**<u>UNIT- IV</u>: Decision support systems and BPR:** Concept and philosophy, Deterministic systems, Artificial Intelligence systems, Knowledge based expert system, Enterprise Management systems, ERP basic features EMS and MIS, Business Process Re- Engineering, Process model of organization, Value stream model of the organization MIS and BPR.

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❖ **Decision Support Systems (DSS): is a computerized information system used to support decision-making in an organization or a business.** DSS helps the information system in the intelligence phase where the objective is to identify the problem and then go to the design phase for solution.

➢ **Concept & Philosophy of DSS:** The decision support system refers to a class of system which support in the process of decision making and does not always give a decision itself.

➢ Decision Support Systems are an application of **Herbert Simon Model**. These models has **three phases**, viz. **Intelligence, Design and Choice**.

❖ **Types of Decision Support System**:

➢ **1. Status Inquiry Systems:** The number of decisions in the operational management and some at the middle management are such that they are **based** on **one or two aspects of a decision-making situation.** If the status is known, the decision is unique relation.

➢ **2. Data Analysis Systems:** These decision systems are **based** on **comparative analysis**, and use of a formula or an algorithm. The cashflow analysis, the inventory analysis and the personal inventory systems are examples of the analysis systems.

➢ **3. Information Analysis Systems:** In this system, **the data is analysed** and information reports are generated. The decision makers use these reports for assessment of the situation for decision-making. The sales analysis, the accounts receivable systems, the market research analysis, the MRP systems are examples of this system.

➢ **4. Accounting Systems:** These systems are not necessarily for decision-making but they are **desirable to keep track of the major aspects of the business** or a function. These systems account items such as cash, inventory, personnel and so on and relate it to a norm or norms developed by the management, for control and decision.

➢ **5. Model Based Systems:** These systems are **simulation models or optimisation models** for decision making. The product mix decision, the material mix, the job scheduling rules, and the resource or asset or facilities planning system are the examples.

Illustration of **decision support systems**, with an example of Materials Management function and the variety of the decision and the type of systems:

| Decision | Type of system required |
|---|---|
| Finding and Selection of vendor | Inquiry system |
| Procurement | Performance Analyses system |
| Pricing | Data analysis |
| Selections of vendor based on price, quality, performance | Information analysis system |
| Selection of order quantity | Model based system |
| Inventory rationalisation | Valuation of inventory and accounting system |
| Management of inventory within various financial and stocking constraints | Inventory optimisation model |

➢ **Types of DSS** in terms of input source, the system, hardware and **the type of user (Table):**

| System | Input source | System | Hardware* | User |
|---|---|---|---|---|
| 1. Inquiry | (a) Database<br>(b) Conventional files | Query System | PC, Servers and clients | Clerks, Assistants |
| 2. Data Analysis other files | Database and Systems | Packages of DP Servers, PCs | Mainframe or Managers | Operations |
| 3. Information Analysis | Processed data files | Analysis Programmes and use of simple models | Mainframe, Mini, Super Mini, Servers, Client PCs | Middle level Managers |
| 4. Accounting ROI Database | Transactions Master files and | Transactions processing system | Mini, Mainframe, Client/Server | Middle and Top Management |
| 5. Model Based Control | Inventory database and External data | Development of OR or Business Models | Mainframe, Mini, Client/Server | Middle and Top Management |

❖ **DSS: Deterministic Systems:** There are a number of situation, where the management has to make a decision based on the analysis of business statistics. Since the organization would have the database information; these decision situations draw data from the database(s). Most of these decision situations are fairly structured and, therefore, can be put in the form of the business models. A far assumption is made that the model has business and decisionmaking validity.

   ➢ If the management can design such models duly tested, they can be used by the decision makers, whenever the need arises. All such tools and models act as the support system for decision making.

   ➢ The tools and the models are generally standard but have to have a custom design to suit the organisation's specific needs in the specifi c situation. The decision support systems based on such tools or models have found extensive use, as a number of computer based software tools and packages are available at a very reasonable price.

