through their connected system, customer comes to know when things are ready, when the thing is going to get dispatched and when they are going to receive the material.

Customer gets all the information and getting information is very important part of MIS. I know that my material will come, for example, when you order something in Amazon and then you can track your order. Amazon will know that your delivery is promised on 7th of July; today is 3rd of July. You know in 4 days' time it will come and then tomorrow you may see that material will be delivered on 6th July, instead of 7th July.

Sometimes it can get delayed and it will come 2 days later. But the important thing is that you have the information. That instead of 7th I will get it on 9th. Then I can change my plans accordingly. Suppose, I was depending on that material for something to do something else, then I will differ that by 2 days because I have got an information that instead of 7th it will come on 9th.

So, that is the power of information and you can do it without asking anybody, without calling up anybody. Simply on your phone you go to Amazon site, find your order, track progress and from there you come to know everything either its coming on that exact date or coming one day before or coming two days later.

Now, that is what is the beauty and power of ERP and just think about your individual one item and now you are thinking about business enterprise working with several customers and several items how powerful this software is. It can give satisfaction to so many customers.

Better data management - I also discussed of online validation which reduces the chances of making any errors. ERP systems use single point of data entry, that is, a single point of truth. You are entering data only once and if in the first time you have not done a mistake then there is no possibility of making anymore mistake for that data. This what is meant by “Single point of Truth”.

It is automating transactions - Many transactions get automated

Better planning analysis and decision making;- It is a decision making tool and it gives a decision making support , because it is giving you Real time information based on which, you can use take your business decisions.

It facilitates BPR (business process reengineering) - I have told you about the best practices we can learn from other successful international companies like Toyotas of the world and big successful multinationals. BPR takes place when we use these best practices to change/modify our existing business processes.

Inventory forecasting models - It also has lot of forecasting models built in through which you can use to forecast and tell you exactly how much material quantity you need for your operations. That is how you can optimize your

inventory requirement by successfully using these forecasting models inbuilt into the system like Reorder Point Planning or Seasonal based Forecasting etcetera.

You can apply these to take decision as to how much material to buy by certain time period because it tells you how much we are going to consume. Thus order forecasted quantity and not anything more because I have already told you how extra inventory is nothing but a loss as it results in blocked up working capital. Money which is blocked is a waste.

Inter organization collaboration - Supplier to Customer the whole chain works with multiple organization and there is a collaboration because of the connectivity and the using the same ERP. Intra organization communication is within the organization, amongst various department etcetera as because everybody is accessing the same central database. All departments are getting the same information.

The quality of information is now excellent as nobody is having different information about the same thing. So, everybody is getting the same information. This is a big advantage from a MIS perspective.

Getting the best out of an ERP- maximize ROI.....

Need to have a comprehensive or through business case for the executives and business stake holders

- **It is not merely an IT project**
- Provides with an excellent opportunity to transform business
- It entails significant organizational change
- Without support from business, the ERP implementation falters and IT often has a hard sell for keeping it going

Getting the best out of an ERP maximizing your return on investments. - I had told you it is a expensive product and implementing ERP software also takes lot of

time and money. When you are investing something, the CIO or the CEO or the CFO will ask you first as to what is going to be the return on investment in, how many months or years are you going to recover this investment from the benefits which it is going to produce. You have to understand as a manager, especially as a IT manager what is meant by return on investment. I am going to invest so many crores of rupees so what is my return.

You need to have a comprehensive or thorough business case for the senior executives and business stakeholders. So, first you have to think is that, it is not just an IT project but it is a business project. That is a common mistake many people do. ERP is not really an IT program; it is a business program because it is doing everything for the business. It is transforming the business, it is helping the business to run. It is fundamental requirement for a business to use any ERP system. Although it is a software and an IT product, but actually it is meant for the business and it is enabling the entire business transformation for example.

Hence, I call it more of a business program rather than an IT program and it is best to see it from the business perspective only because all the value will be derived for the business people. So, the business people have to play a major role in taking a decision on whether to invest on ERP or SAP etcetera.

It provides with an excellent opportunity to transform the business. So, when you implement SAP and business transformation happens, it is called business process reengineering that is where we use a acronym BPR very frequently. You can modernize your business by just implementing SAP and make your business change completely, making it at par with global successful companies.

It entails significant organizational change of course, when you are transforming as transformation means change and you are changing it for the better, you are

making it more efficient, making it smarter, making it more productive and making it more excellent I would say.

Without support from business, the ERP implementation falters and IT often has a very difficult time for keeping it going. So, do not keep it within the IT department. When you are thinking anything to do with ERP or SAP etcetera, talk to the business people and involve them because if they are not involved, it will never be successful. Because they are the main users and they are the only users. The IT team is merely supporting it. So, focus on the business people, involve them right from the beginning, then only you can really extract maximum benefit out of an ERP.

Getting the best out of an ERP- maximize ROI.....

- **Know your ERP and reduce your old applications**
- The **standardized information and processes** of these solutions will streamline your operations so that they are more efficient.
- The **industry best practices** will prepare you to handle external pressures, such as competitions and compliance
- **Customization** will ensure that your particular needs are being met
- **Avoid too many customization** to make it cheaper with less bugs, better systems performance (response time) and easier and less expensive to upgrade version

Know your product and reduce your old applications. - The standardized information and processes of these solutions will streamline your operations so that they are more efficient I already discussed this how with BPR, the processes get improved etcetera. The industry best practices will prepare you to handle external pressures such as competition and compliance. So, when you have the best business processes; obviously, you are better than your competitors.

You are doing things much better way than what your competitors are doing so obviously, you will be able to handle external pressures much better than your competitors and also compliance. Compliance is a very important thing, that are you following the government rules and regulations and that is what you take the best practice from successful companies they are always very complaint.

You can be safe when you know that I am not doing something wrong as far as the government is concerned and the rules and laws of the land is concerned. I am following all rules and laws in things like GST and income tax etcetera.

Customization will ensure that your particular needs are being met in these products and you can customize, change it according to your requirements and need as they (ERP) are not very rigid. You can change it to meet your needs and requirements but at the same time you should avoid too many customization as that is one of the best practice. Do not make too many changes because the products are very standard, they are very international, and they are being used by very large successful company so, do not change it , because then it will create more problem for you.

Getting the best out of an ERP- maximize ROI.....

Cross the It- Business divide

- ERP implementation is NOT an IT programme but a Business Program
- ERP applications form the **information backbone** of your business of your business.
- Increasingly, business executives. The ones making decision and trying to increase profits, are using these applications and need the information it can provide
- Business professionals and not IT experts should be part of the process of defining functional requirements for the application.

Getting the best continuing on that, cross the IT business divide. - ERP implementation is not an IT program, but a business program. So, that is what I

had said earlier I am repeating here. Always keep in mind it is not an IT program, but it is a business program. It should be always the headed by and managed by the business head may be a CFO should actually manage this program.

ERP applications form the information backbone of your business. The information backbone of your business is your ERP or SAP system. Increasingly, business executives the ones making decisions and trying to increase profits, are using these applications and they need all the information it can provide.

The whole business is running on ERP. Because without information you cannot take any decision and all that information is coming from ERP. I have been repeating many times because you should also get it into your system that information, information and information - the whole business runs on information.

Business professionals and not IT experts should be part of the process of defining functional requirements for the application. So, when you are designing your SAP, how to implement it etcetera, lot of functional requirements comes in and here again business professionals have to play the major role. This I will discuss more when we discuss the project part of it. When you implement ERP project, what roles are played by different functional people and how to design the product during the implementation time.

Getting the best out of an ERP- maximize ROI.....

▪ **conclusion**

- ERP software can be an expensive and time consuming IT investment
- ERP applications for facilitate the standardization and accelerations of business processes and contribute to the visibility necessary for run your business well and grow revenue and profit

To conclude getting the best out of ERP, maximizing ROI, ERP software can be an expensive and time consuming IT investment so, you have to be very careful

when you implement SAP. You have to plan properly and thoroughly, involve lot of people, take the help from the business people and then go ahead with it because it is not an easy job. It is a difficult job implementing SAP (or ERP) software program in the organization.

ERP applications facilitate the standardization and acceleration of business processes and contribute to the visibility necessary to run your business well and grow revenue and profits. This summarizes all the advantages I have been talking about generally in one sentence.

It is facilitating standardization so, things need to get standardized. You have to have the best business processes, and to contribute to the visibility because you have to be transparent. Same information, the right information will be available across all functionalities.

You need to have the visibility because everybody needs information to run your business well and of course, your business should be growing your revenue and profit. One of the major motives of business is to make profit.

Business Benefit of ERP

Some of the impacts of ERP implementation. - ERP will impact communication and information domain, leadership and authority, business processes, best practices, company policies, jobs and rewards, company structure and culture, skills and knowledge of employees.

Some of the impacts of ERP implementation

- **ERP will impacted**
- Communication and information domain
- Leadership and authority
- Business process
- Best practice
- Company policies
- Jobs and rewards
- Company structure and culture
- Skills and knowledge of employees

So, you see as so, many areas it will impact it starts from communication in an information domain because that is the basis we are talking about information sharing and communication, leadership and authority. Even leadership and authority gets impacted because now things in the organization become more transparent.

So, you do not have to you now depend on somebody like the CFO will give me the communication and will come to know only then, I because it is all available online on a real time basis. So, I have information on a real time basis.

It is how the leadership style will change the authority and how business information flows. Things will change because there is lot of change in roles and responsibilities which happens after ERP are used in the organization.

Business process - We have talked a lot on best practices and also we have discussed about Company Policies. Jobs and rewards for example, will change because your roles will change and your skill sets will change. Jobs and rewards also need to change because the way a person was doing work previously before ERP and the way he will be doing after ERP implementation, will be it in a different way because the processes have changed and he will be working fully on IT system. He will be working on things which are all real time and online etcetera which requires a change in the skill set of all employees.

His job responsibilities they and so, he has to retrained and reskilled and when you retrain and reskill a person of course, his job definition will change and his rewards etcetera will also need to change. So, lot of HR activities changes.

Company Structure and Culture gets impacted very much because now things are very transparent, online and real time and these have got direct impact on the culture of a company. And then the company structure also changes as we can now become more flexible, and have less hierarchical levels etcetera because the decision making pattern changes. The way decision making is happening and taking place within the functional silos etcetera. However, with ERP, once you break down the walls, and restructure the organization, it makes decision making less complicated with reduced hierarchical levels.

We call this “flattening the organization”. Instead of that sharp pyramid we can make it flatter. Skills and knowledge of employees of course, will change because now you are using a very sophisticated software, and all employees will have to become computer savvy.



How the organization uses ERP? - You have the central database and then you have the major functionalities on the all the four sides, namely, Finance and Accounting, Sales and Marketing, Manufacturing, Purchasing and Materials.

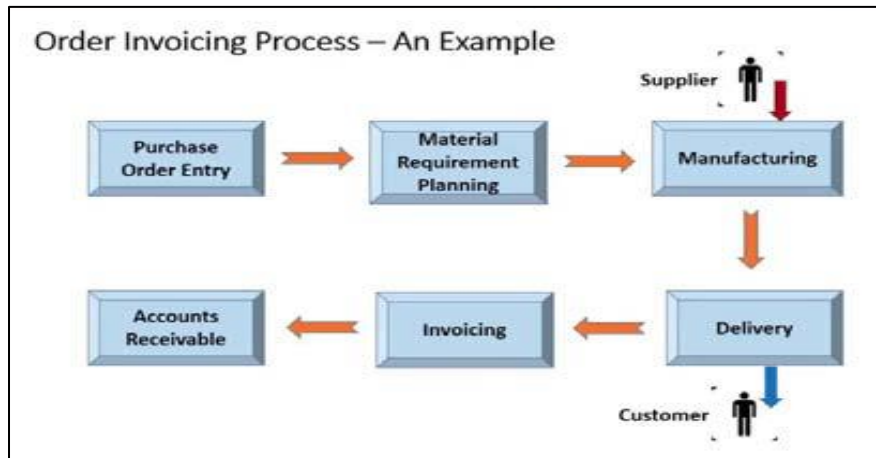
I have considered for my lectures mostly these four major functions, but I have told you repeatedly that other areas are also very much involved like - HR, Quality Management, Plant Maintenance, Service Management, Warehouse Management etc. You name it any other functionalities are also part of ERP, but we cannot have so, many of these in the slides as then the slide will become very complicated.

Let us stick to the four major functional areas the common one's namely, finance purchase, manufacturing and sales and how they use ERP? In the finance area we have, cash in hand, accounts receivable, customer credit, sales revenue. These are various accounting functionalities and all of them are included although I am listing a few of course, but there are plenty of others. Now if you move on to sales and marketing on the left , the areas are pricing and rebates, sales planning, delivery dates, sales returns.

So, all of these activities and sub activities are using ERP. They are using for all the daily business transactions being performed in the organization. I have just listed a few of the common ones. In Manufacturing, some of the major areas are - production, planning, quality assurance, order fulfilment etc.

In Purchasing and Materials module the major sub-area is inventory management. The stock they see always is the most important thing needed to be monitored because neither it should fall short, and manufacturing should not have any shortage of materials, nor there should be excess inventory.

We know the problem of excess inventory and we also know if there is a shortage then the production will come to a halt and the customer's commitment will not be met. So, you have problem on both sides. Managing the right inventory is one of the major challenges for the purchasing and materials department. They keep constant monitoring of the inventory and the pending delivery from vendors. Pending delivery, open Purchase orders, Vendor rating, Invoice verification, exports and imports etcetera. are the various different functionalities which are being used by Materials and Purchasing module of SAP.



Now to give you an example of one of the process - The Order Invoicing Process. So, you have say a purchase order entry. You create a purchase order for a particular component or raw material you need from your supplier or vendor. Now what happens is you know materials requirement planning (MRP) is not what we were talking about when we were talking about the history of a ERP, but this is a program inbuilt within SAP and is also called materials requirement planning (MRP) with similar and better

functionalities. It is a part of a one of the areas / modules of SAP called Production Planning. Whenever, there is a new order or change in the sales order you run the MRP program (transaction).

When you do a material requirement planning run, it will for the example of a car order in an automobile industry, that to make 100 cars, factory will need 500 wheels and will need 100 batteries (we have one battery in a car).

It will create a purchase order for these items. But, first it will create a Purchase Requisition which the planner will convert to a Purchase Order on a battery company (e.g. Exide). Ordering Exide to deliver 100 batteries by such and such date. Two things are important - the quantity and the date of delivery and of course, the model number and other relevant details about the particular battery make.

At Exide factory, once the battery purchase order entry is made the battery is supplied to the car manufacturer. So, the input on the top you see is the supplier is supplying that 100 battery for manufacturing of the cars. Once the manufacturing is over and the 100 cars are ready it goes delivery to the customers,

Before final delivery the cars go to finished good stock and from here the cars can be supplied to the customer. The customers for automobile companies like Maruti are their dealers and individuals like us, we buy car from the dealer. So, the dealer is actually the customer for Maruti and we are the customers of the Dealer.

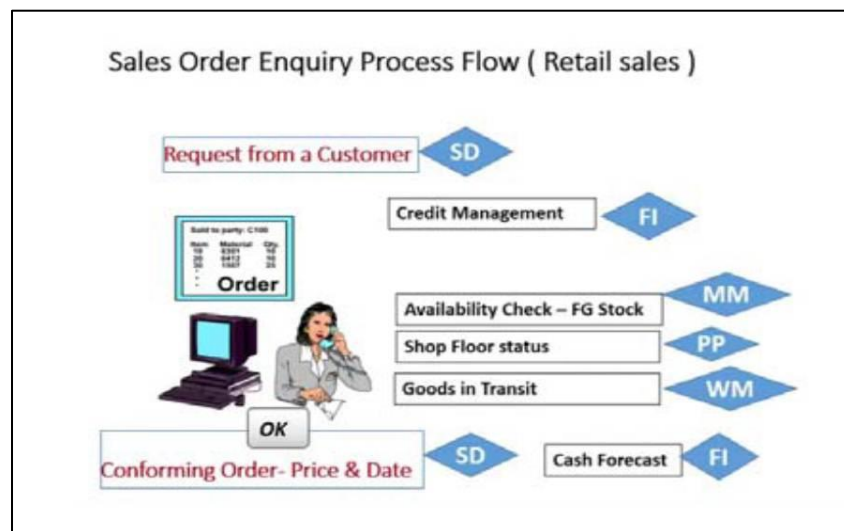
When those 100 cars are supplied to the dealers, Maruti is raising an invoice. Say there is a dealer in Kolkata and he is getting say out of that 100 may be he is getting 20 cars coming to Kolkata and another 20 going to Bombay and 40 cars going to Madras or something like that. When the invoice is raised for 20 cars on that Kolkata dealer, then it becomes something called an Accounts Receivable which is a typical accounting document.

For that car manufacturing company let us say if it is Maruti 100 cars have been distributed over India. 20 has come to Kolkata, 40 has gone to Mumbai etcetera. So, for each of them for the 20 and 40 cars, Invoice has been raised and that invoicing becomes an accounts receivable of a value related to the price of a car, which is say Rs.5 lakhs.

Price of 20 cars is Rs.100 lakhs. Hence, the invoice will be for Rs.100 lakhs. This value becomes the accounts receivable (AR). This is an example of order invoicing

process. This it is not the complete process but a part of the process of Order Processing.

From purchase order to the accounts receivable in the books of the finance department, it will show that I (Maruti) is expected to get Rs.100 lakhs money from my Kolkata dealer as it is my accounts receivable. When the Dealer actually give the money then that Purchase Order gets closed because it gets credited with Rs.100 lakhs. So, the receivable gets closed because Rs.100 lakhs has been received. That is when the process actually ends, but here particular process shows how it operates between a purchase order and accounts receivable. This is a portion of the Purchase Order processing cycle as an example to understand how the thing works in that SAP system.



