CHAPTER 4

INFOTECH INFRASTRUCTURE

4.1 TECHNOLOGY OF INFORMATION SYSTEM

Technology is the more advanced concept in 21st century where information system has significance change to business process and communication pattern within global market. And this all transformation of data into information and transmission of reports, files, and documents confidential details over the network from one source to destination are due to improved and advanced hi-tech facility easily available to the user. Standard and customized software application mainly integrated the entire business functional activity stored at center storage device and same has been monitor by expert team which always tries for best possible option to obtain from process of selection through various processes of IS. Management always tries to evaluate the return on investment i.e. ROI.

New implementation and improvement may need for the compatibility requirement of software application and hardware available for organization structure. Blueprint of entire process has to be ready in form of format to follow specific instruction to complete the configuration of information system before it makes it available for use in real time scenario. Information technology is base of entire communication system where every hardware and software on proper place with updated security process over the internal and external network. Following are the factors which express how technology is playing effective role to achieve the competitive advantage:

- Information technologies connects geographical gap.
- Database plan and Management
- Information system evaluation and format
- Communication flow in management
- IT Governance
- Information Technology connect geographical gap: Companies which are based on two different region and having complete different network structure as per business process transaction. Maintaining a competitive advantage through the technical scope will give stability and growth to the organization. Organizations
which are established on different location can connect with the help of technical collaboration. Based on organization structure network configuration will planned and accordingly create networking connectivity to communicate and transmits the information between employee of the both organization who are based on different location of the organization. Technology and networking made it possible to email the important information and communicate live with office staff through video conferencing. Technical advancement improved the storage capacity over the network. Due to, VPN virtual private network, Cloud technology it's more easy for the employee to travel anywhere in the world with their knowledge bank with them in the form of login id and password. Technology made it easier to face challenges of the organization.

- Database formulation and management: Setup of data center is the integration many technical devices and intelligence to develop it for the optimum use of employee of organization. Management has to decide the design and plan before it emerge in actual form. Modern technique query language such as structural query language. Some model has to be deciding to implement in the organization then management has to identify and set an objective for the organization for the model of application planning to formulate for specific kind of database. Good database where the entire requirement covers in the technical and managerial studies conducted before forming database. Study will evaluate need of the organization in transmission of information flow within the organization.

- Information system evaluation and Design: information system is need of all the departments in organization to process on particular task employee need information. Information system needs to analyze and evaluate its nature of business and size of organization scope to decide certain design. Information system is the matter of different function of specific department. Information system is integrated with all other application database and relevant permission given to the particular employee based on the designation allotted to complete certain task. Design of information system mainly structured after complete evaluation of approval from the top management and technical department for specific kind of collaboration of various system and application details studied and verify to apply in the real time scenario. Networking segregation and
technical specification completely depend of the scope and size of organization and other branches of organization or need of stakeholders.

• Communication flow in management: Communication is the important concept. Flow and connectivity of employee within organization based on the level of management and need of information system to communicate with each other based on certain task to complete. SDLC is the concept of software development life cycle application of which include all the development process of planning and building to maintain information system. The Data flow method, some other development strategies such as Prototyping, waterfall model or object oriented model these are the design to transform certain rules.

• IT Governance: It is a framework which provides guideline to follow certain rules to regulate business in domestic market as well as in international market. ITIL is the best example of IT Governance. COBIT is also another service of IT Governance. These models of ITGC ensure the organization’s technical infrastructure support and enable the structure to manage real time system. IT governance has set of certain rules for particular system to use and department maintained technological system and even information system database and process of functioning department in control of support team for help need for technical knowledge or query. Policy of this IT governance has to implement in proper way to evaluate the process of rules for desirable outcome. ITIL and COBIT are the main governance set of rules which work as backbone of the technology and information systems of the organization.

4.2 STAGES IN I.T. INFRASTRUCTURE EVOLUTION
Information technology is the fundamental element of information system. And its growth has developed the direct and indirect concept of communication technology. It’s involvement in business always push business organization on next level to technological advancement. And technological advancement or any new innovation give new push to business organization. Term information attached with technology and it has given birth of new concept of information system which has many dimensions to improve the organization performance and support in solving problem of processing any functional tasks. This I.T Infrastructure has stages which evolve
with time and has change form on each level of enterprise era. Following list has brief
dimension of infrastructure:

- Electronic accounting machine era (1930-1950):
  - Signature Firm(s):
    - IBM
    - Burroughs
    - NCR
  - Hardware Platform:
    - Programmable card sorters
  - Operating system:
    - Human Operators
  - Application and enterprise software:
    - None application software created by programmer
  - Networking and telecommunication:
    - None
  - System integration:
    - Vendor-provided
  - Data storage and database management:
    - Physical card management
  - Internet platform:
    - None

- Mainframe era (1959 – Present):
  - Signature Firm(s):
    - IBM
  - Hardware Platform:
    - Centralized mainframe
  - Operating system:
    - IBM 360
    - IBM 370
    - Unix
  - Application and enterprise software:
    - Few enterprise-wide application
    - Departmental application created by in-house programmers
• Networking and telecommunication:
  ▪ Vendor-provided:
  ▪ System network architecture (IBM)
  ▪ DECNET (Digital)
  ▪ AT & T Voice

• System integration:
  ▪ Vendor-provided

• Data storage and database management:
  ▪ Magnetic storage
  ▪ Flat files
  ▪ Relational databases

• Internet platform:
  ▪ Poor to none

• PC era (1981- Present):
  • Signature Firm(s):
    ▪ Microsoft / Intel
    ▪ Dell
    ▪ HP
    ▪ IBM
  • Hardware Platform:
    ▪ Wintel computer
  • Operating system:
    ▪ DOS / Windows
    ▪ Linux
    ▪ IBM 390
  • Application and enterprise software:
    ▪ No enterprise connectivity
    ▪ Boxed software
  • Networking and telecommunication:
    ▪ None or limited
  • System integration:
    ▪ None
  • Data storage and database management:
• Database II access
• Database III access

• Internet platform:
  • None at first
  • Later browser enabled clients

• Client-server era (1983- Present):
  • Signature Firm(s):
    • Novell
    • Microsoft
  • Hardware Platform:
    • Wintel computers
  • Operating system:
    • Windows 3.1
    • Windows
    • Server
    • Linux
  • Application and enterprise software:
    • Few enterprise-wide applications
    • Boxed software application for workgroup and department
  • Networking and telecommunication:
    • Novell NetWare
    • Windows server
    • Linux
    • AT & T voice
  • System integration:
    • Accounting firm
    • Consulting firm
    • Service firm
  • Data storage and database management:
    • multiple database with optical storage
    • Magnetic storage
  • Internet platform:
    • Non at first later:
- Apache server
- Microsoft IIS

- Enterprise era (1992- Present):
  - Signature Firm(s):
    - SAP
    - Oracle
    - People soft
  - Hardware Platform:
    - Multiple:
      - Mainframe
      - Server
      - Client
  - Operating system:
    - Multiple:
      - Unix/Linux
      - OS 390
      - Windows server
  - Application and enterprise software:
    - Enterprise-wide application linked to desktop and departmental application
    - mySAP
    - Oracle E-business suite
  - Networking and telecommunication:
  - LAN
    - Enterprise-wide
    - Area network (WAN)
    - TCP/IP
    - Internet standards enabled
  - System integration:
    - Software manufacturer
    - Accounting and consulting firm
    - System integration firm
    - Service firm
Data storage and database management:
  - Enterprise database servers

Internet platform:
  - None in the early years later:
  - Intranet and internet delivered
  - Large server farms

This above dimensions of IT Infrastructure has an evolution of entire combination of hardware software and information growth all together in all levels of era. This change in IT infrastructure improvise in computer technology in effect to this computerized systems are involved from the ground to top floor storing, processing, sorting, presenting, analyzing and evaluating data into information, information into knowledge, knowledge into business intelligence with the components and development in computer processing, memory chip, storage device, telecommunication and networking hardware and software, and software design and programming languages, medium of communication and digital technology all these has increase the productivity and processing power and speed by reducing cost and saved time. This enterprise growth and Five IT evolution stage in below figure:

- **Electronic accounting machine**
- **Duration: Year 1930-1950 (Figure 4.13)**

![Figure 4.13: Electronic accounting system](image)

• Mainframe / minicomputer
  • Duration: Year. 1959 – Present (Figure 4.14)

![Diagram of Mainframe / minicomputer](source)

**Figure 4.14 Mainframe / minicomputer**

• Personal computer
  • Duration: Year. 1981-Present (Figure 4.15)

![Diagram of Personal Computer](source)

**Figure 4.15 Personal Computer**

• Client / Server, Duration: Year. 1983 - Present
  Client server communication in which client send request for specific access over network and server share respective data or information which user authorized to access the server database. In client server network server is powerful to store and processing of database. Network topologies integrate the client server to work in
organization with system configuration where server is having more capability to store the database than client. (Figure 4.16)

![Figure 4.16 Client / server](image)


- Enterprise internet
- Duration: Year. 1992-Present (Figure 4.17)

![Figure 4.17 Enterprise internet](image)

Information technology is the platform available to organization’s management now to develop strategies and use this integrated advance infrastructure of communication over network. Enterprise run through the unified communication network of telecommunication and networking equipments configured with networking protocol through application and system software on system hardware. Enterprise organization improves business capabilities. And these computing platforms provide support to employees, customer, and suppliers for specific functional communication based on the access rights assigned to respective user of integrated system. This available infrastructure mainly performs with management strategies for business growth and expansion as well as for better scale of production, and to made this possible all I.T. infrastructure use for managing and processing of information system for different functional organization. Storage the data and information on server has to differentiate sorting of classified information as per the I.T. strategy and the server decided for the activity to store i.e.:

- **Web server**: web server where user request for web page to access particular kind of data or information about particular product, person, location or it can be anything related to commercial use of business. Client side sent the request though backend configuration of protocols in routers to identify the path for requested web site. These all communication between client and node is automated by the systems configured on networking phase of organization and their Internet Service Provider.

- **File server**: file server is the server of storing data and information in one location. It is the centralized system of organization and authorized access given to users. database saved for all functional department details i.e.
  - Sale database
  - Marketing database
  - Production database
  - Accounting database
  - Operations database
  - Financial database
  - Procurement database
  - Vendor master database
Human resource database

Print server: in big organization printer are configured on network, and it save all the logs of printer activity happened on the network. Printer server is used mainly to take print from any system of organization and give print command from any location of network place.