   ➢ The origins of these tools and models lie in the Business Management, the Management Science and the Operations Research. Some are universally known and proven tools and have application in the Business Management.

   ➢ While designing the models, a flexible approach is taken to solve varied decision-making problems. They undergo a change over a period of  time.

❖ **Artificial Intelligence(AI) systems**: An artificial intelligence is packed into a **database** as a **system**, then the DSS system is AI system.

 ➢ AI systems fall into **three** basic categories, viz.,
   # the Expert Systems (knowledge based),
   # the Natural Language (Native languages) Systems, and
   # the Perception System (vision, speech, touch).

 ➢ Artificial intelligence is a software technique applied to the non-numeric data expressed in terms of symbols, statements and patterns. It uses the methods of symbolic processing, social and scientific reasoning and conceptual modelling for solving the problems. The AI systems are finding applications in configurations, design, diagnosis, interpretation, analysis, planning, scheduling, training, testing and forecasting.

 ➢ The Knowledge-based Expert System is a special AI System. It has wide applications in business and industry.

➢ AI domain is very large and its application spreads in wide areas of business and industry.

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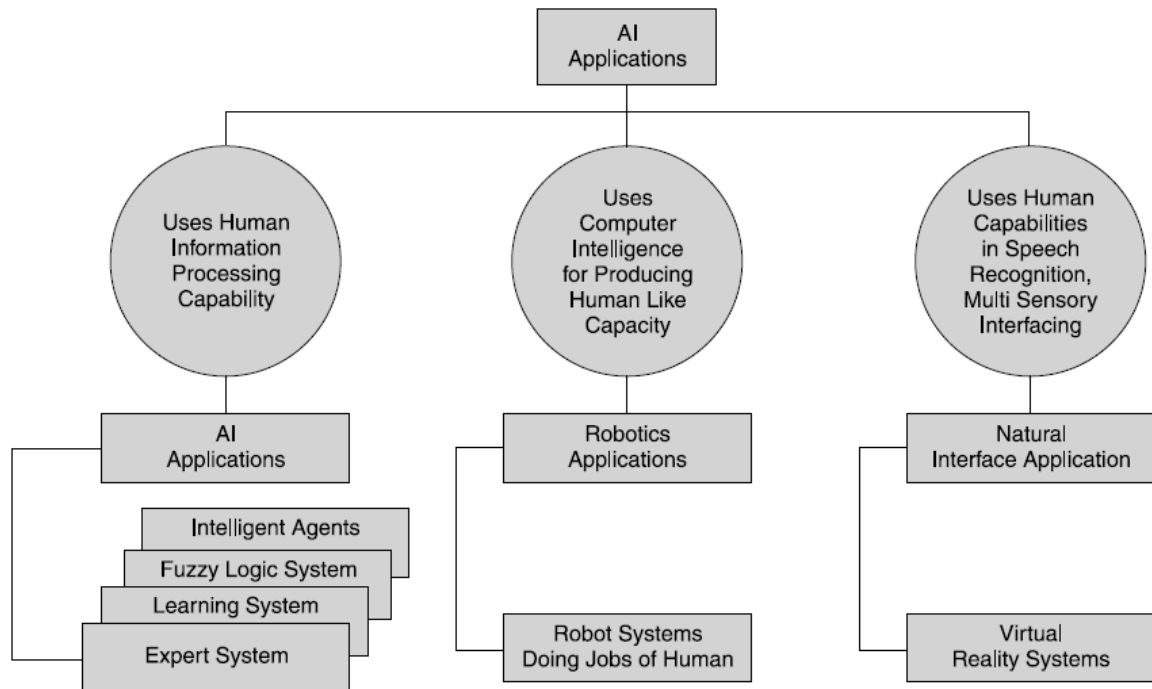


**Structure and Application Areas of AI systems**

➢ **Cognitive science application** uses knowledge and human information processing capabilities to produce major application as expert systems.

➢ **Robotics application** uses AI, engineering science, and physiology to produce computer intelligence to guide a 'computer driven machine' to perform like human being, having capabilities of perception, touch, manipulation, locomotion, navigation and so on. Robotics applications are found useful in manufacturing, material handling, and transportation.