There is another process let us say the Sales Order Enquiry Process flow. I had shown

you this picture earlier in my previous section, but here I will talk in details of this. See what this picture talks about is, (it is very interesting slide here) where you have this lady sales manager or a sales officer of say same battery company, taking the example of Exide battery she works for sitting in a sales office in say Lucknow in UP.

She is operating from the Lucknow sales office, the Lucknow dealer of excide battery calls her on her phone. She gets a call that the dealer wants 100 batteries of this Maruti car (e.g. Alto) . There are different battery models for different cars and Maruti Alto car needs a certain type of battery and the dealer needs 100 of them. When can you give it to me (the dealer) as I need these very urgently? This lady (Exide Sales Manager) looks into her SAP screen and then starts doing lot of things.

So, what happens? It starts with request from a customer that is the phone call she had

received. When she gets a customer's call (dealers call) that I want 100 batteries, the first thing she does is, she goes and does a Credit Check in the Credit Management area which is a finance function (FI module). She checks the credit limit of this particular dealer, whether he has paid for his previous supplies? Sales usually works on credit and nobody pays cash immediately on delivery. So, you get a material, and you have an agreed credit day may be 15 days or 30 days within which you will have to release your payment.

So, this varies from product to product and from company to company, but there has to be some credit days. Now she goes and checks whether this dealer has paid up his previous orders which was say whatever quantity and so, much money was pending. It could be yes or it could be no. If it is yes, then it is fine and she is happy that no overdue are there with the customer and further batteries can be supplied for this new order.

But if it is no and he has not paid up then she will tell him that against your past order of Rs.50 lakhs, Rs.10 lakhs is pending. Please release the cheque and I will

process your new order. So, she has all the information including that from the finance function although she is working as a sales officer sitting in Lucknow and the head office is in Kolkata. She just received a call from the dealer and while she is holding the phone, she goes to a screen and checks, his outstanding and tells him that Rs.10 lakhs is outstanding and that he should send the cheque by today evening? Without getting the cheque, she will not process any new order, even though it is urgent for the dealer. Now it is up to the dealer. If he wants the battery supply very urgently he will have to release his cheque. So, this is how Credit Management works. This is a finance function and this is the first that any sales person does.

Now suppose the dealer says yes I will send the cheque in 2 hours' time and you process my order because it is very urgent and customers are waiting. Now she goes to a transaction known as Availability Check. What does she do in this transaction? She goes into the screen and checks how much stock is available for this battery and in which locations.

This is a materials management function and she finds out that out of that 100 requirement may be in her own stock there are about 10, there are 50 batteries are available in the warehouse in Lucknow. And balance 40 probably is available in the factory in Haldia for example, near Kolkata. This is the nearest factory from Lucknow or maybe all the 40 is not available. Maybe 20 are available and rest are under manufacturing. She needs to now check the shop floor status? She goes to the production planning module (PP module) on her computer screen and checks the stock in transit or whatever is under manufacturing. From this report, she comes to know that 40 batteries will be ready in another 3 days' time as it is under manufacturing. It will take another one week to get that 20 batteries considering transport time from Haldia. So, she can book 40 batteries to get in 7 days time. And she checks also goods in transit whether anything is in transit. The feature being used is a part of warehouse management module (WM) which gives

information about anything being shipped from Haldia to their warehouse in Mughal Sarai somewhere near Lucknow.

She checks all that and then she tells her customer over phone while he is holding the phone and she gets all the information in maybe just 5 or 6 or 10 minutes of time. And she tells the customer, that 10 batteries he will get it today after I get a your cheque then only I release this 10. Another 50 are lying in my warehouse in Mughal Sarai and I will get it delivered by tomorrow as Mughal Sarai is quite close to to Lucknow. So, once I get your cheque I will release the order on Mughal Sarai warehouse. So, they will deliver 50 batteries tomorrow.

So, you get 10 today evening 50 tomorrow evening. The balance 40 is under manufacturing which will take 7 days of time. Four 4 days in the factory and then another 2-3 days for transport for coming from Haldia to Lucknow. So, in another 7 days time you will get another 40 batteries. Do you agree with this? So, 10 battery today 50 tomorrow and another balance 40 , 7 days later and if the person says yes, then she can confirm the order she confirms all the order price and date.

This is an SD functionality sales and distribution and then finally, when she books the order what happens is that 100 batteries costing maybe say 2000 rupees each. So, that 100 batteries means 2 lakhs. So, the 2 lakhs rupees becomes a cash forecast as soon as she books the order. So, suppose that payment credit term is 15 days the cash forecast means the day the customer receives 10, 50 and 40 for each of these days you add 15 days and accordingly so, much of value comes as a cash forecast which a finance function is.

The finance manager and the finance department comes to know that this is my cash forecast. Which means on that particular date I am supposed to get so, much money from this particular supplier.

Because everybody is managing his her own resources, the finance department is continuously monitoring how much cash flow is taking place into the company, how much money is coming in because he has arrange for cash outflow (payment to suppliers) and this an everyday process where the company is receiving cash and company is paying cash. Cash outflow examples: are giving payment to suppliers, paying electricity bills, utility expenses, employee salaries etcetera. There is outflow of cash and supplier payment is happening almost every day, or on periodic basis like salary payment etcetera.

So, the accounts and finance department is continuously monitoring what sort of cash I am receiving every day because of every sale. So, that for him becomes information that he knows that on such and such date this will be my cash position. Cash balance is extremely important for the finance department to monitor on a daily basis.

I just gave you one example of a Sales Order Enquiry process and how SAP or ERP works. One person, a sales officer or sales manager sitting in one office somewhere, who is a sales person, but he or she is referring to so, many functionalities of SAP from sales and distribution, to finance, to materials management, to production planning, to warehouse management, to sales and distribution and finally, finance.

See finally, everything has to end in the finance because end of the day you know it's all about my account getting credited with money. So, that is how the whole business works everywhere. So, all process will end somehow in finance.

The power of SAP was demonstrated by this example where she could do in just about

10 or 15 minutes of time and without talking to anybody. She gets a call from her customer (dealer), and she could close the sales order without talking to either her factory, or the warehouse in Mughal Sarai, or the warehouse manager, of the finance department at the head office in Kolkata.

She does not have to waste any time because when you call up the person may be he is not available, busy in a meeting , or on leave , or not in his desk etc. so, many things can happen and you get delayed as you are not getting the information you are looking for.

But , having SAP (ERP) all the information is at her fingertip literally (because when you are punching your keyboard you are using your fingertip) and that is how you are getting your information.

You do not have to depend on any human being for information. That is the power of ERP, the power of SAP and that is what managing information system is all about. This is the essence which you need to learn to appreciate, the beauty, the power, the strength of SAP or ERP and why it is so important for running a business.

You cannot run a business without this, you can I mean could you realize when I was telling you all this how things are so, easy or smooth. So, when you have

information you have power. She has so, much of power, when a customer calls up asking whether she can supply him 100 batteries as soon as possible, she said just hold on for 10 minutes and I will give you a call back right in 10 minutes and I will tell you the position by date when I can give you the batteries.

And after 10 minutes she calls up and tells him yes today you get 10 tomorrow you get another 50 and 7 days later you get another 40 that is your 100 is that good enough for you then fine I am closing the deal? And you clear my payment of the last order. So, everything is being taken care of.

impact of a goods receipt to Transaction.....

A simple goods Receipt transaction can trigger several activities, e.g.

- Stock and value of inventory get update.
- Inspection lot gets created to trigger a quality inspection.
- Stock and consumption account update.
- Purchase order history gets update.
- A transfer requires is created to move the goods to the ware house.
- Vendor evaluation process gets initiated.

Impacts of a Good Receipts transactions another process something comes in your factory and you are receiving a material? A simple good receipt transaction can trigger several activities, - stock and value of inventory gets updated. So, as soon as you receive the stock the value of inventory, total inventory value of the company goes up by so, much of value say whatever the 100 pieces came and the worth is 10 lakhs. So, you have

total valuation of the company going up by 10 lakhs and you added so much of inventory. Another activity gets triggered for the received material, an inspection

lot gets created for the quantity of item received and a trigger for quality inspection gets created. Automatically.

All that the security officer at the factory gate has done, is that he entered, supply of such item of such and quantity such on that date and time. The value of the whole company goes up because the inventory value has gone up as soon as the security person has completed the data entry.

Inspection lot gets created to trigger a quality inspection and on the screen of the quality manager, says there is an inspection job pending. If you see this pending work you will see one pending inspection of 100 quantities of such material has arrived and it is pending for his action. So, now, he has to get into his job, go to the stores and do the inspection. On completion of inspection the stock and consumption accounts get updated. This is the accounting activity which happens as soon as the material gets accepted by the quality control.

So, your stock account gets updated by value and consumption account also gets updated. So, these are accounting area. In the general ledger or account book , consumption account also gets updated because that material will have to be consumed.

Purchase Order history gets updated. Now you are regularly buying some material from that particular vendor for this material. So, there is a history because you want to analyse and you want to evaluate your vendor as to how good he is and how timely delivery he gives, the quality of his product, whether there is any rejection, whether it is 100 percent accepted or 90 percent or 10 percent whatever needs to be documented. This way you evaluate because you have multiple vendors for a particular item, like Maruti is getting battery from many

vendors and Exide is one of them. So, there are 3 or 4 battery manufacturing company. So, they get continuously evaluated and there are various utilities of this vendor evaluation, about which I will talk later.

A Transfer Request is created to move the goods to the warehouse. So, after the quality check there will be a Transfer Request. So, it has to move to the warehouse or the store from the security gate. So, then a transfer request that is document which is created in the system and then vendor evaluation process gets initiated that I already explained. So, that is another process which gets initiated and the purchase department now evaluate the vendor based on the timeliness of the delivery etc. So, whether it did deliver on time the same date or later date etcetera and then after the quality inspection, they will also add whether all 100 percent was accepted or not. So, accordingly the vendor rating gets changed. Many activities get triggered from a single transaction, like the Goods Receipt (GR) transaction. So, all this is happening automatically and SAP and ERP is doing it. So, this is how the software is working, the transactions are happening and each of the transactions are generating data and information.

The data elements are date of supply, quantity of items which got approved by quality etc. From this data, what information is generated? Information generated are vendor's evaluation score. Purchase Order history gets updated. If he had delivered on right time and 100 percent material got accepted , vendor gets an A rating. Otherwise he would have got say B rating because he delivered one day late. He may have delivered on time,

but then 10 percent of the item got rejected. So, quality was a problem. So, he gets B rating or may be if more items were rejected, he gets a C rating. So, we rate vendors with A , B or C based on their performance.

So, when you get a A rating means what? Next time when you get an order you will get more quantity. You will get more order quantity and customer will rely on you more because you deliver on time and you deliver the right thing. So, if I have 4 or 5 vendors I will give more percentage of the order quantity to you. So, that is why this vendor information is so, important. So, this is information which is created from the data collected from the security gate and quality inspection report. So, you need to know where and how is the data generated and what is the corresponding report or information created.

**Areas of performance improvement through
ERP (1 of 4)**

Revenue generation

- ✓ Ability to service new market segments.
- ✓ Increased asset utilization and capacity through better planning
- ✓ Redeploying workforce into higher value-added roles
- ✓ Broader product offering

Areas of performance improvement through ERP. - Revenue generation through its ability to service new market segments, increased asset utilization and capacity through better planning, redeploying workforce into higher value added roles and broader product offering. These are some very generic advantages and performance improvement in various areas. So, these are all some examples

which I have selected. I will quickly run through as there is not much to explain and are very understandable by themselves.

So, one is revenue generation gets impacted I mean it is an area of improvement when you use SAP or ERP.

**Areas of performance improvement through
ERP (2 of 4)**

Cost Reduction

- ✓ Reduced working capital requirements
- ✓ Better supplier Management
- ✓ Global centralized purchase using strategic Sourcing with leveraged procurement spend
- ✓ Shared services in Purchase, HR and other general functions.

Cost reduction - That is the main thing we started with when we talked about inventory cost reduction etcetera and reducing working capital requirements. I have already explained that. Better supplier management - Global centralized purchasing using strategic sourcing with leveraged procurement spend. Shared services in Purchase, HR and other general functions are things which I will talk later.'

When you have a multinational company and you have say common item you purchase

in several countries or if within a country we have many factories spread across the country and you have a central purchase department. In such a scenario the main item is bought by the central purchase team from a vendor and then the item gets distributed to different factories. So, you can now leverage your weight because you can do everything online and you can place a bulk order on a

supplier and he will supply it to the various factories. So, then you can get lot of price advantage. and you can save lot of cost because you are buying at a bulk.

Areas of performance improvement through ERP (3 of 4)

Strategic Positioning

- ✓ Better information to run the business (Real Time and Decision Support System)
- ✓ Strong and flexible foundation to support future growth (seamless IT Platform)
- ✓ Improved supply chain integration (with Vendors and Customer's ERP systems)
- ✓ Standardized processes across divisions this is very important for globe/ multi national organizations (commonality of processes)
- ✓ Ability to more easily operate as single business
- ✓ Better employee productivity
- ✓ Better employee satisfaction through job enrichment

Strategic Positioning: - Better information to run the business. So, it is mostly about information, as I said earlier - real time decision support system, strong and flexible foundation to support the future growth, seamless IT platform that is you know it has everything, all knowledge and information is available in that IT platform.

So, that supports your growth, improved supply chain integration with vendor's customer's ERP system which I had explained earlier with the Tata Motors example. Standardized processes across divisions. - This is very important for global and multinational operations where you have multiple companies working together so, you need to have standardized business processes. This standardization is enabled through ERP.

Ability to more easily operate as a single business again the same thing I mean if you are using a single software platform you are actually working like a single business unit although you are different companies of the same say group for

example. Different companies located in different countries, but you can literally work seamlessly as a single company.

Better employee productivity :- you have seen how productivity is impacted positively when you are using such softwares and better employee satisfaction through job enrichment.

Areas of performance improvement through ERP (4 of 4)

Improved customer satisfaction

- ✓ Reduced contract cycle times
- ✓ More accurate availability and delivery info
- ✓ Single face to the customer for sales , status and service
- ✓ Quicker response to contract and order changes
- ✓ ATP availability to promise. Product can be booked for specific customers

Improved customer satisfaction - I have discussed earlier also that reduced cycle time more accurate availability of delivery info, single face to the customer for sales, status and service. The example I gave you about that sales lady working in Lucknow, handling dealer's orders. Providing quick response to contract and order changes through MRP and ATP (availability to promise) which helps in committing supply to specific customers to ensure that they get their order in time. So, products can be booked for specific customer. So, you can book by specific for customers so much quantity etc. like she was doing for the Haldia plant, blocking the 40 quantity from the factory to be delivered within 7 days to her dealer provided he confirmed the order. Once the dealer confirms those quantities will be booked and no other sales person can divert these batteries to

be delivered to any other party. It will be exclusively reserved for you. This is another important and strong functionality called availability to promise (ATP) in the SD module of SAP and with that we end this session.

ERP Project Management – Challenges, Risks and Best Practices

Define and manage the scope of the ERP Project

1. Process scope
2. Functionality Scope
3. Organizational Scope
4. Technical Enhancement Scope
5. Technical Infrastructure Scope
6. Interface Scope
7. Data Conversion scope
8. Reports and form Scope

To start with we should define and manage the scope of the ERP project. So, what is the scope? So, first we need to know, what are the scope of a project which is covered under this ERP or what we are talking about enterprise resource planning software. So, one is the process scope. So, like every business, there were lot of business processes which I have been talking about earlier. So, we need to map out the number of processes, which are there in all the functional areas, which are being covered during that program implementation.

You may not sometimes implement all the modules of SAP for example. Just to save time or we want to start something quickly, maybe you want to do only the Finance and Manufacturing for example; I mean you probably you can do HR etcetera later.

So, not so very critical, not so very important; but Sales, Manufacturing and Finance are important areas. Finance is of course, required because finance is at

the core. But things like plant maintenance, quality management etcetera you can delay; HR probably you can delay, but many people do it together. So, anyway, depending on the cost and budget and time etcetera the modules can be selected, but the processes needs to be identified and listed and signed off. These are the processes for which we will do the project.

Functionality - similarly from the process comes the functionality. What are the various functionality we want to capture into this ERP? Some of the functionalities can be better handled by say existing software's which have been custom built for a specific job, for example payroll.

So, many times, it happens that many organizations have developed their own payroll software and which is working and which can work better than what is being offered by say the ERP software. So, you want to may be retain that payroll and then, build a bridge (interface)connecting it with the SAP software. So, that functionality within SAP software, you will not implement because you want to use an existing software. So, that is little bit of less work for the SAP project implementation.

Organizational scope, - again see the companies can constitute of say head office, then multiple locations, multiple factories, multiple manufacturing units, warehouses, sales offices, branches etcetera. So, you have to decide which of the organization elements will be covered under the scope of the SAP project. Some of the remote, for example, sales offices may be in small towns or villages, where only one person is working and you may not include in your project because when you include a location it means additional cost, effort, connectivity etc. You have to have a network and so many other things like training of the people etcetera, and other things are there. So, we have to decide what is the organizational scope.

Technical enhancement scope - is what sort of enhancements to the SAP software you need. SAP is offering several features, but your organization may be needing something which is not being offered by in SAP product. So, you might have to want to add something extra, some other new functionalities. So, that is where

custom development comes in. So, you have to write codes for that. So, that is extra time and cost. So, you should try to minimize the technical enhancements, try to stick to whatever the SAP product is offering. This is commonly referred as a vanilla implementation where no change is being done to the software product from a technical perspective.

So, whatever the product is offering try to stick to that that is because from a future maintenance perspective, the less the amount of code you write better it is for the software quality because the more you write codes, you can actually produce lot of bugs.

So, you have to test it and then, there could be some errors and there could be some integration problem with the existing company product supplied and the component you have written. So, those can only give rise to a lot of maintenance issues. So, best is to avoid and that is the best practice, minimize and changes to the original product. But if it is required, it is required. So, you have to do it.

