SELF GYAN

MMPC 8 IGNOU

INFORMATION SYSTEMS FOR MANAGERS

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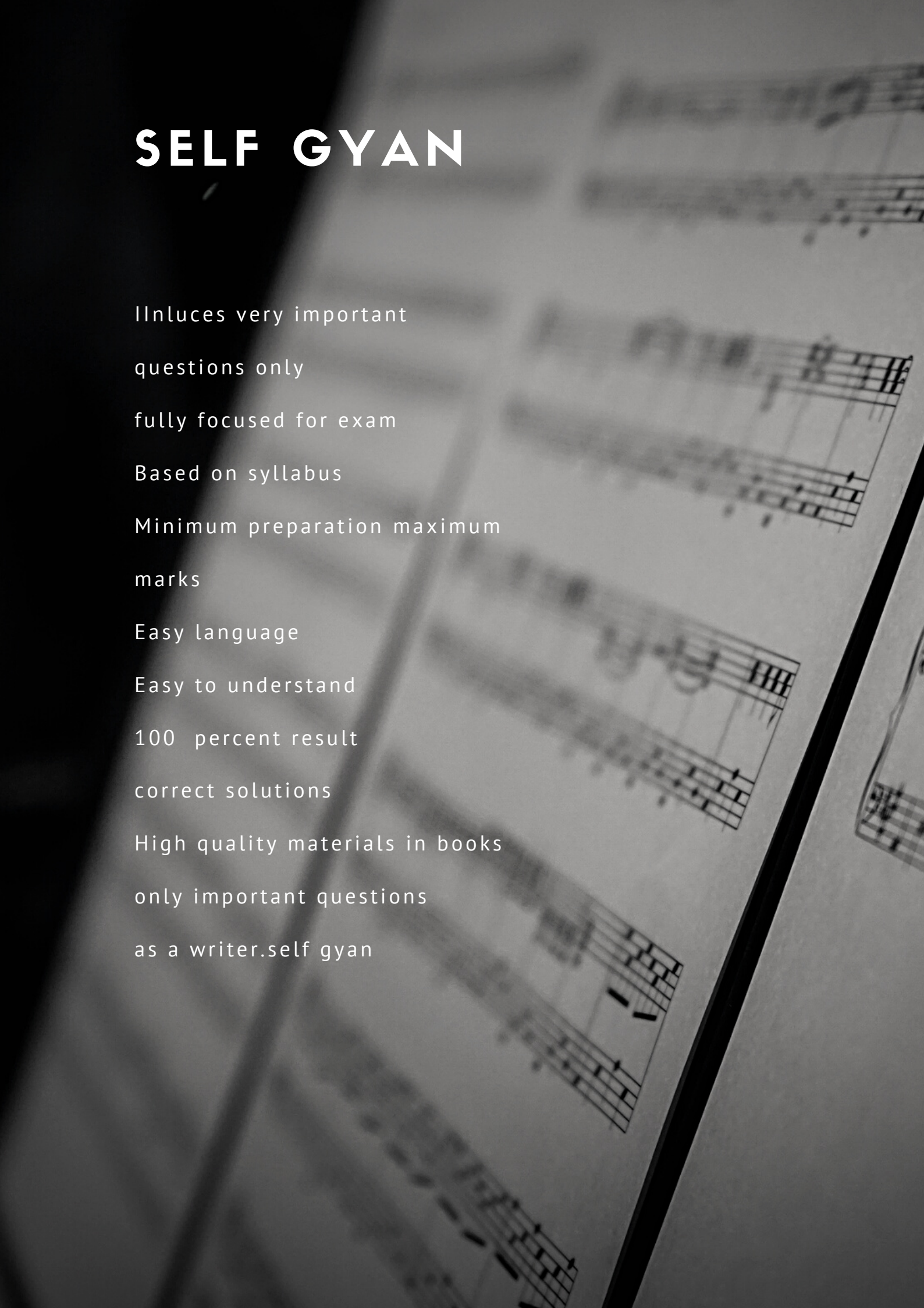
ये book केवल ignou एग्जाम की तैयारी कराने के लिए जिससे काम से काम समय में जल्दी आप तैयारी कर सके और अच्छे मार्क्स ला सकते इसमें सबसे पहले सबसे इम्पोर्टेन्ट question उसके बाद काम इम्पोर्टेन्ट question को वरीयता से लिया गया है आपको बुक को सुरु से अच्छे से पढ़ना है। self gyan



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MMPC 8 INFORMATION SYSTEMS FOR MANAGERS
FIRST PRIORITY MOST IMPORTANT QUESTIONS

Q1- What is INFORMATION SYSTEM/INFORMATION TECHNOLOGY? Describe type of information system? How each type of information system support communication and decision making? (v v v v v imp)

Ans – DEFINITIONS OF IT

Information Technology means the collection, storage, processing, dissemination, and use of Information. It is not confined to hardware and software but acknowledges the importance of man and the goals he sets for his technology, the values employed in making these choices, the assessment criteria used to decide whether he is controlling the technology and is being enriched by it

Let us understand what information is. Information is the finished product for which data is the raw material. The dictionary defines information as processed data, which is used to trigger certain actions or gain understanding of what the data implies. Information has also been defined as data that have been put into a meaningful and useful context and communicated to a recipient who uses it to make decisions. Information involves the communication and reception of intelligence or knowledge. It apprises and notifies; surprises and stimulates, reduces uncertainty, reveals additional alternatives or helps eliminate irrelevant or poor ones, and influences individuals and stimulates them to action. The information must be received by the recipient within the required time frame and the information must be free from errors.

The technology plays an important role in delivering timely and error free information to its recipients. Technology includes hardware, software, databases, and communication system. Hardware is a set of devices such as processor, monitors, keyboard, and printer that accept data, process them, and display them. Software is a set of programs that enable the hardware to process data. Database is also an integral part of IT system, which is a collection of related files, tables, relation etc. that stores data and the association among them. Network connects computing resources of an organization and facilitates sharing of hardware and software. The organization processes and people are integral part of an IT System.

The above definition clearly states that IT is an important tool, which must be used properly. At one time, 60% people used to work in agriculture. Nowadays, in a developed country, about 10% people work in agriculture and 40% people work in information related fields. In a developed country such as US, 50% households have computers and Internet connection. In India, only about 8 people out of every 1000 have access to computers. However, India is making steady progress. As far as history of computing is concerned, people tried to invent a computing machine as early as 800 BC. Abacus is one of the oldest computing devices that are still in use. Every child in China learns to use abacus in school. Our ancestors had built various other mechanical machines using gears. All these efforts laid foundation for better computing machines. The diode tubes, transistors, integrated circuits (ICs) and now very large integrated circuits (VLSI) are the electro-mechanical devices that have been invented over a period of time. The technology has improved since World War II many folds. The improved technology has been the key factor in making better computing devices. Along with improvement in computing technology, the communication technology has also improved in parallel. The software also improved and became user friendly. The spreadsheets, the word processing packages, database packages, simulation software packages, and decision support systems made IT popular among managers as well. The terms Information Systems (IS) and Information Technology (IT) are used synonymously. IS has evolved considerably since 1960

TYPES OF INFORMATION SYSTEM

There are various types of information systems as listed below.

Transaction Processing Systems (TPS)

A TPS is used primarily for record keeping which is required in any organization to conduct the business. Examples of TPS are sales order entry, payroll, and shipping records etc. TPS is used for

periodic report generation in a scheduled manner. TPS is also used for producing reports on demand as well as exception reports.

Decision Support System (DSS)

DSS serves the management of an organization. A decision support system has sophisticated data analysis tools, which support and assist all aspects of problem specific decision-making. DSS may use data from external sources such as current stock prices to enhance decision-making. DSS is used when the problem is complex and the information needed to make the best decision is difficult to obtain and use. DSS is developed with the help of decision makers. DSS helps in decision-making process and does not make any decision.

Executive Information System (EIS)

An Executive Information System is also called Executive Support System. Senior managers of an organization use the EIS. Therefore, it must be easy to use so that executives can use it without any assistance. EIS can do trend analysis, exception reporting and have drill down capabilities. The results are usually presented in a graphical form tailored to executive's information needs. EIS has on-line analysis tools and they access a broad range of internal and external data.

Management Information Systems (MIS)

MIS provides the management routine summary of basic operations of the organization. The basic operations are recorded by the TPS of the organization and MIS consolidates the data on sales, production etc. MIS provides routine information to managers and decision makers. The main objective behind installing an MIS in the organization is to increase operational efficiency. MIS may support marketing, production, finance etc.

Work Flow System

A workflow system is a rule based management system that directs, coordinates, and monitors execution of an interrelated set of tasks arranged to form a business process. A workflow system is also known as a document image management system. For example, a workflow system is used by banks for loan sanction process. An applicant fills out an electronic application form for a bank loan at a bank's web site. The application is then upload to the bank loan officer's site. The loan officer conducts an interview and fills in his feedback and passes the application form to the credit check unit. The credit unit checks the credit limit and fills in the details. The application is now complete and a final decision is made.

There are three types of workflow software. Administrative workflow systems focus on the tracking of expense reports, travel requests, massages. An Ad-hoc workflow system deals with the shaping of product, sales proposals, and strategic plans. Production workflow systems are concerned with mortgage loans and insurance claims. A workflow system may be Internet based and may be combined with e-mail. A workflow system may be based on client/sever architecture that may use a database/file server.

Enterprise Resource Planning (ERP)

ERP system is a set of integrated programs capable of managing a company's vital business operations for an entire multi-site, global organization.

Expert Systems

The system has the ability to make suggestions and act like an expert in a particular field.

An expert system has an extensive knowledge base.

COMPUTER AIDED DECISION MAKING

A decision system supports and assists all aspects of problem specific decisionmaking

A decision support system (DSS), also called Computer Aided Decision System (CADS), is used when the problem is complex and the information needed to make the best decision is difficult to obtain and use.In an organization, a manager has certain goals, which he tries to achieve through the use of

resources. The resources such as people, money, material, and time is always limited. One of the roles that a manager plays among many others is of decisionmaking. The manager would like to examine various alternatives, which may not be possible in a manual system due to time constraint or due to sheer volume of data. Sometimes, a statistical analysis of fluctuating data is required which may be done only with the help of a decision support system. The data may be distributed over various branches of the organization and without the help of Information Technology; it may not be possible to examine the data.

An information system that helps a manager in making a decision is called a computer-aided decision support system (CADS) or simply decision support system (DSS). A DSS is designed with the help of decision makers. A DSS aids in decisionmaking process and does not make any decision. A DSS may be used for doing a thorough risk analysis of a project. Such a DSS performs what - if analysis. A DSS consists of a model of the real world, collection of facts- database, and a user interface.

An analyst talks to the manager and tries to establish his requirement. Analyst may need to interact with users many times before the requirements are completely understood. The analyst may also study the existing system if any. The analyst must have domain knowledge. The reality is examined, the problem is identified, and it is defined. The problem may be too complex to be analyzed. In such a situation, a simplified version of the problem is defined. The simplified problem is used to create a model of the actual problem. There are many ways of creating a model for a problem. The model may be a scale model, i.e. model of a building or a bridge. It may be a mathematical model such as equations describing the trajectory of a missile. The model may be an analog model such as a blue print for a building or a map to show a particular region. There are many other types of models, which are not discussed here. A model has a set of uncontrollable variables that are not under the control of the manager. There is a set of decision variables, which are under the control of the manager, and these variables describe alternative course of action. As the values assigned to decision variables are changed, the results also change. The result variables are dependent on decision variables

The analyst then documents the requirements using one of the formal representations such as Data Flow Diagram, Flowcharts, ER diagram, structured English. Such a document is called Software Requirements Specification (SRS). A system is then built according to the requirements. There are many software development models such as waterfall model, prototype, and incremental models. For a decision support system, usually a prototype is built which is shown to the manager for approval. The complete system is then built taking the feedback from the manager into consideration.

The decision variables are changed and impact on result variables is analyzed. A DSS provides support for decision makers by bringing together human judgment and computerized information. A DSS may provide support throughout large and complex organization or it may support an executive. A DSS may help an executive to perform trend analysis. A DSS may be designed to generate exception report so that the manager does not miss any exceptional condition

Q2- What is data warehouse? Difference between data ware house and in an operation data base ? (v v v v v imp)

Ans – THE DATA WAREHOUSE

We need a new breed of information delivery environment, called a data warehouse, to facilitate strategic decision-making. The concept of a data warehouse given by Bill Inmon, the father of data warehousing, is depicted in Figure

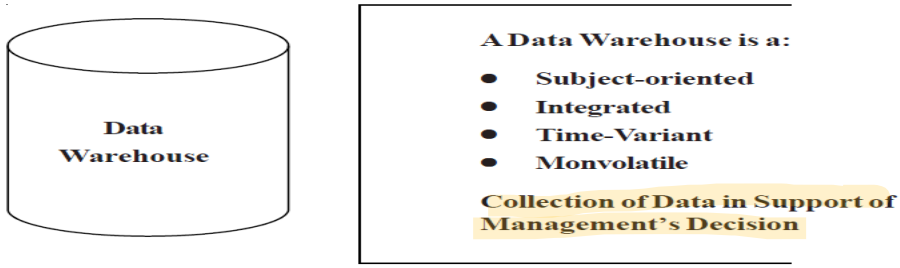

Fig. 17.1: What is a Data Warehouse?

The defining characteristics of a data warehouse are:

- **Subject-orientation**: Data warehouse data are arranged and optimized to provide answers to questions coming from diverse functional area within a company. Therefore, the data warehouse contains data organized and summarized by topic, such as sales, marketing, finance, distribution, and transportation. For each one of these topics the data warehouse contains specific subjects of interest - products, customers, departments, regions, promotions, and so on. Note that this form of data organization is quite different from the more functional or process-oriented organization of typical transaction systems.
- **Time-variancy:** We have already noted that the DSS data include a time element (see *Table 17.1*). In contrast to the operational data, which focus on current transactions, the warehouse data represent the flow of data through time. The data warehouse can even contain projected data generated through statistical and other models.
- **Non-volatility:** Once data enter the data warehouse they are never removed. Because the data in the data warehouse represent the company's entire history, the operational data representing the near-tern history, are always added to it. Because data are never deleted and new data are always added, the data warehouse is always growing. That is why the DSS DBMS must be able to support multi-gigabyte and even multi-terabyte database and multiprocessor hardware.
- **Integration:** The data warehouse is a centralized, consolidated database that integrates data derived from the entire organization. Thus the data warehouse consolidates data from multiple and diverse sources with diverse formats. Data integration implies a well-organized effort to define and standardize all data elements. This integration effort can be time-consuming but, once accomplished, it provides a unified view of the overall organizational situation. Data integration enhances decision-making and helps managers to better understand the company's operations. This understanding can be translated into recognition of strategic business opportunities.

Table summarizes the differences between the data in a data warehouse and that in an operational database

Table 17.2: Operational Data and Data Warehouse Data

CHARCTERISTIC	OPERATIONAL DATABASE DATA	DATA WAREHOUSE DATA
Integrated	Similar data can have different representations or meanings. For example, telephone numbers may be stored as 033-29-70701 or as 0332970701, and a given condition may be labeled as T/F or 0/1 or Y/N. A sales value may be shown in thousands or in millions.	Provide a unified view of all data elements with a common definition and representation for all business units.
Subject-oriented	Data are stored with a functional, or process, orientation. For example, data may be stored for invoices, payments, credit amounts, and so on.	Data are stored with a subject orientation that facilities, multiple views of the data and facilitates decision making .For example, sales may be recorded by product, by division, by manager, or by region.
Time-variant	Data are recorded as current transactions. For example, the sales data may be the sale of a product on a given date, such as Rs. 342.78 on 12-AUG-1999.	Data are recorded with a historical perspective in mind. Therefore, a time dimension is added to facilitate data analysis and various time comparisons.
Non-volatile	Data updates are frequent and common. For example, an inventory amount changes with each sale. Therefore, the data environment is fluid.	Data cannot be changed. Data are only added periodically from historical systems. Once the data are properly stored, no changes are allowed. Therefore the data environment is relatively static.

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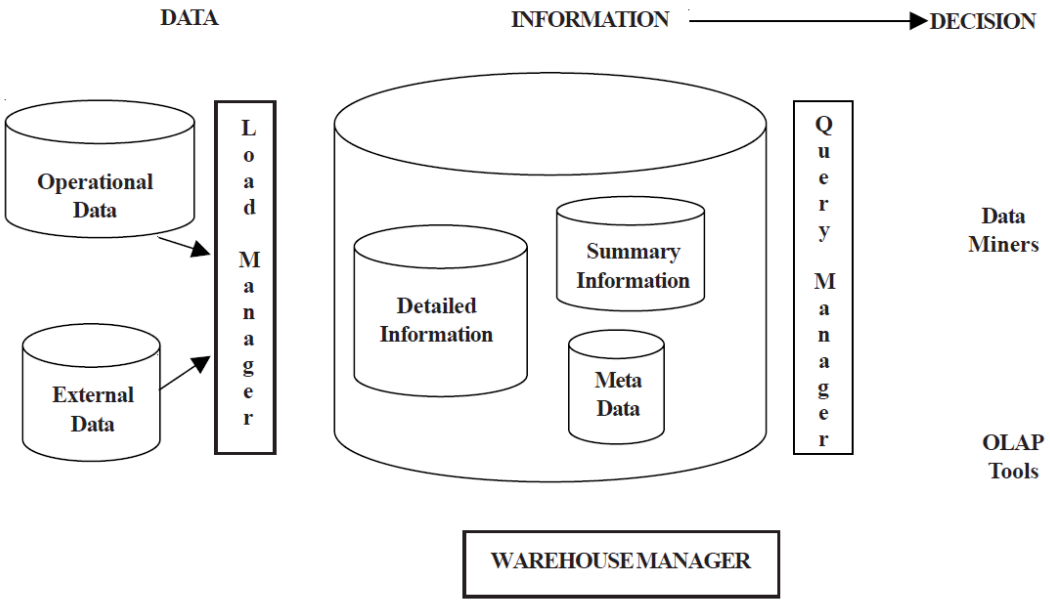


Fig. 17.2: Data Warehouse Architecture

The Load Manager

Data flows into the data warehouse through the load manager. The data is mostly extracted from the operational database(s) and other internal sources (like archived historical data), and supplemented by data imported from external sources. Externally sourced data can greatly enhance the value of information generated from a data warehouse. For example Transco, the gas pipeline operator in UK, uses weather forecast data from the British Met Office on a regular basis to determine demand for gas (the main source of energy used for heating homes and offices) in various areas of the country. The weather data is fed into a model that incorporates several other factors (e.g. day of the week, internal data about customers' usage patterns, demographic and economic

profile data, alternate sources of energy, types of buildings in the area) to arrive at a demand forecast. Types of data from external sources that may be included in data warehouse are: financial indicators and statistics of the industry, market share data of competitors, demographic data, weather data, credit worthiness data, readership / viewer survey data for advertising media, specially commissioned surveys and so on. External data is usually obtained from commercial database services or government agencies (e.g. Equifax, Reuters, Met Office, census agency, industry associations, stock exchanges, local government statistics service). The data from such diverse sources will obviously be in different incompatible formats and will be distributed through various media. Some of them may be available on a downloadable format on the Internet; others may be distributed on CD-ROMs, while some may only be available on printed media. Some data may be available for free but most data (particularly when used for commercial purposes) have to be purchased.
The load manager primarily performs what is termed an extract-transform-load (ETL) operation.