➢ Natural interface application uses AI to build natural, realistic, multi-sensory human – computer interface. This interface enables you to build a 'Virtual Reality'. Virtual reality becomes very handy support to test, feel or experience the 'reality' before it is actually created.

➢ **Expert Systems**: Expert systems are computerised application systems driven by 'Artificial Intelligence'.

    ➢ It stores human intelligence made out of expert's experience, knowledge and model of solving the problem. Expert system includes a knowledge base containing various accumulated experience and a set of rules for applying the knowledge to each particular situation.

➢ **Neural Networks**: A neural network is a category of AI system that attempts to emulate the way the human brain works. Neural networks analyse large quantities of information to establish patterns and characteristics in situations where the logic or rules are unknown.

    ➢ The types of decisions for which neural networks are most useful are those that involve pattern or image recognition, because a neural network can learn from the information it processes looking at the pattern.

> The banking and finance, healthcare hospitals are extensive users of **neural networks in their customer management situations.**

> Fraud detection agencies widely use neural networks. Visa, Master Card, and many other credit card companies, use neural networks to spot peculiarities in individual accounts. They develop overview strategies to manage customers.

> Neural networks are a strong AI system because of the following features. Neural networks:
> # Continuously learn, adjust and modify to become more efficient to handle new situations
> # Lends themselves to parallel processing
> # Function without complete or well-structured information to find its way
> # Analyses non-linear relationships, multiple variable relationships

> **IA driven system:** Intelligent agents are software programs written to carry out tasks on behalf of the users. The capability of agents is wide ranging from automating straightforward routine tasks to adapt user routines and preferences.

> **Sample Applications of AI and ( AI system):**
> **# Establishing sales quotas (Genetic algorithm) :** Establishing sales quota to the agency is governed by a number of restrictions, conditions and limitations. The quota allocation solutions are many to select one which is an optimum one. Genetic algorithm is the DSS for solving the problem of quota allocation.
> **# Generating project proposals ( Expert Systems):** It is a task which requires knowledge of Project strategy, Project management, Project evaluation and estimation, Team building and application of PM tools and technologies.
> **# Planning advertising spot layouts (Neural Networks):** Decision on advertising spot layout is influenced by number of factors, timing, medium, TRP rating, programs and so on. Neural network based AI system will be able to select those spots to ensure that the customer recall index is very high.
> **# Determining credit limits (Genetic Algorithm):** Credit limit options are many. One has to settle with that option where the customer is satisfied and makes payment regularly, and becomes a loyal customer.
> **# Selecting transport routes (Expert System):** This is a classic problem in OR and application of OR models. Being a OR model, it has its own limitations to give the best solution.
> **# Analysing market timing situations (Intelligent Agent):** This is the problem of finding the 'Right Timing' to launch a product in the market. Market timing situations are many and have many factors to consider.
> **# Performance evaluation (Expert Systems):** To judge the performance of a product or a manager, requires are assessment of facts about the achievement and the resources consumed.

❖ **Knowledge Based Expert System (KBES)** : **When Decision-making** is with uncertainty and complexity, dominated by the resource constraints and a possibility of several goals, in such unstructured situations, is is needed to adopt two methods of problem solving, generalised or the **knowledge based expert system (KBES).**

> The generalised problem solving approach considers the generally applicable constraints, examines all possible alternatives and selects one by trial and error method with reference to a goal.

> The knowledge based problem solving approach considers the specific constraints within a domain, examines the limited problem alternatives within a knowledge domain and selects the one with knowledge based reasoning with reference to a goal.

➢ In a generalised approach, all alternatives are considered and the resolution of the problem is by trial and error, with no assurance, whether it is the best or the optimum, while, in the knowledge based approach, only limited alternatives are considered and resolution is made by a logical reasoning with the assurance of the local optimum.

➢ Since, the KBES considers knowledge as the base, the question arises whose knowledge is to be considered as a basis. It is generally agreed that an expert has knowledge, and therefore, he becomes the source of knowledge.