Technical infrastructure scope – includes the Servers, Desktops, Data storage systems, back-up devices, Disaster recovery systems, SAP and other supporting softwares, Operating Systems for the servers, connectivity like LAN, WAN etcetera. retain and build a bridge, that is, custom software to connect these softwares with SAP software because all the financial information has to flow into SAP as because finally, your balance sheet, profit and loss and other statutory reports etcetera everything will have to come out of SAP. So, all financial transaction of the organization has to be captured in the SAP Finance module. So, for that you have to build your interface like I said the payroll. If you want to use existing payroll system, fine you can use it; but then, you have to build a connecting program and we call it an interface. So, whatever transaction happens in the payroll like the salary payment etcetera that information goes into the financial books of account like all the credit and debit entries flow to the SAP finance book of accounts.

So, it depends on the scope as to how many such software's you want to connect because for each one of them, you have to build a separate program and writing a

separate program again means cost and possibilities of introducing bugs. So, that is what you need to budget.

Data conversion scope - Original data which are there in the legacy system from the existing software's will have to be now transported into SAP. So, that is called data conversion. Conversion, because it has to be converted into a format which you are designing for the new product. May be the whole material name codification is changing. So, previously it was known by say a material code of say by the name of the product, now you want to put a number code. Like you have noticed in bank accounts. For example, after the Core banking system, all the banks got computerized; the account numbers got changed. Previously, we had account numbers which were very small, few digits; e.g. 6122 was your account number. But nowadays, normally we will find an account number which is very difficult to remember may be 10 digits, 10 character, 14 characters like 110578345678 (example of new bank account numbers).

So, there is a meaning, I mean there is lot of meaning in that design because they are conveying lot of information not for us, but to the bank employees. They from seeing the account number, can find out many things like whether it is a current account; whether it is a savings account etcetera, which region the account belongs to; may be which city; which region. So, many information, intelligent information is hidden in that number code. So, that is why the number code becomes very long of your account. Previously, we just had a small code 6382 that was your account number, which was very easy to remember.

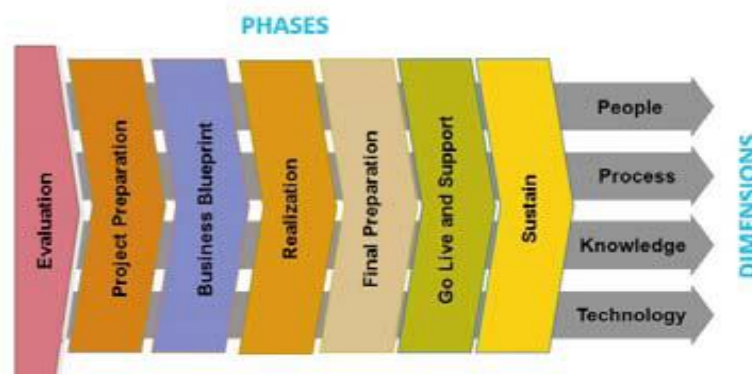
But nowadays, with computerization things have changed. So, that is data conversion where old data which was few 6382 account number will now get converted into an account number which will have 10 characters.

Reports and Forms scope – Reports you know is very important in MIS. The reports has to come out from the SAP system. Normally, SAP, they have their own standard reports which are good enough, but sometimes you want to have reports in your existing template and formats which your management team (specially Senior Management) is used to working with. They would like to see the

data by columns and rows as per existing reports. If you want to replicate and want to get that same reports in the existing formats from the SAP; then, you will have to write again a program. Similarly, for forms where you need to fill up say your purchase requisition is a form. So, you have to design that form because your company logo will be there, company address will be there, company PAN number will be there.

So, the new form has to be designed say the sales invoice. In sales invoice, again same thing; company logo, company address, company registered PAN number etcetera will have to be inserted. So, many important statutory information has to be there in these forms. So, that has to be designed. So, these are all part of the job and lot of development effort is involved in designing these Reports and Forms. This effort also defines the scope of the project as it is a major cost factor.

ERP Implementation Method



Now, the method how do we implement. You see there are lot of phases in these projects and it goes from one phase to other. It starts with Evaluation phase, when you are actually doing the pre-sales, trying to understand the complexity of the job because you have to quote a right price, how much time it will take, how many people you will need etcetera. So, that is a more or less the sales part.

Now, once the sales part is over and you get the order and you get the contract, then you start the project. You start with Project Preparation phase, that is where

you do all the risk analysis, building your team, do the training of the team members of the consulting and also your client's team members. Both the team, start to work from a Project office. Training is the most important starting activity in this phase, where you have to train the client's team members in SAP software and its various features and how it is configured client will need to train your team (consultant who have come to implement the SAP system) about their business processes. As you have come from outside, the consultants, you do not know what the business processes are in that company. Suppose they are manufacturing battery for example. So, they will you around the factory, show you the manufacturing processes, how it starts with the raw material etcetera. And then, they will have to explain in detail all business processes, how the company works, what are the rules and regulations etcetera.

Business blueprint is a design phase, when you are actually designing the To-Be process to be followed by the organization after SAP gets implemented. As-Is refers to the existing process and To-Be is the new process because I have told you in the previous session that something called a Business Process Re-engineering happens. So, when you implement an ERP or SAP, lot of processes undergo change because you are now capturing the best processes, which are there in the SAP product which has been you know gathered from their experience with large multinational corporations like Toyota, General motors, Coca Cola etcetera. So, you get the all their best practices. And you need to change your business process to the best, what is happening in the successful companies. So, that is what we are doing in the design phase. So, my organization today following this business process, but going ahead will adapt these new processes.

So, that becomes the To-Be business process. So, all your stakeholders from the company side like the CFO, the chief of Marketing, the chief of Production, the chief of Purchase everybody will have to agree to the new processes which is being proposed by the product. And you as a consultant, you are telling yes, you should adapt this for your advantage and they will have to understand. And they will have to sign off "yes", we agree and once that whole thing is signed off, then

you move into the Realization Phase which is the Build phase that is where you start actually working on the software.

Now, in SAP is something is known as Customization. Here you do not need actually programmers or coders to customize the software because it is already prebuilt. The software comes ready, everything is written. Now, the functional people, the persons who we call functional resources are the people who are experts in finance, materials management, sales and marketing, manufacturing etcetera. They do not write codes, but they know how the business process works. So, accordingly, they will now configure the product by writing some formula, selecting some check boxes, putting some values etcetera, like the stock values for example. For each item, they will decide what should be the reorder-point for planning the purchasing of these materials. These values are estimated based on their process knowledge and what they think would give the maximum benefit to the company.

So, the project team will discuss with the client and jointly decide the best stock level to maintain for each of the costly material. Stock quantity should neither be in excess nor in shortage as had been explained earlier.

So, all that is being done these consultants and it is something known as configuration. Also, you have to create your master data. So, all the Material Master, the Customer Master, Vendor Master; these are all thing which needs to be created on the computer by capturing all information, like - name, address, phone numbers, contact details, PAN number etcetera. What are the materials they supply etcetera, what are the previous vendor rating you had in the in your records? Apart from these Master records, you have to enter all your stocks and open items like - open purchase order, open sales order just before the system moves to production. This is called Go-Live, when the organization starts to do transactions in SAP.

But these are the things which have to be done without writing any code. We will not get into too much of details about the ERP software. All you need to know that this is a Realization phase where you do building the actual usable system

you are creating for the users (company employees). So, in Blueprint phase you design the system and now you are building it in the Realization phase. Then, Final Preparation phase is when you are getting ready after testing of the system, people are getting trained, data is going to be uploaded etcetera. Infrastructure readiness you have to check, but the main thing here is training of all the Users of the system. So, all the users will need to know how to operate that SAP software.

So, you are a part of materials team and so you will be handling these Materials Management screens. If you are a sales person, you would be viewing or working transactions like - Creating a sales order, Shipping goods , Billing , Invoice verification etcetera. So, how will you create a sales order? You open a customer name and order quantity etcetera. So, that sort of training is given as to how they will do the transactions because day in and day out the sales person has to create sales order or when you are floating a sales enquiry, how will you float a sales enquiry?

So, all those things are taught during the training because that is what the transactions they will be doing when they actually start working on the SAP system when it is goes live. So, Go-Live is the day you shut down your old systems and start working and carrying out your business with the new SAP software. So, that is where the entire company changes over, from their existing systems to the new ERP system. Take the example of banking industry. They moved over from manual systems to the online core banking systems (CBS). So, any branch of the bank you go they are all connected with same software. So, now, you do not have go to your particular branch, you can go to any branch of your bank and withdraw money. There is no restriction that you have to go to your own particular branch and then only you can get money from there. If you have an account in state bank, you can go to walk into any state bank branch and withdraw money. That is because they are having a common ERP type of software platform and everybody knows how to operate that.

So, when it goes live and everybody start working on the same software and then, we have last phase that is Sustain which means maintenance because any software you know has to be continuously maintained and upgraded. When a

user faces a problem he will raise a problem ticket and then, the maintenance team called Helpdesk team will start working to resolve the problem to keep that software up and running.

Because otherwise sometimes software hangs or there is an error, it will crash and so many things can go wrong with a IT system. So, there is a team which looks after continuously 24 x 7 to see that your system is up and running. You have several dimensions which are required as part of this journey. These dimensions are - People, Process, Knowledge and Technology.

I was telling you earlier, how the project is implemented. Knowledgeable persons, and skilled people are required for these projects. People with SAP skills, are involved in developing the new processes which I had talked about before. You have to follow a process step by step for which the consultants follow a methodology.

When you are doing the implementation, you have to go step by step. It cannot be arbitrary knowledge. Of course, you need knowledge of the product and the knowledge of the company/ Organization which is very important. All the team members must be fully aware of how does this company's business work. So, all the business processes of the company have to be known by the team members of both side the clients as well as the company people and then of course knowledge of technology is there. The major thing is about technology including both software and hardware and knowledge of business processes.

Blueprint (Design) phase- Best Practices

- ✓ It is critical to have overall end to end picture of your future state business processes. To be Scenario of the Organization.
- ✓ Business requirements should be as detailed as possible such that the business SMEs and ERP consultants can understand your exact business needs.
- ✓ Only experts in ERP product knowledge should finalize the fit gap analysis as Custom development is one of the major cost and factor for the completion of the project
- ✓ Custom development should be kept to the minimum to reduce cost and have high system performance.

Blue print (design) phase - It is critical to have overall end to end picture of your future state, business process and To-Be scenario. What I was talking about, is you need to know what is my organization that I am designing for the future. Obviously, you want to design something better, something newer. You do not want to stick to your old processes because everybody wants something latest and best, whenever one is investing so much of money buying a new sophisticated world class product.

So, SAP / ERP these are all world class products, best of the things available across the world. So, when you are implementing that at a lot of cost and effort, you want to get some benefits out of this investment. So, you want to have the best processes in the world followed by the leading organizations in the world. So, that is why you have to design new processes and develop proper To-Be scenarios for all the functional areas.

Design is the main thing because unless you design it right whatever you build will not be right. So, you have to think and brain-storm very much. So, that is where here all the top level of the management is involved, all the functional owners, the business process owners, the head of finance department - CFO, the head of marketing - CMO, the head of purchase, the head of manufacturing or head of operations, all of them finally will have to understand the processes and sign off.

They have to give their approval. And only then you can go ahead and design and build as per this signed-off design.

Business requirements should be as detailed as possible such that the business SMEs; SMEs meaning subject matter experts and consultants can understand your exact business needs. So, only experts in SAP product knowledge should finalize the Fit-Gap analysis as custom development is a major cost and should be minimized to the extent possible. Now, here I am discussing about new developments. This is called Fit-Gap in the sense after the design you can realize that some of the process of this company are very unique. They are not covered in the SAP product. So, that is called we call this as a gap. So, what is the solution? One of the solutions is to write / build a separate program like I was talking. So, the gap has to be fulfilled by building a separate program, but then you have to very carefully analyze it. Is it really required in the new scenario? Can we do without that or can be replace it by a standard process given in SAP?

So, all that discussion should go on because any development you want to do that is a question of cost because you have to have a developer. A developer, will write the codes in maybe 5 days, 6 days or 7 days' etcetera. And then, you have to test etcetera. Testing is again a very big costly component in any software development as it takes lot of time.

So, do a proper analysis that do we need it? If it is absolutely required; yes, we have to do it, but try your best to avoid that. So, the custom development should be kept to the minimum to reduce cost and a high system performance.

Deployment & Go live-Best Practices

- ✓ System preparedness- completeness of all system integration testing
- ✓ Completion of all End-User Training
- ✓ System performance Testing (Stress testing) to ensure better performance after go live
- ✓ Checklist to verify internal and external constituent readiness:
 - Support help desk in place
 - All IT equipment fully tested
 - Service level arrangement in place
 - All stockholders duly trained and made aware

And the more the extra programs you build, the software becomes very heavy. So, the response time gets impacted and any IT system you must have felt many times, when you are working, that the response time is very critical for the user. Like if you are using a phone or when you are doing a banking transaction and the system is slow, it hangs; you feel very irritated, you are not happy. So, you want something you think should move very fast.

Deployment and go live best practices - When you are planning to go live with the system; you need to check for system preparedness, completeness of all system integration testing, completion of all end user training etcetera so, which are very important. In the training plan, the people who are going to use system, must be trained thoroughly because it is a complex software. Learning it is not easy. So, you have to train them in all the transactions that each user would execute in SAP. I had told you earlier that because it is an online system working on real time any mistake a user does, gets immediately reflected across the organization.

And it is hitting your finance books. So, as soon as I entered, I have received 10 materials and instead of 10, I type 100, I have added by mistake one more zero, maybe I was not focusing, I was watching something on my phone by or talking to

someone on my phone which we often do. In one hand I am holding the phone and talking while in the other hand, I am doing my typing. And I do a mistake that instead of 10, I hit another zero, making it 100 and that is a major mistake and as soon as I hit enter, it is gone out of your hand. Such things make the training a very critical exercise in the implementation.

Systems performance testing – I was talking about the slow performance etcetera and its importance. So you have to do the load test and performance test, when everybody is working and large volume of much of data is going, how the server would be performing. Too much of data load may make it 'hang'.

You have seen in e-commerce sites or you have read in the newspapers, some day they give lot of discounts and then, plenty of people login across the country, Flipkart etcetera and they crash as the servers cannot handle so much of traffic. So, that load test has to be done which is true for any centralized IT system.

Then, check to verify internal external constituent readiness. You have to have the support Help Desk ready as it is very important because from day one, users will have problems. E.g. he is not able to use a report, he has forgotten his password, he is not able to login, he is not being able to do his transaction, it has become slow etcetera, all sorts of complaints will start coming in as it happens with the new users. So, the help desk should be in place from day one and they should be ready to answer all the questions and solve their problems. Otherwise, users may lose interest and this can place the whole project in jeopardy.

All IT equipment's should be fully tested and their service level agreements for PC's , printers, servers etc. with your vendors in place. All stakeholders should be duly trained and made aware of the changes. So, training, comes in several times. So, everybody must be trained and be made aware. Service level agreements or AMC's (annual maintenance contracts) should be in place because the machines should work, your local PC, your printer because all these gadgets are required for efficient functioning of the software

Continuous Engagement with stakeholders and Project Leaders (Do's and Don'ts).....

- **Work closely with implementer's senior executive (partner/delivery leader) to discuss avenues of improvements in project execution**, faster project delivery, resources challenges, solution optimization and scoping issues.
- **Review risks associated with project delivery**, budget overrun, solution quality and q-gates with vendor executives and propose mitigation plan.
- **Oversee and advice the periodic (daily or weekly) project leadership meeting**. Ensure accurate project progress is reported and discusses. Advice on options to mitigate any know project risks or issue.

Continuous engagement with stakeholder and project leaders - So, that is during the course of the project do's and do not's, work closely with the implementers senior executive and delivery leaders to discuss avenue of improvements in project execution.

As I was telling you, always interact with the senior level people from the client side because they are the people who are giving you decision and if they delay that decision,

then your project will get delayed. So, that is another risk. Review risks associated with project delivery - Budget overruns, solution quality, Qgates with vendor executives and proposed mitigation plans. These various aspects of risk analysis we will talk few slides later.

You should always interact such that your project does not get delayed because as I told you these are long and complex projects and if the project gets delayed there will be a cost overrun. Finally, it will cost more to the company in case of delay. Management does not like whenever a project manager will ask for more money.

Oversee and advise the periodic (daily or weekly) project leadership meetings – Ensure accurate project progress is reported. Communication is extremely important. So, as a project manager, suppose I am assuming you are as a project manager implementing a project, one of your major task is to regularly communicate your project progress and the status to all stakeholders, specially, to the senior leadership of your client. He is your customer for whom you are implementing this project. So, they should be all kept updated and informed.

Continuous Engagement with stakeholders and Project Leaders (Do's and Don'ts).....

- ✓ **Manage disagreements or conflicts between business teams, internal leaderships and systems integrator.** Serve as an independent unbiased advisor to resolve these conflicts and keep the entire project team motivated throughout.
- ✓ **Evaluate and qualify project progress report for preparing periodic “steering committee presentation”.** Provide expert opinion and advice to the steering committee when needed
- ✓ **Ensure that all sign-off and deliverable approval procedures are followed throughout the project organization.**

Continuous engagement with stakeholders and Project leaders (Do's and Don'ts) - Continue to manage disagreement of conflicts between business teams, internal leadership and systems integrator. I mean this is pretty obvious. Evaluate and quality project progress report for preparing periodic steering committee meetings.

See that everything is ready when steering committee meeting takes place because major decisions are taken during steering committee meetings and ensure that all sign-offs and deliverable approvals are obtained and procedures are followed throughout because it is very important to get all documents signed-off.

Because later on people can deny as no, I did not tell you this etc. So, there can be disputes. But, if you have a signed off document then the risk can be avoided.