Firewall server: all the business organization has their own network for internal employee of the organization that network is known as private network, and to access data or information over the network from web server user requested web site on network and that network is the public network such cyber location may have attackers who harm to system hardware or software through malicious attack or virus threads while communication of request transfer to web server and user of organization. Firewall is the system which protect private network from public network via configuration of their security policy on firewall server and assigned it with other servers of organization. Firewall server protect intranet of organization from the viruses or any cyber attack from public network.

Application server: this server saves with all the database related application which is use by employee over the database. Whatever activity handle by the user get saved in this server system. This server also save the application database over the intranet network of organization.

These servers store the records of respective processing system over the network, web server, application server, file server, print server all can maintain separately or on one or two server system its decision of respective organization as per the size and requirement of business strategy in near future, also this database support to the manager for monitoring and managing the records of login and logout on the system. These entire infrastructures provide connectivity between each node and process for business activity. These I.T. infrastructure and services linked with

- Business strategy
- I.T. Strategy
- Information technology

All these element of business process linked with information technology and unified communication system. Telecommunication system support voice, video, data connection to managers, employee, supplier and other stakeholder of organization.
Information technology management plan develop and coordinated the computation of all the business transaction record in server system for further reference to monitoring the business transaction to take decision. Network topology decided by I.T professional with understanding of requisite of business process unit. Client server is an example of these type of configuration in intranet where client desktop, laptop computers are clients computer which also known as node or host PC on network, and the superior quality to perform and store maximum amount of data which also able to share over network as per configuration in it that system called server, which is most power system then client computer. Client is there requestor and user entry whereas server sends the requested data to client and stores the logs and shared data. All local area network integrated over the network and standardized the software tools and application of organization. Following are the list component of information technology infrastructure in business organization:

- Computer hardware platforms
  - HP
  - Dell
  - IBM
  - Apple
  - Sun
  - Linux machine
- Operating system platforms
  - Microsoft windows
  - UNIX
  - Linux
  - Mac OS X
- Enterprise software applications
  - SAP
  - Oracle
  - Microsoft
  - BEA
- Networking telecommunications
  - Linux
  - Novell
• Cisco
• Lucent
• Nortel
• AT&T
• Verizon
• Consultants and system integrators
  • IBM
  • EDS
  • Accenture
• Data management and storage
  • Sybase
  • MySQL
  • SQL Server
  • EMC System
  • IBM DB2
  • Oracle
• Internet platforms
  • Apache
  • Microsoft
  • UNIX
  • Cisco
  • Java

These are the technological platform available to coordinate for the business process to continue with management and Information technological strategy. All small steps of processing to build infrastructure and storing information system on functional database for decision to be obtain for particular business problem. These all configuration and managed techno based information system will give the right and accurate solution for the business. If managers effectively use the information system it will helps to achieve competitive advantage to the organization. While developing information system in organization managers need to be stand with clear transparency in and understanding of organization goal and vision.

Decision making is the important phase of management task to solve any issue of organization, management needs information. Also managers need information
when management decides about the new design of processing system, business expansion, and new product launch or business strategy to decide. Management Information System helps to analyze the relationship among the social, political, ethical issue that raise in the organization due to uncertainty in the low productivity, employee conflicts, shortage of infrastructure, lack of communication between employee and management. Information system always finds the way through the database strategy and technical infrastructural use in the organization. Due to reporting tool of MIS management can easily take the moral decision to manage, control and monitor the system of business process transaction. It helps to evaluate and protect the privacy of intellectual property in the organization. These information technologies, information system, communication infrastructure involve in everyday life of everyone in any kind of business processing transaction, and timely use of variety of business strategy managers can able to achieve the profit for the organization.

Widespread information systems keep increasing the opportunities to organization in competitive force. Regulation of privacy law is the important factor of information system. Fair information practices have to be maintaining in the organization transaction processing system will create the moral values in organization life cycle. As functional department integrated for independent activity of business process but collectively and collaboratively work together for business process transaction in company. Management Information System Data processing is critical and complex activities proceed systematically and with the technology it is easy to form decision particularly to solve the business issue. Information system is the managed database of formal organization which is accountable and responsible to work and perform ethical practices even in uncertain situation of the organization will surely established long business life cycle with profitable performance even in competitive force of organization.

4.3 INFORMATION COMMUNICATION PROCESSING MANAGEMENT
Communication management is the process of managing technology to transfer data from one location to other. Transportation data over the network possible through the medium of copper wire, fiber optic cable, wireless signal which are the primary reason to made communication possible. Technical concept consist client computers servers, telecommunication, networking, data center for information sources, radio
and satellite communication. All these nodes connected together over the network and digital information transfer as per the need of the process. Some technology used in the data communication such as data communication equipment DCE, Data terminal equipment DTE which sending join and receiving join over the unified technology. Following are the five step of information communication process management:

• **Processing of Data:** Collection, verification, validation, sorting, formulating, summarizing and tabulation or graphical presentation of data all these process transform data into information. Specific designs follow the entire process of data and information transformation and communication in the organization.

• **Processing of Transaction of data:** Once data ready to use for business transaction that will disseminate within employee for its further processing on it depending on the functional requirements of the process of information management. Transaction on all level of storage process as per the structure of organization.

• **Processing of application:** Application processing is needed to understand the literacy and awareness of employee to use such application for operational purpose of organization. With proper training and session performance can change for the growth to organization. All system application must be updated with the compatible hardware and software in client and server system to communicate well for further process.

• **Processing of System:** all the system which need to update the require data to proceed further use of business process transaction. These processing particular system for the commercial use has to be maintain with right sources of data and monitor its authenticate usage for optimum use of it. Also two or more system from different department can aligned together to u

• **Integration of enterprise application:** Organization combines and integrates the functional system to make the easy use of centralized database for organization processing. Application of supply chain management, customer relationship management and human resource management integrate with each other system for related information to process for business transaction.
4.3.1 WORKING OF OLAP

Online Application Processing is used in complex decision making process. System based on the various methodology techniques for analysis such as Drill down, aggregation and ranking, Decision support system, Roll up system, data processing system are ensures the filter and evaluated data from OLAP system. It can be presented in 3D or in single format. Two major elements connect through network over local area network or wide area network to retrieve data from server to client. In the Server database stored in hidden pattern and trends in the data. It’s consist of more than thousands fields with certain patterns depending on the relationship between the system. Quality, Product or services and Customer segment which display in the entire processing of multi dimensional system of enterprise application. The component present different dimensions of database structuring and rapid access over the network and tabulation form all dynamically connected with x, y, z dimension in spreadsheet using drag and drop options. Managers extract the information about the database and used the same in design to identify the meaningful and effective structure based on management hierarchy and need of information. It gives depth search evaluation process on certain processing on database for desired output. OLAP consists between client and server database manipulate by RDBMS. Following are the tools of OLAP:

- Congnos
- Micro strategy
- Microsoft analysis services
- Hyperion
- Business object

OLAP is the system which added value to enterprise world for more accuracy and effective decision to extract from the processing. Application has many integration processes which defined certain procedures to achieve desirable output. Choices are mainly based on the selection process and approach of management to work for organization growth and retrieve profitable combination of meaningful information.
4.3.2 TQM OF INFORMATION SYSTEM

Total quality management information system is design which mainly focuses on quality management process. It ensures verifying maintaining software design and its architecture appropriately control the process of entire structure of management to adopt the quality of output from the sources managed in system. The objective of the entire process is only to drive and extract quality product from production process. Quality only possible to achieve when processing step one to even last step has monitor and evaluated with complete information and by using analytical approach to identify best option for problem. Total quality management system has design which considers many other forms of organization needs and new way to perform managerial task and innovation for new product line or service for business expansion. One quality not compromise in production process then next process emerge the more innovation for better service to the customer and maximum utilization of employee knowledge and performance.

TQM pointed out and solve all the requirement of business and identify the need and process further to solve at efficient way of processing. IT plays an important role and TQM manages information system application in more advanced way of communication. It has two phase of technology existing technology and emerging technology, both are used to improve and maintain the quality of performance and output of the information system. Existing technology listed with distributed data processing, object oriented technology, parallel processing technology, database management, network and communication fundamentals where in Emerging technology are internet/Intranet, Electronic Data Interchange, Email and client server communication, multimedia voice, video image processing, artificial intelligence and computer added software engineering application development process. Success and growth ration of any organization is depended on the MIS process and applying TQM system in it will give competitive advantage which monitor and effectively process on the information database. TQM systems mainly provide the information has following a feature which helps organization to effective process in business transaction:

- Quality information consists of value to the business.
- Precise and accurate
- Relatively useful
• Easy to maintain
• More interactive on high level
• Satisfy the maximum source of information
• Target oriented system
• Based on technological interference

4.4 UNIFIED COMMUNICATION AND NETWORK ARCHITECTURE

Unified communication is the integration of communication appliances and technology all together to obtained effective technology out of entire activity. Managers and end users are the actively involved in different technology and communication process to transform business intelligence process which encompass the variety of information and corporate datacenter. It has various techniques to analyze the report and present in the form of dashboard to evaluate the staff performance and quality check on completed task. Communication system is entirely based on the structure, decision authority of managers for business process. All standard, licenses software organized and managed through quality process to progressively work further for data transmission process. Due to IP technology, social network usage, communication system, email, internet messaging sources all these are the unified with technological use for functional information transmission over the network. Manger can use it with own approach of selection and choices for effective result from entire process.

Organization functions many times involve in each other for different relational database of business process all in such situations unified communication work faster and made efficient levels of communication within organization as well as for stakeholders who are connected with entire source of communication. Globally technology accepted in standard form and checked compatibility of the entire work process to create smooth flow for transmission and communication. Emerging technology has computability with communication network and other machineries or devices which are involve in the process of transmission of data over the network.
4.4.1 NETWORKING GLOSSARY
Technology of networking based on common term of its interface. Following are these term which defined networking and its entire connectivity throughout process for standardization and synchronization of terms.

- **Connection**: Networking connection define created synchronization of two source to communicate over the network and that established connection from source to destination for transmission of information, once activity complete connection get dissolved at the same point. Connectivity based on the interface for data transmission through voice, image, text or video, as per forms interface peripherals structure the connection.

- **Packet**: Packet on network is envelope travelling in digital from source to destination. Packet contains header which saved details IP address of source and destination with time details, route address details and data loaded in it.

- **Network Interface**: Interface of network is kind of software to use the hardware. These consist of physical or virtual connection based configuration to complete certain task of computer over the network. A Loopback device is the virtual interface of system on network.

- **LAN**: Local area network is the type of network which maintains the intranet of the organization. It’s logically connected with other system from which data or devices can share within LAN. It’s an entire connection of computer system and devices over same network of intranet.