➢ Hence, a system is required which will hold the knowledge of experienced people and provide an application path to solve the problem. Such a system eliminates the knowledge bottleneck.

➢ **Knowledge in the KBES is defined** as a mix of theory of the subject, knowledge of its application, organised information and the data of problems and its solutions, and an ability to generate new avenues to solve the problem.

➢ The **KBES** has **three basic components** which are necessary to build the system as shown in Figure. Viz.,
   i) Knowledge Base
   ii) Inference Mechanism
   iii) User Control Mechanism
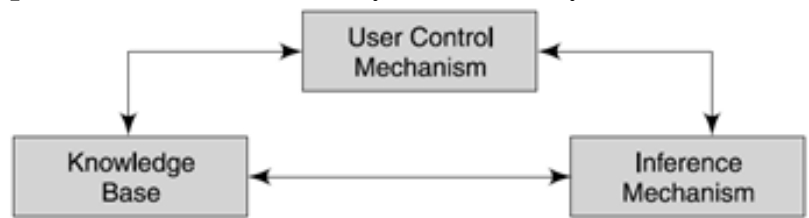


KBES Model

**Knowledge Base**: It is a database of knowledge consisting of the theoretical foundations, facts, judgments, rules, formulae, intuition, and experience. It is a structural storage with facilities of easy access.

**Inference Mechanism**: It is a tool to interpret the knowledge available and to perform logical deductions in a given situation.

**User Control Mechanism**: It is a tool applied to the inference mechanism to select, interpret and deduct or inter. The user control mechanism uses the knowledge base in guiding the inference process.

# In the KBES, **three components are independent** of each other. This helps in modifying the system without affecting all the components.

➢ In the KBES, the knowledge data base uses **Three methods of knowledge representation** : # Semantic Networks,
                    # Frames
                    # Rules.

➢ **Semantic Networks:** A semantic network is a network of nodes and arcs connecting the nodes. The node represents an entity and the arc represents association with a true and false meaning built into it.
   ➢ A knowledge base on '**Table**' is presented in a Semantic network in Figure.
   ➢ A knowledge database of the table is stored with the attributes like location
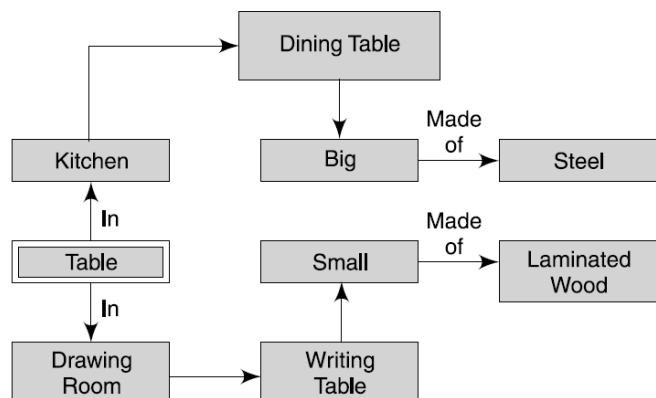


Semantic Network of Knowledge Database on 'Table'