ERP Challenges.....(1 of 3)

Project implementation challenges

- ✓ Scope changes
- ✓ Huge budget
- ✓ Long timeline
- ✓ Process redesign challenges
- ✓ Unrealistic expectation
- ✓ Complex interfaces

Project Implementation challenges; - Scope change; Budget change, Long timelines. I have discussed Process Redesign Challenges, Unrealistic Expectations and Complex Interfaces. So, when there is an unrealistic expectation from the customer, they want something you know they always want the sky but as it is not possible you have to manage their expectations.

Then process redesign could be difficult sometimes as all need to get convinced of the benefits of the new processes. These challenges are faced by the project manager because if anything you would agree to whatever the customer is asking, you will be in a major problem because it will take more time, cost more and the project will go in a loss.

ERP Challenges.....(2 of 3)

Support/ Maintenance Challenges

- ✓ Getting right people
- ✓ Managing multiple vendors
- ✓ Managing regular upgrades
- ✓ Technology obsolescence
- ✓ Large application portfolio
- ✓ Managing transition
- ✓ Realizing benefits

Usually, these projects run on a fixed fee basis. So, they (customer) have told you to deliver this project in one year and they will pay you so many crores and that amount is fixed. Now, if you take more time, spend more money then that is your loss as a consultant. So, you have to keep that in mind.

Support maintenance challenges - Getting right people knowledge here is very important. The skill level and the knowledge of SAP experts, is very important. You cannot have untrained people to do this job of managing multiple vendors and managing regular upgrades. Softwares keep changing; every 1 or 2 years, you know the software companies keep updating their product. So, that is also another thing which has to be handled. Technology obsolescence - Technology also gets back dated; you know in IT industry it happens very often. So, products keep changing.

Managing transition is moving over from the old system to the new system and this can be a big challenge when handling large number of application portfolio.

Realizing benefits - Customer will ask you, I did all these implementations and spend so much money, what is my business benefit. You have to give him the business case and also explain how to estimate the business benefits.

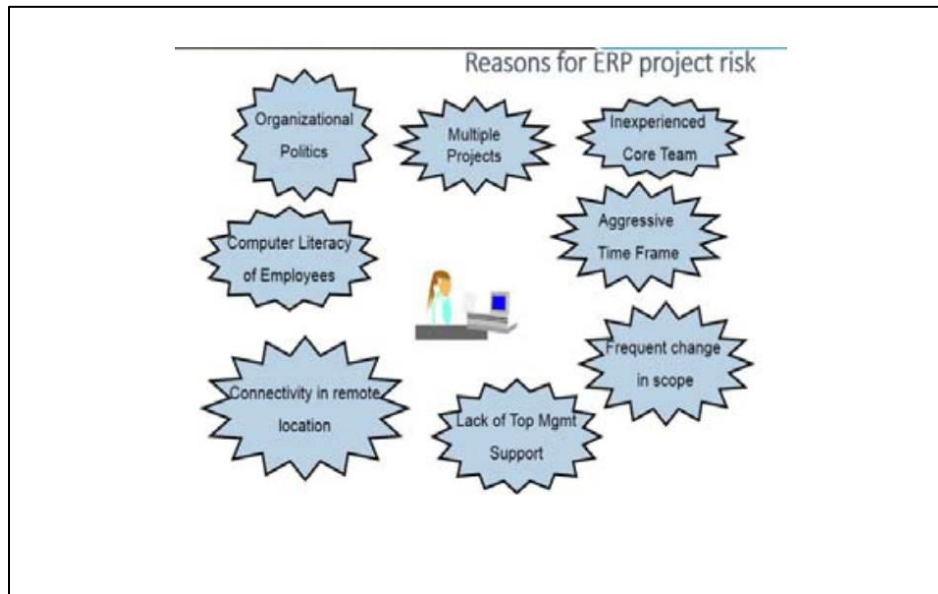
ERP Challenges.....(3 of 3)

Managing people

- ✓ Managing change
- ✓ Managing large project team
- ✓ Managing employee retention and relocation
- ✓ Top management support

Managing people - One of the most difficult thing in such projects is managing people and some of these will be discussed now. e.g. Managing change - Because it is a change management issue as people now have to work in a new system, they have to acquire new knowledge and they have to know little bit about the SAP software. So, all that can become difficult specially, if the people are elderly people and not so computer savvy. So, they will have some problem with the computer working etcetera and people tend to give a resistance to learning new technology. Managing this resistance to change is your challenge.

Managing a large project team is always a challenge. Managing employee retention relocation due to the project are also resisted often by employees. Finally, it is very important to get top management support and sometimes this can become a challenge for the project manager. So, these are the few things which you have to keep in mind as a project manager.



Reasons for ERP project risk; - There are several items which can happen to cause project risk. I will briefly run through this list. So, from the left its organization politics ok, we will not discuss that politics part. Computer literacy of employees; so, employees should be computer literate, if not that is a problem. Connectivity in remote location say any connectivity, it is all about networks. So, LAN WAN etcetera of course, so connectivity is a risk.

Lack of top management support, its it is a very big risk; the management has to support your project. Frequent change in scope, if the scope keeps changing, then project will get delayed and it will increase the cost. So, you should always avoid this scope change.

Aggressive time frame, - the time frame may be very aggressive, then, it can be a risk because then, people have to work very hard, extra weekends etcetera and that can become a problem.

Inexperienced core team, if the team from the company side, they are not experienced enough, they will have inadequate knowledge about the business processes. In that case you will not get proper design inputs. So, that is a risk parameter.

Multiple projects - if in that company there are several projects running simultaneously people will give less importance to this project and that is a risk.

Five Step Project Risk Management Approach



Five Step Project Risk Management Approach: - You have to find a potential risk element, then do an impact analysis and estimate the probability of occurrence and finally, you have to prioritize the risk to know which risk can happen and has a higher probability of occurrence.

And then, you have to have a risk mitigation plan. So, for every risk, you must have a mitigation plan if this happens and how will I handle the situation that is all it means as a mitigation plan.

Some critical success factors.....

- Ownership & Support from top management
- (Project Sponsor & Steering Committee)
- Commitment to the Product (e.g. SAP)
- **COMMITMENT TO CHANGE**
- Quick decision making and avoid lengthy discussion on trivial issues.
- Avoid frequent changes to requirements
- Strict adherence to the project plan

Some of the critical success factors are ownership and support from top management, again this has been said many times. Commitment to the product of course, you have to give commitment to the product you are investing in, like SAP for example. Commitment to change that is very important. So, the whole organization is going to change, the people will need to change, the way they work is going to change etcetera the business process will get changed etc.

So, employees must agree for a commitment to change. If they resist change, the project will not succeed. If we go back to the example of computerization of public sector banks, where the employee union had resisted computerization of banks. So, they were resisting that change. But finally, it was overcome otherwise you know the banking would have remained something very old fashioned. With all manual work, customers would have to stand in a queue, go to the teller, give a cheque and then stand in a queue and then, they will give you cash. And all that would be done only during banking hours.

So, in working day between 10 to 2, you have to go the bank for your cash. But now it is 24 by 7, anytime you go to an ATM, you can withdraw cash and all that has been possible because there was a big change. Quick decision making and avoid lengthy discussions on trivial issues. You should take quick decision because you are all bound by the project time lines which are usually very tight. Delays will result in project loss.

Avoid frequent change to requirement. So, scope change as I told earlier is a major risk. Because many people will come and request can you do me a small thing, it is a favor etcetera, but you have to avoid all that otherwise you will not be able to control your project in time, deliver it in time. Strict adherence to project plans is a must.

ERP- Recent Trends

- ERP vendors are moving into enterprise Application space
(SRM, SRM, PLM, SCM etc.)
- SME clients are everybody's force
- ERP vendors are going vertical i.e building more industry specific extension
- New ERP deployment models are emerging in the form of SAAS, cloud computing etc.
- Newer types of ERP projects are emerging- Migration , consolidation, Harmonization etc.

So, some ERP recent trends; ERP vendors are moving into enterprise application areas, we will discuss it later. CRM, SRM, PLM, SCM we will cover that. SME clients are everybody's focus. Vendors are going vertical. This is general knowledge about ERP, the environment. Newer types of ERP projects are emerging; migration, consolidation, harmonization etcetera. So, when two businesses join one is having one ERP, the other ERP that is a different type of project management problem altogether. But these things happen very frequently; migrations, takeovers, mergers etcetera.

Human Capital Management

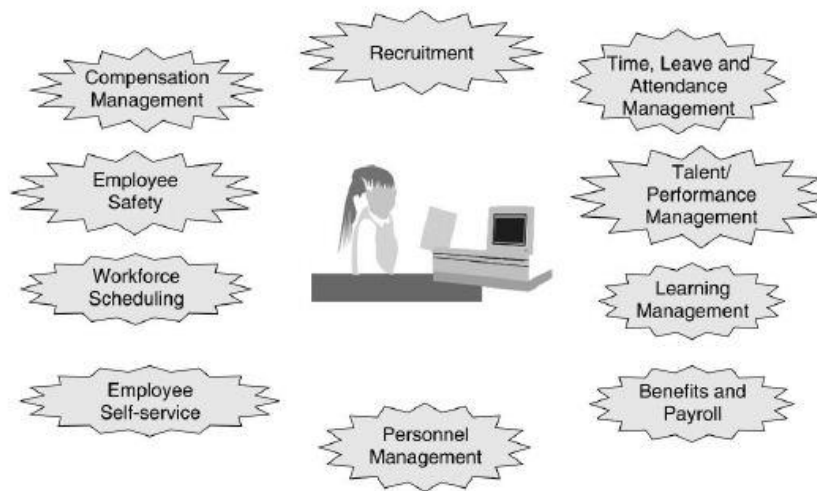
INTRODUCTION

Human capital management is a key process for every organization and this is a standard offering from most of the leading ERP vendors in the market. The offerings differ for different packages. In this chapter we discuss the general modules of HR solution which are covered by most of the leading ERP packages available in the market.

HUMAN CAPITAL MANAGEMENT SYSTEMS

Human capital management processes in the organisation spread across several processes as shown in Figure 20.1. These processes cater over the entire life cycle of an employee, start before an employee joins an organisation and continues till date the employee leaves or retires the organisation.

Fig. 20.1 Human Capital Management Areas



While the order in which a company automates their human resource management processes varies as per the company, typically transaction intensive processes like payroll, employee record management, time and attendance management, leave management, etc. are first automated. The simple logic for this automation is the volume of data/records and transactions. Recruitment processes are next to be automated. Strategic processes like talent management, performance management and learning management processes are last to automate. Figure 20.2 describes this order of automation.

LEADING HR SOLUTIONS FROM ERP PACKAGE VENDORS: SAP AND ORACLE

SAP and Oracle are two leading vendors in HR solution space. In this chapter we discuss the SAP HR solution in detail and give an overview of Oracle HR offerings.

SAP Human Resource Solution SAP HR solution is part of SAP's ERP offering. Currently SAP's offerings are mainly divided into two main areas:

- Talent management
- Workforce process management

Talent Management Talent management comprises four key HR processes: Recruitment, Pay for performance, Educating and developing talent, and Identifying and growing future leaders. This enables the organisation to find the best people, leverage their talent in the right place and

right time, align employees and teams to corporate goals, maximise the impact of training, and retain and promote top performers. The solution has following components:

- **Recruitment:** SAP e-Recruiting in SAP ERP HR enables the organisation to build pools of potential talent, resulting in better hires and a more efficient hiring process. Processes in this module enable applicants and candidates to self-register and maintain their information in a talent warehouse that serves as an effective sourcing channel, provides recruiters functionality to find potential hires quickly, intelligent electronic screening, filtering, sorting, ranking, advanced applicant tracking, analytics (to measure the effectiveness of the overall recruiting and hiring processes), etc. Candidates can use the talent warehouse to upload resumes and CVs, register their interests and skills, and even create a personal page and using this information the organisation can establish and maintain long-term relationships with candidates. This module also supports recruiter from the job requisition stage to the closing of the job offer focusing on tasks that must be completed for a specific requisition by a specific date and trigger the required workflow as required.
- **Career Management:** Enables each employee to manage their career paths and aspirations, either through self-service capabilities or as a result of planning with their managers. Profile match-ups against positions can determine skill and knowledge gaps which, in turn, can be tied directly to training plans to fill necessary qualifications.
- **Succession Management:** Enables a company to identify and track high potential employees and implement development plans to ensure they are prepared to assume future leadership roles. A company can also identify specific positions as key and target specific employees as potential successors.
- **Enterprise Learning:** Delivers training, education, and knowledge to employees to ensure that they have the right skills and information necessary to do their jobs effectively and this is integrated with employee development plans and individual objectives. SAP also offers a Learning Portal as a part of its offering. This web-based portal provides learners with personalised access to information about courses and learners can launch web based courses from the portal. Learners can also enter virtual learning rooms and collaboration rooms from the portal.
- **Employee Performance Management :** This helps in employee reviews and appraisals, and supports performance-oriented compensation process. This integrates corporate goals and strategies with team and individual goals as well as integrates management by objectives.
- **Compensation Management:** This supports several reward strategies such as performance- and competency-based pay, variable pay plans, and long-term incentives. This also helps in comparative analysis of compensation packages, using internal and external data.

Workforce Process Management This includes essential workforce processes such as employee administration, payroll, time management, and legal reporting. The solution has following components:

- **Employee Administration:** Manages all employee related data.
- **Organisational Management:** Manages organisational structures, policy, organisational development capabilities including organisational planning and simulation, organisational development, activity analysis, and job analysis. It also has ability to simulate, analyse, and experiment with proposed organizational changes and previous organisational models.
- **Benefits Management:** Provides administration of all types of benefit plans supported by a full range of self-services to enable employees to more effectively manage their own benefits options.
- **Time and Attendance:** Support processes for planning, managing, and evaluating the working time. Self-service applications can be used to enter leave data, record working times, display key leave information, etc.
- **Payroll and Legal Reporting:** Handles all payroll processes, supports legal regulations and ensures compliance with regulatory changes. This supports payroll accounting, tax, social insurance, travel expenses administration, incentive wages, loans, etc. Enables employees to easily change their address, change their banking information, display and print payment slips using employee self-service functionality for payroll. It provides several country versions. Key functionalities includes: Basic pay calculation, absence valuation, legal deductions (taxes, social security), benefits processing, etc.
- **HCM Processes and Forms:** Automate paper-intensive processes such as hiring, termination, organizational reassignment, leave, etc. This accelerates data entry and all involved business roles such as affected employees, affected managers and HR professionals can be informed through workflow.
- **Oracle Human Resource Solution** Like SAP, Oracle is also a leading vendor in HR solution covering all end to end HR processes. Table 20.4 gives a brief overview of different Oracle HR modules and solution areas.

Table 20.4 *Oracle HR Modules*

<i>Solution Areas</i>	<i>Modules</i>
Global Core HCM	Human Resource Payroll
Workforce Management	Advanced Benefits Time and Labour Workforce Scheduling
Workforce Service Delivery	Self-service HR Oracle Portal Help Desk for HR
Integrated Talent Management	iRecruitment or Electronic Recruitment Incentive Compensation Workbench Learning Management Performance Management
HR Analytics	Oracle HR Analytics Daily Business Intelligence for HR

Financial Management

INTRODUCTION[

Financial Management is one of those areas which is most commonly implemented in any ERP project and is one of those modules which get implemented first. This is due to transaction volumes and legal requirements— any company will like to automate the process. Today’s ERP systems made the life of financial people simple and it is no more sleepless night for closing month end or year end transactions. Finance is one of those ERP modules which is highly integrated and any transaction done in any other ERP module can have its financial application as shown in Figure 21.1.

ERP FINANCIAL APPLICATION

ERP financial applications broadly have offerings as mentioned in Table 21.1. While depending on the application (SAP or Oracle or any other), the module names may change, any ERP application helps in the areas of financial accounting, management accounting, accounts payables, receivables, tax accounting, etc. as shown in Figure 21.2.

Fig. 21.1 *Finance is a Highly Integrated ERP Module*

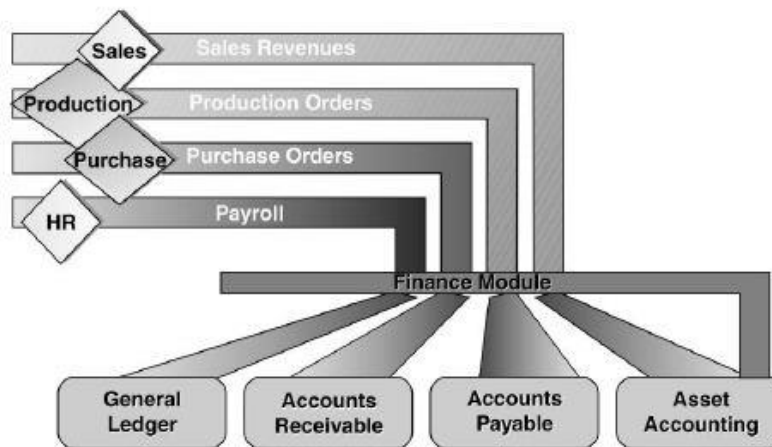


Table 21.1 *Offerings of ERP Financial Application Categories*

Application Category

Application Category Application Description

Accounts Payable

This application automates and streamlines the invoice-to-payment cycle. This helps in receiving invoice from vendor (by electronic way also), validating vendor invoices and executing the payment process (supports electronic payment as well by EDI or automatic bank debit).

Accounts Receivable/ Collection Management

This application automates and streamlines the payment receipt process from customer. This helps in generating and sending invoice for customer (by electronic way also), receiving payment (supports electronic payment as well by EDI or automatic bank debit) and helps in handling any payment-related disputes. These applications manage risk in granting credit to customers, analyse accounts receivable for delinquency and can send reminders to customers for balance collection

Accounting

General ledger is the heartbeat of businesses of all types. This maintains detailed set of books for the organisation, trial balances, balance sheet, etc. These systems also provide a number of reports which may have different audit implications.

Costing and Profitability

These applications enable organisations to update and analyse production and operating costs by product, customer order etc. Some of the ERP applications support activity based costing. This application can determine which customers are most profitable or assess product profitability.