- **WAN**: It means Wide area network which defines connectivity of computer system and networking devices in large area of network connection. Network setup connected through the WAN then internet is accessible through it and user can communicated over the network with internal and external user of this networking type of connectivity.

- **Protocol**: it is a set of rules to devices to communicate over the network. TCP, IP, FTP, ICMP, UDP, and HTTP these are few protocol types which connection forms in data transmission layer. Protocol is set of rules which in network region where devices communicated and transmit the information through networking protocol interface.
• Port: It is a virtual connection interface which allow server to communicate more than many system and application for accessing the data or to transmit the information.

• Firewall: It is the software program which control and monitor traffic and unknown interface over the network. It also maintain intranet i.e. private network from extranet i.e. internet. Firewall blocks specific ports which are not allowed to use on particular application on serve.

• NAT: NAT define Network address translator. It translate the request on network communicate with relevant devices. LAN to route requests through Internet Protocol address to require backend server.

• VPN: VPN defined Virtual Private Network. It create private network to communicate with security concern. Connecting Different LAN through the internet while maintain privacy.

Many other terms related networking field used for interface connectivity. Above are the few important concepts which used in the networking area.

4.4.2 NETWORK LAYER
Network is area of communication from source to destination for particular task to compete, and this layer of networking based on many other software interface and hardware compatibility of different devices. Data transmission from one system to other based on specific require configuration. Various layers of network connection developed and configure with the intranet and extranet to communication private network system to public network to retrieve data from the server. Network topology is the kind of setup which logically defined the design of communication devices and system application for official use.

4.4.3 OSI MODEL
Open system Interconnection model is creating layer over the network to form communication between server and client system or one system to other on the network. This model based on seven layer model. This model developed in the year 1984 by IOS i.e. international organization standard. Communication process entirely defined in seven layer processes of various protocols and transmission of data packet
from one layer to next layer on data communication. Following is the seven layer name of OSI Model:

- **Physical Layer**: It’s first layer of OSI model, where connectivity of system verified physical interface of hardware and software interchange. It also actual connections of physical layer like, boot process of system, checking BIOS and Ethernet connectivity.

- **Data Link Layer**: It’s a second layer of OSI model. It establishes connection between different nodes on network connection. And adds the header to main message to communicate with next layer of sources and destination address details.

- **Network Layer**: It next level on 3rd layer of network phase where communication developed on the network layer with data packets with header details transmit to next layer at transportation of it over the network. It divides packet parts at destination phase completely opposite way, the way it’s assembling in source phase.

- **Transport Layer**: this is fourth layer of communication phase of data transportation. On this layer data packets route over the network and it acknowledge the receipt of packet transportation from one source to destination.

- **Session Layer**: This is fifth layer of OSI Model, where session created as connection handler and take care to create maintain and destroy between nodes in constant way.

- **Presentation layer**: It is sixth layer of Open system interconnection model. This layer responsible for mapping and creating context on presentation phase. And translate the layer of basic to presentation layer.

- **Application Layer**: its seventh and last layer of this model. It take care availability of resources and data synchronization. Application layer mainly defined and proof process of entire work flow from first level to seventh level connectivity existence.

**4.4.4 TCP/IP MODEL**

Transport Control Process and Internet Protocol. These are the protocol suites which established and maintain the communication source of client to server for data
retrieval. This type of model defined in technical words with number separated with dot in its logical address. These model based on the below layer which helps to complete the transmission over the network.

- **Application**: application layer is based on remote system and take place peering between entire processes of communication. This has created and transmitted data between applications.
- **Transport**: This layer is mainly responsible for communication within process. It also needs developed based on connection on protocol use.
- **Internet**: This is the layer of host and server connection over the wide area network. System connected from one place to another through logical IP addresses.
- **Link**: in this layer network established link to communicate of one node to another node of local area connection. It is topology based connectivity. Link developed on the basis of logical configuration between IP address.

These are the way configuration of Local area and define particular topology for the connectivity of host and server communion.

### 4.4.5 NETWORK ARCHITECTURE

Network design nothing but entire communication system of each node over the network or on internet connection. Different integrated and combined sources of communication between host computer and server system. All phase has defined different devices and protocol as per the communication process. Network architecture mainly configures logical address of communication and builds a systematic pattern over the network between client and server for data transmission. There are terms of network technology and application system as follows:

- Gateway
- Bandwidth
- Router
- Wide area network
- Value added network
- Data conferencing
- Integrated service digital network ISDN
- Teleconferencing
• Video conferencing
• Data conferencing
• Electronic data interchange EDI
• Blue tooth
• Electronic data interchange
• Email
• Voicemail
• White boarding
• Instant messaging
• ISP Internet Service provider
• Wi-Fi
• VPN
• VoIP
• IP PBX
• ISO International Standard Organization
• ATM Asynchronous Transfer Mode
• NOS Network operating system
• NIU Network Interface Unit
• BER  Bit error rate
• Network topology
• 4G Forth generation
• IEEE 802.16

Such networking term are mainly used in unified technology of organization. Unified systems collectively function with data, voice, video and mobile application to improve the performance of business process for further profitability and achieve success in competitiveness. Different technological system collectively work together to perform particular activity of organization and combine the communication medium to transfer message from source to destination in some other medium of communication. Such program unifies it automation between device communications into effective human communication. Its real time communication over the network and develop the integrated communication system. It is very useful technological advancement to improve the communication for the business. And it has ability to
connect globally for the market for product and services. There are few elements of unified communication system

- Internet
- Email
- Voicemail
- Video conferencing
- Short messaging service
- Telephony
- White boarding
- Instant messaging
- Network topology
- Software programming application

Communication enabled business process automated through software function correctly within lesser period of time to process for business process to improve. It also provides alert system in the process due to any kind of deficiency emerged in the processing flow. Human interaction is important in system but its most of the task are automated in its system. Particular alert update the user that system asking for something more in specific area of organization and user easily track and provide needed element to the system to complete the activity of business process.

4.4.6 CLIENT SERVER ARCHITECTURE

Client server architecture is the basic structure of DBMS. Client server model is the server host connection to transform the information over the network. Structure of DBMS depends on the network topology. And request sends to server for certain query or data to access server respond to each host and deliver the need data or information based on the respective access defined to requestor. These all activity is automated over the network and computerized. Client is the node or host on network which connected to main server through the configuration. Servers are powerful computer to store the database and support too many other workstations over the network. Different server is aligned and monitor on network to separate with many other defined architecture. File server, print server and many other servers managed for access of user. Other type of network structure is peer to peer network where all nodes are equally important for accessing data from each node. each node is
responsible with its own functionality. Client server architecture is two-tier structure. Client server’s best example is the internet.

Web server work as server and all other nodes are workstation. Communication in client server structure defined specific communication process within client and server based on the configuration of needed protocol over the network. At present all the web access system based on these basic architecture of the client server communication system.TCP/IP, OSI model of protocol in these communication based on the operating system of host or server system.

4.4.7 DEFINE DATA TRANSMISSION
Computer world is full of encoding and decoding factor of data transmission. This transmission based on the binary process of data patterns of digital. And all the Binary coding system use 0,1 number for coding decoding system. Data transformations from one system to another basically convert data files from connection layer to application layer. Transferring process of data over network has many different phase of network level its procedures mainly define the specific structure over the network and entire system complete the process of information transformation from one system to another.

4.4.8 DATA COMMUNICATION
Data mainly communicate over the network based on the signal form of communication. Converting signal from analog to digital depends on geographical area of computer topology. Data communication is exchanging ideas or information over network, data electronically transport with the containing patterns of packet added source and destination details with main data and communication between these sources to destination happened due to the protocol which defined compatibility of communication. It’s configured the logical address of communication or needed physical connectivity between source to destination of different nodes and server. Ethernet cable needs to communicate over the network. Transformation of data provides Back end process service and front end service to get access to the client system. Client to talk, click to chart, click to video and many other messaging functionality made the use of these advanced and new data transformation for communication.
4.4.9 PRESENCE OF UNIFIED COMMUNICATIONS

Unified communication tools improve the automation feature of ACD automated call distribution and IVR interactive voice response. These unified communication defined collaboration of information and communication system. These system types changes depending on the changes of organization technological setup and management scope of communication. Technology is important element of unified communication system. Presence technology has many form of communication of messaging ways through email. Internet, chat messaging system, voice over mail VoIP, many other messaging apps in the market for communication these all unified system which are based on technology and information. Understanding audio, video and web, conferencing are the communication medium of transmission media. Modern enterprises are interacting all over the globe and unified communication technology such as UC, VoIP, PBX. Unified communication has following term:

Worldwide Interoperability for Microwave Access (WiMAX):

IEEE 802.16 set of standard of wireless communication standard. It provides multiple PHY and MAC i.e. physical layer and Media Access Control options. This technology supports mobile and fixed wireless application. This available in public place where this connectivity configure for use and even in home location it’s available on demand. WiMAX connectivity provides at a distance 10 km from station with the uploading and downloading speed of 10mb/per.sec. In maximum 135 countries has deploy 455 WiMAX Connection. It also combined businesses with Intel, Google, Comcast, time Warner cable, and bright house network and invest $3.2 billion in clear wire. Deployment of 4G market has increased and management information system and computer technology used the MIS ability to expand for further communication to use. Database system can connect on satellite communication system if user travelling and need to have database access to their storage system. Storage capacity of MIS system has increases and a computer has capacity of digital, voice, image and text processing system. Software is the interface to use hardware to specific purpose. This entire unified communication system used in corporate world for effective transmission of information all over the world at user needs. Based on UC complex plans are easier to deal for business transmission as all contract and documentation can complete online. Contents are important and people in the organization have various levels of communication sources in management. Use of these entire
communication technology and get this used from all employees who are part of project will give effective result of performance.

4.5 DBMS AND ITS COMPONENTS

4.5.1 DEFINE DBMS

Database management is the centralized storage system of the management. It’s control centrally to create store and generate new structure of information system. Database has different design based on the nature of business and size of organization. Structure and different transaction files, database managed by respective departmental managers for modification in matter of data and information. They can discussed structure with technical expert for further configuration as per the require segmentation within it. And approval of access can distributed further through online communication with respective manager and department of specific function. DBMS reduce the redundancy concern as its monitoring and configuration based on relative fields which will not allowed data duplication in specific area. This system managed with confidentiality, integrity and in consistence way of its communication. Database mainly evaluate the structure based on the types of data, levels of management and kind of data size and relevant information added in storage system. Its models are mainly conceptual which is independent of the application model. DBMS has various modules in it. Each element on DBMS has its assigned role to complete. Compatibility of Operating system checked with nodes and server to sync for further communication. DBMS is continuous process of workflow where new data captured and added in storage on accurate place of concern database, data source can be external or internal and database defined many others sources over the network. Data further sorted and distributed ion functional database, some selected database access as reports and system generated advice on network as newsletters or guideline of DBMS.
There is much other view of DBMS (Figure 4.18). Logical view of database mainly defined with its schema and sub-schema fields. Logical view of database is format of data center and defined how exactly organization connected and communicated with each other and with stakeholder over the network. Physical view of DBMS is storing database and organize database through different model which has its functional structure namely Hierarchical Data model, Network data model, relational data model. Defined name of model is used in different organization based on organization setup, size, and nature depending on the need of organization.