> ➢ **Frames** : The second method of representing the knowledge is putting the same in frames. The concept of frame is to put the related knowledge in one area called a frame.
>> ➢ The frame is an organised data structure of a knowledge. The frames can be related to other frames. A frame consists of the slots representing a part of the knowledge. Each slot has a value which is expressed in the form of data, information, process and rules.
> ➢ **Rules** : The third method of representing the knowledge is rule based. A rule is a conditional statement of an action that is supposed to take place, under certain conditions. Some rules can be constructed in the form of '**If Then'** statements.
> ❖ **Enterprise Management Systems (EMS):** The dependence on the information, as driving energy source, is increasing. Every business has additional dimensions, viz., speed and time. The business needs of today are beyond the transaction processing. It requires and instant real time response in every case, wherever it occurs.
>> ➢ Though the tools, the technologies, and the well designed solutions and systems are available to support all such needs of the business, what is **needed is an integrated solution** out of these **technologies** and the **systems** offering an **enterprise wide management support**. Such an **integrated solutions** is called as the **Enterprise Management System (EMS).**
>> ➢ **Components of Enterprise Management Systems (EMS)**: (Figure)
>> # ERP: Enterprise Resource Planning Systems.
>> # EDI: Electronic Data Interchange System for commerce, communication and action
>> # CAD/CAM/CAE: Computer Aided Design Manufacturing and Engineering Systems for Production Management.
>> # AMS: Attendance Management System, for the role management or Data Capture Systems on floors, in stores, at gates, etc.
>> # DMS: Document Management System, viz., imaging, copying and text management and dispatching document DBMS.
>> # CMS: Communication Management Systems, such as, paging, cordless, mobile telephone systems and the audio video systems.
>> # SMS: Security Management Systems such as the close circuit television, alarm or warning systems, movement tracing systems, etc.
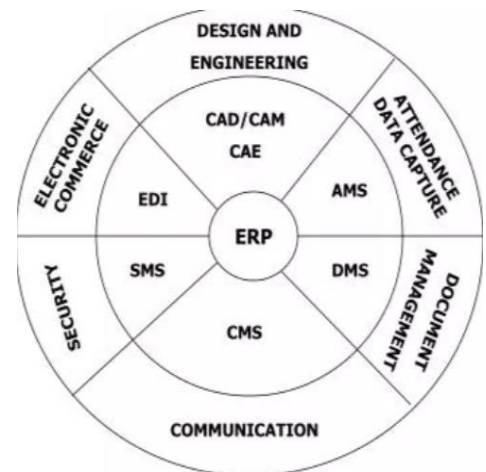


> ➢ In the EMS, the Enterprise Resource Planning (ERP) system plays the role of front running system. The major decision making and execution takes place through the ERP. It is a system of managing all functions of the business with information support coming through the ERP.
> ➢ The Electronic Data Interchange (EDI) system assists the ERP in connecting two systems electronically for E-Mail, Documents Transfer, Data Transfer, etc. It is designed to handle to commercial functions of the business popularly known as the electronic commerce.

❖ **Enterprise Resource Planning (ERP) System in MIS:**

➢ Enterprise resource planning (**ERP**) is an enterprise-wide information system designed to coordinate all the resources, information, and activities needed to complete business processes The focus of ERP is on resource management within constraints to maximise the return on investment.

➢ The ERP package design is built on the principle of '**Best Practices**'. The user of the package is to choose the best one which is close to his requirement. Ideally customisation of the practice is not advisable to maintain the ERP software integrity.

➢ **Advantages of Implementation of ERP:**

# Seamless integration among different functional areas.

# Design engineering support to make the best of resource.

# Customer or vendor order tracking till its fulfillment.

# Receivable and credit management linked order execution.

# Managing inter-dependencies of complex processes.

# Accounting and measuring the progress and performance with respect to resources planned and consumed.

➢ **Application areas of ERP:**

A typical ERP package solution has following modules:

1. Sales, Marketing, Distribution

2. Manufacturing

3. Stores Management

4. Finance

5. Personnel

6. Maintenance

7. Purchase, Inventory

8. Planning and Control

➢ **Features of ERP :**

➢ The ERP features are many. The important ones are **security authorisation, referencing responsibility, and the implementation of the business rules**.

➢ These are provided to safeguard the business of the organisation from illegal practice and also to protect the valuable information from misuse.

➢ These features help to keep the system, the information and the data integrity at the highest level.

➢ The ERP is activated by its users.

➢ The security is built for authorized usage and also for selective access. The ERP usage can be controlled at all levels, viz., the data, transaction, information and analysis level.

➢ The security system of the ERP is build around the OS security and the additional features are provided while designing the system. It provides access and updation rights to the users as per the control requirement of the management.

➢ **Authorisation** is a feature provided for ensuring that the transaction is completed with regards to the business rules set by the management. The systems provides the mapping capability to tie the data, information or process to the user.

➢ **Referencing** is a feature, provided for tracking the chain of events for monitoring, progress checking and control. For example, if one wants to check the status of

customer order, the referring feature helps to link the customer order to work order to delivery note to Excise gate pass to bill.