Reporting different expenses Budgeting

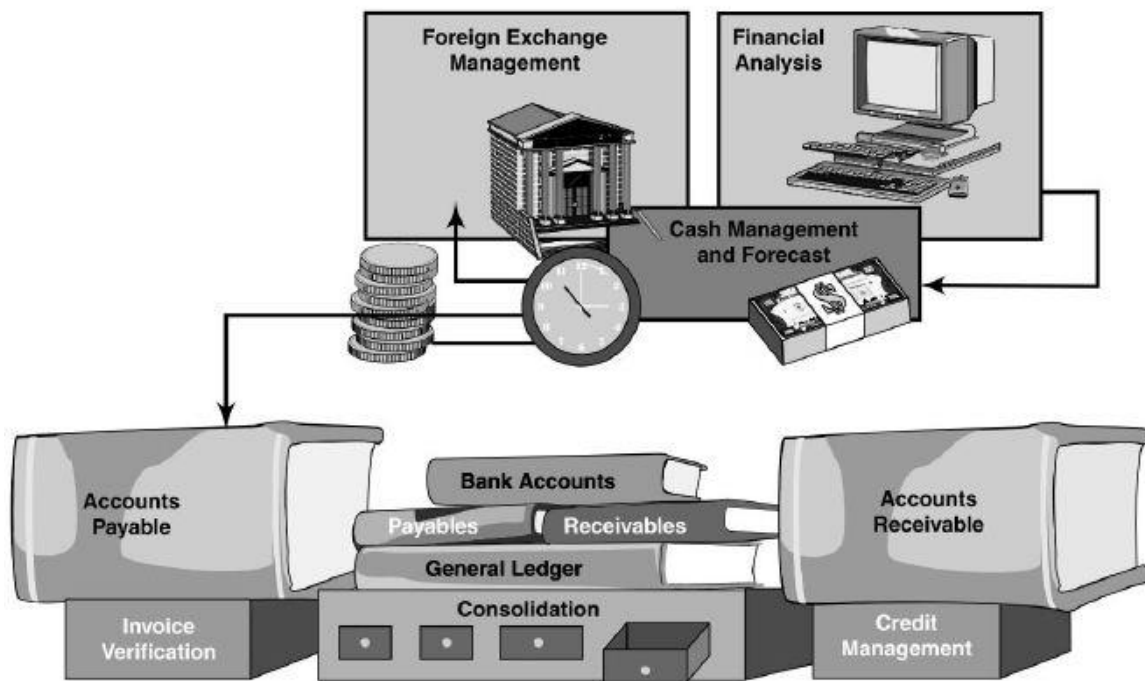
Financial applications are needed for accounting and reporting for different employee expenses for travel, etc. ERP financial tools are also used for creating annual budgets of an enterprise, specific project budgets, revenue and expense forecasts, etc.

Consolidation

Consolidation (or aggregation) of financial

Financial reporting	data (like general ledger) across multiple companies/business units/legal entities helps in business consolidation. ERP financial module also helps in producing financial statements as per regulatory compliance requirements and conformance with global accounting principles (e.g. GAAP and IFRS).
Internal control and audits	ERP modules support different internal controls (checks and balances) and audits for business.
Tax planning	ERP Tax module ensures compliance with various tax jurisdictions and tax types from corporate tax provision to calculating sales tax and payroll taxes. This can estimate tax liabilities, helps in e-filing of returns and can report on taxing.
Treasury and cash management	ERP financial software helps in managing treasury operations, managing cash and investments, monitoring liquidity, managing financial risk, and ensuring compliance as per different financial standards.

Fig. 21.2 *The Elements of Financial Accounting*

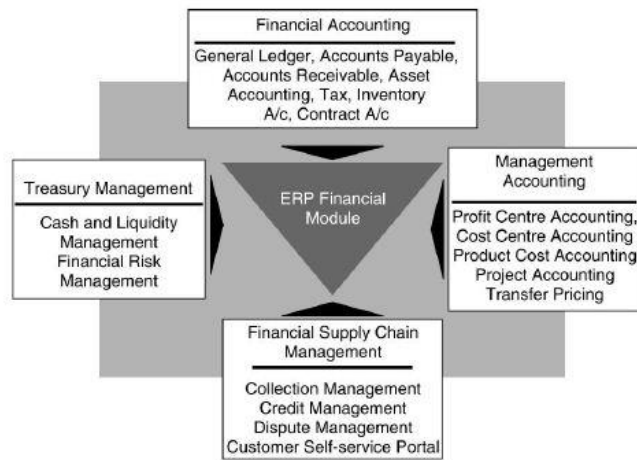


FINANCIAL MODULES IN DETAIL

Traditional ERP financial applications can be broadly classified in four categories as shown in Figure 21.3 and these are:

- Financial accounting applications

Fig. 21.3 ERP Financial Module



- Management accounting applications
- Financial supply chain management applications
- Treasury applications

These four sets of applications are described in brief below:

Financial Accounting

This module of ERP helps in financial accounting as per local accounting standards and as per international accounting standards (US-GAAP, local GAAP, etc.). This module helps in maintaining different ledgers, trial balances and is integrated with accounts receivable and payables management. The module automates financial transactions and help speedy period end accounting tasks and financial closing cycle. This module also complies with different regulatory compliance standards. This helps in managing following processes:

- **General Ledger (GL):** This records all business transactions and is integrated with other operational areas of a company as most of the business transactions in a company can have accounting implications.
- **Accounts Receivable (AR):** This component of ERP financial accounting module manages and records all customer accounting data. From this component a lot of useful reports on customer's payment history can be obtained like for which customers payment is due more than 30, 60 or 90 days.
- **Accounts Payable (AP):** This component of ERP Financial accounting module manages and records all vendor accounting data.
- **Assets Accounting:** This component maintains the accounts of fixed assets according to company specific different depreciation standards and accounting rules.
- **Contract Accounting:** This is a specialised type of accounting requirement for managing contracts, i.e. managing high-volume, recurring time or quantity-based billing.

- **Bank Accounting:** This component manages different bank transactions of the company like processing of incoming and outgoing payments, cheques, etc.
- **Cash Journal Accounting:** This component manages all cash transactions.
- **Inventory Accounting:** Helps in different types of inventory (raw material, work in process, finished goods, etc.) valuation and inventory accounting according to different principles (like first-in first out).
- **Tax Accounting:** Supports the calculation and reporting of taxes on sales and purchases.
- **Creation of different Financial Statements:** Financial module helps in creating different financial statements as per company laws and country-specific regulations.

Management Accounting

Management accounting module of ERP helps in all type of cost and valuation related accounting like profit centre accounting, cost centre accounting, etc.

- **Profit Centre Accounting:** Supports accounting of different profit centres by assigning costs, revenues and balance sheet items to respective profit centre.
- **Profit Centre Accounting:** Supports accounting of different profit centres by assigning costs, revenues and balance sheet items to respective profit centre.
- **Project Accounting and Budgeting:** ERP Management accounting supports detailed project financial planning and budgeting and helps project managers to execute the project on time and within budget.
- **Product Cost Accounting:** ERP cost accounting module helps in calculating cost of goods manufactured(COGM) or cost of goods sold (COGS) with details like cost of raw material, cost of manufacturing, cost of distribution, etc. This module works very closely with production management module of ERP as product costing depends a lot on manufacturing process. In an engineer-to-order (for example, shipbuilding) or make-to-order (for example, making special grade of steel for a customer) environment, the focus is on controlling the individual sales order. In a make-to-stock environment (for example, making soap or detergent type of product), the focus is on controlling the individual production or process order.
- **Transfer Pricing:** Exchange of goods and services within different divisions of a company is a common practice – the issue is how to value such transactions. ERP supports different transfer pricing approach for valuating the goods and services exchanged between these units.

Financial Supply Chain Management

ERP financial supply chain management applications help in receivables and collections management

processes, thus reducing operating costs and improving cash flow. These solutions also help in resolving payment (invoice) disputes, reducing the collections cycle time and customer credit risk, accelerating cash flow and lower operating expenses.

- **Self-service Portals for Customers:** These portals provide self-service functions via internet and enable customers access invoices, account status, and payment information. These portals can also integrate with customer or supplier portals.
- **Collections Management:** This tool of FSCM has a variety of tools to ensure that collections from customer happen on time and include things like payment reminders, collection strategies, collection controlling, etc. This also helps in effective management of past due accounts and faster collection of delinquent payments through prioritised and personalised collections efforts.
- **Credit Management:** This module of FSCM helps in managing credit limits to customers by analyzing customer credit information, employs sophisticated tools to analyse customer credit worthiness and helps to avoid customer overdue accounts and losses due to bad debt.
- **Dispute Management:** This FSCM tool helps to resolve all invoice and payment related disputes with supplier or customer quickly and, thereby, reduces days' sales outstanding (DSO) and improve cash flows.

Treasury Applications

Treasury module of ERP helps in managing cash, liquidity and bank interactions. Focus of this module is mainly in the areas of

- **Cash and Liquidity Management:** Helps monitor and manage cash flow and liquidity as well as do cash forecasting. The ERP system provides the opportunity to determine liquidity forecast at different levels of the company.
- **Financial Risk Management:** Ensures adherence to regulatory compliance and financial reporting standards.
- **Managing Bank Interactions:** Streamline all payment processes and corporate-to-bank communications through online connectivity with banks via secure electronic payment networks and thus, reduces bank fees and cost of cash transfers. This also helps in centralised control of banking balances, cash management, and payments. This enables a company to connect to its bank, track the entire payment life cycle of a transaction, and monitor payment status and bank statement.

Procurement and Inventory Management Through ERP

In this chapter two important logistics processes for any organisation, i.e. Procurement and Inventory Management have been introduced. For many companies, these processes are the major drivers for implementing a new ERP system. This chapter starts with procurement followed by inventory management.

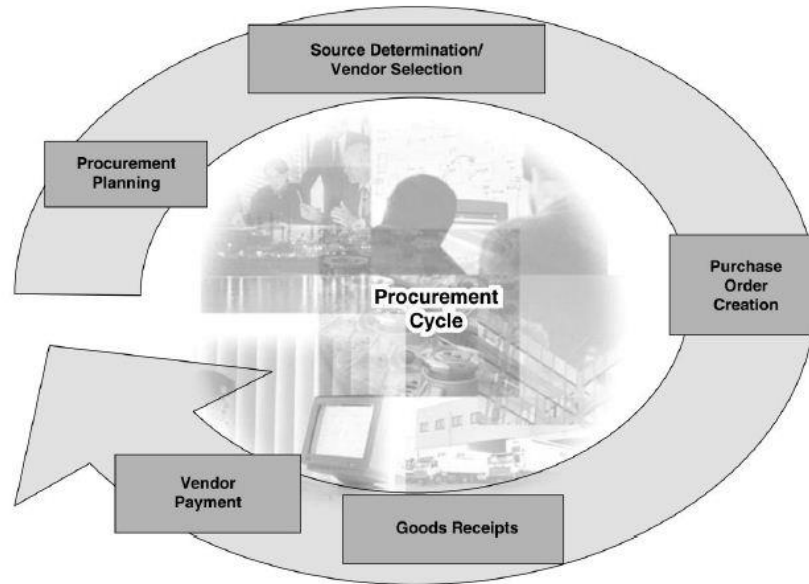
PROCUREMENT

Procurement Process

Procurement is the process of sourcing material from vendor, inspecting it and finally paying the vendor for accepted materials. Procurement is a requirement for almost every organisation which is why it is considered as a very fundamental module of any ERP system. Procurement being a transaction-intensive process, it is one of the most widely used ERP module. Figure 22.1 shows steps of a typical procurement cycle and these steps are detailed below:

- **Determining what to buy and how much—Procurement planning:** The first step of procurement cycle is deciding what items to buy and of how much (quantity). This process is also called procurement planning process and depending on type of items, the process differs. For regular production items i.e. items that are needed for producing finished goods, a detailed material requirement planning process is needed, whereas for one-time purchases and items that are not needed regularly, user department, can create a purchase requisition. For example, a company manufacturing car will need tire, battery and engine regularly for making the car and these items need to be planned by a material requirement planning, process, whereas it may need some engineering spares for its machines only in case there is a breakdown and for these the engineering department can create purchase requisitions as and when required.

Fig. 22.1 Procurement Cycle



- **Determination of the source of supply and selecting vendor:** Determining the right source of supply is the next challenge for buyer. Once buyer identifies few technically capable vendors, he asks for a price quotation and delivery terms from them. Once price and commercial terms of different vendors are compared, purchaser finally selects the vendor for the particular item.
- **Purchase order creation:** In this step a purchase order is created with item details, quantity, price, delivery terms, etc. This is a legal document between the company and the vendor.

Goods receipt: In this step goods are received. There can be several checks during goods receipt

process like quantity check (whether the same quantity had been delivered as asked for), quality check (whether goods are of proper quality as per specification provided), etc. Goods receipt is generally happens at factory level where a goods receipt posting to stock with reference to a purchase order is done.

- **Processing vendor payment and invoice verification:** The final step of procurement process is paying vendors after verifying the invoice submitted by him.

How ERPs Support Procurement Process

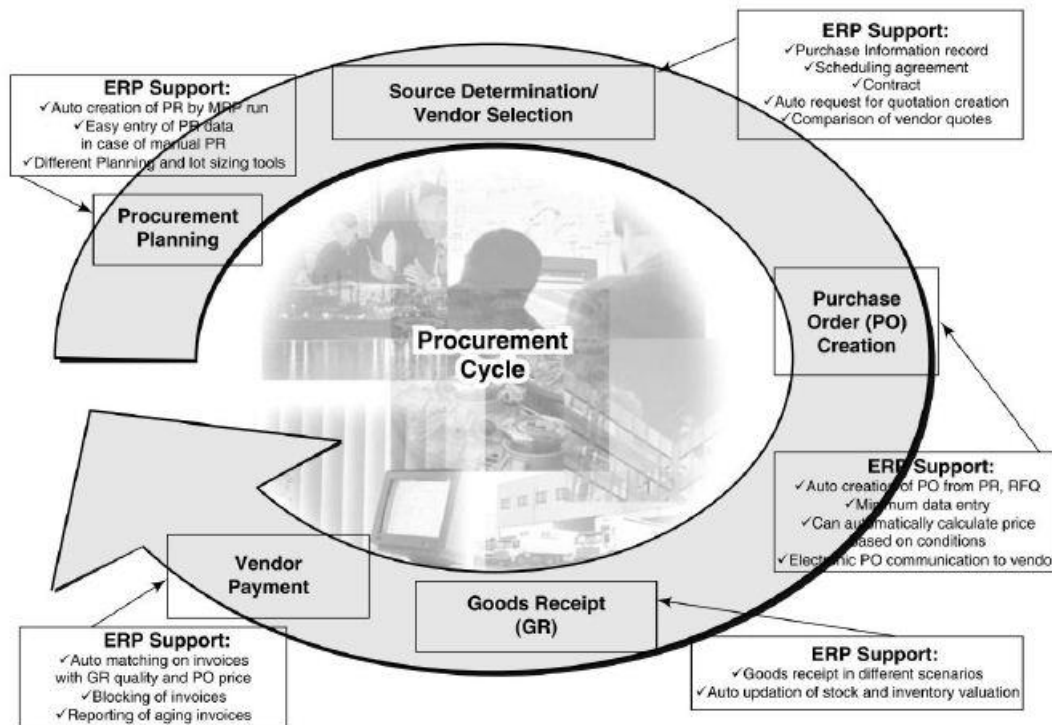
Figure 22.2 explains how ERP can make these processes more efficient.

- **Determining what to buy and how much—Procurement planning:** ERPs support different strategies of procurement planning and automatic creation of purchase requisition based on finished goods requirement and past sales. ERPs also support manual creation of purchase requisition in the system for requirements not regular in

nature. Generally for material planning, an MRP procedure need to be setup in the material master and based on this setting, the ERP system automatically generates purchase requisition.

- **Determination of the source of supply and selecting the vendor:** ERP systems help buyers determining possible sources of supply, provided vendor information is maintained in the system and vendor material linkage (i.e. which vendor supplies what material) is available in the system. The system supports creation of requests for quotation (RFQs). RFQs can be sent to vendors and their responses can be entered into the system. The system helps in selection of vendors by making price comparisons between various quotations.
- **Purchase order creation:** The ERP system facilitates data entry for purchase orders, i.e. as soon as the vendor and material code is entered, the system populates relevant vendor and material details (vendor name, address, tax code, material description, UOM (unit of measure), etc.) from masters. Purchase order creation is also facilitated by copying relevant terms and conditions from condition master. The system also calculates pricing discounts based on conditions and apply the same in purchase order. The order status can be monitored online to see whether goods or invoice have been received for the relevant purchase order item. The system also supports sending purchase order electronically to vendors.
- **Goods receipt:** The ERP system supports different types of goods receipt scenario against purchase order, without purchase order, etc. and different kinds of checks can be activated while receiving goods. The system can compare the goods receipt quantity with the purchase order quantity, can reject goods if the quality specification is not met, can block materials, can block vendors, etc. There can be several checks during goods receipt point like whether the delivery is the same as what is ordered in the purchase order and the quality of the items. When goods receipt is against a purchase order, the ERP system suggests data (like items and quantity) from the purchase order and this makes it easier to enter the goods receipt and check over deliveries and under deliveries. With goods receipt, the purchase order history is automatically updated,.

Fig. 22.2 Procurement Cycle—How ERP Makes this Process More Efficient



and purchasing department comes to know that if there are late deliveries. Goods receipt also create accounting document and value of the stock is updated. Goods receipt can also happen without reference to the purchase order for reasons like urgent purchase.