• Data Extraction

• Data Transformation

• Data Loading

Data Extraction: This function has to deal with numerous data sources. Appropriate techniques have to be employed for each data source. Source data may be from different source machines in diverse data formats. Part of the source data may be in relational database systems. Some data may be on other legacy network and hierarchical data models. Many data sources may still be in flat files. There may also be the need to include data from spreadsheets and local departmental data sets. Data extraction can become quite a complex operation at times. Various tools are available on the market for data extraction. Use of outside tools may be considered suitable for certain data sources. For the other data sources, inhouse programs may need to be developed to do the data extraction. Purchasing outside tools may entail high initial costs. In-house programs, on the other hand, may mean ongoing costs for development and maintenance. After extraction, the data needs to be kept somewhere for further preparation. Sometimes the extraction function is performed in the legacy platform itself if that approach suits the designed framework. More frequently, data warehouse implementation teams extract the source data into a separate physical environment from which moving the data into the data warehouse would be easier. In the separate environment, the source data may be extracted into a group of flat files, or an intermediate relational database, or a combination of both. This physical environment is called the data-staging area
Data Transformation: In every system implementation, data conversion is an important function. For example, when implementing an operational system such as a magazine subscription application, the database has to be initially populated with data from the existing system records. The conversion may either be from a manual system or from a file-oriented system to a modern system supported with relational database tables. In either case, the data will need to be converted from the existing systems. So, what is so different for a data warehouse? Why is data transformation for a data warehouse more involved than that for an operational system? As already discussed, data for a data warehouse comes from many disparate sources. If data extraction for a data warehouse poses great challenges, data transformation presents even greater challenges. Another factor in the data warehouse is that the data feed is not just an initial one-time load. The ongoing changes will have to continue to be picked up from the source systems. Any transformation tasks are set up for the initial load will have to be adapted for the ongoing revisions as well.
A number of individual tasks are performed as part of data transformation. First, the data extracted from each source is cleaned. Cleaning may be correction of misspellings, or may include resolutions of conflicts between state codes and pin codes in the source data, or may deal with providing default values for missing data elements, or elimination of duplicates when the same data is brought in from

multiple source systems. Standardization of data elements forms a large part of data transformation. The data types and field lengths for same data elements retrieved from the various sources need to be standardized. Semantic standardization is another major task. Synonyms and homonyms have to be resolved. Resolution of synonyms is required when two or more terms from different source systems mean the same thing. On the other hand, when a single term means many different things in different source systems, resolution of homonyms have to be performed.

Data transformation involves many forms of combining pieces of data from the different sources. In some cases, data from a single source record or related data elements from many source records are combined. In other situations, data transformation may also involve purging source data that is not useful and/or separating out source records into new combinations. During data transformation sorting and merging of data takes place on a large scale in the data staging area. In many cases, the keys chosen for the operational systems are field values with built-in meanings. For example, the product key value may be a combination of characters indicating the product category, the code of the warehouse where the product is stored, and some code to show the production batch. Primary keys in the data warehouse cannot have built-in meanings. Therefore, data transformation also includes the assignment of surrogate keys derived from the source system primary keys. A grocery chain point-of-sale operational system keeps the unit sales and revenue amounts by individual transactions at the checkout counter at each store. But in the data warehouse, it may not be necessary to keep the data at this detailed level. It may be more appropriate to summarize the totals by product at each store for a given day and keep the summary totals of the sale units and revenue in the data warehouse's storage. In such cases, the data transformation function would include such summarization processing.

Data Loading: Two distinct groups of tasks form the data loading function. After completion of the design and construction of the data warehouse, when it goes live for the first time, the initial loading of data is done. The initial load moves large volumes of data and takes substantial amount of time, but it is a one-time effort. As the data warehouse starts functioning, extraction of additions (and changes) to the source data continues on an ongoing basis, together with the transformation and loading operations.

The Query Manager

The *query manager* provides an interface between the data warehouse and its users. It performs tasks like directing the queries to the appropriate tables, generating views on an ad-hoc basis if required, monitoring the effectiveness of indexes and summary data, and query scheduling.

Data Warehouse Design Considerations

The key considerations involved in the design of a data warehouse are:

- Time Span
- Granularity
- Dimensionality
- Aggregations
- Partitioning

- **Time span:** Operational data represent current (atomic) transactions. Such transactions might define a purchase order, a sales invoice, an inventory movement, and so on. In short, operational data cover a short time frame. In contrast, data warehouse data tend to cover a longer time frame. Managers are seldom interested in a specific sales invoice to customer X; rather they tend to focus on sales generated during the last month, the last year, or the last five years. Rather than concern themselves with a single customer purchase, they might be interested in the buying pattern of such a customer or groups of customers. In short, data warehouse data tend to be historic in nature. That is, the data warehouse data represent company transactions up to a given point in time, yesterday, last week, last month, and the like. The time period for which data is held in the data warehouse is determined by the data analysis requirements of the users of the data warehouse. These needs, in turn, arise from the changes in the business environment that a particular organization needs to monitor, in its effort to stay ahead of its competitors. Since, a data warehouse's size depends on the span of time for which data is stored, the time span covered by the data warehouse is an important design consideration. If, for example, the environment changes rapidly, the data required for analysis would relate more often to the *recent past*, rather than that over several years or decades. In that case the designers of the data warehouse need to consider whether or not the cost incurred in holding data for indefinitely long time spans would be worthwhile.

- **Granularity:** According to Inmon, the single most important design aspect of a data warehouse is the decision on granularity. It refers to the level of detail or summarization available in units of data in the data warehouse. The more detail there is, the lower the level of granularity. The less detail there is, the higher the level of granularity.

Operational data represent specific transactions that occur at a given time, such as customer purchase of product X in store A. Thus, granularity is taken for granted to be of the lowest level, in operational systems. Data warehouse data must be presented at different levels of aggregation, from highly summarized to near atomic. This requirement is based on the fact that managers at different levels in the organization require data with different levels of aggregation. It is also possible that a single problem requires data with different summarization levels. For example, if a manager must analyze sales by region, (s)he must be able to access data showing the sales by region, by city within the region, by store within the city within the region, and so on. In this case, the manager requires summarized data to compare the regions, but (s)he also needs data in a structure that enables him or her to decompose (drill down) the data into more atomic components (that is, data at lower levels of aggregation). For example, it is necessary to be able to drill down to the stores within the region in order to compare store performance by region. Granularity level in a data warehouse cannot, therefore, be assumed.

The decision on granularity level profoundly affects both the volume of data that resides in the data warehouse, and the type of query that can be answered. A trade off exists between the volume of data in the data warehouse and the level of detail of queries (see Figure 17.3 below). Some data warehouses are designed to support dual granularity. In such environments some data (usually the most recent) is held at a relatively low level of granularity, while the rest is held in more summarized form (i.e. at a higher granularity level). This enables detailed analysis at the same time allows reduction of data volume

- **Dimensionality:** This is probably the most distinguishing characteristic of a data warehouse. From the data analyst's point of view, the data is always related in many different ways. For example, when we analyze product sales by a customer during a given time span, we are likely to ask how many widgets of type X were sold to customer Y during the last six months. In fact, the question tends to expand quickly to include many different data *dimensions*. For instance, we might want know how the product X fared relative to product Z during the past six months, by region, state, city, store, and customer (or sales of various products by quarters by country, as shown in *Figure 17.4*). In this case, both place and time are part of the picture. In general, data analysis tends to include many data dimensions, producing a multidimensional view of the data.

The data model used for modeling data warehouses is known as the *dimensional model*. The numerical measurements related to the business (like sales volumes) are stored in *fact tables*. The descriptions of the dimensions are stored in *dimension tables*. We will discuss this in more detail in later sections. The number and types of dimensions and facts that are to be stored in a data warehouse is a very important design decision, and (much like the decision on granularity) affects both the data volume and the types of analysis that can be supported.

- **Aggregations:** We have seen how data analysis queries directed at data warehouses involve dimensions. Another very common type of query directed at data warehouses involves sums of values along the different dimensions. For example: what is the total sales volume of VCR during the past 4 quarters? Answering this query using the fact and dimension tables would involve summing up the individual sales volume figures over the 4 quarters and the 3 counties. In real situations, similar queries might involve retrieving and summing hundreds or thousands of individual values. To avoid excessive processing load on the data warehouse arising from frequently asked queries of this type, it is often decided, at design time, to store some *pre-calculated aggregations*, along with the base facts, in the data warehouse (as illustrated in *Figure 17.4* above). This decision affects the data volume and performance of certain types of queries.
- **Partitioning:** One of the essences of the data warehouse is flexible data storage, management, and access. When data resides in large physical units, among other things it cannot be:
  - indexed easily
  - sequentially scanned, if needed
  - restructured easily
  - backed up conveniently
  - recovered easily
  - monitored easily

In short, having a big mass of data defeats much of the purpose of the data warehouse. The purpose of *partitioning* is to break the data into smaller (more manageable) physical units of storage. The criteria used for dividing the data can be: date, line of business / product category, geography / location, organizational / administrative unit, or any combination of these.

Q3- What is meta data? Explain METADATA REPOSITORY? (v v v v v imp)

Ans – METADATA

Metadata in a data warehouse is similar to the data dictionary in the context of a database. It stores data about data in the data warehouse

Types of Metadata

Metadata in a data warehouse fall into three major categories:

• Operational Metadata
• Extraction and Transformation Metadata
• End-User Metadata

Operational Metadata: As already discussed, data for the data warehouse comes from several operational systems of the enterprise. These source systems contain different data structures. The data elements selected for the data warehouse have various field lengths and data types. Selecting

data from different source files, and loading it into the data warehouse, requires splitting of records, combining parts of records from different source files, and dealing with multiple coding schemes and field lengths. When information is delivered to the end-users, it is essential to be able relate back to the original source data sets. Operational metadata contain all of this information about the operational data sources that allow us to trace back to the original source.

Extraction and Transformation Metadata: Extraction and transformation metadata contain data about the extraction of data from the source systems, namely, the extraction frequencies, extraction methods, and business rules for the data extraction. Also, this category of metadata contains information about all the data transformations that take place in the data staging area.

End-User Metadata. The end-user metadata is the navigational map of the data warehouse. It enables the end-users to find information from the data warehouse. The end-user metadata allows the end-users to use their own business terminology and look for information in those ways in which they normally think of the business.

Special Significance

Why is metadata especially important in a data warehouse?

- First, it acts as the glue that connects all parts of the data warehouse.
- Next, it provides information about the contents and structure to the developers.
- Finally, it opens the door to the end-users and makes the contents recognizable in their own terms.

Metadata Requirements

According to Inmon, a new user approaching a data warehouse wants to know

- What tables, attributes, and keys does the data warehouse contain?
- From where did each set of data come?
- What transformation logic was applied in loading the data?
- How has the data changed over time?
- What aliases exist, and how are they related to each other?
- What are the cross-references between technical and business terms? (For instance, the field name XVT-351J presumably meant something to a COBOL programmer in 1965, but what does it mean to me today?)
- How often does the data get reloaded?
- How much data is there? This helps end-users to avoid submitting unrealistic queries. Given some means of determining the size of tables, staff can tell the end users, "You can do what you like with 15,000 rows, but if it turns out be 15 million rows, back off and ask for help!"

Metadata requirements of various classes of users are summarized in *Table 17.4* below:

Table 17.4: Uses of Metadata

	IT Professionals	Power Users	Casual Users
Analysis and Discovery	Database Tables, Columns, Server Platforms.	Databases, Tables, Columns	List of Predefined Queries and Reports, Business views.
Meaning of Data	Data structures, Data Definitions, Data Mapping, Cleansing Functions, Transformation Rules	Business Terms, Data Definitions, Data Mapping, Cleansing Functions, Transformation Rules	Business Terms, Data Definitions, Filters, Data Sources, Conversion, Data Owners
Information Access	Program Code in SQL, 3GL, 4GL, Front-end Applications, Security	Query Toolsets, Database Access for Complex Analysis	Authorization Requests, Information Retrieval into Desktop Applications such as Spreadsheets.

Metadata Components

Warehouse metadata is not very different in kind from ordinary database metadata, although it is versioned in order to permit historical analysis. Prism gives the following breakdown of warehouse metadata in its Tech Topic, "Metadata in the Data Warehouse:"

Mapping

The mapping information records how data from operational sources is transformed on its way into the warehouse. Typical contents are:

- Identification of source fields
- Simple attribute-to-attribute mapping
- Attribute conversions
- Physical characteristic conversions
- Encoding/reference table conversions
- Naming changes
- Key changes
- Defaults
- Logic to choose from among multiple sources
- Algorithmic changes

Extract History

Whenever historical information is analyzed, meticulous update records have to be kept. The metadata history is a good place to start any time-based report, because the analyst has to know when the rules changed in order to apply the right rules to the right data. If, for example, sales territories were remapped in 1991, results from before that date may not be directly comparable with more recent results.

Miscellaneous

- Aliases can make the warehouses much more use-friendly by allowing a table to be queried by "Widgets produced by each factory" rather than "MF-STATS." Aliases also come in useful when different departments want to use their own names to refer to the same underlying data. Obviously, though, aliases can also cause a great deal of confusion if they are not carefully tracked.

- Often, parts of the same data warehouse may be in different stages of development. Status information can be used to keep track of this: for instance, tables might be classified "in-design," "in-test," inactive," or "active."

- Volumetric information lets users know how much data they are dealing with, so that they can have some idea how much their queries will cost in terms of time and computational resources. Volumetrics could usefully include such information as number of rows, growth rate, usage characteristics, indexing, and byte specifications.

- It is also useful to publish the criteria and time scales for purging old data.

Summarization and Aggregation Algorithms

As discussed above, a typical data warehouse contains lightly and heavily summarized data, and aggregations as well as full detailed records. The algorithms for summarizing (and aggregating) the detail data are obviously of interest to anyone who takes responsibility for interpreting the meaning of the summaries. This metadata can also save time by making it easier to decide which level of summarization is most appropriate for a given purpose.

Relationship Artifacts and History

Data warehouses implement relationships in a different way form production databases. Metadata pertaining to related tables, constraints, and cardinality are maintained, together with text descriptions and ownership records. This information and the history of changes to it can be useful to analysts.

Ownership / Stewardship

Operational databases are often owned by particular departments or business groups. In an enterprise data warehouse, however, all data is stored in a common format and accessible to all. This makes it necessary to identify the originator of each set of data, so that inquiries and corrections can be made by the proper group. It is useful to distinguish between *ownership* of data in the operational environment and *stewardship* in the data warehouse.

Access Patterns

It is desirable to record patterns of access to the warehouse in order to optimize and tune performance. Less frequently used data can be migrated to cheaper storage media, and various methods can be used to accelerate access to the data that is most in demand. Most databases do a good job of hiding such physical details, but specialized performance analysis tools are usually available. Some general-purpose tools, such as Information Builders' SiteAnalyzer, also are available.

Reference Tables / Encoded Data

Reference data is stored in an external table (see discussion on Star Schema above) and contains commonly used translations of encoded values. The contents of these tables must be stored in order to guarantee the ability to recover the original un-encoded data, together with effective from and effective to dates.

Data Model – Design Reference

Building a data warehouse without first constructing a data model is very difficult and frustrating. When a data model is used, metadata describing the mapping between the data model and the physical design should be stored. This allows all ambiguities or uncertainties to be resolved.

From the point of view of the Query Manager (see *Figure 17.2* above) of the data warehouse, the *Metadata Repository* can be perceived to have three logical layers: the *Information Navigator*, the *Business Metadata*, and the *Technical Metadata*.

Figure 17.9 below illustrates this concept. The query manager accesses the metadata through the Information Navigator layer which is the topmost layer of the metadata repository. The higher layers, in turn, access more detailed metadata components resident in the lower layers whenever required.