➢ The business organisation runs through the rules and the responsibility allocation. A strict adherence to them is essential for creation of the controlled environment. The ERP satisfies this need of the business.

➢ The ERP systems provides a variety of technology supports to implement the solution very fast in execution mode. The solution provides the E-mail facility for communication of memos, reminders, and text to the selected list. It also sends copies to the concerned persons as stipulated. Through the EDI connectivity, it can transact directly to the vendor or the customer in its own format.

➢ The ERP also provides an intelligent support in business management. It allows the user to defi ne the events, alert and schedule them at his choice.

➢ These events alerts are triggered by the database inserts or updates. Having raised the alert, it also allows you to defi ne the action to respond to the alert. The ERP sends the electronic mail and executors the SQL statements. It is also capable of taking multiple actions through the stored procedures.

❖ **Business Process Re- Engineering (BPR):**

➢ Business Process Re-engineering (BPR) is a management strategy aimed at improving organizational performance by re-designing and optimizing business processes.

➢ BPR involves a comprehensive analysis of existing business processes, identifying inefficiencies, bottlenecks, and waste, and then developing new and improved processes that align with the organization's strategic objectives. The objective is to eliminate unnecessary steps, reduce cycle time, and improve overall efficiency, while maximizing the value delivered to customers.

➢ **Definition:** Business Process Re-engineering (BPR) is the **rethinking and radical redesign of business** processes to achieve dramatic improvements in critical aspects like **quality, output, cost, service, and speed**. BPR aims at cutting down enterprise costs and process redundancies on a very huge scale.

➢ Business process re-engineering is not just a change, but actually it is a dramatic change and dramatic improvements. This is only achieved through overhaul the organization structures, job descriptions, performance management, training and the most importantly, the use of IT i.e. **Information Technology.**



➢ **Phases of BPR:**

**1. Organize for BPR:** Involves creating business process map, identify areas for re-engineering, establish process ownership and initiate projects.

  ✓ Create business process map
  ✓ Prioritize areas for improvement
  ✓ Establish process ownership
  ✓ Form BPR team
  ✓ Initiate project

**2. Process Diagnosis:** Involves determining requirements, mapping the processes, collecting process performance data, and rating processes based on these data.
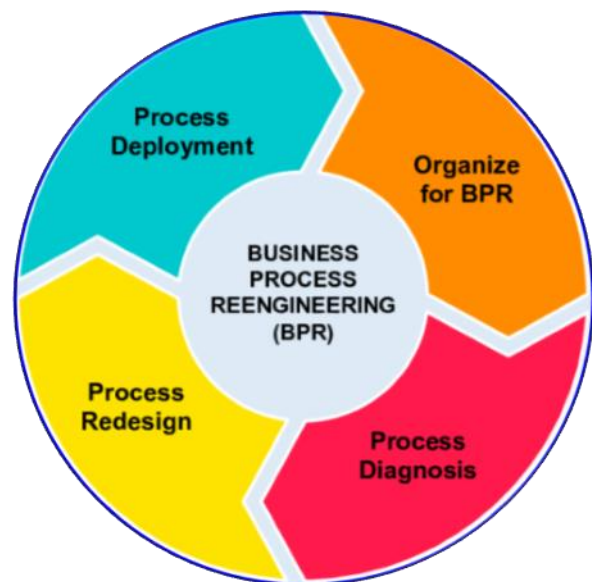
- ✓ Determine customer requirements
- ✓ Determine and document current process
- ✓ Rate the process

**3. Process Redesign:** Uses the data collected in Process Diagnosis to evaluate and develop plans to improve processes.

- ✓ Benchmark the process
- ✓ Develop solutions to close gaps
- ✓ Get buy-in
- ✓ Develop improvement plans

**4. Process Deployment:** Involves implementing the process improvement plan, obtaining customer feedback on the results, revising the plan as appropriate, and rolling out the solution across the organization.