Object data based model is mainly structure on the base of main objective of the organization. Model application and designed mainly defined the way management want to mold their business on specific direction and what goal planned to start these industry. So structure model or object can be different but processing of DBMS will be always give success of accuracy and effective use of DBMS by management. Certain rules set to management to communicate over the network for processing business transaction. Following are the steps of DBMS, Design process, Data analysis, graphical presentation, relational identity.

**Design process:** any database first decision will be its designing part of its process flow. Its input flow will give the desired output from DBMS. How the data will be
communicating over the network and how it will become more useful to user through the process. Design layout will be the concept of functional responsibility to flow between respective departments as per their role and responsibilities. Step by step procedures defined which decide specific process.

**Relational identity:** all these information system communicate with each other on defined relationship between the process and management hierarchy. Identity defines the specification detail of particular field and its area of functional department. Normalization is the process of entire group of attributes and entities. DBMS has two way table form and in five form of normalization. Group of value will never forms at intersection. All data in DBMS will in form of management and database are effective to control the system performance.

**Data analysis:** analysis is mainly based on the functional process of evaluation part. Collected data which is stored in the system and analyzed further for the data transmission and attributes will define the entity of department function. Evaluation process of DBMS data analysis will be for its accuracy verification of attributed and fields. Its security, access, read and write, delete access will assigned to employee as per management policy and analysis of data will also done by respective employees.

**Data Store:** Storing data on DBMS is the kind of process to fill the input and store the database system. Collected data will store in functional database. And before that sorting will decide which data must be added in which filed of its related attributes.

**Data dictionary:** it is kind of databases which store the specific words or phrase which are uniquely used for DBMS and corporate use. And it’s available to all the users. Technical terms and corporate terms which used on communication level of database has to be stored.

**Data Interrogation:** Specific data selected and copied for processing such activity called interrogation in data identity. Further step of query processing to take print or copied the data. Entire value of data has to be verified before it’s added in database for further use.

**Data updating:** Data need to update in system periodically by research team, functional team or employee who are involve in this process of DBMS flow. Following information needed to update the database, value of data, description of data, present value of data, changed value of data, processing value of data. These are the steps of updating database. With this processing part of DBMS further its defined the components of DBMS
• **Consistency Control:** Everything in DBMS system need to be consistent as all process set to follow for particular task to complete in the organization and all these control system has to define control over the abundant information system. Control on economic level, control on process level and control on management level will maintain the consistency flow in the organization.

• **Transaction Control:** sequence of the process flow and operational activities are the component of DBMS that transaction control need to defined ability and modify the records depending on the business process transaction. Database form on certain changes which will be permanent in system but transactional will roll back as per information need to employee for business transaction.

• **Security control:** Database management system where employee assigned with certain permission to access function and defined database on which they need to perform further activity. It adds protection to the system. Not everyone can access anything form entire database, also database protect from public network through the firewall configuration. Certain rules and policy set for specific data access over the network.

• **Language interface:** its main language configuration on database as standard one. And access given to user on workstation to customized their language option for their preferences. So interface of machine language will be same universally to all system i.e. binary language and application base language change its flow through the communication over the network.

• **Recovery control** : anything worked on the database system has mode of recovery option if data loss through any insufficiency of storage reasons and respondent can send data for query access, based on logs recovery of data is possible

• **Data catalog management:** data dictionary which managed the logs and process as data catalogs. Relationship about data mainly the components of the database everything added and computable in logs file with access time, modified time, created date and time all attributes are defined in the one place of catalog in database management process.

• **Storage control:** In DBMS storage of information system, data collectively added, sorted based on functional task and disseminate to the specific
employee with permission to them as defined by management. all mechanism process of database is only for the purpose of staring data.

- **Data processing control:**
  This all system based on the processing flow control which will define where to stop and when to start for particular data modification or updating process at backend of DBMS. Whatever questions to user in regards to the technical support or about permission and access concerns will all defined structure of processing:
  - **Query processor:** Certain instruction set needs to be modified and alter for reason with the help of data dictionary. Query processor sorted data with the dictionary based details and uses catalogs to verify the query details. Query resolved at the level and responded to the user with change in system of DBMS.
  - **Run time database manager:** It handled the DBMS access. And maintain the integrity over the network recovery options backlog performance all these process defined security through the run time database manager which has all the processing activity details. Authorization and command process are the subcomponent of the DBMS. Authorization verifies the authentication levels assigned as per the management approval and decision. And command processor allows the query processing system of access information rights. This all process based and controlled by software module.
  - **Integrity checker:** It verify the reliability of information system over the network as well as it checks the truthfulness of process of accessing information over the network.
  - **Scheduler:** it is created the situation where different users working on similar slot of data. this logs the time in and time out of the process of each login detail over database.
  - **Data manger:** data manager is the important process of handling the database over the network and processing of recovery of different modules of data to the management. all the process of data creation, manager and data recovery or distribution over the network are mainly
defined the task under data manager process of controlling entire activity on network.

- **Execution process:** user working on store data and SQL commands the programming base query DBMS execute the entire process with the support of technical connectivity and logical connectivity of system.

- **RDBMS Component:** relational database management system where data structured in the database table, fields and records and provide relational connection between them to form different patterns of information which useful to various functional department. This database also based of the SQL query language to perform entire software program. This database has sub-components: Data structure, Data integrity, Data manipulation process. Relational database connect with the process relationship with other processing system of various database of same organization.

### 4.5.2 DIFFERENT MODEL OF DBMS

- **Hierarchical database model (HDBM):** This model define database in stepwise process and put down hierarchical levels one after another. This model can compare with the structure of tree, as tree has root, branches and leaves likewise HDBMS is having record, nodes and fields. Step start with root, root has many branches and branches has leaves and leaves set again connected to some other branched of same tree. HDBM also logically defined the same process where fields are recorded and changes as per the node direction of process. its represent pyramidal structure. Common data was introduced by IBM in the year 1968 i.e. Information management system.

- **Network database model (NDBM):** This model interconnects the different entities of an organization. This model introduces by blocks and these blocks defined entities and record. All blocks combined together and form database. NDBM uses blocks, area and arrows to present the NDBM. it logically connect many to many relationship. It helps organization to analysis the report of sales performance and sales recovery status.

- **Relational database Model (RDBM):** it is the two dimensioned table. Number of component and name of component defines the data in the table. These activity proposed by Dr. E.F.Cod in the year 1970. It has records in
rows and column. Information is available in database but all function departments have different use of same information of database. Extracting relate information which need to use for further processing system. Rows states individual records. These models consist of three operations. Project, join and selection process. It define the database in two form i.e. table and relationship between it. Relationship of entire database mentioned in table to its further processing of data.

These above three models have difference in its structuring functional acts, while designing of the database, relational model widely accepted because it has reason i.e.: Non procedural request in these models no structural dependency found. And no procedural language needed for this model. Data independence: as it’s mainly based on relation model so there is no structure available of data so data is more independent. Simplicity: it’s based in tabular form so easy to understand. All the request on database must be accurate and complete. Principle of normalization used in the relation theory of database. To handle these model need high capacity, large storage place and access speed.

The MIS main foundation is database and even center point of all connectivity of process also DBMS used for decision making. Database model NDBM, HDBM, RDBMS plays an equivalent role in MIS. Database approach depends on the data processing efforts and approach of conventional system. Due to well formed database and processing speed storage capacity over the network it’s easy to access MIS for business transaction. Following are the needs of MIS which considered while decide the design of DBMS:

- User interface is easy and friendly for accessing data
- Data is easily available over the network
- SQL handling query from user to resolve it.
- Output design consider before consider any form of DBMS
- MIS is become open system to user of organization
- MIS distribute information over the network to process on functional task.
- Management has to consider the nature of business and resources for DBMS
- Hierarchy of relationship and network connectivity defines the MIS DB.
4.5.3 SECURITY OF DATABASE ENVIRONMENT

Security mentioned the number of measure to protect and secure the database over the network. Server needs to be uploaded with advance operating system and updated antivirus so it will secure over network to entire database from malicious threads and attacks. It has wide scope to protect the security system within database environment. Database has to protect data from various steps like accidental loss, unauthorized access and corruption of data due to technical issue or failure of certain process. Secondary concern based on the interference to the point of denial of service while accessing data over the public network. Security reason organization spending amount of money in billions and millions of dollars annually on database protection security cost.

Organizations also maintain session to spread knowledge related the awareness between users to protection of system over the network. Today world is globally connected through networking technology and communicate on various forms to complete the transaction where security plays an important role. Specific principles can develop over the network to protect it from the viruses and threads. Entire area of implementation about hardware, software, application and maintenance administrate by management regularly to build secure network. All transaction processing decided by the management for functional task of particular and access of public network has abides with operational activity so due to collusion on network or while accessing there may be some error which can be major issue of database if there is no support system to stop and allowed permission wherever need to control. Such protection will build the strong database. The involved element in database and its processing system includes the server, schema, table, application, reports, charts, field, images and many other application usages. It will be responsibility of security officer and chief information officer to take relevant and accountable decision to keep the safe network with his decision of security concerns. Rules of confidentiality, Integrity and availability these are the basic things management has to be follow on electronic data processing data over digital network.
Figure 4.19 Database Network Securities

Source: Client-server computing for technical professional, by Hart (1990)

As per (Figure 4.19) technical management team has to keep complete secure connectivity system with the entire logically connected area of organization and to do that information technology department has its process of workflow which defined security concerns and its importance to implement over the integrated database system.