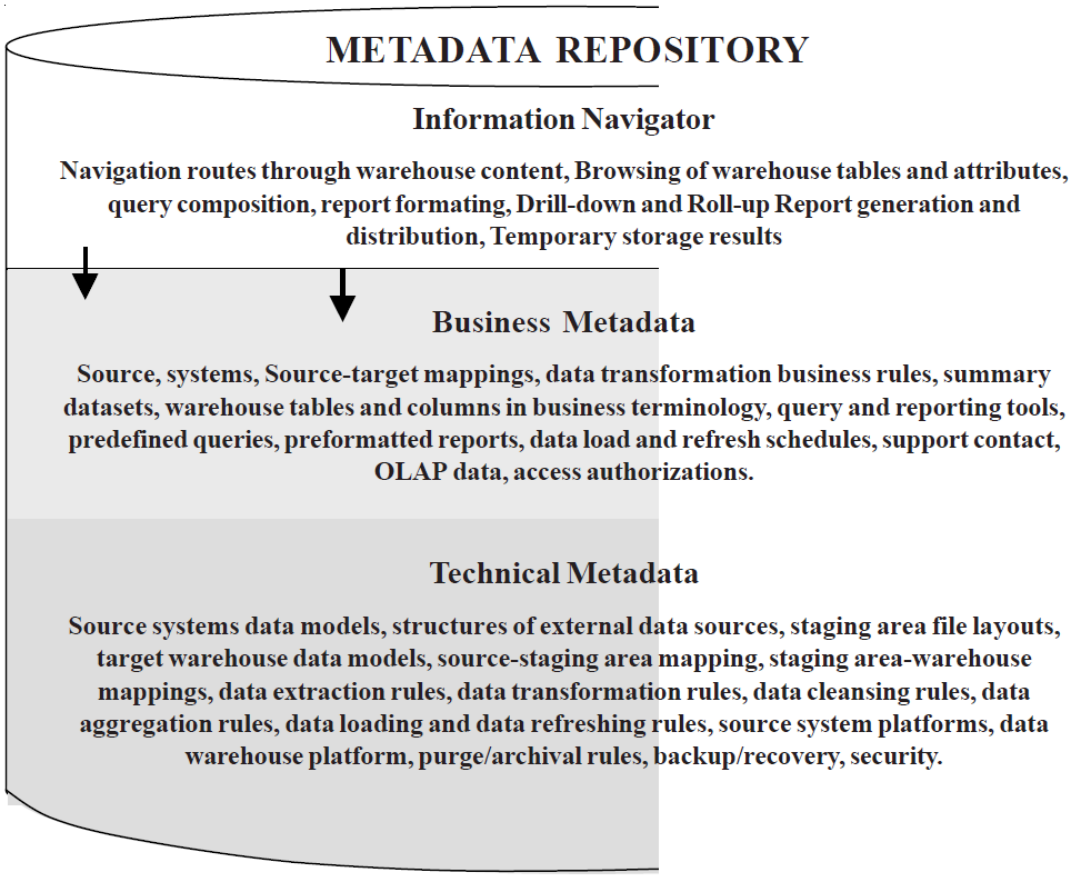


Fig. 17.9: The Metadata Repository

Q4- What is NEURAL NETWORKS? (v v v v v imp)

Ans – NEURAL NETWORKS

Neural networks are a great aid to computing. They involves mathematical structures that are capable of learning. Neural network is a set of connected input/output units where each connection has a weight associated with it. Neural networks are primarily used for predictions. Neural networks use past data and fit a model on it to predict and classify. Neural networks as the name suggest resembles the namesake found in human beings. Neural networks begin with an input layer, which is given some weight before it connects to the output unit. The output unit processes the values of input variable and weights with a combination function. There are many hidden layers between the input and output layer. A neural network is trained by assigning weights on the inputs of each of the units so that the network predicts the variable under question in the best possible manner. According to Barry & Linoff (2001), "Neural Networks are a good choice for most classification and prediction tasks when the results of the model are more important than understanding how the model works. Neural Networks actually represent complex mathematical equations, with lots of summations, exponential functions and any parameters. These equations describe the neural network, but are quite opaque for human eyes… Neural networks do not work well when there are

man hundreds or thousands of input features… Neural network works well with decision trees… decision tress are good at choosing the most important variables- and these can be used for training a network." A major difference between neural networks and the statistical modeling is that the former is based on the rules it explores from the data while the latter is based on previously specified functional form. As our nervous system is made up of neurons that are connected with a nerve fiber, neural nets also have nodes that are connected. As a neuron receives signals from its neighboring neurons, processes them and move those signals forward, the neural net also do the same functions.

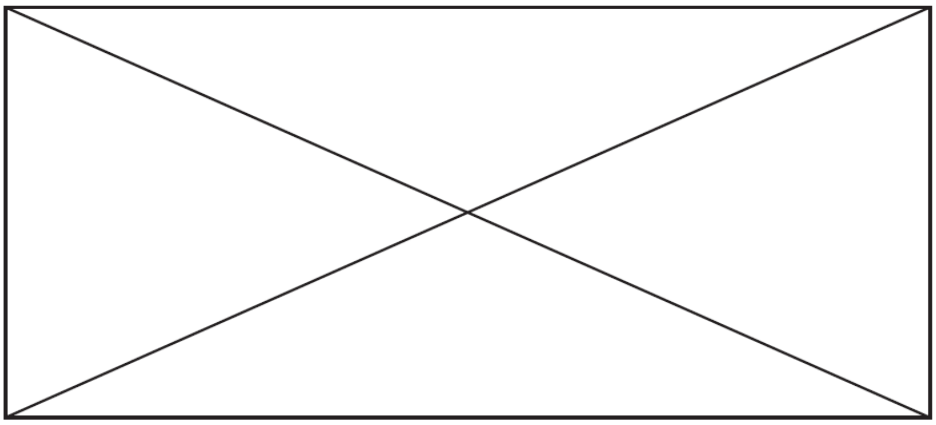
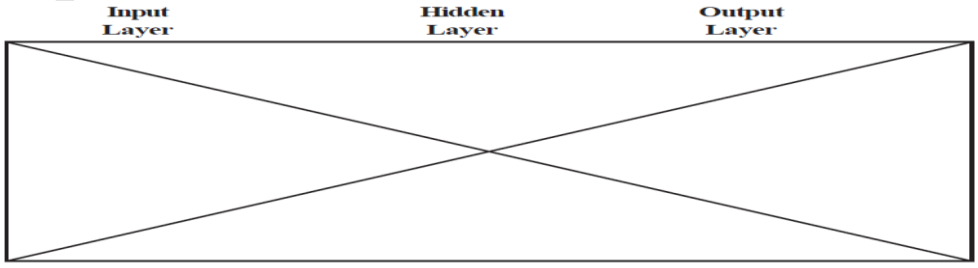


Fig. 19.3 : A Single Node Neural Network

Thus artificial neural networks are electrical analogues of the biological neural nets. The most common application of neural network is in the field of machine learning. One can find many applications of neural networks in control, automation, robotics, computer vision, scheduling, knowledge acquisition and planning. They are useful in many applications because they derive meaning from complicated or imprecise data. These situations are otherwise complex and undetectable by humans and other computer techniques. Neural Networks are good at identifying patterns or trends in data and hence they are well suited for prediction and forecasting needs

A neural network can have multiple layers. Suppose, we have a training data and we measure attributes for training data. These measured attributes form the input layer. Weights are given to the input layer according to their importance in the problem. The output from the input layer is assigned some weights and this feed to the second layer, known as hidden layer. Similarly the weighted outputs of this hidden layers can be fed to the next hidden layer and so on. Finally these outputs go into the output layer, which emits network's prediction. This process is explained in the figure given below. Figure shows how a training sample x1 , x2 ,…xi is fed to the input layer. Weighted connections exist between each layer denoted by wij.

If there is a single hidden layer then the network is called a two-layer neural network. Similarly a network containing two hidden layers is called a three-layer neural network



Source: *Han & Kamber(2001)*

Fig. 19.4 : A Multilayer Neural Network

Business Applications of Neural Networks

There are immense applications of Neural Networks in business. It is just not possible to mention all of them. However an attempt has been made to give you a glimpse of the purposes for which neural networks are being applied. Following are some of the applications of the artificial neural networks Pujari (2001), Konar (2000):

1) Used in investment analysis to predict the movement of stocks, currencies etc., from previous data. They have become worthy successors of linear models.

2) Used in monitoring the state of aircraft engines. Parameters like vibration levels and sound are used to predict or forecast engine problems.

3) Used to improve marketing mailshots. They are employed to find a predictive mapping from the known data about the clients and their response. This mapping is then used to direct further mailshots.

4) A simple neural network based diagnostic expert system, which diagnoses and recommends treatments for acute sarcophagal disease.

5) In the development of a system for criminal investigation for voice classification scheme. A multi layered feed forward neural net was trained. Speech features of the suspect are supplied to the neural net, which then processes the output signals.

6) In path planning of the mobile robots. Mobile robots works on sensors that help them recognize the world as the humans do. Neural Network based navigational model has been applied for online navigation of such robots. They help the robot to receive sensory information, generate control commands for motion and direction and finally set the schedule of motions.

7) For acquisition of knowledge in an expert system. Fuzzy neural networks are applied for automated estimation of certainty factors of knowledge from proven and historical databases of a typical reasoning system.

8) In recognition of human faces from their facial images. Self-organizing neural nets are applied for this task. Weights are given to each multi-dimensional point on the 2-d plane and then it is mapped to a single point. This process is repeated for all the 360 images (corresponding multi-dimensional points.)

9) In cognitive learning for applications in psychological modeling. Fuzzy neural networks are used to mimic the activities of "long term memory" of the biological cognitive system.

These applications are never-ending. As said earlier, neural networks are useful in many applications because they derive meaning from complicated or imprecise data. These situations are otherwise complex and undetectable by humans and other computer techniques. We now move on to another important concept i.e. fuzzy logic and its business applications.

Q5- What is system developed life cycle(SDLC) and phases? (v v v v v imp)

Ans – TRADITIONAL SYSTEM LIFE CYCLE

The goal of the traditional system life cycle is to keep the project under control and assure that the information system produced, satisfies the requirements. The traditional system life cycle divides the project into a series of steps, each of which has distinct deliverables, such as documents or computer programs. This is known as the **systems development life cycle (SDLC).** The deliverables are related because each subsequent step builds on the conclusions of previous steps. This has been

shown in Figure. Some deliverables are oriented toward the technical staff, whereas others are directed toward or produced by users and mangers. The latter ensure that users and their management are included in the system development process.

Although there is general agreement about what needs to be done in the traditional system life cycle, different authors name individual steps and deliverables differently. Many versions of the traditional system life cycle emphasize the building or software and de-emphasize what happens in the organization before and after software development. Because this unit is directed at business professionals, its version of the traditional system life cycle emphasizes implementation and operation in the organization in addition to software development.

Initiation

The initiation phase may begin in many different ways. A user may work with the IS staff to produce a written request to study a particular business problem. The IS staff may discover an opportunity to use information systems beneficially and then try to interest users. A top manager may notice a business problem and ask the head of IS to look into it. A computer crash or other operational problem may reveal a major problem that can be patched temporarily but requires a larger project to fix it completely. Regardless of how this phase begins, its goal is to analyze the scope and feasibility of a proposed system and to develop a project plan. This involves two steps, the feasibility study and project planning, which produce the functional specification and a project plan

The feasibility study is a user-oriented overview of the proposed information system's purpose and feasibility. A system's feasibility is typically considered from economic, technical, and organizational viewpoints.

- Economic feasibility involves question such as whether the firm can afford to build the information system, whether its benefits should substantially exceed its costs, and whether the project has higher priority than other projects that might use the same resources.

- Technical feasibility involves question such as whether the technology needed for the information system exists and whether the firm has enough experience using that technology.

- Organizational feasibility involves questions such as whether the information system has enough support to be implemented successfully, whether it brings as excessive amount of change, and whether the organization is changing too rapidly to absorb it.

If the information system appears to be feasible, the initiation phase produces a functional specification and a project plan. The functional specification explains the important of the business problem; summarizes changes in business processes; and estimates the project's benefits, costs, and risks. The project plan breaks the project into sub-projects with start and completion times. It also identifies staffing, resource requirements, and dependencies between project steps.

The functional specification is approved by both user and IS personnel. It clarifies the purpose and scope of the proposed project by describing the business processes that will be affected and how they will be performed using the system. Functional specifications once consisted primarily of prose. With the advent of diagramming tools such as data flow have become much easier to read and understand. These visual representations help parts of the system will play. Functional specifications typically do not explain exactly what data, reports, or data entry screens will be included. This more detailed description is produced in the development phase.

Development

The development phase creates computer programs (with accompanying user and programmer documentation) plus installed hardware that accomplishes the data processing described in the functional specification. This is done through a process of successive refinement in which the functional requirements are translated into computer programs and hardware requirements. The purpose of the various steps and deliverables in the development phase is to ensure that the system accomplishes the goals explained in the functional specification. These steps are summarized in Figure

The first step in the development phase is the detailed requirements analysis, which produces a user-oriented description of exactly what the information system will do. This step is usually performed by a team including user representative and the IS department. It produces a document called the external specification. Building on the functional specification, the external specification shows the data input screens and major reports and explains the calculations that will be automated. It shows what information system users will see, rather than explaining exactly how the computer will perform the required processing. Users reviewing this document focus on whether they understand the data input screens, reports, and calculations, and whether these will support the desired business process. By approving the external specification, the users and IS staff signify their belief that the information system will accomplish what they want.

The next step is internal system design, in which the technical staff decides how the data processing will be configured on the computer. This step produces the internal specification, a technical blueprint for the information system. It documents the computer environment the system will operate in, the detailed structure and content of the database, and the inputs and outputs of all programs and subsystems. Users do not sign off on the internal specification because it addresses technical system design issues. Instead, the IS staff signs off that the internal specification accomplishes the functions called for in the external specification the users have approved. Thus far the discussion has focused on software. Because the software will work only if there is hardware for it to run on, and essential step in the development phase is hardware acquisition and installation. For some information systems, this is not an issue because it is a foregone conclusion that existing hardware will be used. Other systems require a careful analysis to decide which hardware to acquire, how to acquire it most economically, where to put it, and how to install it by the time it is indeed. Factors considered in hardware acquisition decisions include compatibility with existing hardware and software, price, customer service, and compatibility with long-term company plans. Computer hardware can be purchased or rented through a variety of financing arrangements, each with its own tax consequences. A firm's finance department usually makes the financing arrangements for significant hardware purchases. Especially if new computer hardware requires a new computer room, lead times for building the room, installing the electricity and air conditioning, and installing the computer may be important factors in the project plan

In firms with large IS staffs; users rarely get involved with the acquisition, installation, and operation of computer hardware. Much as with telephone systems, users expect the hardware to be available when needed and complain furiously whenever it goes down. This is one reason computer hardware managers sometimes consider their jobs thankless.

A number of improvements in programming methods have made programming faster and more reliable. Structured programming is often used to make the programs more consistent, easier to understand and less error prone. Fourth generation languages (4GLs) also expedite programming for some systems. However, as should be clear from all of the steps leading up to coding and following coding, coding often accounts for less than 20% of the work in developing a system. This is one of the reasons 4GLs and other improved programming tools do not drastically shrink the system life cycle for large systems, even when they slash programming time. Documentation is another activity that can proceed in parallel with programming and hardware acquisition. Both user and technical documentation is completed from the material that already exists. The functional specification and external specification are the basis for the user documentation, and the internal specification and program documentation are the basis for the programmer documentation. With the adoption of

Computer Aided Software Engineering (CASE) tools, more of the documentation is basically a compilation of data and diagrams already stored on a computer. Additional user documentation is usually required, however, because different users need to know different things depending on their roles. People who perform data entry tasks need to understand the data entry procedures and what the data mean; people who use data from the system need to understand what the data mean and how to retrieve and analyze data, but do not need to know much about data entry details

After the individual programs have been tested, the entire information system must be tested to ensure that the programs operate together to accomplish the desired functions. This is called the system testing, or integration testing. System tests frequently uncover inconsistencies among programs as well as inconsistencies in the original internal specification. These must be reconciled and the programs changed and retested. One of the reasons for Microsoft's "synch and stabilize" method is to eliminate the surprises and extensive network that might occur if system testing showed that programs were incompatible. Although system testing may seem an obvious requirement, inadequate system testing has led to serious problems. For example, a new trust accounting system put into operation prematurely by Bank of America on March 1, 1987, lost data and fell months behind in generating statements for customers. By January 1988, 100 institutional customers with $ 4 billion in assets moved to other banks, several top executives resigned, and 2.5 million lines of code were scrapped. An important part of testing is the creations of a testing plan, a precise statement of exactly how the information system will be tested. This plan includes the data that will be used for testing. Creating a testing plan serves many purposes. It encourages careful thought about how the system will be tested. In addition, a thorough plan increases the likelihood that all foreseeable contingences will be considered and that the testing will catch more of the bugs in the system

It should be clear that the development phase for a large information system is a complex undertaking, quite different from sitting down at a personal computer and developing a small spreadsheet model. Explicitly separating out all the steps in the development phase helps to ensure that the information system accomplishes the desired functions and is debugged. Such an elaborate approach is needed because the system is a tool of an organization rather than an individual. An individual producing a spreadsheet is often typing to solve a current problem with no intention to use the spreadsheet next month, much less that someone else will need to decipher and modify it next year. In contrast, the traditional system life cycle assumes that the information system may survive for years, may be used by people who were not involved in its development, and may be changed repeatedly during that time by people other than the original developers. The steps in the traditional life cycle try to make the long-term existence of the information system as efficient error-free as possible

Implementation

Implementation is the process of putting a system into operation in an organization. Figure shows that it starts with the end product of the development phase, namely, a set of computer programs that run correctly on the computer, plus accompanying documentation. This phase begins with implementation planning, the process of creating plans for training, conversion, and acceptance testing.

System Analysis and Computer Languages The training plan explains how and when the user will be trained. The conversion plan explains how and when the organization will convert to new business processes. The acceptance-testing plan describes the process and criteria for verifying that the information system works properly in supporting the improved work system. Training is the process of ensuring that system participants know what they need to know about both the work system and the information system. The training format depends on user backgrounds and the purpose and features of both the work system and the information system. Users with no computer experience may require special training. Training for frequently used transaction processing systems differs from training for data analysis systems that are used occasionally. Information systems performing diverse functions require more extensive training than systems used repetitively for new functions. Training

manuals and presentations help in the implementation system. After the previous methods have receded into history, other types of training material are more appropriate

Following the training comes the carefully planned process of conversion from the old business processes to new ones using the new information system. Conversion is often called cutover or changeover. It can be accomplished in several ways, depending on the nature of the work and the characteristics of the old and new systems. One possibility is to simply choose a date, shut off the old information system, and turn on the new one while hoping that the work system will operate as intended. This is risky, though, because it does not verify that the information system will operate properly and that the users understand how to use it. Consider the following example: The State of California installed an optical disk system to streamline the process of doing title searches (establishing ownership and identifying indebtedness on a property) for borrowers who wished to purchase property. Previously, there was a 2 to 3 week delay between the borrower's loan request and the bank's receipt of a confirmation that the title was clear. The new system was to reduce this delay to 2 days. Both the vendor and several state officials recommended that the existing manual system remain in full operation during the conversion in case of problems. However, the Secretary of Finance rejected the request for an additional $2.4 million, and the manual system was simply shut down when the optical disk system came up. Unfortunately, software bugs plagued the new system, and the resulting logjam of 50,000 loan requests delayed title searches for up to 10 weeks. The new system was shut down for repair, and the old manual system reinstated. The Assistant Secretary of State said that some banks almost went out of business because of the slow turnaround

To minimize risk and wasted effort, most conversions occur in stages, which can be done in several ways. A phased approach uses the new information system and work system for a limited subset of the processing while continuing to use old methods for the rest of the processing. If something goes wrong, the part of the business using the new system can switch back to the old system. The simultaneous use of the old system and the new system is called running in parallel. Although this involves double record keeping for a while, it verifies that the new information system operates properly and helps the users understand how to use it effectively within the new work system

Conversion requires careful planning because people who don't want the new system and use the problems as an opportunity to complain can blow even minor problems out of proportion. For these reasons, it is often wise to do a pilot implementation with a small group of users who are enthusiastic about the system improvements. Ideally, their enthusiasm will motivate them to make the effort to learn about the changes and to forgive minor problems. After a pilot implementation demonstrates that the new information system works, it is usually much easier to motivate everyone else (including the skeptics) to start using it. Acceptance testing is testing of the information system by the users as it goes into operation. Acceptance testing is important because the information system may not fit, regardless of what was approved and signed off in the external specification. The business situation may have changed; the external specification may reflect misunderstandings; the development process may have introduced errors; or the implementation may have revealed unforeseen problems. For all these reasons, it makes sense to include an explicit step of deciding whether the information system is accepted for ongoing use. If it doesn't fit user needs, for whatever reason, installing it without changes may lead to major problems and may harm the organization instead of helping. Acceptance testing also solidifies user commitment because it gets people in the user organization to state publicly that the system works. The post-implementation audit is the last step in the implementation phase, even though it occurs after the new system has been in operation for a number of months. Its purpose is to determine whether the project has met its objectives for costs and benefits and to make recommendations for the future. This is also an opportunity to identify what the organization can learn from the way the project was carried out

Operations and Maintenance

The operation and maintenance phase starts after the users have accepted the new system. This phase can be divided into two activities: (1) ongoing operation and support, and (2) maintenance.