- **Quality inspection and shelf life expiration check:** Goods receipts from vendor are generally put under quality inspection stock as most of the materials need to undergo quality inspection before it is used. However, there can be exceptions to this, i.e. for self-certified vendors and items, there is no quality inspection and materials are directly delivered to the shop floor. Materials from new vendors generally go through stringent quality inspection. Shelf life expiration check may be important for certain items and ERP systems support this provided the expiry date or production date of the material at the time of goods receipt is entered in the system. The ERP system checks while receiving goods that whether the minimum remaining shelf life meets the requirements entered in the purchase order and in case of an exception, it issues a warning or error message. The shelf life expiration date is printed on the goods receipt/issue slip.
- **Under-delivery and over-delivery:** When goods are received with reference to a purchase

order, the ERP system proposes the purchase order quantity of each item during goods receipt. If the actual receipt quantity from the vendor is different from that, then the ERP system compares the quantity of goods received with the quantity in purchase order and, thereby, identifies under-deliveries or over-deliveries. In purchase order item, a percentage value for the under-delivery or over-delivery tolerance can be maintained, and if quantity of goods receipt is within these tolerance limits, then goods can be accepted.

- **Processing vendor payment and invoice verification:** This is the final process of procurement cycle after which vendor payments are made and this process is typically done by accounts department of the company. ERP systems facilitate this process in different ways like:

- **Invoice entry:** As invoice is entered with reference to a purchase order, the system suggests data from the purchase order and the goods receipts for the purchase order (for example, vendor, material, terms of payment, etc.). Invoices can be posted in the ERP system in different ways. The company can receive invoices by post and then an employee enters data and posts them in the system. The company can also receive invoices via electronic transfer and the system posts them automatically.
- **Three-way matching and invoice variances:** If there are discrepancies between the purchase order or goods receipt and the invoice, the system warns the user, and can block the invoice for payment. ERP systems generally do a three-way check before making payments to vendors, i.e. the match between purchase order, goods receipt document and invoice. Price in invoice should match with purchase order price for an item. The quantity in invoice should match with goods receipt quantity and purchase order quantity. When all three matches, the payment is processed. There can be three possible types of variances: Quantity variance (ERP compares the difference between the delivered quantity and the quantity already invoiced), Price variance (ERP compares the purchase order price with the invoice price) and Date variance (ERP compares the planned delivery date to invoice entry date).
- **Invoice Blocking:** ERP systems can block an invoice for payment for various reasons like: Block due to quality inspection (If vendor's goods are rejected), Blocking due to amount (If the invoice value is higher than the purchase order value and more than the value tolerance

limit), Manual Blocking (ERP systems also allow manual blocking of invoice for any other reason). Once the blocking reasons no longer apply, ERP systems automatically release the invoice or it can be released manually.

- **Parking of invoice:** An invoice can be put in temporary parking for various reasons like missing information during processing an invoice or invoice data need to be checked by another authority before posting etc.
- **Credit/Debit memos:** Credit memos are received from a vendor if there is an overcharge and these memos can be entered in ERP with reference to a purchase order or a good receipt and are posted as a subsequent debit/credit.
- **Reports on aging invoices:** It can create reports of aging invoices, i.e. invoices which are not paid for a particular duration, etc.

Posting of the invoice completes the invoice verification process. The system updates the purchase order history and financial accounting initiates payment for the invoice items.

Some Important Functionality of the ERP System to Support Procurement Process A. Purchase requisition (PR): Purchase requisitions (PRs) are needed to request purchasing department to procure particular quantity of a material or a service for a particular date. PRs can be created by material requirement planning (MRP) runs or manually. When creating a PR, the requester can specify a source of supply or a preferred vendor for the item. Sometimes PRs (for example, for high value items) need to be authorised by particular person in the organisation. PRs can be converted to purchase order.

B. Contracts: Contracts are long-term agreements for buying a set of items at a defined price from a particular vendor. They do not contain quantity and delivery dates for each of the items. The company entering into contract with a vendor use delivery schedule against the contract to inform vendor how much quantity is required on which date. Though contract does not specify the details of quantities it may set the quantity limit.

For example, an auto company can enter into a yearly contract with the tyre supplier as they need this item regularly. The contract in this case will specify different types of tyre that the auto company will buy from the supplier, price for each item, packing instruction, delivery instruction, legal and commercial terms and a maximum quantity limit of 100000, i.e. the company will not buy more than 100000 tyres during the year. This contract will now talk about on which date how much quantity to be supplied and for that there can be separate release orders of 5000 in 1st month, 8000 in 2nd month and so on. Sometimes long-term contracts also include price variation clause. For example, here if the rubber prices changes a lot during the year, it is difficult for the tyre supplier to supply tyre at a fixed price and in that case the contract price may be linked to the rubber price and one of the contract clause can be "For more than + / - 10% variation of rubber base price (price of rubber at the time of entering into

the contract with tyre vendor is considered as base price) the contract prices has to be renegotiated”.

- **Central contract and plant specific contract:** Contracts can be specific to one particular factory or it can be centrally agreed. In case of a centrally agreed contract, all the plants of a company can order against this. Typically, companies having a central purchasing organisation covering several plants use centrally agreed contract as this help them to negotiate better commercial conditions with the vendor. Generally for centrally agreed contract though the contract is agreed centrally, individual delivery orders are given by particular factories specifying on which date which plan will need what item and of what quantity.
- **Quantity contract:** This type of contract is considered as complete when the agreed total quantity as mentioned in the contract has been supplied based on individual release orders issued against the contract. For example, a contract of 100000 quantities will be completed as soon as all release orders against this will reach this quantity.
- **Value contract:** This type of contract is considered as complete when the agreed total value as mentioned in the contract has been supplied based on individual release orders issued against the contract.

For example, a contract of 10 lakh value will be complete as soon as total vendor's invoice value against this reaches 10 lakh.

C. Quota arrangement: If there is more than one source for a material, the ERP system allows maintaining these individual sources of supply through quota arrangement. The quota arrangement has a defined validity period and specifies in percentage how the receipts should be distributed amongst each source of supply. This includes external procurement or in-house production, as well as various special procurement types. For example, if a car company has two vendors for tyre, it can tell that for the year 2009, they want to give 60% of their volume to vendor A and 40% to vendor B. In that case, PRs will get split in this proportion and will get assigned to these two vendors.

D. Forecast delivery schedule and detailed delivery schedule (Firm schedule): One of the typical requirements for many vendors is that while they should know how much material they need to supply on the next date, i.e. on the next day or next week, it is also important for them to have a forecast for relatively longer period, i.e. how much material will be needed in the next few weeks/next few months. This helps them in better material planning. For example, the vendor supplying tyres to a car company will like to know from the car company that how many tyres he needs to supply tomorrow and a high-level estimate of how much the car company will need in the next few weeks and months so that he can plan his procurement of essential raw material like rubber and other items in the best possible manner. This necessitates two kinds of schedule release:

- **Forecast delivery schedules:** These schedules are used to give the vendor a medium-term overview of the requirements. These schedules may over the time change to a limited extent, i.e. final schedule can be + / - 10% of this forecast schedule.
- **Detailed or Firm schedule:** Sometimes this is also called just-in-time (JIT) delivery schedule. This is to inform the vendor just the next set of requirements, i.e. the next delivery schedule. Such schedules may comprise a daily or even hourly breakdown of requirements over the next few days or weeks. These are also called firm schedule as these will not change in future.

Scheduled delivery dates that lie in the near future (for example, in the next week) can represent a firm commitment than those that are further away in time (for example, in the next month). In the car company example, the tyre vendor may have a firm zone schedule of next one week for which the car company is committed to buy and a trade off zone schedule for six weeks during which his plan may change and this is only to help the tire vendor to procure his raw materials.

E. Source list: Source list is a concept of ERP system that is used to define which sources of supply (vendor) are allowed or not allowed for a material in a particular plant, i.e. it is a list of allowed, preferred, and/or blocked vendor for a material for a particular plant, indicating the periods during which procurement from such sources is possible. If in the source list only one source is defined for a material in a plant, ERP systems automatically assign this source during the creation of PR and this process is known as automatic source determination in purchasing. However, if there are multiple sources for an item as defined in the source list, automatic source assignment does not work.

F. RFQ (Request for Quotation) and Quotation: The ERP system helps in creating the request for quotation (RFQ) manually or with reference to a PR. If RFQ is created with reference to a PR, the information already in the PR is copied directly to the RFQ and sent to the chosen vendors, who then submit their quotations. These quotations (price, conditions, delivery dates, etc.) can be entered in the ERP system with reference to the corresponding RFQ and the system determines the best vendor for each item individually by means of a quotation comparison. Purchase orders can be created with reference to a quotation. The system can issue rejection letters to the vendors whose quotations are not selected.

G. Converting PR to Purchase Order: Once vendors are selected, buyers convert purchase requisitions into purchase orders. Generally it is done manually. However, ERP systems also allow automatic conversion of PRs into purchase orders.

H. Purchase Order: A purchase order is a formal request/document to a vendor to supply certain goods or services under conditions stated in the order. ERP systems allow creating purchase orders with reference to a PR, a request for quotation (RFQ), or another purchase

order and this reduces data entry. ERP systems also facilitate creating purchase order by suggesting default values. For example, it suggests the ordering address as well as the terms of payment and freight (in co-terms) from the vendor master record. The system also finds details of material from material master record. A purchase order can be input for lots of subsequent activities like the goods receipt and invoice verification which are usually carried out on the basis of the purchase order. ERP systems support order acknowledgements and sending the purchase order to the vendor via Electronic Data Interchange (EDI) or e-mail.

Typically, order acknowledgements are sent by the vendor against this purchase order to inform customers when ordered materials are expected to arrive and help in planning more accurately as the actual delivery dates and quantities are known.

There can be several variations of purchase order like:

Blanket Purchase Order: These are used to procure consumable materials or services for which it does not make sense to create separate purchase order and subsequent transactions for each procurement. Blanket purchase orders are valid for a longer period of time (say, 1 year) and invoices can directly be posted for the materials and services procured for this blanket purchase order.

Procurement Process Variants for Different Types of Procurement

Procurement of Materials and Services Procurement of materials and services is different from different dimensions. Table 22.1 explains how procurement of materials is different from procurement of services.

Table 22.1 *Material Procurement vs. Service Procurement*

<i>Material Procurement</i>	<i>Service Procurement</i>
Materials can be inventorised	Services can not be inventorised
Specifications are clearly defined during material procurement	Sometimes it is difficult to define a service specification during procurement
For a given specification price comparison is simple	For a given specification service price comparison is difficult – price may differ by time of purchase (early booking vs. late booking in airlines), ambience (same food in a five star hotel and in a normal hotel may be priced very differently).

Typical Challenges for Service Procurement In ERP

- **Service cannot be inventorised:** If you buy an item and it is not used, the same can be kept in stock and used in future. In contrast, if an airline can not sell a seat for a particular flight as soon as the flight left the airport, the revenue opportunity is permanently lost. Services as intangible goods are procured for immediate consumption.
- **It is difficult to define a service specification:** When materials are procured, exact specification of the material and quantity is known. In contrast, if the pump of a particular compressor is broken, it is difficult to define a service specification to the technician as you do not know whether repairing this will need replacement of some spares and how much amount is needed to do the repair. So defining the service just by a service code and short description in purchase order is sometimes not enough and a detailed service specification (statement of work) may exist for each service item.
- **Price comparison for service is complex:** Price comparison is complex as you cannot see the final output from different vendors at the time of giving the order while in case of products, it is easy to ask for a sample.
- **Goods receipt is replaced by service entry and acceptance for service procurement:** Service procurement cycle follows the same five steps as product procurement. However, the fourth step is different here as there is no goods receipt (GR) in case of a service procurement and this is replaced by service entry and acceptance. Services performed are stored in a service entry sheet and this sheet is signed off by the person who had created a requisition for the service.

Procurement of Direct and Indirect Items There is a basic difference in procurement needs of indirect items (these are also called MRO—Maintenance, Repair and Overhaul items) and that of direct items. MRO items are generally low-value indirect items, i.e. not part of finished goods and procured for the needs of internal customers. Direct procurement items are part of finished goods and is driven by market demand of finished goods. Table 22.2 explains the difference of procurement approaches between direct and indirect items.

Table 22.2 *Direct Items vs. Indirect Items*

<i>Direct Items</i>	<i>Indirect Items</i>
Demand driven by market demand of end items.	Demand not driven by end item demand and mostly driven by past consumption trend.
Involvement for procurement department is much higher here as they need to collaborate with supplier to design the component or product.	Involvement for procurement department is much lower here as mostly off the shelf items are procured.
Generally contribute a significant portion by value of total monthly procurement spend.	Generally contribute a small portion by value of total monthly procurement spend as these are typically low-value items.
Planning is done generally through planning runs of MRP (material requirement) or advanced planning systems.	Planning is consumption-based. In some cases, purchase requisitions are created manually.
Procurement is always done by procurement team.	Procurement can be done by procurement team and also by end user/employee through e-Procurement or Portal.
Backend integration needed with ERP solutions is much higher here for reasons like delivery schedules release.	Backend integration needed with ERP solutions is lower here.

Indirect Procurement support by ERPs ERP solutions having its origin in MRP had most of its offerings for procurement of direct items in the beginning, but increasingly now they started supporting indirect procurement. Leading ERPs came up with specialised MRO modules and e-Procurement capability (discussed in detail in Chapter 23) to support such indirect procurement.

Commodity Procurement Commodities are the items which are not branded and can see wide price variations depending on demand and supply. These can be items like steel, iron ore, coal, oil and most of the agricultural products like pulses, vegetables, tobacco etc. Some of the commodities like agricultural products see lot of seasonal variations in price due to availability issues. Commodity procurement is a specialized procurement process and ERPs provide special procurement tools for managing this. Some examples are:

e-Procurement/Auctions: Leading ERPs provide e-Procurement/auction options to commodity companies as the challenge here is to get the items at best price of required quality and the company need not work with the vendor for a longer duration and in collaborative mode to develop the item (long-term relationship with the vendor for developing an item is common for items like component, packaging items, etc.). This is the reason that companies in industries like coal, oil and gas, steel, tobacco, etc. opt for e-Procurement/auction. Some of the good examples in India are SAIL, Tata Steel, and ONGC had opted for e-Procurement/auctions. This is discussed later in chapter.

Hedging: Hedging is a common strategy for managing commodity risk. In financial terms hedge is defined as follows: “Hedge is a position established in one market in an attempt to offset

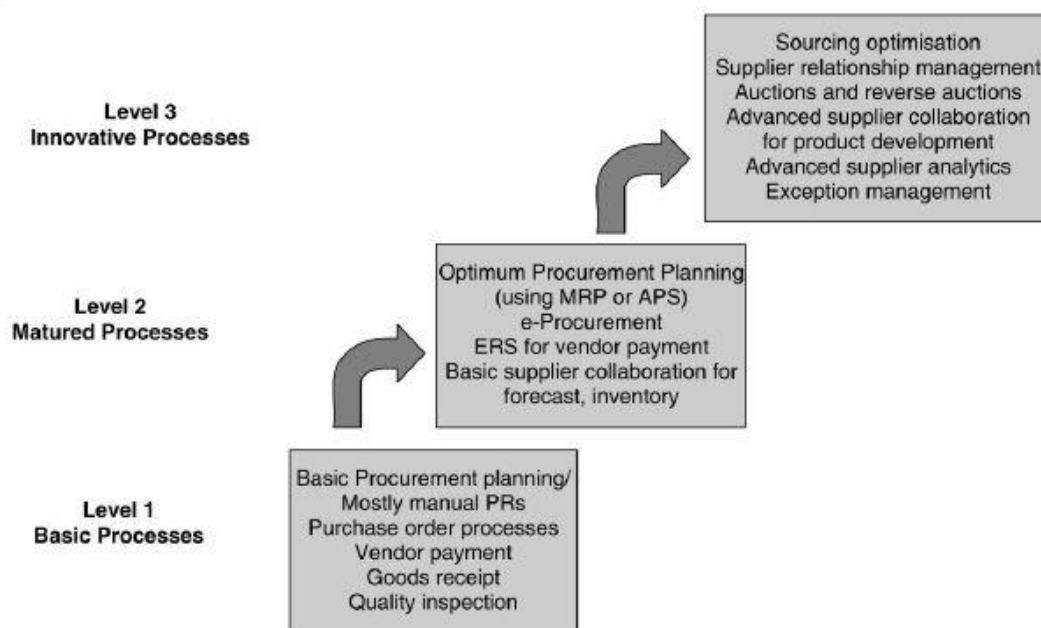
exposure to the price risk of an equal but opposite obligation or position in another market”. This is done by taking a position in the future market that is opposite to the one in the physical market with the objective of reducing or limiting risks associated with price changes. The news item below shows how Hedging is becoming popular in India as well. Most of the leading ERPs support e-Procurement and auctions these days while few of them support hedging as well.

Government/Public Sector Procurement Public sector procurement is again a specialised type of procurement as it needs to follow separate set of guidelines of different government bodies (for example, any procurement need at least three supporting quotations to release the order. Any tender news item need to be published in popular daily newspapers, etc.). In most cases, the rates follow defined standards (for example, there can be standard rate for laying every meter of pipeline plumbing or brick work). Several ERPs came up with specialised modules to address this like SAP’s module on “Procurement for Public Sector”.

Procurement Maturity Model and Item-based Procurement Strategy

Figure 22.3 shows procurement maturity model for ERP deployment. Procurement maturity model explains the maturity of procurement processes for ERP deployment. At basic level the companies do regular trans-

Fig. 22.3 Procurement Maturity Model



actions like purchase order creation, vendor payment, goods receipt, etc. to keep their business running. At matured and innovation level the drive is for better planning, optimisation and collaboration. A company can deploy ERP at any level and ERP can support processes at each of this level. As it is obvious that the benefits are more when you are at matured or innovative level of processes and then deploy technologies like ERP to support these processes.

Figure 22.4 shows how the procurement objective differs for different class of items. For example, for MRO it is reducing procurement administration cost, while for critical items it is closer coordination with the vendor. This shows that the kind of procurement tool you use within ERP may differ based on the kind of product you procure. While collaboration tools may make lots of sense in case of a critical item, it does not have much value for a routine MRO item.