Databases mainly flow with the user access in two area of network intranet and internet, both has its different logical address to locate the specific node on the network. Security concern has different team of information security team in organization and these teams monitor all logs and evaluate the right flow of communication happening on the network. They also check system venerability report and monitor periodic check for security reason. There are not only technical issue matters for creating problem of security but its responsibility of employee too. Whenever they are leaving their desk they must logout from their system or it must lock for time being. for the security reason such small rules play an important role

Many other concerns are affected Information security procedure need to take care of following concerns by employee and executive of information system:

- Never share password and login details to anyone.
- Lock the system whenever it is not in use.
- Privacy rule must follow throughout the office hours consistently.
- Must cover confidential matters on computer by adding additional security.
- Everyday system must shutdown properly.
- Maintain the system through periodic antivirus update sync with server.
- Windows update policy and license version must verify.

No technical support can save the insecure network. Number operating system users increases and hundreds of applications and software implemented in the organization, thousands of problems emerged due to unauthorized access over the network. Accordingly number of interaction will increase over the network. Such situations need more flexibility but secure access rights on database. Everyday managers and other employee accessing application, these multiple access also creates the issue over the network database. Central administrated effectively process and managed to control the database and system where identity, authentication, authorization need to communicate the application through which system login logout time saved in the log register in database. Security function is the key point of any organization system and to manage frequently will secure the network area and even database. Department of information security annually check antivirus and operating system license copy, monthly maintain and aligned the datacenter activity for backup and once check RAID configuration system, weekly scan the workstation and finally monitor the daily log reports to evaluate and analyzed. All such activity will keep security system alert and active which protect database in network scenario of organization.

4.6 DATA WAREHOUSE STRUCTURE, DW ELEMENTS AND TOOLS
4.6.1 CONCEPT OF DATA WAREHOUSE AND ITS STRUTURE: In the year 1980 IBM researcher Paul Murphy and Barry Devlin developed the business data warehouse. This concept emerged to store the database in central location and take specific decision and select a best possible alternative to implement in the business process environment that structure where data flow for operational activity through the entire search analysis and evaluation on collected options of different database at one location as report or process to implement.

Data warehousing is the wide concept of information storage. Different sources data collected and analyzed with many database systems and model to
retrieve desirable decision support system. Enterprise database managed at one place to reduce multiple decision support systems, for further easy resolution entire support system of different database collaborated and operates independently to retrieve enterprise solution for organization problem. Information accessing, sorting, processing integrating modified new data through data marts. It's central repository of informational data.

Data warehouse (Figure 4.20) structure mainly based on two types Data mart and Data farm. Data mart is smaller part of data warehouse. Data mart particularly defined department. Data farm is the location where all these computers and server placed with other peripherals. Data warehouse mainly based on the two approached, Dimensional approach and normalized approach. Dimensional approach is also known as Ralph Kimball’s approach where data warehouse should use star schema and Normalized approach also known as 3NF Model i.e. Third Normal Form which mentioned to Bill Inmon’s approach using E-R model. In dimensional model less use of relational database model. In dimensional model facts are transactional data. It’s
easy to use and understand. Retrieval quickly possible through the approach, its structure divided into measurement-fact and context-dimensions. Facts relate with business process and operational system and dimensions surround context about measurement. In normalized approach divide data into entities and forms table in relational database. If it’s implemented in big organization it generate dozens of table which connected through the web link, each create entities transformed into separate physical table. This is very clear approach to add information into it. Disadvantage of this approach has heavy number of tables will difficult to identify sources of it. Normalized and dimensional both approach states entity relationship diagrams whereas both contains combined relational table.

**Top down design:** In normalized approach top down model use to store the data. Data mart contains the specific departmental process with dimensional approach.

**Bottom-up design:** Integrated data mart provides reports and analytical process for primary implementation. Data warehouse bus architecture where data mart shared the confirmed dimension and fact.

**Hybrid Design:** Data warehouse combine the enterprise resource planning and business process. Generating data and process on it in different form by applying certain model and store the obtained designed, this is Hybrid resolution saved in data warehouse. This design allow to data warehouse replace with master data management.

**Data Vault model:** This model consists of top-down architecture and bottom up design model, its actual flow of communication process in data warehouse. It’s obtained the business purpose.

**Data Mart:** It focused on functional area and segregated departmentally. All functional area in organization mainly inter-related for different activity on operational network. Source of the data mart is internal source, central data warehouse, and external data. It is the subset of the data warehouse. Following are certain points which differentiate Data warehouse and Data mart.

- **Scope:** DW is having enterprise wide data and DM is department wide data.
- **Subject:** it’s multiple subject area and DM is single subject area.
- **Setup:** it’s difficult to build and DM is easy to build.
- **Time span:** Take more time to build and DM take less time to build.
- **Storage space:** its larger memory and its limited memory.
Types of data mart

- Dependent data mart.
- Independent data mart.
- Hybrid data mart.

4.6.2 DATA WAREHOUSE ELEMENT

Data warehouse is basically based on relational database management system. Operational and transactional processing data are a part from the warehousing processing system. Entered data in data warehouses separated department wise cleared filter and sorted depending on the model defined as per structural changes to it. It next transformed to process further summarization of data mart. Volume of database managing in process and complex flow of data in data warehouse structure maintain due to its structural elements and processing system.

Data warehouse Database: It is important element of data warehouse. Its complete enterprise data and implemented on relational database management system (RDBMS) technology. Wide range of data captured from different sources and RDBMS optimize for maximum processing. Query, attributes defined, data aggregates, multiple joins and drill down techniques use different approaches to data warehouse. Multidimensional database technology, data clustering, innovative approach and different configuration at connectivity of table, field and records of database all are related to each other for business processing.

Database mainly used to share on network it need many models of shared memory, shared disk and shared nothing. Multidimensional database enable online analytical processing tool that group jointly categorized the data query, reporting, and mining tools. Data warehouse database mainly based data farm and data mart, these included everything of data warehouse concept and entire concept cover about its database. All different data mart are subject to store the data department wise and data farm where these data mart inter-related concept of connectivity defined the processing on database. All processing of data mainly form data mart for further processing on it.

Metadata: This is about data warehouse. It’s further defined into Technical Meta data which carry all maintain task of data warehouse. Business Meta data which contain all enterprise information stored in it. Meta data software use interface between user and
database. Meta data repository management software runs on workstation, this use to map the source of database, generate code for transformation and control moving database into data warehouse. Meta data gives easy scope to understand perspective of information to store in data warehouse. Meta data is one source of information and all other access information stored in the Meta data repository system.

**Access tools:** Basic principle of data warehouse is to serve the information to take business decisions. It’s used for strategic decision making. Expert of system users are access and use this tools, Front end tools used to interact with data warehouse. Following are four type of toll which categorized here

- Application development tool
- Online analytical processing tool
- Data mining tool
- Query and reporting tool

Access tools are supportive interaction connectivity provide over the process in data warehouse. Reporting and query further divided into two groups i.e. reporting tool has two phases reporting tool basically used to generate the report and report writers manage designed tools for end user and managed query tool. Managed query tools support user from programming languages complexity and added Meta phase in between user and database. All these reporting part work on easy flow access and on click process. Due graphical development in visual basic and forte and many other application development of OLAP tool access database system of Informix, Oracle all integration based on the dimensional data model. Application, software use in database with access tools to achieve right decision for the organization. With the support of access tools companies can forecast sales target, production capability, product quality improvement, marketing strategy and many other multidimensional design and evaluate the best for the organization. Information is everywhere but ability to use information in right way at right time that’s the management skill and control over the technical processing all over the data warehouse operations. To achieve effective decision through discovering new patterns and format for innovation and profitability to organization by data mining in data warehouse using artificial intelligence, statistical and mathematical tools and techniques. Access tool to get appropriate information from entire data mart is the skill to analyze the right way to
access it so access tools also support in some in built program to give ready options available to extract reports from entire data warehouse system.

**Data mart:** Data mart defines as partition of data in subjective to use for standardize way to interact in organization. Some time it uses option for data warehouse in few organizations which are unable to afford the cost to build the data warehouse system. Data warehouse is the integrated data. Data mart is summarized and aggregated data for department wise detail structuring and information in it. Department wise database server can be maintain separately even in regards to physical location. In rational database OLAP technology creates a dimensional design which is differentiate the Data mart technology. Data mart is dependent data mart in its form because the entire data source is the data warehouse for data mart. Users access the data mart for end number of details with available tools and models of process methods to generate reports or to extract the reports. Data warehouse maintained high volume of data structure and models and various users are extracting data with the help of enabled technological tools which further departed in subjective form for departmental database which are depending as per the functional task of group of people. Data mart states as independent and this type of implementation gives solution to enterprise business problem.

Data integration in data warehouse and data differ in subjective form in data mart positioning define the entire process of database management. Independently data mart use not found in enterprise scenario as environment developed data mart for specific functional use and relative connectivity less found in these structure of data processing whereas data warehouse has developed data farm with number of department wise database namely marketing database, production system database, operational database, human resource database, all such database combined form of data mart for problem solving or to generate specific reports from operational function and external source. Data mart is the important element of data warehouse and effective use of data mart structure will grow the transmission of information system.

**4.6.3 FUNCTIONS OF DATAWAREHOUSE**

- **Data warehouse management:** Concept data warehouse is the wide in the scope and challenge to maintain. It’s much time bigger in size than operational database. Data ware administration involves many things of collection of data
from the various sources, managing data mart and access tools of data warehouse. Major part of any data warehouse is the data

- **Data warehouse access tools:** Data warehouse has defined various access tools to use the data sources from data warehouse. This complete data farm is contents of many data mart and to read access data with different dimensional retrieval tool needed, to present such report and designed it for best form for business profits. Drilling down the information for suitable use of reporting system and objective output from entire processing of data would possible with advanced access tools such as access tool, retrieval tool, database reporting tool, data analysis tool and data mining tool.

- **Information delivery system:** This system mainly serves data to other data warehouse and end users which are directly connected with main database. To create reports or to know the enterprise details data mart information, information delivery system plays an important role. Reports, analytical view and operational system everything needed to reach at right decision. World Wide Web is the example of wide data warehouse where end number of end user connected at a time and access the information to complete the task with desired result. Maintaining such data warehouse has typical process of information system and it completely defined within the boundaries of data mart concept to store the information and between its relational concept to view and analytical power of management. Volume of data and information over the data warehouse process is defined by the method which present in the procedure to resolve the difficult situation. The client-server relationship has basic concept behind this data warehousing processing structure. Individual need information and its available easily on click. It the ability of the user to search right source option, identify effective tools over internet and in database, process of delivery information is the end user interface asking for query over the web to database and database respond with optional data link this process is the example online analytical processing which has various automated tools of data mining. Data warehouse benefited to user due to following reason of quality of database, time saved over the web, quantity of database, decision making business processing capability, object oriented
system, easy access on network of various public network and defined privacy tools on private data warehouse scenario.