Unlike the other steps in the life cycle, these steps continue throughout the system's useful life. The end of a system's life cycle is its absorption into another system or its termination. Ongoing operation and support is the process of ensuring that the technical system components continue to operate correctly and that the users use it effectively. This process is similar to the process of making sure a car or building operates well. It works best when a person or group has direct responsibility for keeping the information system operating. This responsibility is often split, with the technical staff taking care of computer operations and a member of the user organization ensuring that users understand the system and use it effectively. Day-to-day computer operations typically include scheduled events such as generating summary reports from management and backups of the database. The operations manual specifies when these jobs should be done. For transaction processing systems essential to the operation of the business, a member of the technical staff also monitors computer-generated statistics related to response times, program run times, disk space utilization, and similar factors to ensure the programs are running efficiently

System Analysis and Computer Languages When the database becomes too full, or when response times start to increase, the technical configuration of the information system must be changed. This is done by allocating more disk space, unloading (backing up onto tape or discarding) data that are not current, or changing job schedules. Maintenance is the process of modifying the information system over time. As users gain experience with a system, they discover its shortcomings and usually suggest improvements. The shortcomings may involve problems unrelated to the information system or may involve ways that the information system might do more to support the work system, regardless of the original intentions. Some shortcomings are bugs. Important shortcomings must be corrected if users are to continue using an information system enthusiastically. Handling enhancement requests and bug fix requests is both a technical challenge and a delicate political issue for IS departments. The technical challenge is ensuring that changes don't affect other parts of the system in unanticipated ways. The traditional life cycle helps here because documentation and internal design methods enforce modularization and make it easier to understand the scope and impact of changes. The political issue for most IS departments are their inability to support even half of the enhancement requests they receive. For new or inadequately planned information systems, some departments have more enhancement requests than they can even analyze. In this environment, it requires both technical and political skill to keep users satisfied. Users are often frustrated by how long it takes to make changes

What might seem to be a simple change to a person who "programs" spreadsheet is often vastly more complex in a large information spawn changes in several levels of documentation. The steps in each of the four phases of the traditional system life cycle have now been introduced. Table 14.1 outlines the steps in each phase and makes two major points in addition to the details it presents. First it shows that users are highly involved in three of the four phases. In other words, building information systems is not just technical work done by the technical staff. It also shows that each step has specific deliverables that document progress to date and help keep the project under control. The traditional system life cycle is a tightly controlled approach designed to reduce the likelihood of mistakes or omissions? Despite its compelling logic, it has both advantages and disadvantages. Adherence to fixed deliverables and signoffs improves control but guarantees a lengthy process. Having specific deliverables due at specific times makes it schedule of deliverables sometimes takes on a life of its own and seems as important as the real project goals. When merely going through the motions of producing deliverables on schedule, participants may be tempted to turn in work that is incomplete and to approve documents they do not truly understand

Q6- What is integrated software application? Discuss Advantages and Business Utility integrated software application? (v v v v v imp)

Ans – INTEGRATED SOFTWARE APPLICATIONS

Literal meaning of "Integration" is combination or amalgamation. In terms of computer terminology, "Integration" is a broad term for any software that serves to join together or act as a go-between between two separate and usually already. Information Systems - II existing applications. Integrated

software applications for business gives you the ability to integrate the diverse information sources pertaining to your business into a single framework. This integrated information can then be shared by applications such as Customer relationship Management (CRM), Supply Chain Management (SCM) and Business process Re-engineering (BPR) systems.

ERP: Short for enterprise resource planning, a business management system that integrates all facets of the business, including planning, manufacturing, sales, and marketing. As the ERP methodology has become more popular, software applications have emerged to help business managers implement ERP in business activities such as inventory control, order tracking, customer service, finance and human resources.

CRM: Short for customer relationship management. CRM entails all aspects of interaction a company has with its customer, whether it be sales or service related. Computerization has changed the way companies are approaching their CRM strategies because it has also changed consumer-buying behavior. With each new advance in technology, especially the proliferation of self-service channels like the Web and WAP phones, more of the relationship is being managed electronically. Organizations are therefore looking for ways to personalize online experiences (a process also referred to as mass customization) through tools such as help-desk software, e-mail organizers and Web development applications.

SCM: Short for supply chain management, the control of the supply chain as a process from supplier to manufacturer to wholesaler to retailer to consumer. Supply chain management does not involve only the movement of a physical product (such as a microchip) through the chain but also any data that goes along with the product (such as order status information, payment schedules, and ownership titles) and the actual entities that handle the product from stage to stage of the supply chain. There are essentially three goals of SCM: to reduce inventory, to increase the speed of transactions with real-time data exchange, and to increase revenue by satisfying customer demands more efficiently

BPR: Short for Business Process Re-engineering. It is aimed to make radical changes in an organization from the ground up in an aim to improve performance and make more efficient use of resources. The concept of BPR generally includes the use of computers and information technology to organize data, project trends, etc. (Source: http://www. computeruser.com/resources/dictionary) Many big companies are giving high importance to software integration. Today nobody wants to access data stored in multiple systems. They want to build strong links between business systems and make information flow better. Let us take an example, suppose you want to place an order through the net. An integrated software solution will, on one hand, take that order, shift it and allocate them to the manufacturing plant and on the other hand place order for the raw materials on the basis of the stock, update the financial position of the company with respect to suppliers and the inventory and so on. Many people have given different names to the integration of ERP, SCM, BPR and CRM. These names include e-business, c-business, m-business and KM etc. There are many software that do these integration activities. To name a few there are software known as Baan, Fourth Shift, Frida, JD Edwards One World, Manage 2000, Masterpiece - MP/Net, Micro strategy, Oracle e-Business Suite, People Soft and SAP R/3. We will discuss few among them

ADVANTAGES AND BUSINESS UTILITY

There is a lot of interest among IT solution providers about packages that help in ERP, SCM, BPR and CRM. The plea given is that they help in real business growth. Companies actually want to integrate their diverse business processes to simplify operations for faster decision-making. Many companies have realized that if they have to survive and grow, they have to use tools that can provide quicker and useful information and cut costs to increase efficiency. Till now IT was used in large and multinational companies only. Small companies were not willing to invest more on IT. In India, on an average, small and medium companies were reluctant to invest more than 2-5% on IT. Circumstances have changed now. Businesses are not trying really hard to reap the benefits of IT for gaining competitive advantages. IT has given businesses a chance to generate information in real-time and thus grab opportunities that were non-existent or unseen earlier. With the development of

cutting-edge technology, we have seen evolution of many systems that has adapted market demands. IT is readily providing business solutions now. These solutions provides a platform to integrate all processes in an organization enabling it to plan, trace and see its 4-m resources (materials, machines, men and money) in the best possible ways to service customers and reduce costs. If you want that your Business should survive with low overheads and still run efficiently then you have no choice but to opt for IT solutions.

A typical business solution is an integration of ERP, BPR, SCM and SCM. While ERP can take care of functions like accounts production planning, payroll and marketing etc., BPR can be used simultaneously to cut-down on all non-value added business processes and paperwork. These systems are the enablers of change in the business for better. With the help of these systems your business can compete better. These systems if combined with the web help you to reach your customers most cost-effectively. There would be no cost incurred on travel and communication and no cost incurred on setting up offices and employees.

The key to establishing a good IT system lies in the proper planning. Businesses should first specify their needs, processes and key data. They should clearly specify the kind of information and its flow. Once these specifications are done, it is the integration of information that is required. Once integration is done, information is accessible to every department around the company

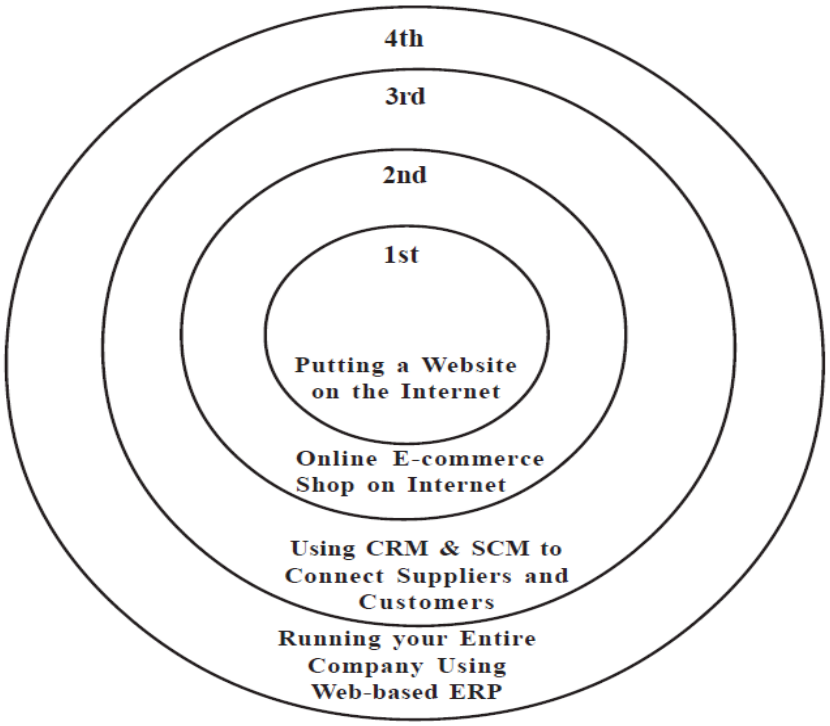


Figure 12.1: Generations of E-business

Information Systems - II Given above is a pictorial representation of the generations of e-business. By this you would be able to appreciate why we are talking about integrations and business solutions and what place it has in the present world. It can also be seen that many of the businesses in India have not yet touched the first generation even. It can be seen that 4th generations business solutions are using web to integrate all systems. ERP is used in a broader term here

SECOND PRIORITY MOST IMPORTANT QUESTIONS

Q7- Why CPU is called brain of computer? Describe 3 main parts of CPU? (v v v v v imp) (SHORT NOTE ALSO)

Ans – CENTRAL PROCESSING UNIT (CPU)

In order to work, a computer needs some sort of "brain". At the core of each computer, there is a device called central processing unit (CPU), which is the brain of the computer. CPU reads the program from the main memory, and executes each step of the program, which may involve calculations and decision-making. The CPU is responsible for controlling all devices of the computer. It initiates a memory operation, which may involve reading data from an input device and storing it into memory or read data from the memory and display it on an output device. The CPU mainly consists of three parts— Control Unit, Arithmetic Logic Unit (ALU), and Primary Storage (also referred to as Main Memory).

The ALU is the unit, which performs all mathematical calculations and logical operations. It performs addition, subtraction, multiplication, and division. It performs a logical operation by comparing two numbers. It can determine the smaller number, larger number or determine if the two numbers are equal. It can also determine whether a number is positive, negative or zero. A program is a sequence of instructions. An instruction may be an arithmetic operation, a logical operation, an assignment, or a jump. The control unit sequentially accesses program instructions, decodes them, and directs ALU, Main Memory, input devices, and output devices so that the program instructions can be carried out. Execution of one program instruction may require control unit to issue many directives. The ALU may also perform many operations to complete one program instruction. Each operation performed by ALU and control unit is referred to as machine instruction. Each program instruction may involve many machine instructions. A single machine instruction is completed in a machine cycle. The number of machine instructions completed in a second is called the speed of the CPU and it is measured in MIPS (Millions of instructions per second). A CPU also contains a set of registers, which are specialized, small, high-speed memory for storing temporary results of ALU and for storing control information.

Computer Speed

The word length of a CPU is the number of bits it can process in a single cycle. A 64-bit machine can process 64 bits in a single cycle. A 64-bit machine is faster than a 32-bit machine

The cycle is defined by the internal clock of the control unit. The Pentium based systems have a clock speed of 1GHz or more whereas 3 years ago the speed used to be 300 MHz. The bus carries data, control signals, and address in a system. If the data bus width is same as the word length, then one word can be moved at a time. If the bus width is half of word length, two cycles are required for moving one word. The instruction set also affects the speed. If the instruction set is simple, as in RISC, one or more instructions may get executed in each cycle. There will be some long instructions, which take more than one cycle. It is possible that a given application extensively uses long instructions (such as scientific computing) and the machine will appear to be slow. There is no direct relationship between clock frequency and the speed of a system. There are benchmark programs that are run to establish the speed of a computer system

Q8- Why is data mining bring put to use in more and more business?Discuss data mining techniques?? (v v v v v imp) (SHORT NOTE ALSO)

Ans – DATA MINING-

According to Berry and Linoff, Data Mining is the exploration and analysis, by automatic or semiautomatic means, of large quantities of data in order to discover meaningful patterns and rules. This definition, justifiably, raises the question: how does data mining differ from OLAP? OLAP is undoubtedly a semiautomatic means of analyzing data, but the main difference lies in quantities of

data that can be handled. There are other differences as well.

Why Now?

Why is data mining being put to use in more and more businesses? Here are some basic reasons:

- In today's world, an organization generates more information in a week than most people can read in a lifetime. It is humanly impossible to study, decipher, and interpret all that data to find useful patterns.
- A data warehouse pools all the data after proper transformation and cleansing into well-organized data structures. Nevertheless, the sheer volume of data makes it impossible for anyone to use analysis and query tools to discern useful patterns.
- In recent times, many data mining tools suitable for a wide range of applications have appeared in the market. The tools and products are now mature enough for business use.
- Data mining needs substantial computing power. Parallel hardware, databases, and other powerful components are available and are becoming very affordable.
- Organizations are placing enormous emphasis on building sound customer relationships, and for good reasons. Companies want to know how they can sell more to existing customers. Organizations are interested in determining which of their customers will prove to be of long-term value to them. Companies need to discover any existing natural classifications among their customers so that the each such class may be properly targeted with products and services. Data mining enables companies to find answers and discover patterns in their customer data.
- Finally, competitive considerations weigh heavily on organizations to get into data mining. Perhaps competitors are already using data mining.

Data Mining Technique

Data mining covers a broad range of techniques. Each technique has been heavily researched in recent years, and several mature and efficient algorithms have evolved for each of them. The main techniques are: Cluster detection, Decision trees, Memory based reasoning, Link analysis, Rule induction, Association rule discovery, Outlier detection and analysis, Neural networks, Genetic algorithms, and Sequential pattern discovery. Discussion on the algorithms associated with the various techniques has been kept outside the scope of this text for two main reasons: firstly, because they are too mathematical / technical in nature, and secondly, because there are numerous, well written text books, to serve the needs of those who are specially interested in the subject. Table 17.7 below summarized the important features of some of these techniques. The model structure refers to how the technique is perceived, not how it is actually implemented. For example, a decision tree model may actually be implemented through SQL statements. In the framework, the basic process is the process performed by the particular data mining technique. For example, the decision trees perform the process of splitting at decision points. How a technique validate the model is important. In the case of neural networks, the technique does not contain a validation method to determine termination. The model calls for processing the input records through the different layers of nodes and terminate the discovery at the output node

Table 17.7: Summary of Data Mining Techniques

Data Mining Technique	Underlying Structure	Basic Process	Validation Method
Cluster Detection	Distance calculation in n-vector space	Grouping of values in the same neighborhood	Cross Validation to Verify Accuracy
Decision Trees	n-ary Tree	Splits at decision points based on entropy	Cross Validation
Memory-based Reasoning	Predictive Structure Based on Distance and Combination Functions	Association of unknown instances with known instances	Cross Validation
Link Analysis	Graphs	Discover links among variables by their values	Not Applicable
Neural Networks	Forward Propagation Network	Weighted inputs of predictors at each node	Not Applicable
Genetic Algorithms	Fitness Functions	Survival of the fittest on mutation of derived values	Mostly Cross Validation

Data Mining Applications

Data mining technology encompasses a rich collection of proven techniques that cover a wide range of applications in both the commercial and noncommercial realms. In some cases, multiple techniques are used, back to back, to greater advantage. For instance, a cluster detection technique to identify clusters of customers may be followed by a predictive algorithm applied to some of the identified clusters to discover the expected behaviour of the customers in those clusters. Noncommercial use of data mining is strong and pervasive in the research area. In oil exploration and research, data mining techniques discover locations suitable for drilling based on potential mineral and oil deposits. Pattern discovery and matching techniques have military applications in assisting to identify targets. Medical research is a field ripe for data mining. The technology helps researchers with discoveries of correlations between diseases and patient characteristics. Crime investigation agencies use the technology to connect criminal profiles to crimes. In astronomy and cosmology, data mining helps predict cosmetic events. The scientific community makes use of data mining to a moderate extent, but the technology has widespread applications in the commercial arena. Most of the tools target the commercial sector. Consider the following list of a few major applications of data mining in the business area.

Customer Segmentation: This is one of the most widespread applications. Businesses use data mining to understand their customers. Cluster detection algorithms discover clusters of customers sharing the same characteristics.

Market Basket Analysis: This very useful application for the retail industry. Association rule algorithms uncover affinities between products that are bought together. Other businesses such as upscale auction houses use these algorithms to find customers to whom they can sell higher-value items.

Risk Management: Insurance companies and mortgage businesses use data mining to uncover risks associated with potential customers.

Fraud Detection: Credit card companies use data mining to discover abnormal spending patterns of customers. Such patterns can expose fraudulent use of the cards.

Delinquency Tracking: Loan companies use the technology to track customers who are likely to default on repayments.

Demand Prediction: Retail and other businesses use data mining to match demand and supply trends to forecast for specific products.