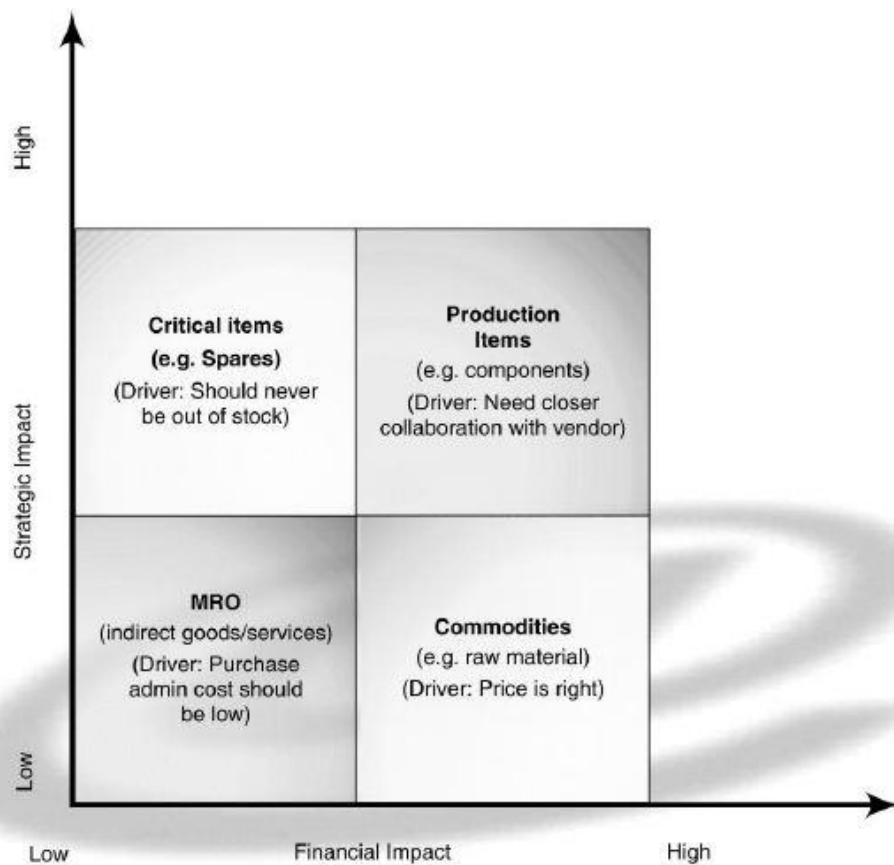
Master Data for ERP Procurement

Master data in an ERP system are the data records that are stored in the database centrally for a long period of time and are used by multiple modules of ERP system and thus, prevents multiple storage and redundancy of data. For materials management module of ERP system, the most common master data elements are:

- Material master record
- Vendor master record
- Terms and conditions master
- Service master record and service catalog

Material Master Material master record is a company's main source of material-specific data. It is used by all modules of ERP system like purchasing, inventory management, materials planning, invoice verification, etc. for different purposes like:

Fig. 22.4 Procurement Strategy for Different Item Groups



- Purchasing data for ordering
 - Inventory management data for posting goods movements and managing inventory
 - Accounting data for material valuation
 - MRP data for material requirements planning
-
- **Material master can have different views:** Materials are needed by various departments within a company and each department need different information for the materials. The material master is sub-divided into information grouped by user departments and each department has a different view of the material master record and is responsible for maintaining the data to support its function. For example, accounts department maintain accounting view, sales maintains sales view and procurement maintains procurement view of materials.

- **Different data is valid at different levels:** Some material data is valid for the entire company while some is only valid for certain levels, i.e. only for a particular plant. For example, a particular material's size and description may be same for the entire company while its planning parameters can change depending on the plant.

Vendor Master Data Vendor master is another important master from materials management perspective and data in the vendor master record can be sub-divided into different categories like:

- **General data:** This includes data like vendor's address, contact number, bank details, etc.
- **Purchasing data:** This includes data like purchase order currency, incoterms, vendor's tax data etc.
- **Accounting data:** This comprises accounting data relevant for a vendor.

In ERP system each vendor is given a unique code and this code is referred while creating any purchase order on the vendor, while receiving goods for them, during vendor rating and for any other transaction with the vendor.

Terms and Conditions Master This is a standard repository of all terms and conditions for procurement. The company can refer to this master while creating new purchase orders, contracts, etc. It is better to pick and choose from this master instead of typing every time. A lot of these terms/conditions can be legally binding.

Service Master Record/Service Catalogue Service master contains detailed information on the service. Unlike manufacturing, prices for service can differ based on conditions. For example, a courier service may charge different price based on delivery condition, i.e. one price for normal delivery and a different price for express delivery. Service catalogue is a service master file that contains standardised descriptions of services and given unique service number which can be referred to in purchasing documents.

Key Performance Indicators for Procurement

Some of the common procurement measures are shown in Table 22.3.

Table 22.3 *Procurement Measures*

<i>Measure</i>	<i>Definition</i>
Cost savings	Most common KPI for procurement department across organisation. This can be defined as: "Aggregate amount of money procurement department saved by reducing costs from one year to the next. This KPI measures the procurement department's contribution to the financial success of the organisation".
Supplier performance	Performance of suppliers on price, delivery, quality, service, etc. KPI like percent on-time supplier deliveries measures how well the procurement department gets what the organisation needs. KPI like supplier quality defect rate can be calculated by dividing number of defective items by the total number of items purchased and this KPI measures the quality of purchases made by the procurement department.
Procurement cycle time	The average time it takes between requisition submission and purchase order placement is one measure of procurement cycle time.
Procurement ROI	This is a ratio of savings made by procurement department by operating costs. Procurement operating costs may include cost components like pay, benefits, facilities costs, equipment and software costs and more. This KPI measures the procurement department's cost efficiency.
Contract compliance	The ratio indicates number of exceptions in contract quantity, price or any other legal clause.
Purchasing analysis	Order value analysis by net order value, ABC analysis, frequency analysis, and so on.

Offerings from Two Leading ERP Vendors in the Procurement Area

Procurement and materials management is one of the oldest and core ERP modules and all ERPs offer a variety of functionalities to support this process. Two leading ERP vendors' procurement offerings are discussed here.

SAP Offerings Procurement is a part of SAP MM (materials management) module. SAP MM supports following procurement scenarios and processes:

Procurement Planning Scenarios

Consumption-based planning

Reorder point planning

Forecast-based planning

MRP-based planning

Procurement Scenarios

Purchase requisition

Purchase of materials to production

Purchase to stock

Purchase by KANBAN

Purchase to sales order

Purchase to projects

Procurement for direct consumption

Internal procurement between plants

Procurement via sub-contracting

Oracle Offerings Oracle has four different products to support the procurement process and they are as follows:

1. **Internet Procurement** (formerly self-service purchasing): A web-shopping solution for all employees that automates finding and requisitioning goods and services using self-guiding online catalogues coupled with efficient content management. Industry standard XML interfaces allow integration to customers' existing Oracle, non-Oracle or legacy financial systems.
2. **Purchasing Intelligence**: A web-enabled analysis tool which provides access to enterprise-wide procurement information along with the ability to perform ongoing analysis of sourcing decisions, contract compliance, and supplier performance.
3. **Internet Supplier Portal**: A self-service solution giving trading partners internet access to purchasing, receiving and payment information as well as providing suppliers the capability to easily process their own transactions.
4. **Purchasing**: This streamlines order planning and management for purchasing professionals. Apart from these four basic products, Oracle is also used as an advance version of purchasing solutions:
 - **Oracle Sourcing** is the enterprise application that drives more and better sourcing through online

- collaboration and negotiation
- Oracle Procurement Contracts is used for creating and enforcing better purchasing contracts.
- Oracle Daily Business Intelligence for procurement is used for the spend-analysis application that allows buyers to spot savings opportunities immediately.
- Quality

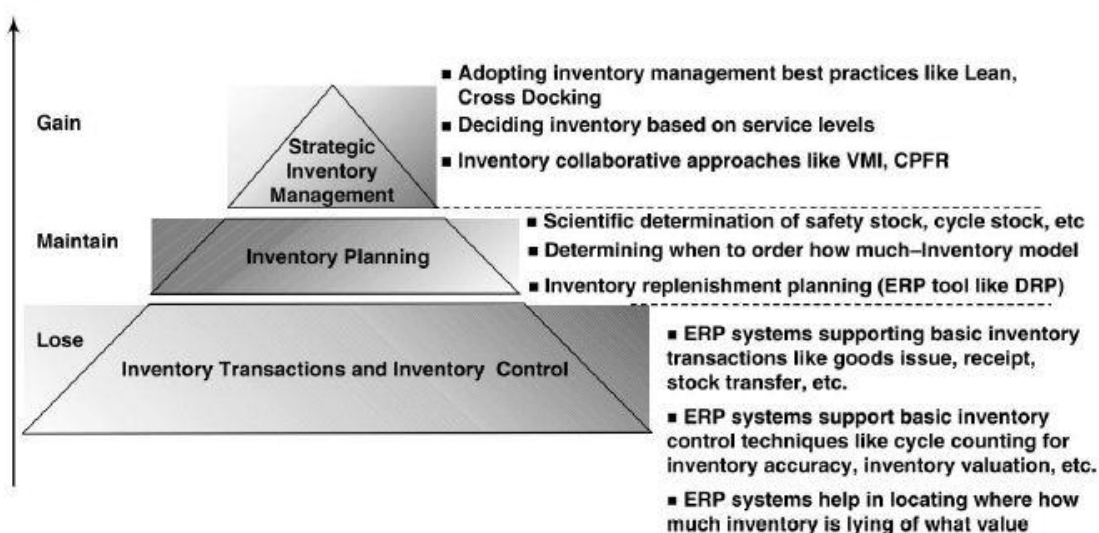
INVENTORY MANAGEMENT

Inventory Management Process

Concept of Inventory Management Pyramid Inventory management processes can be divided into three levels of processes as shown in Figure 22.5 through an inventory management pyramid. ERP and supply chain systems can support all these three levels.

- **Inventory transactions and inventory control:** Base of the pyramid talks about inventory transactions and basic inventory control tools. These are absolutely fundamental to run the business and from regulatory point of view (yearly stock taking and publishing inventory valuation under asset in the balance sheet is mandated by law). Inventory transactions focus on activities like recording all inventory transactions like goods issue, receipt, stock transfer, etc. These are the most basic processes to achieve timely and accurate information on inventory status. Inventory control are processes like physical inventory, cycle counting, inventory valuation, etc. This ensures that the company has basic level of control on its inventory, i.e. it knows where how much stock is lying, the value of the stocks and where the stock is reaching near minimum level, cases of stock-outs, etc. Inventory control is also enabled through a set of reports and alerts for proactive action for inventory planner.

Fig. 22.5 ERP Support at All Levels of Inventory Management Pyramid



- **Inventory planning:** At this level, the company takes scientific approach for deciding where to hold inventory, how much to hold, when to order, etc. The company can have several approaches like adopting collaborative approaches for planning inventory and scientific process for inventory replenishment.
- **Strategic inventory management processes:** These are innovative processes that differentiate a company from others.

Inventory Management Processes in ERP As described above, inventory management processes can be grouped under inventory transaction processes, inventory control processes and inventory planning processes. These three sets of processes are discussed here with how ERP helps in managing these processes.

A. Inventory Transaction Processes

There can be different types of inventory transactions supported by the ERP system and these are:

1. Goods receipt
2. Goods issue
3. Reservations
4. Stock transfer

1. Goods receipt: Goods receipt is one of the fundamental inventory transactions. Goods are received from the supplier, quality check is done, and goods are returned which are not within quality limit. Sometimes advanced shipping notification (ASN) are received before actual goods receipt. ERP systems support several sub-processes under this like:

- Receiving goods against a purchase order
- Receiving goods against a delivery schedule
- Damage identification on receipt
- Unloading and unpacking
- Capture lots of information on receipt
- Reconcile purchase order/delivery schedule line item with receipt
- Vendor returns in case the goods are not within quality limits
- Receiving advanced shipping notification (ASN) receipt from supplier before receiving the actual consignment
- Posting goods receipt (with total quantity, accepted quantity, date, etc. This becomes the basis for rating the supplier)

These days with bar codes and radio frequency (RF) scanner at receiving doc, goods receipt process has become simpler.

2. Goods issue: There can be different types of goods issues like raw materials issue in the factory for production, issue of materials to quality department for quality inspection, finished goods issue from warehouse for dispatch, etc. These issues can be recorded in ERP inventory management system so that the inventories are updated. There can be different types of activities related to goods issue and they are as follows:

- Delivery creation
- Packing
- Goods issue
- Loading
- Posting goods issue to inventory management
- Creating ASN for customer before making the dispatch
- Receiving proof of delivery (POD) from customer

3. Reservations: Reservations are requests to the warehouse to have materials ready for issue at a later date and for a particular purpose and it ensures that a material is available when it is needed. Reservations are typically done for a customer.

4. Stock transfer: ERP systems allow different types of stock transfers like stock transfer from one company code to another, from one plant to another and from one storage location to another. A stock transfer consists of a goods issue from the issuing point and a goods receipt at the receiving point.

B. Inventory Control Processes

1. Quantity control:

It is important for every organisation to know how much inventory is lying at what location. Inventory transactions described earlier always update stock position in the system and this stock needs to be in tally with physical stock actually available. Quantity control processes like physical inventory or cycle counting or stock overview reports help in this.

- **Physical inventory:** Difference of stock figures between what is in the system and what is physically available is always a challenge. ERP systems help in managing physical inventory process and controlling the difference between system inventory and actual

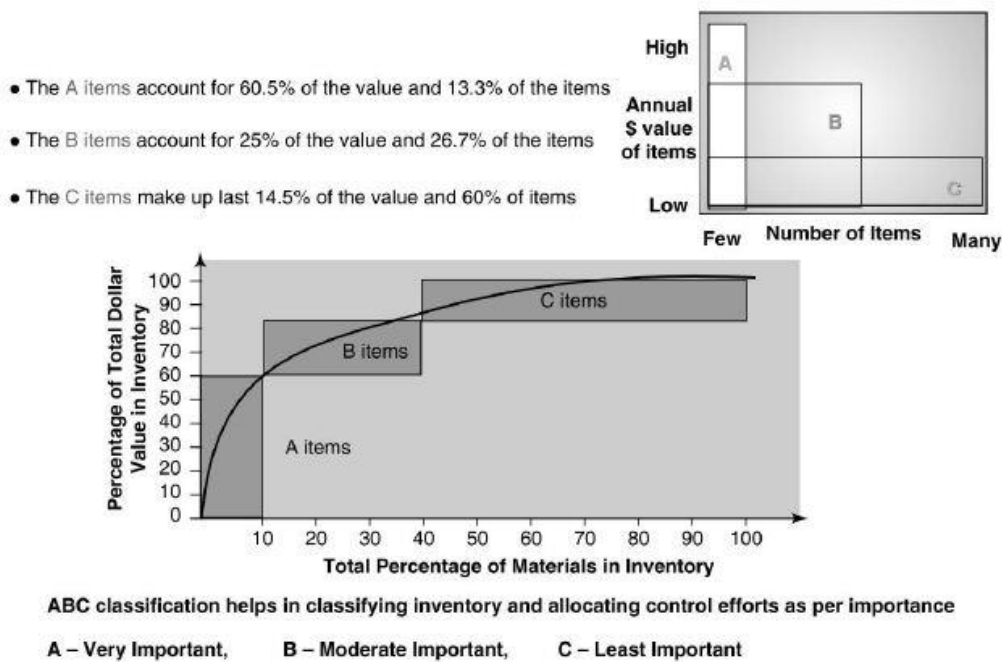
physical stock. Stocks are counted and the count results are entered in ERP system. Using the list of inventory differences, variances in the stocks can be checked and if required, recount can be initiated. If the difference is accepted, it is posted and the stock is corrected.

- **Cycle counting:** This is a method of physical inventory counting where every material is counted at regular intervals during the year and intervals/cycles are determined based on the type of material. Thus, cycle counting allows fast-moving items to be counted more frequently than slow-moving items and materials can be classified based on cycle counting frequency (for example, A, B, C, D). For each category, cycle counting frequency can be defined in an ERP system, based on which ERP system calculates the due date for next cycle counting for each material. Class A items are all high-revenue products, which typically accounts for about 80% of annual sales and represent about 20% of inventory SKUs. Class B items include products that typically account for about 15% of annual sales and represent about 30% of inventory SKUs. Class C items include products that typically account for about 5% of annual sales and represent about 50% of inventory SKUs. To identify A, B and C class, a Pareto analysis is done depending on annual dollar volume. As Class A items account for the major part of the business, a high-frequency periodic review policy (e.g. a weekly review) is appropriate in this case. Similarly, a periodic review policy is applied to control B class products although the frequency of review is not as high as that for class A products. Finally, depending on product value, the firm either keeps no inventory of expensive class C products or keeps high-inventory of inexpensive Class C products. Figure 22.6 explains cycle counting and ABC classification process.
- **Stock overview:** ERP systems at any point can display current stock situation at particular factory level or at total company level. Stock can also be viewed at different batch levels.

2. Value control/Stock valuation

Along with quantity, it is also important to know the value of the stock that the company is currently holding. Goods receipts are valued depending on the valuation procedures defined in the ERP system and leading ERPs support several valuation procedures like moving average price procedure, standard price procedure, etc. In the standard price procedure, the system carries out all stock postings at a standard price as defined in the material master and variances are posted to price difference accounts. In the moving average price procedure, the system values goods receipts with the purchase order price and goods issues with the current moving average price.

Fig. 22.6 Example of ABC Classification of Materials



Every transaction in the ERP system creates a material document as a proof of a transaction involving stock changes and if the goods movement is relevant to valuation, the system creates one accounting document in addition to the material document as every material transaction like goods receipt or goods issue can increase or decrease stock value.

C. Inventory Planning Processes

Inventory transactions and inventory control defined earlier are basic requirements for a business and a business can not run without these. Inventory planning is a more matured component of inventory management. Though every company does some amount of inventory planning it can differ from most basic to advanced level depending on maturity of the organisation.