- ✓ Implement process improvement plan
- ✓ Measure results
- ✓ Obtain customer feedback on process performance
- ✓ Do it all over again

➢ **Objectives of BPR:**
- ✓ To dramatically reduce cost.
- ✓ To reduce time requirements.
- ✓ To improve customer services dramatically.
- ✓ To reinvent the basic rules of the business e.g. The airline industry.
- ✓ Customer satisfaction.
- ✓ Organizational learning.

➢ **Advantages of BPR :**
- ✓ BPR offers tight integration among different modules.
- ✓ It offers same views for the business i.e. same database, consistent reporting and analysis.
- ✓ It offers process orientation facility i.e. streamline processes.
- ✓ It offers rich functionality like templates and reference models.
- ✓ It is flexible.
- ✓ It is scalable.
- ✓ It is expandable.

➢ **Disadvantages of BPR:**
- ✓ It depends on various factors like size and availability of resources. So, it will not fit for every business.
- ✓ It is not capable of providing an immediate resolution.
- ✓ Before embarking on a BPR initiative. Some of the key disadvantages of BPR include:
- ✓ **High costs:** Implementing BPR can be a costly and time-consuming process.
- ✓ **Resistance to change:** Implementing BPR can be a difficult and complex process that requires significant changes.
- ✓ **Risk of failure:** BPR is a high-risk strategy that can fail if not implemented properly. The failure to gain employee support, lack of a clear strategy, or poor planning can all lead to a BPR initiative's failure.
- ✓ **Disruption to operations:** Implementing BPR can disrupt the day-to-day operations of the organization, leading to decreased productivity.

❖ **Process model of organization:** Business organisation model with modular and process view of enterprise shows functional breakup and business process continuity of customer order processing across the functions. ERP solution architecture deals with business functions, popularly known as modules, but also takes care of business process needs across the functions.

Integration of business functions is achieved through information process integration.
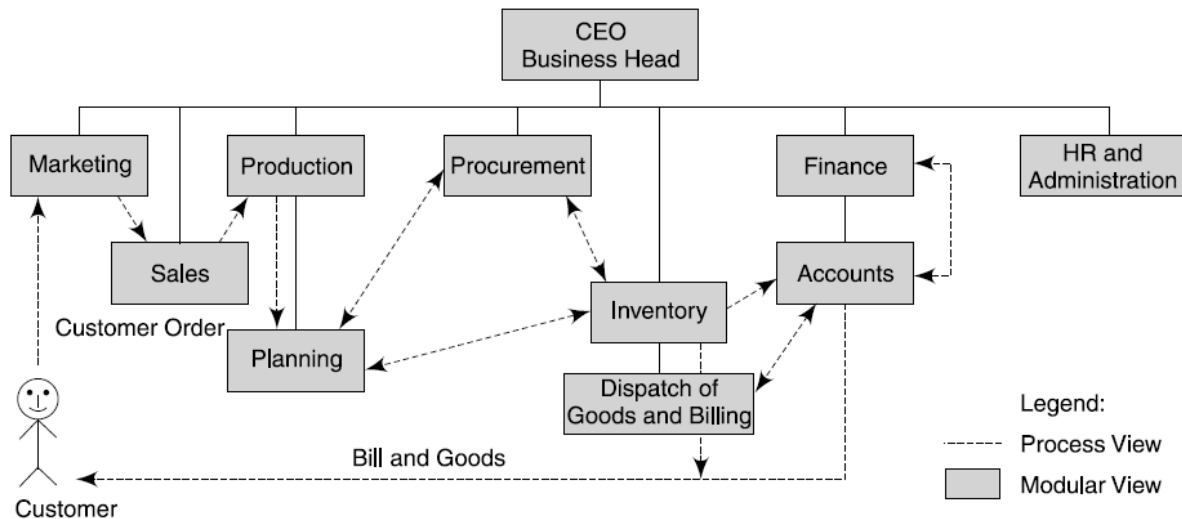


*Business Organisation Model: Modular and Process View*

➢ A more detail modular structure of typical ERP is made of
   • Marketing/Promotions/Advertising.
   • Sales Order Management (Pricing, Credit, Delivery, Billing).
   • Procurement and Inventory management.
   • Warehousing & Logistics.
   • Production Management (Capacity Planning, MRP I, MRP II, Scheduling, QA).
➢ Since, it has modular structure, one can implement the solution in a phased manner module by module. It can be implemented fi rst on a smaller scale and expanded subsequently with more users, more locations and more modules as well. Since the whole solution is a package product, the manufacturer of the package brings out newer versions of the product offering more facilities to the user to improve the utility of the solution.