Table 17.8: Application of Data Mining Techniques

Application Area	Examples of Mining Functions	Mining Processes	Mining Techniques
Fraud Detection	Credit Card Frauds Internal Audits Warehouse Pilferage	Determination of Variation from Norms	Data Visualization Memory-based Reasoning Outlier Detection and Analysis
Risk Management	Credit Card Upgrades Mortgage Loans Customer Retention Credit Rating	Detection and Analysis of Association Affinity Grouping	Decision Trees Memory Based Reasoning Neural Networks
Market Analysis	Market basket analysis Target marketing Cross selling Customer Relationship Management	Predictive Modeling Database Segmentation	Cluster Detection Decision Trees Association Rules Genetic Algorithms

The Data Mining Project

Step 1: Define Business Objectives— This step is similar to any information system project. First of all, determine whether a data mining solution is really needed. State the objectives. Are we looking to improve our direct marketing campaigns? Do we want to detect fraud in credit card usage? Are we looking for associations between products that sell together? In this step, define expectations. Express how the final results will be presented and used.

Step 2: Prepare Data— This step consists of data selection, preprocessing of data, and data transformation. Select the data to be extracted from the data warehouse. Use the business objectives to determine what data has to be selected. Include appropriate metadata about the selected data. Select the appropriate data mining technique(s) and algorithm(s). The mining algorithm has a bearing on data selection.

Unless the data is extracted from the data warehouse, when it is assumed that the data is already cleansed, pre-processing may be required to cleanse the data. Preprocessing could also involve enriching the selected data with external data. In the preprocessing sub-step, remove noisy data, that is, data blatantly out of range. Also ensure that there are no missing values.

Step 3: Perform Data Mining— Obviously, this is the crucial step. The knowledge discovery engine applies the selected algorithm to the prepared data. The output from this step is a set of relationships or patterns. However, this step and the next step of evaluation may be performed in an iterative manner. After an initial evaluation, there may be need to adjust the data and redo this step. The duration and intensity of this step depend on the type of data mining application. If the database is being segmented not too many iterations are needed. If a predictive model is being created, the models are repeatedly set up and tested with sample data before testing with the real database.

Step 4: Evaluate Results— The aim is to discover interesting patterns or relationships that help in the understanding of customers, products, profits, and markets. In the selected data, there are potentially many patterns or relationships. In this step, all the resulting patterns are examined, and a filtering mechanism is applied so as to select only the promising patterns for presentation and use.

Step 5: Present Discoveries— Presentation of patterns / associations discovered may be in the form of visual navigation, charts, graphs, or free-form texts. Presentation also includes storing of interesting discoveries in the knowledge base for repeated use.

Step 6: Ensure Usage of Discoveries— The goal of any data mining operation is to understand the business, discern new patterns and possibilities, and also turn this understanding into actions. This step is for using the results to create actionable items in the business. The results of the discovery are disseminated so that action can be taken to improve the business.

Selecting Data Mining Software Tools

Before we get into a detailed list of criteria for selecting data mining tools, let us make a few general but important observations about tool selection.

- The tool must be able to integrate well with the data warehouse environment by accepting data from the warehouse and be compatible with the overall metadata framework.
- The patterns and relationships discovered must be as accurate as possible. Discovering erratic patterns is more dangerous than not discovering any patterns at all.

- In most cases, an explanation for the working of the model and how the results were produced is required. The tool must be able to explain the rules and how patterns were discovered.

Let us complete this section with a list of criteria for evaluating data mining tools. The list is by no means exhaustive, but it covers the essential points.

Data Access: The data mining tool must be able to access data sources including the data warehouse and quickly bring over the required datasets to its environment. On many occasions data from other sources may be needed to augment the data extracted from the data warehouse. The tool must be capable of reading other data sources and input formats.

Data Selection: While selecting and extracting data for mining, the tool must be able to perform its operations according to a variety of criteria. Selection abilities must include filtering out of unwanted data and deriving new data items from existing ones.

Sensitivity to Data Quality: Because of its importance, data quality is worth mentioning again. The tool must be able to recognize missing or incomplete data and compensate for the problem. The tool must also be able to produce error reports.

Data Visualization: Data mining techniques process substantial data volumes and produce a wide range of results. Inability to display results graphically and diagrammatically diminishes the value of the tool severely.

Extensibility: The tool architecture must be able to integrate with the data warehouse administration and other functions such as data extraction and metadata management.

Performance: The tool must provide consistent performance irrespective of the amount of data to be mined, the specific algorithm applied, the number of variables specified, and the level of accuracy demanded.

Scalability: Data mining needs to work with large volumes of data to discover meaningful and useful patterns and relationships. Therefore, ensure that the tool scales up to handle huge data volumes.

Openness: This is a desirable feature. Openness refers to being able to integrate with the environment and other types of tools. The ability of the tool to connect to external applications where users could gain access to data mining algorithms from the applications, is desirable. The tool must be able to share the output with desktop tools such as graphical displays, spreadsheets, and database utilities. The feature of openness must also include availability of the tool on leading server platforms.

Suite of Algorithms: A tool that provides several different algorithms rather than one that supports only a few data mining algorithms, is more advantageous.

Multi-technique Support: A data mining tool supporting more than one technique is worth consideration. The organization may not presently need a composite tool with many techniques, but a multi-technique tool opens up more possibilities. Moreover, many data mining analysts desire to cross-validate discovered patterns using several techniques.

Benefits of Data Mining

Without data mining, useful knowledge lying buried in the mountains of data in many organizations would never be discovered and the benefits from using the discovered patterns and relationships would not be realized. What are the types of such benefits? We have already touched upon the applications of data mining and have indicated the implied benefits.

Just to appreciate the enormous utility of data mining, the following list enumerates some real-world situations:

- In a large company manufacturing consumer goods, the shipping department regularly short-ships orders and hides the variations between the purchase orders and the freight bills. Data mining detects the criminal behaviour by uncovering patterns of orders and premature inventory reductions.
- A mail order company improves direct mail promotions to prospects through more targeted campaigns.
- A supermarket chain improves earnings by rearranging the shelves based on discovery of affinities of products that sell together.
- An airlines company increases sales to business travelers by discovering traveling patterns of frequent flyers.

- A department store hikes the sales in specialty departments by anticipating sudden surges in demand.
- A national health insurance provider saves large amounts of money by detecting fraudulent claims.
- A major banking corporation with investment and financial services increases the leverage of direct marketing campaigns. Predictive modeling algorithms uncover clusters of customers with high lifetime values.
- A manufacturer of diesel engines increases sales by forecasting sales of engines based on patterns discovered from historical data of truck registrations.
- A major bank prevents loss by detecting early warning signs for attrition in its checking account business.
- A catalog sales company doubles its holiday sales from the previous year by predicting which customers would use the holiday catalog.

Q9- Explain expert sysytem? (v v v v v imp)

Ans – EXPERT SYSTEMS

Amongst the most noteworthy developments in the field of Artificial Intelligence (AI) is the advent of "expert" or "knowledge based" systems. Joint efforts by human experts yielded systems that can diagnose diseases, fly planes, drive vehicles and configure computer systems at performance levels that can exceed the best human expertise. Question thus arises that what are expert systems? To put it most simply: Expert systems are computer programs that use knowledge to solve problems competently and successfully. They are similar to human experts in the sense that they also use logic and heuristics to solve problems, they also make errors and they also learn from their errors. This expertise is easier to store, retrieve, transfer and is cost-effective and permanent. Johnson (1983) described the term 'expert" in the most accurate manner as, " An expert is a person who, because of training and experience, is able to do things the rest of s cannot; experts are not only proficient but also smooth and efficient in actions they take. Experts knows a great many things and have tricks and caveats for applying what they know to problems and tasks; they are also good at plowing through irrelevant information in order to get at basic issues, and they are good at recognizing the problems they face as instances of types with which they are familiar. Underlying the behavior of experts is the body of operative knowledge, we have termed expertise…" Thus we can now define expert systems. Patterson (1990) described expert systems as, " An expert system is a set of programs that manipulate encoded knowledge to solve problems in a specialized domain that normally requires human expertise. An expert system's knowledge is obtained from expert sources and coded in a form suitable for the system to use in its inference or reasoning process." You might recall the earlier description; an expert system consists of a knowledge base, database and an inference engine for interpreting the database using the knowledge embedded in the knowledge base. There is sound reasoning process that has to build in order to create an expert system.

Brief History of Expert Systems

Expert systems emerged as a consequence of the developments in the artificial intelligence field in early 70's at a few leading US universities like Stanford. They started as problem solvers using specialized domain knowledge. We will discuss a few early successful systems. This is summarized in the table given below:

Table 19.3: Brief History of Expert Systems

S. No.	Expert System	Year	Developer	Functions
1	DENDRAL / Meta-DENDRAL	Late 60's	Stanford University	Determines the structure of chemical compounds using constituent elements and mass spectrometry data. Later adapted inductive learning form
2	MYCIN/ THEIRESIUS/ GUIDON/MYSIN	Mid 70's	Stanford University	Diagnoses infectious blood diseases and determine therapies. Started with 200 rules to build over 600 rules by early 80's
3	PROSPECTOR	1974-1983	Stanford Research Institute	Assists geologists in the discovery of mineral deposits. First computer system to assist geologists.
4	XCON	Late 70's	Digital Equipment Corporation & Carnegie-Mellon University	Select and configure components of complex computer systems. Expert system work in computer systems is typified by XCON.
5	ACE	Early 80's Early 70's	Bell Laboratories	Equipment fault diagnosis and integrated circuit design. AT&T uses it for identify trouble spots in telephone networks
6	HASP/ SIAP		Stanford University & Systems Control Technology	Identifies ship types by interpreting data from hydrophone arrays that monitors regions of the ocean

These were some of the path setting work in the expert systems. These works provided the base for other systems to build on them. Today one can see a plethora of applications of expert systems in virtually all areas like agriculture, chemistry, computer systems, electronics, engineering, geology, information management, law, manufacturing, mathematics, medicine, meteorology, military science, physics, process control nd space technology etc

Working Principles of Expert Systems

Expert System is a result of the interaction between the system builder (knowledge engineer) and many domain experts Expert systems are computer systems that are based on knowledge rather than the data. They accumulate this knowledge at the time of system building. Knowledge is programmed and kept in such a manner so that it can be browsed and appended from time to time. Expert systems possess a very high level of expertise in the area for which they are made for. The best thing about expert systems is that they grow over time and but for the initial expenditure incurred in building them, they work in a cost effective manner. Expert systems have predictive modeling power i.e. they are capable of describing the effects of new situation on the data and the solution. Expert system uses symbolic representations for knowledge (rules, networks or frames). This compilation often becomes a quick reference for best strategies, methods and consensus decisions. This becomes a permanent knowledge base. Thus, one can say that expert systems have a permanent memory. Expert systems gives access to the user to understand it's reasoning and can be used to provide training. This is possible because of its knowledge base; it can provide trainees with experiences and strategies from which to learn

Building Expert System

The process of building an expert system is also called knowledge engineering. As we have discussed earlier that there is an interaction between the domain expert and the expert system builder which generates the knowledge into the expert system. The latter is also called "knowledge engineer". There is further to it. The remaining players in the building of the expert system are the expert system building tools, the user and the expert system itself. Let us have a quick tour on their meaning. Expert system is the collection of programs that solves problems in a particular area; domain expert is a person who is knowledgeable about that particular problem area and has

solutions to those problems; knowledge engineer is a computer science expert who translates the domain expert's knowledge into the one, which is understandable by the computer; expert system building tool is the programming language that is used by the knowledge engineer to build the expert system. And finally the user is the one, which will use the expert system.

Knowledge Representation in Expert Systems

The knowledge can be represented in expert systems in three ways. These ways are rules, frames and semantic nets. A rule-based system consists of a rule-base (permanent data); an inference engine (process); and a workspace or working memory (temporary data). Knowledge is stored as rules, which are of the form IF some condition THEN some action

Q10- Describe the competitiveness of information and communication technology? (v v v v v imp)

Ans – COMPETITIVENESS OF ICT

Information and communication technologies have been regarded as the tools for increasing efficiency levels in all spheres of operation in the postindustrial age. ICTs are also setting the foundation for new industrial order. This belief is equally shared by developed nations and most of the developing nations. For evaluating the impact of ICTs one has to go through the era known for high industrial growth i.e. latter half of the current century in which they have come into widespread use. The dramatic and continuing liberalization of world trade is indeed a central feature in global economy and the spread of ICT and goods derived using ICTs has been rapid with an accompanying emphasis on the issue of "competitiveness". The word competitiveness is widely used to reflect the growing needs of business enterprises to evaluate their relative position with regard to their domestic competitors in international market and foreign competitors in domestic markets.

An enterprise is said be competitive if it can cut its share in international and domestic markets from its rivals. Similarly, the term competitiveness can also be used in the context of national economy to judge whether the nation is moving ahead in building market shares in business sectors that promote economic growth, employment, and other measures of social developments. The use or production of ICT is not itself, a principal determinant of social welfare measures like growth or employment, but it does play an important role in the ability of nations to participate in economic activities where growth and employment prospects are more favorable than would be available otherwise. The use of ICTs strengthens the efforts of enterprises to achieve higher levels of competitiveness to contribute towards expansion of economic activities promoting growth, employment, and other social developments

Historically, every major change in global economic activities has witnessed a complete transformation of industrial growth patterns involving different processes, practices and materials yielding explicit gains. In industrial nations, most of these gains had been realized by the first half of the 20th century owing to rapid industrialization. During the second half of the 20th century, the industrial growth of developing nations may have been constrained by the existence of the productive capacity of already industrialized nations. By the first half of the past century, most of the possible gains from this transformation had been realized in industrialized nations while developing nations, for many reasons, have experienced difficulties in fully entering this process. The ICTs provide an opportunity for addressing manufacturing productivity advances in developing nations, which would allow a substantial expansion of industrial output. Such output expansion, if large enough, could substantially influence the creation of employment and the creation of wealth.

Because ICTs are often laborsaving, a large increase in output is necessary to raise the derived demand for labor, through productivity improvement. Otherwise the impact of ICTs may be to reduce labor inputs, an undesirable, and alarming outcome for developing nations if there are not sufficient employment alternatives. The promise of ICTs seems to be partially supported by observed technical progress made by the developing nations. Much of this progress has been the direct result of the application of materials science to the production of modern ICTs. The earliest, and still the most important of these applications, is the use of semiconductors for the production of computers,

telecommunications equipment, and related electronic devices. Technological improvement in semiconductor technology, as measured by the cost and speed of performing narrowly defined functions, has advanced at rates that were unprecedented for other manufacturing technologies such as power generation using fossil fuels or improvements in machine operating speeds through improvement in mechanical technology. The rapid advances in technical characteristics, which have also led to dramatic falls in price per unit of performance, have generated optimistic expectations about the contributions of information technology to manufacturing productivity growth

Productivity gains from the use of information technologies involve improved control, smoother integration of production processes, and better control in the acquisition of inputs and the disposition of outputs. Communication technologies play important roles, particularly in co-ordination of functions, such as conveying timely information about inventories and scheduling throughout a distribution system. The productivity gains from ICTs are greatly realized through cost-reduction, in material inputs, labor, and capital. The relative shares of these reductions may differ across industries and over time, but labor saving is a principle source of cost-reduction. In addition, ICTs usually make it possible to produce more or higher quality with the same levels of inputs, resulting in productivity advances that are independent of changes in input use. Growth in the use of ICTs in manufacturing appear to involve greater flexibility and changeover speeds as well as shortened and accelerated flows of materials for processing, work in process, and finished good inventories. These changes suggest a transformation in methods of organizing production systems from traditional models of mass production. The trade-off between the creation of new organizational models and the augmenting of old is essential for evaluating the issue of competitiveness

The use of ICTs, have also made it possible to expand other economic activities, conventionally referred to as the "service sector". The contributions of ICTs in the service area are apparent with the fact that ICTs are a major component in the predominant form of physical capital that service industries employ. It can be said without reservations that ICTs are the tools for productivity improvement in the postindustrial or information society age for achieving higher productivity gains that match or exceed those that have been historically experienced in manufacturing technologies. With such productivity gains it would be possible to indefinitely sustain the growth of economic output and productivity despite the trend towards a growing share of this output being produced in service sectors. The possibility of indefinite growth in the production and consumption of services is encouraging sign for both developed and developing economies. For developed nations, an increasing share of output in services is consistent with increasing investments in human capital or the dispersal of industrial activities domestically and internationally to reduce localized environmental problems. For developed nations, the growth of services provide domestic growth opportunities that can absorb labor displaced by productivity improvements in agriculture and industry and that are less challenged by imports from developed or other developing nations. The corresponding problem for developing countries is to find ways to upgrade the value and quality of services so that service sector employees experience increasing wages over time. Doing this, of course, requires improvements in the productivity of the service sector. Thus, both developed and developing nations face a common challenge in finding ways to improve service sector productivity. Again, however, it is the issue of organizational change that provides a fundamental barrier to translating the rapid technological advances of ICTs into productivity gains. Developing and implementing the organizational changes would permit ICT use to have the same productivity impact in services as previous organizational changes had in manufacturing sector. For example, in financial services, where the ICTs do support economies of scale in transactions processing they also permit the creation of many new services.

There are several reasons to believe that developing nations could benefit from productivity improvements in services. First, in developing nations, governments often absorb relatively large shares of national output and most government activities are involved in the delivery of services. Hence, improvements in productivity in government services could free resources for private

investment. Second, services are often close complements to manufacturing. For example, the effectiveness of the retail and distribution sector of an economy influences the growth of manufacturing by providing more efficient market outlets for manufactured output. Third, developing nations are increasingly faced with the problems of harmonizing their production systems with the use of ICTs in developed nations so that they can serve as suppliers and sub-contractors in an increasingly global division of labor. This process of harmonization requires adoption of ICTs not only at the "service" level of the firm, such as the front office and the communication links to developed nation suppliers, but also within the production process to control quality and scheduling in ways that are consistent with customer demands. Many of these harmonization problems, nonetheless, are reflected in demands for services that, without the extensive use of ICTs, serve as barriers rather than complements to improvement in international trade and that absorb resources that could otherwise be used directly for production. Fourth, and finally, productivity improvements in both services and manufacturing are worthwhile wherever they may be achieved. Having more output using the same amount of inputs is of benefit in whichever sector it is achieved. To the extent that ICT use achieves greater productivity through releasing labor, the problem is to develop other opportunities for their employment (or remove barriers to this adjustment) rather than to lock them into employment patterns where they have low productivity

ICT-intensive retailing activities, the systems that manufacturers employ must increasingly be compatible with the emerging new industrial models based on more intense ICT use. Examples of these developments include the growing emphasis on international quality standards with high levels of information content, the specification of product design using computer aided design and manufacturing, and the co-ordination of product delivery such as "Just in time" and "sales driven" production using high levels of ICT. Developing countries thus have an "offensive" strategic interest in adopting ICTs to maintain their competitiveness in export markets. Moreover, the liberal international trade environment that has characterized the "new world order" offers developing nations access to new markets, although developed countries maintain substantial import barriers in some areas, provided that they open their own markets to import competition. Imports from nations that employ ICTs to augment the flexibility and tighten control of the production process can offer formidable competition even with large differences in wage rates. Competition for domestic markets from exports in developing nations makes it necessary for developing country enterprises to adopt similar tools for achieving flexibility and variety that their competitors in developed and other developing nations are coming to employ. Effective use of ICTs requires knowledge from a range of disciplines and the solution of difficult problems of synthesizing technological knowledge and managerial "know how". The absence of well-established models for effectively achieving this synthesis suggests that the creation of substantial variety of knowledge creating and using capabilities will improve the likelihood of adaptive success in realizing the potentials from ICT use. Many of the problems of implementing the new models of organization require skilled and flexible human resources that can solve a variety of problems.