- **Data warehouse Versus operational system:** Operational system mainly based on designed flow of process of normalization and entity-relationship model. Data normalization ensures the data integrity in business transaction process. Operational system based on business transaction store many tables. Relational database effectively processing with amount of data sourcing and delivering process of relationship between the tables. To maintained and update the storage device safe and maintained the storage of operational system need to monitor and eliminate unwanted data and procedural model which can make database and operational system update for effective use of end user. Operational database proceed through OLTP with the use of row oriented database management system and analytical database proceed through OLAP with the use of column oriented database management system. Database. Like operational system database data warehouse manage infinite database which implemented through ETL (Figure 4.21) process which transform from operation system after certain regular time gap. Data warehouse is the central repository information systems which stores, sorted, defined and transform it into multidimensional design for user query and for further evaluation.

![Data Warehouse Architecture](image)

**Figure 4.21 data warehouse architecture**

*Sources: MIS Managing Digital firm, 10th edition – PHI learning (2007)*
Online transaction process OLTP versus Online analytical Process OLAP

Online transaction processing system mainly use for sourcing data to data warehouse and online analytical process use to evaluate it. (Figure 4.22)

![Diagram of Business Processes, OLTP Operations, OLAP Information, Business Data Warehouse](https://datawarehouse101.info)

**Figure 4.22 Data mining tool**

*Source: MIS Managing Digital firm, 10th edition – PHI learning (2007)*

OLTP processing on query on rapid way, data integrity is the main source for many users response, in fraction seconds many transactions managed effectively in multiuser and multi access process of query to collect the data and for finding resolution the problem. It designed in large environment for wide transactions; INSERT, UPDATE and DELETE are the element process. OLTP maintain updated data in schema form to store transaction processing details in the entity mode basically in BNF Design model. **OLAP, online analytical processing** where queries are very critical and involved comprehensive process. Its responding period is the effective measures of its analytical view. It’s basically use in data mining tool. It combined multidimensional schema and historical data. OLAP and OLAP both these processing tools are important element in data warehousing process to complete the transactions and transmission of query in response to effective solution and structural database system to be managed. Data warehouse is the collection, storing processing of different sources data and make it available for querying and analysis.
Data warehouse is the complex structure managed with the tools and database in small form of functional processing activity in such a way so it will effortlessly use for querying and data analysis. Data warehouse not the reason for data usage but it maintain the huge size and old data, separated in different logical units namely data mart based on its departmental activity involved function to integrate the information which are from different source and transform data in live source from the stored data warehouse for reporting and analysis purpose of enterprise or for end user support. Data warehouse is the enterprise data warehouse where many reporting and data analysis uses this source to complete the enterprise transaction and main component transactional processing system is business intelligence.

Data warehouse are the repositories of integrated data from source to destination for query solution with analytical view. Reports can be schedule report or reports which analyze sales margin, marketing strategy, production range or human resource management scale in particular period and many more in enterprise environment. OLAP approach used for multi analyzing of different sources and perspective of the different data which mainly operate in three ways roll up, drill down and Slicing and dicing. Roll up here is the consolidation process of different data sources for managing entire data warehouse system. Predictive analysis is identify, qualify and forms hidden patterns in critical mathematical model to use in further processing of business transition for decision making of certain process. It is different form OLAP and OLTP which are based on historical data analysis and fasted in speed of reactive in nature whereas predictive analysis focused on forecasting plan. Such analysis applies for customer relationship management.

Many access tools applied to use the data warehouse processing system. These software tools mainly involve in ETL processing i.e. Extract-transform-load. It uses data inter-relationship, access level and management staging rules to function over the entire processing of information system in systematic structure of data warehouse. Data extracted from various different source of database on staging rule, inter-relationship of data from different sources are combined in central repository location where transform data in operational database. These integrated databases further summarized or form in reporting database and arranged in multi dimensional structure which display fact with many different factors of aggregate database. Such design called star schema which interconnected in various database table. Data warehouse system mainly defined to the information storage system which cleaned, transformed
and segmented for data mining process and online analytical processing for research and decision making process. Data warehouse has various components and data dictionary one of them to store the patterns and methods which combined and integrated for specific reason and certain data forms which retrieve out of data analysis. Extract data transform it and load on specific location of data warehouse is the essential task to manage in periodic time based on the functional procedure. Data based on repository tool of database and retrieve the information for data analysis to transform the further process of Meta data in the data warehouse. User search for certain data on database by sending query and source of transaction system find these query with contents of its header to provide further transmission of information to present data as reaction for their query.

Query resolution reach at the satisfaction level of the analysis it reflect in the output processing system which transform decision making in the real database use and its result for the organization growth and on its transactional processing system. Data warehousing tools are always benefited to user in any form of its processing Meta data and integrated database. It improves the quality and focused on the rapid way of transition and communication. Add value to the processing system and generic data warehouse and data mart includes the following:

- Meta data processing
- Data integration
- Use of access tools
- Different architecture
- Different integration technology
- Managing Data mart
- Operational database
- Ensure the durability
- Manage the maximum use of analytical view
- Control over the process through security policy
- Integrity of data sources and confidentiality need to be maintain.

Above all are the functions and elements of data warehouse processing system. Which mainly involve in the process, Collecting, searching, analyzing, processing, integrate and reporting function in data warehouse where data mart and data farm entirely cover the concept of data warehouse. The process of data warehouse where extract
data from the different sources, transform them and load them into data mart for further use out of it. Today companies which data warehouse processing adopted the rapid change and update the data sources table column, refresh their schedule and measure data usage performance, such companies are growing in the competitive world and create monopoly for their product and services all over the region where they enter with such plan and strategic information database.

4.7 DATA MINNING AND E-BUSINESS TECHNOLOGY

4.7.1 DEFINE DATA MINING AND ITS FUNCTIONS

Data discovery and innovation in patterns from different data farms and knowledge discovery process of researching and analyzing huge set of relationship, this defined data mining is. Reason to perform data mining in various forms to extract the data from different sources and drill down the information at that extend of the data source where it emerged certain pattern of new data, data form or design in data mining. There is trend behind each database before it forms in particular format. Data mining process has extracted and identifies trends and many other patterns which improve the results of many different departmental targets. Now a day software companies producing software for text analysis, text mining, visualization and information retrieval.

Data mining is the tool of data warehouse process which is interdisciplinary subfield of computer science. It’s based on computational form discover new patterns or identify existing design which hidden in various form in large data. Data mining method are involvement of artificial intelligence, machine learning, statistics and database system. Main purpose of data mining tool is to extract the information from various sources and transform it into form to use further in business process transition.

Data mining process are as follows:

- Raw analysis step to identify the different sources of relative subject.
- Involves database and data management aspect from selected source.
- Data pre-processing step
- Assumption of consideration
- Related and interesting matrix
- Complexity consideration
- Post processing of new innovation
• Visualization process
• Discover certain pattern
• Online updating
• Knowledge discovered pattern to use and implement as KDD

The data mining is automated and semi automated tool which use in wide area slot of various data warehouse at a same time. Clusters analysis and dependent rules of association, detection are involve in data mining process. Data mining may extract data from multiple groups in the data and obtain right prediction for result of decision support system, further it process data in KDD which know as data digging, data fishing and data snooping refers using data mining in specified area of population. It involves mathematical and statistical process discovers pattern and tested hypothesis test in wide population. In 1700s Bayes theorem which is identifies the data pattern and regression analysis in 1800s. Due to technology usage data collection, storage and manipulation ability are growing fast but also it emerge the solution for complexity and hands on tools for data evaluation and discoveries in computer field such as genetic algorithm, cluster analysis and neural network in 1950’s, decision rule and decision tree in the year 1960’s, support vector machine in the year 1990’s.

In large database it’s very difficult to understand the hidden pattern in it. Use of statistics and algorithm, artificial intelligence, database management and discover the new knowledge of pattern in different data set. Preprocessing is the effective process before starting data mining on particular set of multivariate data set. Target data sets collected and try to find patterns within the time period. Source will always common to its search i.e. data mart and data warehouses. Following are the data mining six steps of preprocessing:

• Different detection
• Association rule
• Clustering
• Classification
• Regression
• Summarization

Above are the steps of pre processing on data mining where pre process plays an important impact over the further process.
• Different detection / deviation detection: identification of odd data records, and data errors which need to analyze through deviation detection process.

• Association rule / dependency modeling: search for dependency between two variables. Many times different variable of study are interdependent with their case and effect of change in both or one of their quality or result.

• Clustering: it’s grouping of similar structure data, discovering the group of data. This will further support to align the data structure of similar group data.

• Classification: it generalizes the task of structure. Before start the data mining process this step of classification decide further functional classification.

• Regression: in this step identify data with minimum error, on the regression base least error data models attempts to find.

• Summarization: it is in reporting form or visualization form of data. It’s set of data which present in the form of summary.

This are the data mining preprocessing tools data mining used in many business processes, medical and surveillance department.

**Privacy concern and ethics:** data mining not having any implication. And in many enterprise data mining practice unethically which raise the question on the way data collected and mining happening over it. This kind of mining context and few cases emerged with question of legality, ethics and privacy concern. Government has enforced total information awareness program to data mining process for data set in government database and commercial data set to maintain the ethical and privacy state of database and data warehouse. Data mining identify the hidden patterns in different data set. Data aggregation collect data to analyze in a way that privacy maintain the ethical and legal boundaries set by organization. Following are the suggestion to make them alert before they start accessing data for data mining:

• Defined aim to use data mining
• Method to utilized collected data
• Who can access the data
• Need to know the data derivatives process
• Privacy and security concern need to confirm with require approval
• Assembled data need to be update

Data altered as per data set need with its functional of the organization. De-identify is one process to know the potential of information it carries for further processing.
There were many cases which filed a lawsuit against the company for unethical practices found to data mining activity which are the instance of policy violation.

4.7.2 E- BUSINESS APPLICATION OF DATA MINING
Data mining is important tool to understand the data pattern and hidden structure which can use in different form for business purpose and company can survive or play a monopoly if they understand the right use of data set through data mining capabilities. Data mining also known as information discovery, data analysis, information harvesting, data fishing, data dredging, data archaeology, need of data mining, knowledge discovery database all these name are concern with data mining activity. This help to organization to understand the potential value of data set and one can use such information for processing in the various data warehouse to transform these into data mart. In this automated information system data can be need for business, web or research purposes.