There are two basic drivers for better inventory planning:

- Never have a stock out as for a finished goods stock out, there will be customer dissatisfaction and lost sales. For a raw material and component stock out, there will be production loss.
- Never carry excess inventory as this increases cost of operation; moreover there is chance of obsolescence and heavy markdown.

So, inventory planning tries to achieve inventory of right items, at right location, at right time and of right quantity. ERP and supply chain management solutions support better inventory planning in variety of ways like:

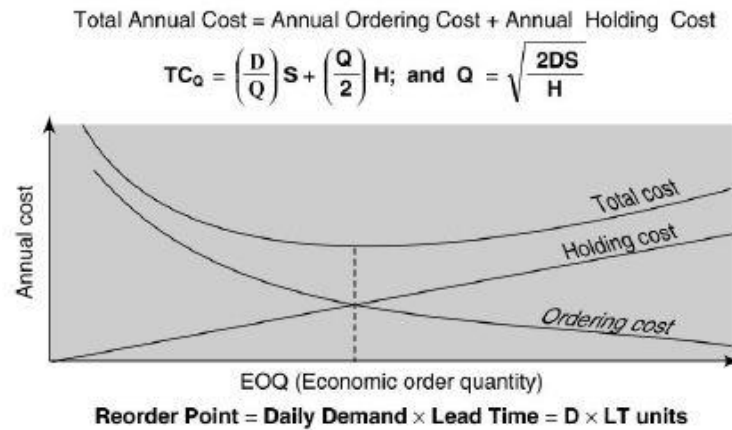
- **Designing better process of inventory replenishment:** ERP systems support better replenishment planning from factory to warehouse and from warehouse to store. ERP tools like distribution requirement planning (DRP) helps in this with a variety of replenishment approaches like push, pull or a mix of both.
- **Supporting process of managing different inventory exceptions:** ERP systems supports different inventory exceptions by providing different alerts and workflows which automatically get triggered if stock at a location is higher/lower than recommended and if there is a stock out.
- **Taking scientific decision on when to order and how much to order:** To decide how much to order and when, ERP support a set of inventory models like: EOQ (economic order quantity) or Q models, P Models (periodic review models), Min – Max models, Two bin models, etc. These are discussed below.

Different Inventory Models supported by ERPs

There are different inventory models as follows:

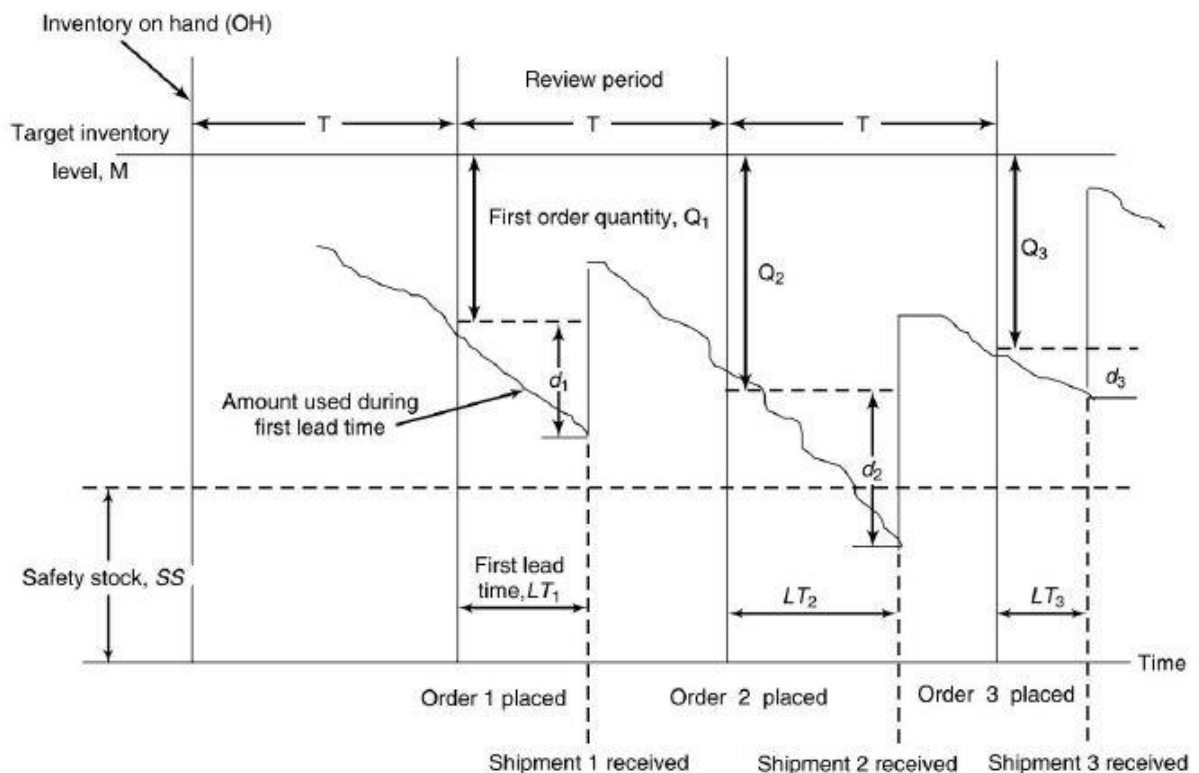
- **Q model:** As shown in Figure 22.7, EOQ model balances between carrying cost and ordering cost. If orders are placed too frequently, ordering cost increases, but it reduces the inventory carrying cost. On the other hand, if orders are placed after long intervals, this increases the carrying cost and reduces ordering cost. These costs are opposing costs, i.e. as one increases, the other decreases. The sum of the two costs is the total stocking cost (TSC). When plotted against order quantity, the TSC decreases to a minimum cost and then increases. This order quantity where TSC is minimum is known as the economic order quantity (EOQ). The amount ordered each time, an order is placed is fixed or constant. As per the EOQ model, the ordering should be done at reorder point, i.e. when the quantity on hand of an item drops to this amount, the item is reordered.

Fig. 22.7 EOQ Inventory Model



- P model:** The philosophy of P model is opposite of that of EOQ model. As shown in Figure 22.8, here the inventory is reviewed at regular intervals, i.e. review frequency is set (T). Quantity to place on order is the difference between maximum quantity (M) and amount on hand at the time of review (OH). So, here the inventory review frequency is fixed and quantity varies with each order. Management needs to set optimal values of T and M to balance stock availability and cost. Targeted inventory of P model is: $TI = d(RP + L) + SS$, (d = average period demand, RP = review period (days, wks), L = lead time (days, wks), SS = Safety stock). Replenishment Quantity (Q) = $TI - OH$.

Fig. 22.8 Periodic Review System (P Model)



- **Min–Max Models:** In this model either a pre-determined minimum and maximum inventory level is defined for each item. As soon as the stock reaches close to minimum point, the ordering is done.
- **Two-Bin Models:** One of the simplest inventory models to administer—there are two containers of inventory—reorder when the first is empty.

D. Strategic Inventory Management Processes

Processes at this level of inventory management provide a company competitive advantage over others and differentiate themselves. Most of the leading ERP and supply chain management solutions today support processes at this level and processes can be:

- **Process of inventory collaboration:** As discussed earlier in this chapter, ERP systems support different forms of inventory collaboration like Vendor-managed inventory (VMI). Here, instead of the company managing the stock of items, the supplier takes the responsibility of managing the stock based on stock and sales information from the supplier. VMI between Wal-Mart and P&G is a much talked about case. As stock is

replenished more frequently and managed by supplier who has better information about the sales trend of the product, the inventory in the chain comes down. Vendor managed inventory is supported by SAP and Oracle where collaboration is facilitated through EDI.

- Deciding inventory based on service levels: Service level is an important concept where inventory levels are decided based on service levels, i.e. items that are critical and need higher service levels will require high inventory and items having lower service level need lesser inventory. Most of the leading ERP vendors support service levels concept.
- **Best practice processes of inventory management like Cross docking:** Cross docking reduces the inventory at distribution centre warehouses by effective coordination of inbound (shipments from suppliers to distribution centre) and outbound (shipments from distribution centre to user) shipments. Items are not taken inside the warehouse at all and sent directly to user. This reduces inventory in the total supply chain and also reduces the lead time of supply from supplier to user. Wal-Mart, the leading retailer uses cross docking effectively. Cross docking is a part of warehouse management module for most of the leading ERPs like SAP and Oracle and best of breed warehouse management vendor like Manhattan.
- **Lean inventory management:** Lean philosophies talk about reducing waste from the supply chain in all possible forms. Inventory is one of the largest contributor of this waste. Lean principles suggest a variety of approach to reduce raw material—work in progress and finished goods inventory and leading ERPs like SAP and Oracle support lean principles of inventory management through Kanban.

Offerings from Two Leading ERP Vendors in Materials and Inventory Management Area

All leading ERPs support inventory management processes. Offerings from two leading ERP solution vendors SAP and Oracle are discussed here.

SAP Offerings—SAP Materials Management Materials and inventory management is a part of SAP MM (materials management) module. SAP MM supports following materials management processes/ scenarios:

Goods receipt

Goods issue

Goods return

Goods movement to quality management

Stock transfers

Consignment stock management

Physical inventory and cycle counting

Inventory valuation

Oracle Offerings—Oracle Inventory Management Inventory Procurement is a part of Oracle inventory management module. Some features of Oracle inventory management module are as follows:

- Inbound outbound and reverse logistics transactional support
- Finished goods, raw materials and work-in-process components tracking
- Support for manufacturing, distribution and after-market service and spares environments
- Active alerts and intelligent messages for proactive management
- Global inventory visibility and product genealogy integrity for both lots and serial numbers
- Streamline inventory management processes such as replenishment, order fulfillment, manufacturing and inventory counting
- Compliance support for electronic records and electronic signatures in support of 21 CFR Part 11 regulations
- Consigned, vendor managed and project-based inventory tracking

Key Performance Indicators For Inventory Management

Inventory is something very closely measured in most organisations and there can be several inventory measures as shown in Table 22.4.

Table 22.4 *Inventory Measures*

<i>Measure</i>	<i>Definition</i>
Stock-outs	Number of incidents when a particular item is required and the item is missing in a particular time period
Inventory turn	Annual sales/average inventory level
Inventory carrying costs	Sum of all costs associated with finished goods inventory (like, opportunity cost, shrinkage, insurance and taxes, total obsolescence, channel obsolescence, etc.) as a percentage of sales turnover
SKU turnover	The number of times an SKU cycles or turns over in a year; divide the average inventory level into the annual cost of sales
Inventory aging	The percentage of total gross inventory (based on value) covered by expected demand within specific time buckets
Inventory cycle counting accuracy	The absolute value of the sum of the variance between physical inventory and perpetual inventory or the number of accurate part cycle counts divided by the total number of cycle counts performed expressed as a percentage
Inventory obsolescence as a percentage of total inventory	The annual obsolete and scrap reserves taken for inventory obsolescence expressed as a percentage of annual average gross inventory value
Shrinkage	The costs associated with breakage, pilferage and deterioration of inventories
Storage space utilisation	Volume of all materials stored divided by the total volume of the storage facility expressed as a percentage

Supplier Relationship Management

UNDERSTANDING SUPPLIER RELATIONSHIP MANAGEMENT

Supplier relationship management is not one single software, but an umbrella term that refers to a set of technologies that make procurement process more efficient. Different leading analyst group defines SRM as follows:

Gartner defines SRM as: “The practices needed to establish the business rules and understanding needed for interacting with suppliers of products and services of varied criticality to the profitability of the enterprise” (Source: Gartner Supplier Relationship Management: Why Does It Matter? 05/2001)

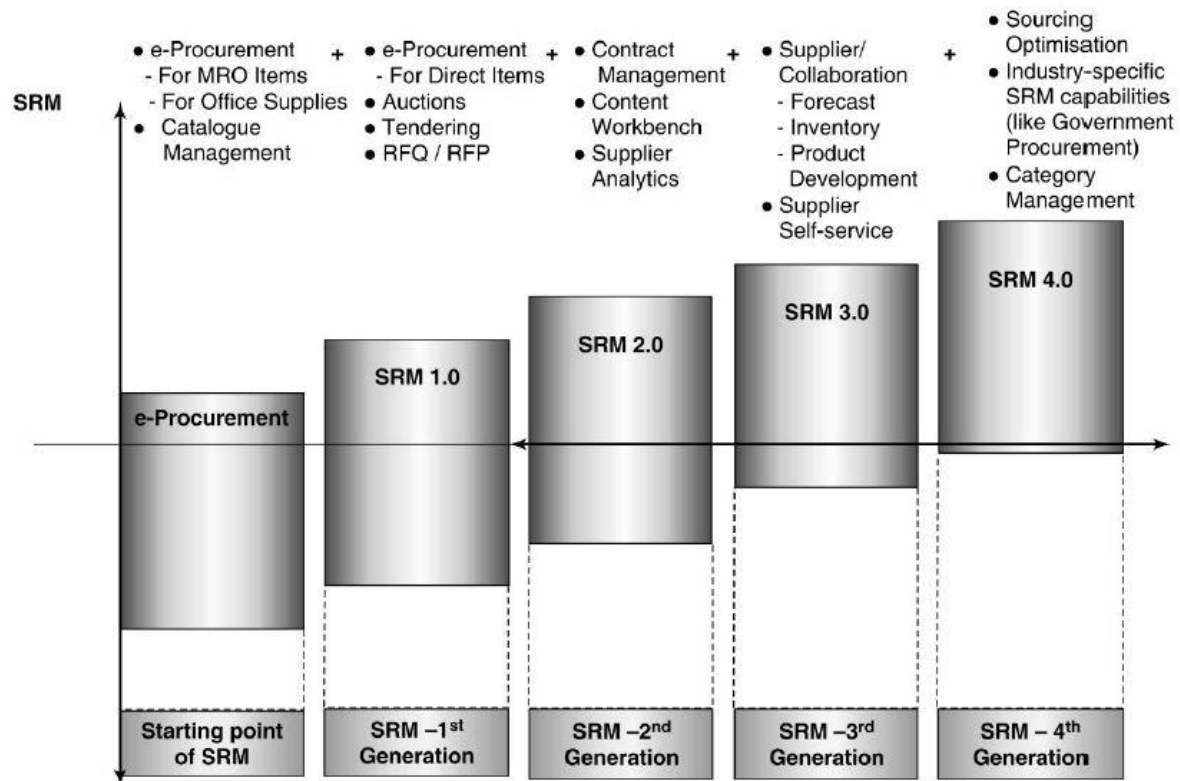
Meta defines SRM as “SRM is a system of applications that automates specific planning, scheduling, shipment, and payment processes between a manufacturer and its critical direct materials suppliers. SRM systems track both data and process-interchange flows as well as provide the management and analytical tools to intelligently track the performance of direct suppliers based on benchmark, historical, and/or contractual conditions.” (Source: META Group Supplier Relationship Management: Part 1 10/2000)

AMR Research defines SRM as “SRM in its purest form to include extended procurement processes, such as sourcing analytics (e.g., spend analysis), sourcing execution, procurement execution, payment and settlement, and closing the feedback loop of supplier score carding and performance monitoring”. (Source: AMR Research)

Evolution of SRM Applications

As shown in Figure 23.1 most of the supplier relationship management applications had its origin from electronic procurement for low value MRO (maintenance, repair and overhaul) items and office stationary items for employees. The major driver here was reducing cost of procurement administration, speed and convenience and taking advantage of consolidating procurement. These e-Procurement applications also had catalogue management as one of their offerings as employees or procurement department need to select items from predefined catalogues of vendors.

Fig. 23.1 *Supplier Relationship Management—Application Evolution*



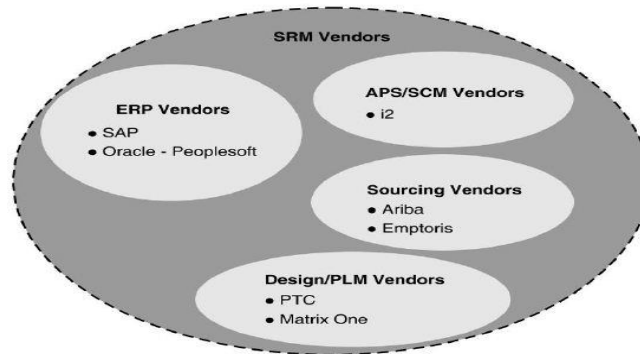
In the second generation of SRM applications, these applications developed capabilities for procuring direct items procurement and developed specialised capabilities in the form of tendering, forward and reverse auctions, etc. as needed for procuring regular production items.

SRM applications gradually ventured into lot of new areas over time like contract management, supplier analytics, supplier collaboration, self-service, sourcing optimisation, etc.

SRM Applications Come from Different Origin

Figure 23.2 shows how SRM vendors came from different origin. Leading ERP vendors, Supply chain management (SCM) and Advanced planning and scheduling (APS) vendors, Sourcing vendors and Product

Fig. 23.2 SRM Vendors Come from Different Origin



lifecycle management (PLM) vendors all are trying to enter into this space. However, as market is getting more matured – two leading ERP vendors, i.e. SAP and Oracle and a leading sourcing vendor Ariba are becoming prominent players in the market.

SRM Applications Solve Different Sourcing Problems for Different Types of Buyers

Figure 23.3 shows how SRM applications solve different types of sourcing problems for different types of users using various types of technologies like shopping cart, procurement card, auctions platform, collaboration platform, catalogue and content management, workflow, etc. While employees can buy directly office supplies through e-Procurement, engineering buyers source MRO items through e-Procurement and strategic sourcing team can source direct production items by SRM auction applications.

In this chapter five important application areas of Supplier relationship management are discussed. They are as follows:

- Electronic procurement
- Catalogue management
- Content management
- Contract management
- Supplier collaboration

Fig. 23.3 SRM Vendors Serve Different Purpose for Different Types of Buyers