Q11- Explain the open source software? (v v v v v imp)

Ans – OPEN SOURCE SOFTWARE

Open Source Software (OSS) is primarily defined as software, which is freely re-distributable and includes the source code. The licenses under which OSS is released vary greatly. The complete Open Source Definition can be found at http:// www.opensource.org/osd.html. OSS is vastly different from the mainstream software industry where source code is highly guarded and programs are only distributed in their binary form, which is non-modifiable format.

The most important aspect of the open source movement is the participation of users. When a user wants a feature or a bug fix for a commercial program, the user is at the mercy of the software vendor. However, with open source, the user can modify the program according to his needs or fix a

bug. Many users will help develop p the program for free, simply to improve the product and for the benefit of the community. These are a few of the most common and popular licenses for OSS

- GNU Public License (GPL)
- Limited GNU Public License (LGPL)
- BSD-Style License
- The Artistic License
- The Netscape Public License (NPL) and the Mozilla Public License (MPL)
- Apple Public Source License (APSL)

A few advantages of OSS are:

1) **Cost Effective:** Open source software often comes free. The individual or organization users can save the software cost.
2) **Customizable:** Since Open source software comes with the source; one can customize existing software to suit one's needs. Closed source software *may* be customizable, but you need to negotiate and/or pay for customization. Open source licenses typically *guarantee* you the right to be able to customize the software.
3) **More Secure:** Since the source code is open, more people scrutinize the source code, and hence more flaws are found and corrected. The end result is that the code produced is more secure compared to similar closed-source code.

The following terms are synonymous with Open Source Software: Freeware, Free/ Libre/Open Source Software (FLOSS).

Q12- What is Simon's framework for decision-making? How does it help in MIS design? Discuss three major stage? (v v v v v imp)

Ans – Simon's framework

Let us now look at Simon's framework that has broken down the process of decision making into three stages:

1. *Intelligence*: This is the stage in which the decision maker recognizes that there is a problem or opportunity that requires him to make a decision.
2. *Design*: The decision maker determines the alternatives that are available to him to resolve the problem or exploit the opportunity.
3. *Choice*: In this stage, an alternative generated in stage-2 is singled out to be pursued. The selection process may involve feasibility analysis or cost-benefit analysis.

With this framework, we can distinguish between three major classes of decisions.

a) Programmed Decisions are there in which all stages are handled by following a preset well-defined procedure. The decisions are repetitive and routine which arise often and are capable of being modeled mathematically in their entirety. The classic example would be inventory-ordering decisions.

b) Non-programmed decisions are difficult to structure in logical-mathematical terms. There decisions cannot be handled in well-defined and pre-specified procedures. There opportunities are not repetitive in nature and they require fresh intelligence, design and choice phases to be executed. An example would be the decision to set up a new factory or launch a new line of product.

c) Semi-programmed decisions are those in which at least one and no more than two of the above stages can be handled by well-defined preset procedures. An example where the intelligence phase is well structured would be the diverse kinds of variance analysis. A comparison with a budget or standard is undertaken in a well-defined way to signal the need for a decision. Subsequent stages of design and choice, however, are not handled by a set procedure.

Recall that an MIS support problem-specific decision-making. Depending on the framework used by the organization for decision-making and goal set for MIS, the designer should determine the information needs.

An MIS should not automate the existing procedures. MIS should act as a catalyst of change in the processes of an organization. For instance, a private bank sanctions loans by using a sequential process. An applicant applies for a loan, the details provided by him are verified, and his application details are entered into the bank application format along with his credit limit. The computer application is then passed on to the loan sanctioning authority. The process takes two weeks time even though the staff spends about thirty minutes on the application. A workflow system should not automate the existing process. It should aim to reduce the application processing time to less than a week. The present workflow systems let everyone look at the application simultaneously and each concerned person adds his feedback. The sequential process has been changed to a parallel process. The total time has come down to less than a week.

According to Zani, the important determinants of MIS design are:

1) Opportunities and risks
2) Company strategy
3) Company structure
4) Management and decision-making process
5) Available technology
6) Available information sources.

An MIS should be designed, viewing the organization. A company's structure subdivides essential tasks to be performed, assigns them to individuals, and spells out the interrelationships of their tasks. The organizational structure and the tasks determine the information needs of the company. The MIS designer must plan to deliver reports in line with the organization structure. This means that the main decision makers and the power centers must be recognized in the MIS. If the decision-making responsibilities are clearly defined and allocated in the organization, MIS must capture them. If the organization culture provides sufficient incentives for efficiency and results, the MIS support this culture by providing such information, which will aid the promotion of efficiency. The organization system is an open system and MIS should be so designed that it highlights the changes to the concerned level in the organization so that the action can be taken to correct the situation.

The designer of the MIS should take care of the data problems. The input data to the MIS may contain bias and error. The inputs to the MIS must be controlled to ensure impartiality, reliability and consistency. If the organization culture provides sufficient incentives for efficiency and results, the MIS should provide information that will aid the promotion of efficiency. If the organization is an open system then MIS should be designed to highlight critical changes in the system or in its environment. In designing an MIS there are two types of situations one may come across. If the organization has no experience of computing applications, which will create the maximum impact on the organization, it can be identified by using Zani's framework. Key success variables are however seldom obtained through a questionnaire survey of managers. Data on environment, past company performance must be analyzed and discussed to identify key success variable. It is sometimes useful to pen down a quantitative measure of such variable. For example the performance of a textile unit can be summed up through two indicators: contribution per loom shift and fixed cost per loom shift. Similarly the performance of a shipping company may be measured as gross operating profit per day per voyage. Precise definitions of performance indicators enable the analyst to understand and quantify the likely impact of improvement in different task of planning and monitoring. An analysis of the company's key success variables can be done only after a thorough understanding of the company's operations. Consultants and vendors who do not spend adequate time in understanding the operations are unlikely to throw up application areas, which will create the maximum impact. They are likely to suggest "off-the-shelf" applications. One should use standard software, which is available for such applications. For a company getting into computerization for the first time, a list of applications would have to be generated, keeping in view a 4-5 year perspective on the basis of which a suitable configuration would be decided. However the development and implementation of the applications would have to be done in a phased manner. The first few applications must be those, which can create an impact on the performance of the organization, are quick to implement with the least amount of changes in the existing procedures and systems. Initial success can make the later implementation of complex and more involved systems easier. For organizations, which have been into data processing and would like to graduate to MIS, the choices are somewhat limited. Existing computer technology, manpower, and past experience with computer applications etc., all such factors will condition the future growth of MIS

By and large an effort is made to create useful databases, which capture data during the execution of routine data processing systems. Such data are then analyzed to produce periodic planning report for monitoring. Examples of such systems are the sales analysis based on invoice processing; inventory control based on stock accounting; costing and profitability analysis on the basis of financial accounting system. Marginal additions to data fields, new coding structure, and revised procedures are introduced to make the data base and reporting more useful

Factors Facilitating Implementation of MIS

A few factors, which will increase the chances of a successful implementation of MIS, are:

1) Involvement of top management in the computerization effort, in defining the purpose and goals of computers within the organization.
2) Selection of an EDP Manager who has the political skills to involve managers in choosing application areas, identifying information needs and designing reports.
3) A computer staff, which has interdisciplinary skills in computers, management, and operations research.
4) A balanced expenditure on hardware and software.

Q13- What is Outsourcing Information System? Discuss Advantages and Disadvantages of Outsourcing? (v v v v v imp)

Ans – OUTSOURCING INFORMATION SYSTEMS

If a firm does not want to use its own internal resources to build and operate information systems, it can hire an external organization that specializes in providing these services to do the work. The process of turning over an organization's computer central operations, telecommunications networks, or applications development to external vendors of these services is called outsourcing. Outsourcing information system is not a new phenomenon. Outsourcing options have existed since the dawn of data processing. As early as 1963, Petrot's Electronic Data Systems (EDS) handled data processing services for Frito-Lay and Blue Cross. Activities such as software programming, operation of large computers, time-sharing and purchase of packaged software have to some extent been outsourced since the 1960s

Because information systems play such a large role in contemporary organizations, information technology now accounts for about half of most large firms' capital expenditure. In firms where the cost of information systems function has risen rapidly, managers are seeking ways to control those costs and are treating information technology as a capital investment instead of an operating cost of the firm. One option for controlling these costs is to outsource

Advantages and Disadvantages of Outsourcing

Outsourcing is becoming popular because some organization perceive it as being more cost effective than it would be to maintain their own computer center and information systems staff. The provider of outsourcing services can benefit from economies of scale (the same knowledge, skills, and capacity can be shared with many different customers) and is likely to charge competitive prices for information systems services. Outsourcing allows a company with fluctuating needs for computer processing to pay for only what it uses rather than to build its own computer center to stand underutilized when there is no peak load. Some firms outsource because their internal information systems staff cannot keep pace with technological change. But not all organizations benefit from outsourcing, and the disadvantages of outsourcing can create serious problems for organizations if they are not well understood and managed.

Advantages of Outsourcing:

The most popular explanations for outsourcing are the following:

Economy: Outsourcing vendors are specialists in the information systems services and technologies they provide. Through specialization and economies of scale, they can deliver the same service and value for less money than the cost of an internal organization.

Service Quality: Because outsourcing vendors will lose their clients if the service is unsatisfactory, companies often have more leverage over external vendors than over their own employees. The firm that out-sources may be able to obtain a higher level of service from vendors for the same or lower costs.

Predicatability: An outsourcing contract with a fixed price for a specified level of service reduces uncertainly of costs.

Flexibility: Business growth can be accommodated without making major changes in the organization's information systems infrastructure. As information technology permeates the entire value chain of a business, outsourcing may provide superior control of the business because its costs and capabilities can be adjusted to meet changing needs.

Making Fixed Costs Variable: Some outsourcing agreements, such as running payroll, are based on the price per unit of work done (such as the cost to process each cheque). Many out-sources will take into account variations in transaction processing volumes likely to occur during the year or over the course of the outsourcing agreement. Clients only need to pay for the amount of services they consume, as opposed to paying a fixed cost to maintain internal systems that are not fully utilized.

Freeing up Human Resources for other Projects and Financial Capital: Scarce and costly talent within an organization can refocus on activities with higher value and payback than they would find in running a technology factory. Some agreements with outsource include the sale for cash of the outsourced firm's technology capital assets to the vendor.

Disadvantages of Outsourcing

Not all organizations obtain these benefits from outsourcing. There are dangers in placing the information systems functions outside the organization. Outsourcing can create serious problems such as loss of control, vulnerability of strategic information, and dependence on the fortunes of an external firm.

Loss of Control: When a firm farms out the responsibility for developing and operating its information systems to another organization, it can lose control over its information systems function. Outsourcing places the vendor in an advantageous position where the client has to accept whatever the vendor does and whatever fees the vendor charges. If a vendor becomes the firm's only alternative for running and developing its information systems, the client must accept whatever technologies the vendor provides. This dependency could eventually result in higher costs or loss of control over technological direction.

Vulnerability of Strategic Information: Trade secrets or proprietary information may leak out to competitors because a firm's information systems are being run or developed by outsiders. This could be especially harmful if a firm allows an outsourcer to develop or to operate applications that give it some type of competitive advantage.

Dependency: The firm becomes dependent on the viability of the vendor. A vendor with financial problems or deteriorating services may create severe problems for its clients.

When to Use Outsourcing?

Since outsourcing has both benefits and liabilities and is not meant for all organizations or all situations, managers should assess the role of information systems in their organization before making an outsourcing decision. There are a number of circumstances under which outsourcing makes a great deal of sense:

When there is limited opportunity for the firm to distinguish itself competitively through a particular information systems application or series of applications. For instance, both the development and operation of payroll systems are frequently outsourced to free the information systems staff to concentrate on activities with a higher potential payoff, such as customer service or manufacturing systems. Applications such as payroll or cafeteria accounting, for which the firm obtains little competitive advantage from excellence, are strong candidates for outsourcing. If carefully developed, applications such as airline reservations or plant scheduling could provide a firm with a distinct advantage over competitors. The firm could lose profits, customers, or market share if such systems have problems. Applications where the rewards for excellence are high and where the penalties for failure are high should probably be developed and operated internally.

Companies may also continue to develop applications internally while outsourcing their computer center operations when they do not need to distinguish themselves competitively by performing their computer processing onsite. When the predictability of uninterrupted information systems service is not very important. For instance, airline reservations or catalog shopping systems are too "critical" to be trusted outside. If these systems failed to operate for a few days or even a few hours, they could close down the business. On the other hand, a system to process employee insurance claims could be more easily outsourced because uninterrupted processing of claims is not critical to the survival of the firm. When outsourcing does not strip the company of the technical know-how required for future information systems innovation. If a firm outsource some of its system but maintains its own internal information systems staff, it should ensure that its staff remains technically up to date and has the expertise to develop future applications. When the firm's existing information systems capabilities are limited, ineffective, or technically inferior. Some organizations use outsourcers as an easy way to revamp their information systems technology. For instance, they might use an outsourcer to help them make the transition from traditional mainframe-based computing to a new information architecture – distributed computing environment. Despite the conventional wisdom on when to outsource, companies sometimes do outsource strategic functions. In any case, if systems development and the information systems function are well managed and productive, there may not be much immediate benefit that can be provided by an external vendor.

Managing Outsourcing

To obtain value from outsourcing, organizations need to make sure the process is properly managed. With sound business analysis and an understanding of outsourcing's strengths and limitations, managers can identify the most appropriate applications to outsource and develop a workable outsourcing plan. Segmenting the firm's range of information systems activities into pieces that potentially can be outsourced makes the problem more manageable and also helps companies match an outsourcer with the appropriate job. Noncritical applications are usually the most appropriate candidates for outsourcing. Firms should identify mission-critical applications and mission-critical human resources required to develop and manage these applications. This would allow the firm to retain its most highly skilled people and focus all of its efforts on the most mission-critical applications development. Setting technology strategy is one area that companies should not abdicate to outsourcers. This strategic task is best kept in-house. Ideally, the firm should have a working relationship of trust with an outsourcing vendor. The vendor should understand the client's business and work with client as a partner, adapting agreements to meet the client's changing needs. Firms should clearly understand the advantages provided by the vendor and what they will have to give up to obtain these advantages. For lower operating costs, can the client live with a five-second-response time during peak hours or next-day repair of microcomputers in remote offices?

Organizations should not abdicate management responsibility by outsourcing. They need to manage the outsourcer as they would manage their own internal information systems department by setting priorities, ensuring that the right people are brought in, and guaranteeing that information systems are running smoothly. They should establish criteria for evaluating the outsourcing vendor that include performance expectations and measurement methods for response time, transaction volumes, security, disaster recovery, backup in the event of a catastrophe, processing requirements of new applications and distributed processing on microcomputers, workstations, and LANs. Firms should design outsourcing contracts carefully so that the outsourcing services can be adjusted if the nature of the business changes.

Q14- What is system software and application software? (v v v v v imp)

Ans – SYSTEM SOFTWARE

System software co-ordinates the various parts of computer system and mediates between the application software and computer hardware. Operating system is system software, which manages and controls the computers activities. The other system software consists of computer language translation programs that convert programming languages into machine language and utility programs that perform common processing tasks.

1 Operating Systems

An operating system is a set of computer programs that controls the computer hardware and acts as an interface with the application programs. The operating system plays a central role in the functioning of a computer system. It is usually stored on disk, after the computer system is started or booted up portions of operating system are transferred to memory as required. The kernel as the name suggests is the heart of the operating system and controls the most critical processes. Windows by Microsoft, Linux, UNIX, and the Macintosh are the commonly used operating systems. In some specialized or embedded computers the operating instructions are contained in their circuitry; common examples are the microcomputers found in calculators, automobile engines, mobile phones and microwave ovens.

Functions of Operating System

An operating system performs allocation and assignment of system resources, schedules the use of computer resources, monitors the computer system activities etc. The various activities performed by a typical operating system are:

- Performing common computer hardware functions.
- Providing a user interface
- Providing a degree of hardware independence
- Managing system memory
- Managing processing tasks
- Providing networking capability
- Controlling access to system resources
- Managing files

Common Hardware Functions

All application programs must perform certain tasks. For example

- Getting input from the keyboard or some other input devices
- Retrieving data from disks
- Storing data on disks
- Displaying information on a monitor or printer

Each of these basic functions requires a more detailed set of instructions to complete. The operating system converts a simple, basic instruction into the set of detailed instructions required by the hardware. In effect, the operating system acts as intermediary between the application program and

the hardware. The typical OS performs hundreds of such functions, each of which is translated into one or more instructions for the hardware. The OS notifies the user if input/output devices need attention, if an error has occurred, or if anything abnormal has happened in the system.

2 Language Translators

The CPU (also called processor) of a computer understands commands in machine language, where each instruction is a series of binary digits. Programming in machine language is not easy, as programmers have to remember the machine codes, which are in binary format. To help programmers, other high level programming languages have been developed whose instructions are easy to remember for programmers as these languages use English words. C, Java, SQL are examples of high level programming languages. Programming languages can be divided into assembly languages and high-level programming languages. For any program to be executed, it has to be first converted into its equivalent machine language program and then loaded into the memory of computer. To perform the translations of programs, language translators are used. As the process of programming language translations are machine dependent, the translators fall in the system software category.