Data mining extracted data set are ruling decision of many organizations to achieve the growth commercially. Sometimes data rich but information poor because if information not carry any value to it’s become useless, and entire process of data mining consider unproductive time wasted in the process. Data mining function is continuous process of identifying the situation, developing design, initiating action, and identify technology used in data mining. Following are the elements of data mining:

- Decision rules
- Decision tree
- Generic algorithms
- Dependency check
- Case studies
- Artificial Neural network: it’s based on biological nervous system. Its self learning orientation. Real time operation system
- Its functional based data set analysis
- Avoid just dumping data
- Technology used for hardware trend, network trend, computing trend.

The following are licenses software of data mining software:

- IBM SPSS
- KXEN Modeler
• LION Solver, Learning and Intelligent Optimization
• Clarabridge for text analytics
• Angoss knowledge Studio
• Open text Big data analytics
• Oracle Data mining
• PSeven Platform for automation of engineering simulation and analysis, data mining provided.
• NetOwl suite of multilingual text and entity analytics product.
• Microsoft analysis services
• SAS Enterprise miner
• Rapid miner for machine learning and data mining experiments

Data mining tool mainly using data warehouse where data set proceed for data drilling at the extend to extract new and profitable data set from the data digging process. These above various software application of data mining are advance technique to apply in the process of entire activity to drill to data analysis. Data mining activity is part of entire database management system, where management employee or any individual who trying to achieve new data set from data mining process will applicable to the manager decision support system out of the these systematic study and evaluation through different database sources.

**Recent trend of open source data mining tool**

There are certain Open source systems which is useful for the process of data development model and data mining tool for management information system. There is end number of tools available in the data mining process using artificial intelligence, machine learning and other techniques of data extraction. it helps to structure the data:

• Sponsor note
• Rapid miner
• R- programming
• NLTK
• WEKA
• Orange
• KNIME
• **Sponsor note:** A discussion for application creators, data structure architecture. This particularly built the open source Cloud Foundry, Hadoop, Redis, Spring IO Project,

• **Rapid miner:** It disseminated from AGPL open source license, and also it can downloaded from source Forge website where its ranked on number one business analytics software. It also provides function such as visualization, data preprocessing and statistical modeling.

• **R-Programming:** Its free programming language with statistical computing software. It is mainly used for the data analysis and developing statistical software. It added linear programming, clustering etc.

• **NLTK:** It use for data scraping, machine learning, sentiment analysis. It gives the option of customization. It provides language processing tools.

• **WEKA:** WEKA primarily use for agricultural domain. It is free through general public license, it support to clustering, classification, regression, modeling, visualization.

• **Orange:** It is Python based tool easy to use and powerful open source tool which is expertise and popular toll for data mining.

• **KNIME:** KNIME provide GUI mode to combined node for data processing. It gives the features of ETL i.e. extraction, transformation and loading. It’s mainly used for business intelligence and financial data analysis.

### 4.8 DEFINED DSS AND ITS COMPONENTS

#### 4.8.1 DEFINED AND FUNCTION BASED MODEL OF DSS

Decision support systems are interactive information system which depends on the combined set of employee using technological tools to produce desirable decision to use in business transaction. Decision support system is computer based information technology which helps managers to select best alternative for the business transaction. It’s rapid in a process of transmission data into decision. Enterprises always involve in the profit of enhancing quality and reduce the cost while extracting decision through decision support system. In the year 1960’s there was a wide range of information system and with change in time in the year 1970’s special type of information system. New information is more interactive and supports to solve the complex situations. Integrated various type of database and worked in combination of
hardware and software interference. In decision support system input of data and information from other system need to verify and analysis before it start for analysis on it for decision making. Accuracy in information system needs in to confirm through its sources database.

Decision support system is the key element of information system. Decision can be semi structured, structured or unstructured decision based on the level of management with the help of different software and other tools involved in decision making concern which improve the quality of process. There is different parameter to process for decision making system. Decision support system flexible and adaptive as it’s based on computerized procedural which utilized decision rule and designing rules to reach at particular decision. it increase the effectiveness due to accurate decision through complete process of decision support system. Following are the function of decision support system.

- Report based decision suites
- Graphical and textual form of data suites
- It mainly based on the database on mainframe computer and network
- It contains table, chart, trend and tables
- Amount of data searches
- It perform the complex situation even in critical business environment
- Use of many advance statistical software
- Uses spreadsheet with function and advance formulas to analyze the data
- Its more approach oriented
- Decision support system mainly based on the capability of its procedural act
- Its intellectually advanced and choice is the fundamental principle of all
- Implementation of entire process support for problem solving phase
- Its continuous process of information system in the organization
- Management levels are the parallel phase of decision making
- Operational level decision are structured
- Tactical level decision are semi-structured
- Top level management decision involve are unstructured decision
- Decision support system is goal oriented
- Its planned activity of structural based decision
- DSS identifying the opportunity to solve the problem of specific decision
• It is the process of best possible choices

Decision support system is the process based on model as per its function task involved Simulation model and optimization model used for decision making process. There are general guidelines for the process to complete decision making process. There are many data mart and repository system involve in the process of management task. Following are the types of functional model of decision system:

• Report writing software: this model of decision system produces both periodic and special report. It’s typically scheduled in the system for regular report system to provide accurate information. Coded and procedural languages involve such as COBOL. DBMS is the sources of database as a response to user query with specific information. Decision making is the process which summaries the process of effective answer in form of decision out of all the staging of management and decision making process.

• Data evaluation system: data is available in all phase of communication but one need to understand the usefulness of right kind of data use as input to the system to analyze for further usage. All functional department going through the decision making process it may be cash flow analysis, sale report analysis, and inventory or asset report analysis.

• Status enquiry system: to take any kind of business decision, management needs to have specific and right report in hand to give complete status of particular subject or department on which decision has to be made. Enquiry system process for status of operational, tactical and top level management decision.

• Mathematical model: it is stepwise written programming language which give with specific form and this advice content many other physical elements in this procedure. It identify real potential of component involve in the decision making process and all factor are interdependent to achieve procedural growth through mathematical model. There are many program involved in operational activity of management as accounting process and finance programming model produces the expert system.

• Knowledge based expert system model: artificial intelligence is the technology which will study the human behavior and perception, reasoning of behavioral study of human being.
• Group wise multiple decision making: decision making has different approaches by different people, hence discussing problem with employee on particular situation GDSS will give the right and effective decision through discussion. It is interactive computer based communication and GDSS provide analytical view and scope of this view can be used for further decision making.

These are the functional based model of decision making process. With the help of technology everything that collaborates with the technology and database system will useful and part of decision support system. It also available in time and it accuracy play an important role in communication.

4.8.2 COMPONENT AND TYPES OF DSS

Components of Decision support system (Figure 4.23)

- Data management
- Model management
- Knowledge management
- User interface

![Figure 4.23 Connectivity between Components of DSS](image)

• **Data management:** Decision always based on the data which added as input data from different database. Data management is the critical process to maintain, as it needs expertise human resources, technological infrastructure, communication interface and management which managed the entire database management system. Data collections from the various sources, analyze it for functional task, distribute in respective department and evaluate to understand its effective use for business process or to eliminate from the database. Data management will entirely cover the data warehouse system of the organization.

• **Model management:** everything work in management has structure to complete it. Model management managing the process of management and provide access to different model. Model base management system MBMS can be connected through external source of storage database. This model coordinated in DSS processing.

• **Knowledge management:** Knowledge base management system in decision support system is very useful in future consideration of decision making process. Knowledge is the 3rd hierarchy phase of data structure. Data proceed become information and information which applicable and added in database for further use will know as knowledge bank of database system.

• **User interface:** the user interface system which makes aware systems and user from different alert system. Language interface and technical interface helps to support the communication process of decision support system. This model of interface also known as dialog management system with database and model base interaction of user interface elements of user. Interface help to database system to take effective decision making process.(Figure 4.24)
Decision support system is the analytical model to provide effective solution from processing. It will try to innovate new suggestion list from different processing skill and it compile with raw data, previous report and personal knowledge of different manager’s point of view to identify decision. Following are the categorized into five subsystem of decision support system.

- **Data-driven DSS**: Decision support system which drives by data source and for data source both are different concept of DSS but all together here DSS works with data. Data is the important element of decision support system. Data store in database storage and data retrieve from database for specific reason. It’s all computerized database management with different sources of communication for data to use for decision support system. It deploy client server link and web link for accessing data source from the various database to managed and solve the query database or data warehouse which are data farm of organization to use for further business processing. This system target to managers.

- **Communication-driven DSS**: Communication is the interface between database and user to make the easy use of hardware and software application and even help to connect to web server and internet link. It is easy way of formal communication and make easy to take decision on particular topic before this topic call for meeting agenda to discuss. Prior to all discussion basic idea manager can get over on chat system so that they will be ready with certain point and action plan based on the response they received on chat.
discussion. Collaborating networking system and software are mainly important element of communication driven DSS.

- Knowledge-driven DSS: The aim of this decision support system to expand the scope of knowledge to improve the wisdom to understand and perform more effectively. This decision support system interacting with organization and database for processing model for covering knowledge base communication within organization. This deployed on client server system. And running software through web access and even on standalone system which managed for database of functional details.

- Document-driven DSS: decision support system mainly based on documentation. These documents driven decision support system process for documents to create, maintain, download or evaluate for the specific use. It helps to search web pages and specific keyword over web access. Typically company documents are verified and approved by management and save it on database as guideline and policy base data. This group targeted wide range of user group. And documentation always give right direction if its maintained and managed by the management team, with the specification of functional task this use to set via client server system over web link.

- Model-driven DSS: These decision support systems help to analyze the data. This is one of the complex system which depends on the database these used by employee of the organization and managers. This can deploy in the scheduling, analysis system in client server and or web based communication. Model is the ready format of particular situation. There are many model system of which can deployed in client server system or on the web.

4.8.3 TYPES OF DECISION SUPPORT SYSTEM

Decision support system is the procedural activity which based on the specific purpose and its dependent on many other subsystems as mentioned in above points. Now base on management structure and software based following are the type of decision making process which has its support system to reach at particular decision to implement in the organization. Management has decided level which defined the decision support system. Types of information system has further divided in important level for decision making process at each stage such as transaction processing system,
management information system and executive information system. Reports are defined clear details about managerial work flow and based on which decision support system work on the level of all stages of management. This automated service, degree of customer and competitor all these element of decision making process of the organization about day to day activity, long term activity or medium term activity.