Assemblers: The computer software that translates the assembly language programs into corresponding machine language programs are known as *assemblers*. Assembly language uses mnemonics instead of binary codes used in machine language. For example ADD R1 R2 is an assembly language instruction for adding the contents of register R1 with the contents of register R2 and store the result in R1. The use of mnemonics helps programmers to remember programming codes. But still to write big programs like a word processing software can be very cumbersome in assembly language.

Compiler and Interpreter: Compiler and interpreter are used to translate a high level programming language program into a machine language program. As the translation process is very cumbersome, some compilers first translate the source code (the program in high-level language) into the equivalent assembly language program and then use the assemblers for the next step. To define, a compiler is a program that translates a source text written in a language A into a target program in language B, whereas, interpreter is a program which directly executes the program in a given programming language A.

5

Advantages and Disadvantages of Interpreter over Compiler **Networking Technologies**

Advantages

- As compared to compiler no synthesis phase is required in interpreter: Neither there is a need to learn target language B nor the target code is to be generated. Thus interpreters don't have synthesis phase.
- Direct Execution: There is no intermediate compilation phase so the code is directly executed.

Disadvantages

- Efficiency Loss: As the code is executed on the fly, the efficiency of the program is low. In compilers, there is a separate phase for optimization of the program code.
- Interpreter must be available on target machine: The compiled code can be executed on any similar machine. The code needs not to be compiled every time. For languages, which are interpreter based, the interpreter must be available on each machine where the code is to be executed.

3 Utility Programs

A utility program is designed for general support to the processes of a computer. They are usually for routine, repetitive tasks and many users share them. Examples of utility programs include diagnostic programs, trace programs, input routines, and programs used to perform routine tasks, i.e., perform everyday tasks, such as copying data from one storage location to another. Utility programs are also available commercially; for example, Norton Utilities package is a set of utility programs for checking disks for computer viruses, checking hard drive for bad locations and removing them and for performing disk compression.

APPLICATION SOFTWARE

Application software is a complete, self-contained program that performs a specific function directly for the user. This is in contrast to system software, which exists to support application programs. Application software may consist of a single program, such as an image viewer; a small collection of programs (often called a software package) that work together to accomplish a task, such as a spreadsheet or text processing system; a larger collection (often called a software suite) of related but independent programs and packages that have a common user interface or shared data format, such as Microsoft Office, which consists of closely integrated word processor, spreadsheet, database manager, etc.; or a software system, such as a database management system, which is a collection of fundamental programs that may provide some service to a variety of other independent applications. Some of the example application software according to their types are given below in the table.

Information Technology for Managers

Table 3.1: Examples of Application Software

Type	Software
Word Processing	Microsoft Word, Corel Word Perfect
Spreadsheet	Microsoft Excel, Lotus 1-2-3
Graphics	Adobe Illustrator, Macromedia FreeHand
Desk Top Publishing	Quark Express, Adobe Page Maker, Corel Ventura Publisher

Programming Languages

A programming language is an artificial language (as opposed to natural languages such as Hindi, English etc.) that is used to generate or to express computer programs. Both system software and application software are developed using one or many programming languages

Generations of Programming Languages

The programming languages have been divided into different generations according to their characteristics and capabilities.

- **Machine Language** The first generation of computer programming languages is machine language. Programs in machine language consist of instructions coded in of 0s and 1s, thus the alphabets of machine language are 0 and 1. The storage locations and data items are also specified using 0s and 1s. These languages are machine dependent. There is a machine language corresponding to each microprocessor available.

- **Assembly Language** The second generation of computer programming language started using mnemonics (like ADD, SUB) to represent machine language instructions and storage locations. Assembly language is also machine-dependent. System software or at least part of it is usually developed in assembly languages.

- **Third Generation Language (3GL)** 3GL are English-like languages. They use statements and commands, which are similar to the words used in English. 3GLs are easier to learn, but less efficient in the use of computer resources as compared to machine and assembly languages. Typically, a statement in 3GL is translated into many instructions of machine language. C, BASIC, FORTRAN, COBOL and Pascal are the popular third generation languages.

FORTRAN (FORmula TRANslation): Fortran was developed in 1956 by John Backus. It was developed keeping in mind the scientific and engineering application.

COBOL (Common Business Oriented Language): COBOL was developed in the early 1960s under the auspices of the U.S. Department of Defense in cooperation with computer manufactures, users, and universities. It was designed to be a language for writing programs for business problems. Another design objective was to keep it machine independent. The language was designed in such a manner that it could evolve and grow to take care of changing program development requirements. Many standards for COBOL have been published since then.

BASIC (Beginners All-purpose Symbolic Instruction Code): BASIC was developed in 1964 by John Kemeny and Thomas Kurtz to teach students as Dartmouth College to use computers. It was meant to be a very simple language to learn and also one that would be easy to translate. Furthermore, the designers wished it to be a foundation language for students who wished to learn more powerful languages such as FORTRAN or ALGOL.

Pascal: It was developed in the late 1960s by Niklaus Wirth of Zurich. He named it after the great mathematician and philosopher, Blaise Pascal. Both Pascal and BASIC have been used extensively for teaching to the beginners.

C was developed at Bell Laboratories in 1972 by Dennis Ritchie. Many of its principles and ideas were taken from the earlier language B and B's earlier ancestors BCPL and CPL. C was developed with the purpose of creating a high level language that could be used for writing machine independent programs and would still allow the programmer to control the behavior of individual bits of data. The bit processing features have made C a popular system software development language.

Q15- Explain the FRAMEWORK FOR UNDERSTANDING MIS? (v v v v v imp)

Ans – FRAMEWORK FOR UNDERSTANDING MIS

There is too much data and information in an organization. In order to design a MIS successfully, we need a framework to structure the information so that the data and information relevant for decision-making can be separated from rest of the data. Before we talk about the design of MIS, let us understand the strategic management of a business. An organization must respond to market forces, competition, to environment and to technological changes. The scope of business is wide, touching many fronts. A business, among other activities, must do a long-term strategic planning. There are many methodologies for strategic planning. According to model presented by Robert Anthony, the strategic planning is one of the major activities in business planning and control. The other two are the management control and operational control. This framework is illustrated below:

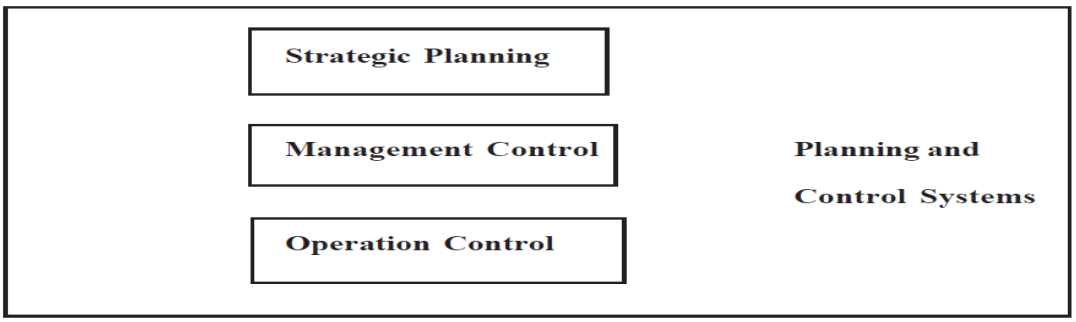


Fig. 5.3: Framework of business planning and control

1) Strategic Planning is the process of deciding objectives of the organization, determining the possible shift in objectives, deciding on the resources used to attain there objectives and the policies that govern the acquisition, use and disposition of there resources.

2) Management Control is the process by which managers assure that the resources are obtained and used effectively and efficiently to attain the objectives of the organization.

3) Operational Control is the process of assuming that specific tasks are carried out effectively and efficiently.

It is useful to classify the above definitions with some examples. The table below gives instances of planning and control activities in different functional areas.

Table 5.1: Planning and Control Activities in Different Functional Areas

	Strategic Planning	**Management Control**	**Operational Control**
Production	Location of a new factory	Determine the product mix for a monthly production program	Scheduling specific jobs on specific machines in a shift
Marketing	Entering the export market	Media planning for advertising expenditure	Planning sales contacts to be made by a salesman in the next week
Finance	Raising capital by issuing new shares	Determining maximum levels of credit for customers	Determining what action to take against nonpayment by a specific customer
Personal	Deciding on changes to be made in the organization structure	Determining who will be promoted to fill a vacated post at middle and lower levels, in the organization.	Determining which workers will be on each shift.

Let us now look at Simon's framework that has broken down the process of decision making into three stages:

1. *Intelligence*: This is the stage in which the decision maker recognizes that there is a problem or opportunity that requires him to make a decision.
2. *Design*: The decision maker determines the alternatives that are available to him to resolve the problem or exploit the opportunity.
3. *Choice*: In this stage, an alternative generated in stage-2 is singled out to be pursued. The selection process may involve feasibility analysis or cost-benefit analysis.

With this framework, we can distinguish between three major classes of decisions.

a) Programmed Decisions are there in which all stages are handled by following a preset well-defined procedure. The decisions are repetitive and routine which arise often and are capable of being modeled mathematically in their entirety. The classic example would be inventory-ordering decisions.

b) Non-programmed decisions are difficult to structure in logical-mathematical terms. There decisions cannot be handled in well-defined and pre-specified procedures. There opportunities are not repetitive in nature and they require fresh intelligence, design and choice phases to be executed. An example would be the decision to set up a new factory or launch a new line of product.

c) Semi-programmed decisions are those in which at least one and no more than two of the above stages can be handled by well-defined preset procedures. An example where the intelligence phase is well structured would be the diverse kinds of variance analysis. A comparison with a budget or standard is undertaken in a well-defined way to signal the need for a decision. Subsequent stages of design and choice, however, are not handled by a set procedure.

Recall that an MIS support problem-specific decision-making. Depending on the framework used by the organization for decision-making and goal set for MIS, the designer should determine the information needs.

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A few factors, which will increase the chances of a successful implementation of MIS, are:

1) Involvement of top management in the computerization effort, in defining the purpose and goals of computers within the organization.
2) Selection of an EDP Manager who has the political skills to involve managers in choosing application areas, identifying information needs and designing reports.
3) A computer staff, which has interdisciplinary skills in computers, management, and operations research.
4) A balanced expenditure on hardware and software.

Q16- Explain the CONVERGENCE OF IT AND CONSUMER ELECTRONICS: EMERGING TRENDS? (v v v v v imp)

Ans – FRAMEWORK FOR UNDERSTANDING MIS

Whenever the issue of convergence is discussed in the context of information technology it is imperative to refer the convergence of information and communication systems so that devices can be unified for different application services. The third dimension of human needs, which occupies the sphere of modern digital world with equal importance, is entertainment. The landmarks in history of the developments in communication are telephone (1870s), radio (1890s) and television (1930s) with increasing value addition for entertainment over information and communication. The personal computer (1980s) evolved primarily to address the information processing needs and it was the only device in the chain of revolutionary products developed which was digital by birth. The fast development in digital technologies paved the way of merger or hybridization of these different generation devices promoting the preferences for single device to cater information processing, communication and entertainment needs. This resulted in need driven efforts for convergence of technologies with an eye to develop innovative consumer products which can provide a common platform for handling different services and applications. The mix of research & development of technologies and innovative product development and design created a new paradigm to ever-increasing urge for value-added products. This process of value addition is creating new dimensions to existing products and setting newer trends for consumer preferences and needs well supported by convergence of technologies.

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The consumer electronics industry, in short, is entering a new era based on the promise of utilizing broadband and wireless technologies to promote the more widespread use of electronic devices. Advanced in microelectronics further enhances the potential for consumer electronic devices to

proliferate and be utilized well beyond what is in the market today. The personal computer led to a revolution in terms of how data could be managed and manipulated. The Internet enhanced this function by providing direct access to more data. Mobile wireless and wideband provides the consumer with all of the above in more places with greater access. The trend is leading many markets that were traditionally separate on a competitive collision course.

In an interesting development, the convergence trend is leading both hardware and software companies to become both hardware and software companies. Microsoft has unveiled its new Smart Personal Objects Technology (SPOT). Chips in the devices pick up signals from a radio network built on the under-used FM spectrum. It is part of the company's strategy to produce a wide range of software for the new devices of the future beyond a PC, as well as such common consumer electronics products as watches, clocks, and even key chains. Microsoft has already developed special software for Pocket and Tablet PCs (a derivative of laptops) in order to participate in the wireless market. Clearly, this approach appears to be a copy of what Sony and other Japanese electronics firms decided to do toward the beginning of the 1990s. Sony sought to develop seamless networks of electronic devices for the home connected through wireless systems. Sony is making serious efforts to establish the Linux operating system as the global and open standard for transferring digital entertainment from device to device in the home as the use of broadband expands. It is believed that the PC may be useful in transmitting downloaded content to the TV, or even TV could bypass the PC entirely and get its content from devices like Sony's proposed Cocoon set-top box, which has already been tested in Japan. Cocoon is a Linux-based, Internet-connected set-top box with a hard-disk drive that can transfer and play movies on devices connected to a home network.

Microsoft, along with Dell, Hewlett Packard, and Gateway, are interested in expanding into the consumer electronics business. Microsoft, which also produces products such as the Xbox, now likes to be called a consumer electronics manufacturer. Companies in the increasingly commoditized PC business are seeking to expand into consumer electronics by entering into product categories that compliment to the PC via "gateways", especially home entertainment devices. The gateways can take the shape of a PC-centric system, a set-top box, or a handheld computer containing special software that allows the user to control a variety of devices throughout the home. It should be interesting to see future competition between firms such as Microsoft that are developing proprietary standards for networked electronic appliances versus firms such as Sony that support more open standards. It is evident that firms that have specialized in producing electronic devices for the rest of the world, especially those in Japan and Asia, may benefit greatly from the aforementioned trends. Such a trend may provide an advantage to hardware makers over software companies and those that excel at branding and the farming out production to other firms

New emerging technologies feature new, innovative products with a focus on the convergence and consumer adoption of 3G, highlighting the growth potential after the success of GSM. In developed countries wireless phone owners prefer converged wireless phone/PDA devices to two stand-alone products capable of performing the same functions. More advanced phones are made for more advanced networks. Many advances in wireless technologies are seen for next-generation wireless systems such as smart phones with high-definition screens, camera functionality and those that double for PDAs. This has resulted due to better, faster networks being setup and strong demand from consumers

Q17- Explain the Components of a Network and type of network? (v v v v v imp)

Ans – COMPONENTS OF A NETWORK

A network system consists of hardware components as well as software components. The hardware components are the following:

The Server or Host Computer - Host is the computer that has data to be transmitted.

The Client : This is the computer on the other end of the transmission system as the server. It receives the transmitted data from the server.

The Network Interface Card: Earlier, one had to buy a network interface card (NIC) separately and install it in the computer. Nowadays, the NIC has become a standard component of a system. The NIC is the interface between the network cable and the computer.

The Circuit: The circuit is the pathway through which data travels from the host to the client. The circuit may be a copper wire or an optical fiber. The commonly used media are twisted-pair cables and coaxial cables. These days, fiber optic cables are also being used. Fiber optic cables can withstand higher temperature and has much higher bandwidth. Microwaves are also used for data transmission. The communication may take place through wireless medium.

Network Hubs : Hubs are used to connect cables. The hubs come in 4, 8 and 16 port sizes. An 8-port hub can connect 8 systems to the central cable.

Network Operating System : On top of the hardware, there is always special purpose network software, which makes the hardware work. The Network Operating System (NOS) is the software that controls the network. NOS have software for the server as well as for the client. The Novell NetWare is one of the oldest NOS. Novell supports a wide variety of topologies, protocols and computers. Microsoft's Windows NT and Linux are two very popular NOS and are rapidly growing.

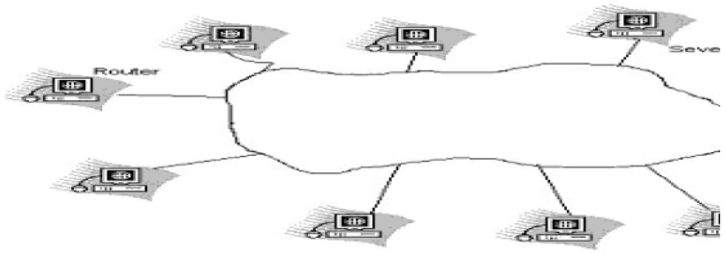


Fig. 4.1: A network

TYPES OF NETWORKS

Local Area Network

A local area network connects computers that are in the same building. A network spread over few kilometers also comes under LAN. The LAN is usually realized using Ethernet technology or token ring technology. Fiber Distributed Data Interface (FDDI) is also becoming popular. The transmission rate varies from 10 Million bits per second to 1-giga bits per second (10Mbps-1Gbps). A computer has a network interface card such as Ethernet card that connects it to the network circuit. Usually LAN is under the control of a single organization. The prime objective of LAN is to facilitate information and resource sharing within an organization. For instance, a application software which is used by many people in the organization can be installed on a computer. This computer is connected to other computer by LAN and everybody can use the same software. The machine on which the software is installed is often called a server. In the absence of LAN, the same software will have to be installed on all machines, which may be very expensive. In addition, an upgrade in the software will require re-installation/modification on all computers.

The server may be a file server, print server or a database server, depending on the service it provides to its users. LAN is also connected to other LANs through a gateway. Almost seventy percent of all LANs in the world use Ethernet. Ethernet uses a bus topology. All computers are connected to one circuit. All messages from a computer flow on to the central cable and through it to all computers on the LAN. In other words, messages are broadcasted.

Wide Area Network

A wide area network connects computers in different cities or countries. The network to connect computers that are thousands of miles apart is not built by an organization. Instead, the organization uses leased telephone lines.

It is obvious that WAN is not owned by a single organization. It is owned and managed collectively by many cooperating organizations.

Internet

Internet or Inter-Network is the connection of two or more networks so that a computer on one network can communicate with a computer on another network. The Internet is a set of thousands of networks linked together around the world. The communication between two computers takes place such that the user does not have to worry about the technology used by the networks. It is easy to find out the location of another system on the network. The router (also called gateway) acts as an interface between two networks. The Internet has no central administration but there are protocols, which are followed by each network of Internet.

Intranet

An Intranet is a network that connects the internal computing resources of an organization. The prime motive of Intranet is to facilitate information sharing within the organization with the help of tools such as web browsers. For instance, a manager can check the inventory level sitting in his own room. Email becomes an easy way to communicate, without having to worry about the physical presence of the person on his seat. Intranets operate within the company's firewalls. A firewall is a method of isolating the company's computers behind a device that acts as a gatekeeper. All outgoing requests for information go to a special computer, which hides the sender's machine address but passes on the request. All incoming information is also checked by the firewall computer. Employees can venture out into the Internet but unauthorized users cannot come in.

3

Q18- Explain the Group Decision Support Systems (GDSS)? (v v v v v imp)

Ans – GROUP DSS

Having basic understanding of decision-making process and DSS, let us find out what is Group Decision Support Systems (GDSS). GDSS are interactive computer-based systems that facilitate decision-makers working together as a group to arrive at a solution for unstructured problem. The group of executives analyzes problem situations and performs group decision-making tasks. The GDSS provides mechanisms to help the users to coordinate and keep track of on-going projects, allow them to work together thru computer-supported communication, collaboration, and coordination. Typical applications of GDSS include email, awareness and notification systems, videoconferencing, chat systems, multi-player games, and negotiation systems.

The group decision support system addresses the vary issue of human behaviour in a given environment along with computer science and management. It is found that a task assigned to a group is a typical information processing system that usually provides a judicious solution with alternatives. The GDSS has several implications that can be listed as follows

- Enable all participants to work simultaneously thereby promoting broader input into the meeting process and reducing dominance of few people;
- Provide equal opportunity for participation;
- Enable larger group meetings that can effectively bring more information, knowledge, and skills for a given task;
- Provide process structure to help focus the group on key issues and discourages irrelevant digressions and nonproductive behaviors;
- Support the development of an organizational memory from meeting to meeting; and
- Individual satisfaction increases with group size.

The software developed for GDSS focuses principally on assisting brainstorming and mechanizing voting, two of the rare events in business meetings. We have reached the stage of mechanizing word-oriented problems in group meetings.

Group support systems are designed to support group decision-making through specialized software, hardware and decision support tools. This can be defined as a combination of computer, communications and decision technologies working in tandem to provide support for problem identification, formulation and solution generation during group meetings. Broadly, the fundamental goal of GDSS is to support the exchange of ideas, opinions, and preferences within the group. The primary goal of GSS is to reduce **process loss** attributed to disorganization within the group, social issues such as member dominance, inhibition, peer pressure and other recognized difficulties of group interaction and to improve overall decision quality. The taxonomy of GDSS is forced by three factors :

1) Group size,
2) Communication channel (face-to-face vs. computer-mediated) and
3) Task type.

GDSS are believed to improve the quality of group decisions by minimizing process losses and maximizing **process gains.** Process gains occur when certain aspects of the meeting improve the eventual outcome or result and process losses delay or reduce the final outcome. Thus, the overall meeting outcome is reliant upon the process gains versus the process losses.

Let us now study some of the terms used in GDSS.

Groupthink : Groupthink is a tendency of group members to fall in to similar thought patters and to disapprove the opinions that do not confirm to the patterns. This creates problems in group decision making process and sometimes become big hurdle in reaching to an appropriate decision. GDSS provides an opportunity to overcome the problems of groupthink where junior members of the group get equal chance to put forth their opinions that could not have been possible in face-to-face situations.

Media Richness is defined as the potential information carrying capacity of data transmission medium. The information processing depends on the richness of the communication medium. Figure 18.4 describes the level of communication richness across various media. In GDSS, the richness of a medium depends on availability of number of communication channels and the feedback that is received by the decision makers. In face-to-face situation, the communication richness is very high as the feedback and inputs are received through words used, facial expression, body language and tone. An important aspect is also selection of communication medium as this varies from task to task. For example, a low medium richness is more effective in money transactions via an ATM whereas to understand loaning system of bank highly rich medium may be required.

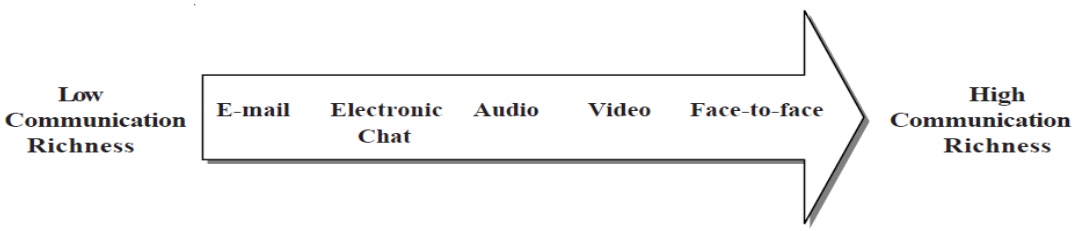


Fig.18.4 : Degree of Communication Medium Richness

Groupware : It is a term which relates to GDSS but is not identical. It is defined as a computer based system that support groups of people engaged in common goal and provide interface to a shared environment (Ellis, 1991). The field that studies how people use groupware is called **Computer-Supported Cooperative Work (CSCW)**. The relations among the DSS, GDSS and Groupware can be understood through *Figure 18.5*.

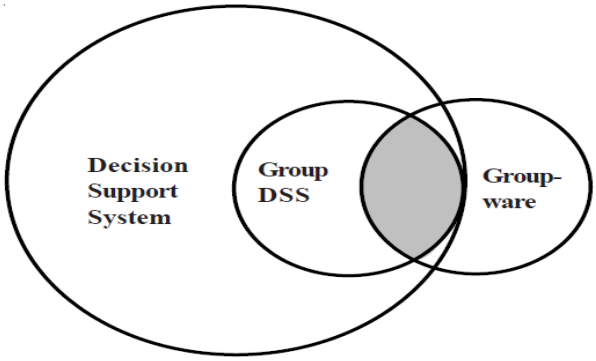


Fig.18.5 : Relationship Among DSS, GDSS and Groupware

As can be seen, GDSS is a part of DSS whereas groupware may or may not be essential component of DSS though it has some properties similar to GDSS.

War room, also known as electronic meeting room or electronic boardroom, is a facility created for GDSS by networking computers for each member participant. It is equipped with a large screen video display that can be seen by all the participants. There is a facilitator to control the display and have access to all members' computers. The software used have the capabilities to plan a session and group members can propose agenda items through it. It can organize and structure members' comments and can record them as organisational memory for longer and effective use.

Let us now look at the system of GDSS software procurement.

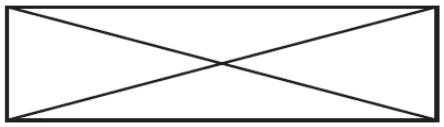
FIRST PRIORITY MOST IMPORTANT SHORT QUESTIONS

Q1- Explain business application of fuzzy logic? (v v v v v imp)

Ans -FUZZY LOGIC

Traditional logic has many limitations when one deals with uncertain and incomplete knowledge. Unfortunately knowledge in the real world is never certain and complete. Fussy logic came into picture as a concept that extends the expressive power of traditional logics. You would recall that in standard set theory, an object is either a member of a set or it is not. There is no middle way. There is no partial containment. The characteristic function of a traditional set assumes values 1 and 0, on the basis of membership. If we generalize this concept and allow the characteristic function to assume all values between 0 and 1, then we talk about the fuzzy sets and the value assumed by the characteristic function denotes the degree or level of membership. Prof. Zadeh of University of California, Berkley in 1965, first introduced fuzzy sets. The main objective was to define the fuzziness and vagueness. Fuzzy set theory forms the basis of Fuzzy logic. It is a relatively new discipline that has found applications in automated reasoning of expert systems. Fuzzy models require defining of memberships functions. These functions can often be defined on the basis of intuitive knowledge. Because of their simplicity to use and cost effectiveness, fuzzy logic and fuzzy computation are good prospects for the next generation expert systems. The universe of fuzzy set can take any value in the real interval 0 and 1. Let us take an example to explain the concept better. Suppose we want to define the membership of batsmen of national level in a country

We may define the membership characteristic function u as follows.



1 for $0 \leq \times \leq 50$

for $x > 50$

here x is the national average of the batsman. The interpretation is if a batsman has an average of more than 50 runs he is strong member of the fuzzy set. An average of 40 means his membership is partial with $u_A(x)=0.5$, similarly an average of 30 would get $u_A(x)=0.2$ and so on. The characteristic function for fuzzy sets provides a direct linkage to fuzzy logic.

Business Applications of Fuzzy Logic

1) Fuzzy matching is used in matching problems that is an essential operation in speech recognition, automated reasoning and expert systems. Computing fuzzy distance between two objects forms the basis of such matching.
2) Fuzzy relations are used in modeling a physical system, whose variations of output parameters with input parameters are known.
3) Fuzzy logic has been applied in management of ambiguity of the data by analyzing the knowledge about predecessors to determine the truth-value of a proposition.

4) Fuzzy reasoning is used for identifying criminals from imprecise and inconsistent word description of criminal history.

5) Fuzzy logic is used in medical diagnostic systems in identifying diseases on the basis of symptoms by calculating fuzzy beliefs.

Q2- Explain the SYSTEMS ANALYSIS? (v v v v v imp)

Ans -SYSTEMS ANALYSIS

Systems analysis is the analysis of the problem that the organization will try to solve with an information system. It consists of defining the problem, identifying its causes, specifying the solution, and identifying the information requirements that must be met by a system solution.
The key to building any large information system is a thorough understanding of the existing organization and system. Thus, the systems analyst creates a road map of the existing organization and systems, identifying the primary owners and users of data in the organization. These stakeholders have a direct interest in the information affected by the new system. In addition to these organizational aspects, the analyst also briefly describes the existing hardware and software that serve the organization. From this organizational analysis, the systems analyst details the problems of existing systems. By examining documents, work papers, and procedures; observing system operations; and interviewing key users of the systems, the analyst can identify the problem are and objectives to be achieved by a solution. Often the solution requires buildings a new information system or improving an existing one.

Feasibility

In addition to suggesting a solution, systems analysis involves a feasibility study to determine whether that solution is feasible, or achievable, given the organization's resources and constraints. Three major areas of feasibility must be addressed:

Technical Feasibility: Whether the proposed solution can be implemented with the available hardware, software, and technical resources.

Economic Feasibility: Whether the benefits of the proposed solution outweigh the costs. We explore this topic in greater detail in Section 11.4, Understanding the Business Value of Information Systems.

Organizational Feasibility: Whether the proposed solution is desirable within the existing managerial and organizational framework.

Normally the systems analysis process will identify several alternative solutions that can be pursued by the organization. The process will then assess the feasibility of each. Three basic solution alternatives exist for every systems problem:

1. To do nothing, leaving the existing situation unchanged
2. To do modify or enhance existing systems
3. To develop a new system

There may be several solution design options within the second and third solution alternatives. A written systems proposal report will describe the costs and benefits, advantages and disadvantages of each alternative. It is then up to management to determine which mix of costs, benefits, technical features, and organization impacts represents the most desirable alternative.

Establishing Information Requirements

Perhaps the most difficult task of the systems analyst is to define the specific information requirements that must be met by the system solution selected. This is the area where many large system efforts go wrong and the one that poses the greater difficulty for the analyst. At the most basic level, the information requirements of a new system involve identifying who needs what information, where, when, and how. Requirements analysis carefully defines the objectives of the new or modified system and develops a detailed description of the functions that the new system must perform. Requirements must consider economic, technical, and time constraints, as well as the goals, procedures, and decision processes of the organization. Faulty requirements analysis is a leading cause of systems failure and high systems development costs. A system designed around the wrong set of requirements either will have to be discarded because of poor performance or will need to be heavily revised. Therefore, the importance of requirements analysis must not be underestimated.

Q3- Explain Groupware? (v v v v v imp)

Ans -Groupware

A relatively new and still somewhat unshaped category, groupware helps teams work together by sharing information and by controlling internal workflows. Coined in the late 1980s the term groupware has attained wide recognition due to the increasing need for groups to work together more effectively at a distance as a result of downsizing and rapid organizational change. Products viewed as groupware are still new enough that their long-term direction is unclear even though the competitive need to work effectively in dispersed teams is greater than ever. Groupware goes beyond messaging by facilitative access to documents and controlling team-related workflow. Many groupware products are related to specific group related tasks such as project management, scheduling meetings ("calendaring"), and retrieving data from shared databases. Lotus Notes, a prominent product in this category, is designed for sharing text and images and contains a data structure that is a cross between a table-oriented database and an outline. For example, a law firm in Seattle uses Lotus Notes to permit everyone working on a particular case to have access to the most current memos and other information about that case, even if they are traveling. Other companies use Lotus Notes to store and revise product information for salespeople selling industrial products, thereby replacing the massive three-ring binders they formerly lugged around. Yet other groupware functions are performed through computer conferencing, the exchange of text messages typed into computers from various locations to discuss a particular issue. When done through the Internet this is sometimes called a newsgroup. A computer conference permits people in dispersed locations to combine their ideas in useful ways even though they cannot speak to each other face-to-face. Any conference participant may be able to add new ideas, attach comments existing messages, or direct comments to specific individuals or groups. Proponents of computer conferencing recognize some disadvantages or working through computers but emphasize major advantages, such as preventing a single forceful individual from dominating a meeting. Also, because everything is done through a computer, a record of how ideas developed is automatically generated. A different type of groupware product focuses primarily on the flow of work in office settings. These products provide tools for structuring the process by which information for a particular multi-step

task is managed, transferred, and routed. A typical example is the approval of travel expenditure. In this case, one person must propose the expenditure and someone else must approve it. The workflow application is set up to make the approval process simple and complete. In effect, groupware is being used as a small transaction processing system for multistep transaction

Q4- Explain the OPEN SOURCE SOFTWARE? (v v v v v imp)

Ans - Open Source Software (OSS) is primarily defined as software, which is freely re-distributable and includes the source code. The licenses under which OSS is released vary greatly. The complete Open Source Definition can be found at http:// www.opensource.org/osd.html. OSS is vastly different from the mainstream software industry where source code is highly guarded and programs are only distributed in their binary form, which is non-modifiable format. The most important aspect of the open source movement is the participation of users. When a user wants a feature or a bug fix for a commercial program, the user is at the mercy of the software vendor. However, with open source, the user can modify the program according to his needs or fix a bug. Many users will help develop the program for free, simply to improve the product and for the benefit of the community.

These are a few of the most common and popular licenses for OSS.

- GNU Public License (GPL)
- Limited GNU Public License (LGPL)
- BSD-Style License
- The Artistic License
- The Netscape Public License (NPL) and the Mozilla Public License (MPL)
- Apple Public Source License (APSL)

A few advantages of OSS are:

1) **Cost Effective:** Open source software often comes free. The individual or organization users can save the software cost.
2) **Customizable:** Since Open source software comes with the source; one can customize existing software to suit one's needs. Closed source software *may* be customizable, but you need to negotiate and/or pay for customization. Open source licenses typically *guarantee* you the right to be able to customize the software.
3) **More Secure:** Since the source code is open, more people scrutinize the source code, and hence more flaws are found and corrected. The end result is that the code produced is more secure compared to similar closed-source code.

The following terms are synonymous with Open Source Software: Freeware, Free/ Libre/Open Source Software (FLOSS).

Q5- Explain the TCP/IP? (v v v v v imp)

Ans - TCP stands for Transmission Control Protocol a communications standard that enables application programs and computing devices to exchange messages over a network. It is designed to send packets across the internet and ensure the successful delivery of data and messages over networks.

TCP is one of the basic standards that define the rules of the internet and is included within the standards defined by the Internet Engineering Task Force (IETF). It is one of the most commonly used protocols within digital network communications and ensures end-to-end data delivery.

TCP organizes data so that it can be transmitted between a server and a client. It guarantees the integrity of the data being communicated over a network. Before it transmits data, TCP establishes a

connection between a source and its destination, which it ensures remains live until communication begins. It then breaks large amounts of data into smaller packets, while ensuring data integrity is in place throughout the process.

As a result, high-level protocols that need to transmit data all use TCP Protocol. Examples include peer-to-peer sharing methods like File Transfer Protocol (FTP), Secure Shell (SSH), and Telnet. It is also used to send and receive email through Internet Message Access Protocol (IMAP), Post Office Protocol (POP), and Simple Mail Transfer Protocol (SMTP), and for web access through the Hypertext Transfer Protocol (HTTP).

An alternative to TCP is the User Datagram Protocol (UDP), which is used to establish low-latency connections between applications and decrease transmissions time. TCP can be an expensive network tool as it includes absent or corrupted packets and protects data delivery with controls like acknowledgments, connection startup, and flow control.

UDP does not provide error connection or packet sequencing nor does it signal a destination before it delivers data, which makes it less reliable but less expensive. As such, it is a good option for time-sensitive situations, such as Domain Name System (DNS) lookup, Voice over Internet Protocol (VoIP), and streaming media.

The Internet Protocol (IP) is the method for sending data from one device to another across the internet. Every device has an IP address that uniquely identifies it and enables it to communicate with and exchange data with other devices connected to the internet.

IP is responsible for defining how applications and devices exchange packets of data with each other. It is the principal communications protocol responsible for the formats and rules for exchanging data and messages between computers on a single network or several internet-connected networks. It does this through the Internet Protocol Suite (TCP/IP), a group of communications protocols that are split into four abstraction layers.

IP is the main protocol within the internet layer of the TCP/IP. Its main purpose is to deliver data packets between the source application or device and the destination using methods and structures that place tags, such as address information, within data packets.

Q6- Explain inventory management system? (v v v v v imp)

Ans - An inventory management system is the combination of technology (hardware and software) and processes and procedures that oversee the monitoring and maintenance of stocked products, whether those products are company assets, raw materials and supplies, or finished products ready to be sent to vendors or end consumers. A complete inventory management system consists of:

A system for identifying every inventory item and its associated information, such as barcode labels or asset tags.

- Hardware tools for reading barcode labels, such as handheld barcode scanners or smartphones with barcode scanning apps.
- Inventory management software, which provides a central database and point of reference for all inventory, coupled with the ability to analyze data, generate reports, forecast future demand, and more.

Processes and policies for labeling, documentation, and reporting. This should include an inventory management technique such as Just in Time, ABC Analysis, First-In First-Out (FIFO), Stock Review, or another proven methodology.

- People who trained to follow these policies and processes.

Inventory management as “the supervision of non-capitalized assets (inventory) and stock items.” Inventory management is a component of supply chain management that oversees the flow of items (products, goods, etc.) as they move from the manufacturer to the warehouse and then to the point of sale. “A key function of inventory management is to keep a detailed record of each new or returned product as it enters or leaves a warehouse or point of sale,” SearchERP explains, which

points to the importance of having a clear and established inventory management system to ensure that the process and documentation are as streamlined and efficient as possible, as well as to minimize error.

Q7- DATA WAREHOUSE ? (v v v v v imp) IN LONG QUESTION

Q8- CPU ? (v v v v v imp) IN LONG QUESTION