- **Unstructured decision**: 
- **Semi structured decision:**
- **Structured decision:**

**Using DSS in decision making process:**

- **Intelligence stage:** to identify the problem of entire process
- **Design stage:** to draw format to find the desired solution
- **Alternative stage:** to draw and obtain other options for comparison
- **Selection stage:** to elect the most effective alternative
- **Implementation stage:** to apply in the simulation or real time scenario
- **Feedback stage:** to evaluate the effect of its implication

So decision making is the process of choices and with effective choice for particular problem will affect in entire business scenario. DSS play its role for decision making on each level with its automated system based on the input provided in to it. Spreadsheet is also one of the best tools for decision making process; it is less effective in wide information system for effective result. Other DSS software plays an efficient role in functional area for different decision for various kinds of situations. Depending on the management level and the process of transition over the process related problem in all functional departments such as production management, marketing management, human resource management, finance management, customer relationship management, supply chain management where DSS apply for decision making with other factorial element like competitors, economical change, political change, government policy change, environmental change with all these dimension DSS process with the help of data mart and interference of model database to obtained effective decision making. Hierarchy of organization has its impact on decision making level. On transactional level decision making process deal with structure decision may be short term and medium process and policy on specific problem.

In Management information system level semi-structure decision obtained as combination of certain rules and regulation of long term goal with the support of top
manager decision and few important decisions on medium term goal which are involve in operational activity of management. DSS always help in decision making process with specific criteria of information sources. On top management level unstructured decisions which are uncertain and deployed by top managers.

4.9 DETERMINED INFORMATION NEED AND DATA FLOW MODEL

4.9.1 NEED OF INFORMATION TO ORGANIZATION

Organization is the business entity which involved with many functional departments to control the activity of business transition and to manage this organization need information. This information mainly extracted from database to precede further management task. Organization will not run without information and it can’t reach to any decision without right information system to its database. Active and passive way resources are engage in accessing gain for the organization. Organization processing decision to achieve profit based on the decision output. Information need to store in the information system. This information system further segregated to the functional activity where the database managed to provide decision based on the MIS.

Information always gives direction to the system where to go and what will be the outcome of procedural activity. Functional decision of management may needed the detail status of element and factors involve in the decision making process are need to be accurate and relevant to the require process to complete. Following are the factors which elaborate the need of information system in organization:

- To take accurate and effective decision
- To build information system database
- To achieve competitive advantage in the market
- To make profit out of business
- To improve the flow of communication
- To enlarge the business expansion
- To keep update the internal information system
- To maintain the track of integrated database
- To make easy flow of information in management level
- To study and evaluate the critical success factor with support of Information

Information needed mainly for two dimensions i.e. Organization and management. Research in these two area main element is information which play the role of
Connectivity Bridge between entire processes of communication. Framework design makes this integration of level of management and structure of organization need for decision making process. Specific design, methodology which is helpful in decision making process and for effective decision there is need of information on time and with ethical sources.

4.9.2 OVERVIEW OF DATA FLOW METHOD
Decision support system and business intelligence technologies both interconnected with each other for same purpose to complete. Information systems need to draw the path for decision to achieve with the help of simple and complex support tool. Research based study designed the different patterns of information and based on this information management try to extract the decision for final implementation to achieve specific target or to solve problem in the organization. Structuring of IS based on the functional role of department it separated in data mart but relationally connected with each other with model database. Information system developed on different application and software based database which are integrated. Information system departed with these elements of system, user, organization, strategic level to achieve business objective.

This information significantly important for framework of databases its model, record, fields based on which structure stands of data flow. Data flow is the structure of decision making process and gives clear presentation of path to reach at final decision. In software development time data flow diagram introduce in 1970’s. Primary it was in classic text about structured design by Larry Constantine then Object oriented analysis and Design OOA/D visualizing software system. Designs of data flow diagram notations represent the meaning to its process. It use to system analysis and design, DFD are simplest way for visualizing information system:

- **Process notation:** its represent incoming data flow and outgoing data flow (Figure 4.25)

![Figure 4.25 Process notation](image-url)
• Data store notation: it is repository data in the system as file
(Figure 4.26)

![Data store notation](image1.png)

Figure 4.26 Data store notation

• Data flow notation: its pipeline through which data packet flow
(Figure 4.27)

![Data flow notation](image2.png)

Figure 4.27 data flow notation

• External entity notation: objects outside of system, represent source and
destination of external system
(Figure 4.28)

![External entity notation](image3.png)

Figure 4.28 external entity notations

Creating data flow diagram with smart draw which are easy to understand
analysis of information to take decision for certain problem based on the information
avail as source in processing and flow of each step for solving complex situation.
Element in the process of analysis data flow diagram play an important role, and it’s
related with alternatives, criteria of choice, choice mode everything present in the
diagram of data flow and finally with different mode and choices it reach at the level
of decision which determined through numerous and control system which measure each step of data flow. It’s all steps are the symbol of certain step related with problem to solution:

- Simplification
- Form decision design
- Select model for best solution
- Repeat the same format if problem are similar

Computerized automation system is more integrated and due to its connectivity many application collectively provide solution to enterprise system. Data flow diagram is the type of function which sets specific rules to follow and extract the effective decision for organization growth.

**Context diagram, DFD Layers and level:**

**Context diagram** define level 0 and it’s precedes a top level. It’s contain one process node define process 0 it means the entire system has general connectivity to external entity. **DFD layers** draw diagram in many nested layer. Data flow diagram expanded a single process node on high level and each level has further many levels till level of pseudo code. Data Flow Diagram and Context Diagram are the technique of decision making process.

### 4.9.3 DECISION ANALYSIS PROCESS AND ELEMENTS

Decision analysis is the study of various procedures on specific purpose to understand and find out effective process for the organization in terms of values and profit from the entire business transition with various functional department. There are number of way to analyze the decision support design and to evaluate the model in real scenario it has to modify process to extract the best structure and probabilities of the computation model.

Decision support system need to have the quality to evaluate exact evaluation of the process require in the system of organization based on the investment and resource optimization. Even in uncertain situation decision analysis involve in the certain parameter which analyze the utility of each alternative. Risk factor has to be cover in designing of decision analysis process where element are integrated and it has impact on each other while processing. There is much guidance of structure, policy and information to find out complexity in particular situation thesis is what the
process of decision analysis technique. Data which used for decision analysis has
following qualities to support for effective evaluation process of decision making:

- Data must be right for which entire process formed
- Extracted objective from data must be relevant
- Data content with patterns of fact which add value to the decision process
- Data must have strong purpose to use it in the decision analysis process
- Data need to drive the management objective
- Data must form particular element which give integrated value to the process

Hence to process of decision analysis model data must be analyzed before it use for
analysis process. Following are the five level of data analysis process model:

**Level 1: Identify and form your question:**

In daily task of business transition process set to complete certain work to achieve day
goal, weekly goal, monthly or yearly goal. And on each level of management managers
has to identify the question to run certain task within group and get things done.
Opportunities and risk element of the market also consider while forming question to
decision analysis. Forming question is critical task but it will decide the direction of
team in analysis process and management can predict for result from the process.

**Level 2: Measurement has to be prioritized:** once management form question for
which entire decision analysis process driven further in analysis process. Has to
confirm the answer within team of management regarding following question of **what**
kind of data collection needed for this process to start. **How** it drive with the process
of analysis in with current situation. **Why** this process has important to start within
group that awareness must be there in team of organization. **When** it has to be start
with level of processing, and who the player to drive this process further is, decide
**where** to compete the task of decision analysis after defining the question of analysis.
All these point need to measure in processing decision analysis process model. Decide
how to and who will measure the factors of decision analysis.

**Level 3: Gather accurate and relevant data:**

One question defined and measures decided to proceed of decision analysis process
manager’s start the next process of this is gather relevant data and determine the
required information to store in database. Proper file naming and file storing of
created and modified database helps further team to work on the database to drive the
decision analysis methods on the nest level of it. Data normalization form will create support system in organization.

**Level 4: Analyze the collected data:** going through all above process of decision analysis management team who assigned to process of collected and store information system on defined question to correlate with complete processing for analyze it in different patterns and form of database. To analyze data in many form with the support of application software such as excel spreadsheet, goal seek analysis, pivot table, what if analysis and many more options are available to assign and identify different patterns of information through analysis process of database. Minitab, Visio and many other software packages has support to give advanced software package with statistical methods for decision making process. This automated form of decision making will integrate certain and uncertain situation and many other element of environment to analyze the decision alternatives for effective decision as final processing in these levels of decision analysis.

**Level 5: Form the results:** Though out complete the process of the decision analysis from forming question and processing on collected database to analyze the alternatives for best substitute based on it interpret analysis some time formed hypothesis can be failed accept or reject. And this entire process interprets in steps of conclusion as consideration of answer to the defined question of level 1st. this extract result through the process of analyzing for decision analysis process is the result to use further in decision making process of organization structure.

Above five level of decision analysis process is actually analyzing the data for effective information system to establish. And this mathematical model concerned with prescribed theory of action and choice. This process of analyzing factors which affect the result. And form set of alternative to optimize the use of resources along with action and plans to process on each level to payoff in terms of numerical decision and summarized pattern decision for particular objective. **The elements of decision analysis problems are follows:**

- State of nature
- State of authority
- State of mind to select effective alternative
- Traditional approach to selection process alternative
- Payoff returns of a decision in the form of positive or negative note
• Positive value i.e. net revenue, income, profit
• Negative value i.e. net cost, loss, and expenses
• Matrix of decision alternatives
• Process analysis techniques with the methods and tools of process analysis
• Decision tree technique and its influence diagram representation

Approach of Decision Tree:
It is the chronological arrangement of decision process. It has graphical presentation of tree where two type of nodes utilized in the process, Decision node which also know as choice node and denoted with square shape and second is state of nature which also called as chance node which denoted by circles in structure of decision tree (Figure 4.29).

![Decision Tree](source: Decision analysis: choice under uncertainty, by Raiffa H (1974))

It is logical concept of representation. Decision node gives action for choices and Chance node provide further branches of tree with moving forward or backward for specific reason of choices node. Square controls the decision to implements and branches gives direction to decision whereas based on decision node each circle further represent many alternative options. Above figure represent the decision tree format and Following are the steps of decision tree construction or formation:

• Start with the square represent decision question
• Move further with choice node as action to select the direction
• Draw circle to represent uncertainty in the process or event
• Evaluate and analyze the decision tree for final decision
• Result are the outcome of formed started question in square
• Calculate the working value from all left to right dimension
• Calculate the expected value
• Calculate by multiplying value of outcome and uncertain probability
• To extract expected result from entire process of decision making
• Value of node are using base of probability
• rolling the tree backward with decision form in square and circle
• above steps connectivity to root of entire process as outcome
• Computing value of node including root of tree are the important element of decision tree. This decision tree approach is the value to its process of finding evaluated output for the question of the particular task to get things done.