❖ **Value stream model of the organization – MIS:**
➢ **Value Stream Modelling** can be used for defining a Business Model: 'how the organization delivers value?' In addition, value stream modelling can be used for identifying business capabilities, and connecting them to value stream stages. With business capabilities, in turn, the organization can define what activities are required within the value stream.
➢ Value stream modelling is a beneficial tool to analyze which capabilities participate in value creation, and to which value stream stages they are assigned to.
➢ Value Stream Modelling can be used together with other tools and techniques such as Capability-Based Planning (CBP), Resource-Based View (RBV) of the firm and Business.
➢ "A Business Model should also provide a very high-level view of the key parameters that together combine to produce the value proposition. An Operating Model explains the configuration of the enterprise resources considered optimal by the leadership team for the realization of the business model.
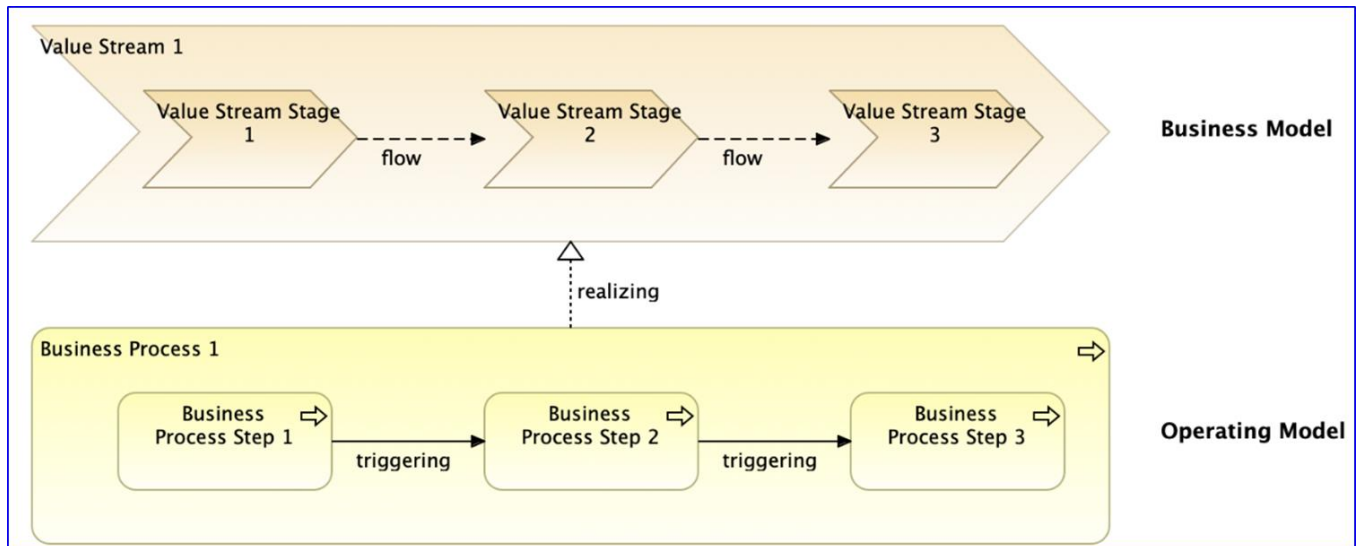
> The figure above is a simplification of the relation between the value stream and the business process, just to illustrate their usage in different levels of the business architecture. Typically each value stream stage can be defined and modelled in more detail in a business process.
> In the organizational context, a value can be (shall be) linked to the following intra-organizational things:
> > # to each and every behavioral or functional act that an organizational actor does, (we should always ask ourselves when doing something: what is the value of doing this? Is this valuable to the customer, directly or indirectly?)
> > # to all the services or products an organization provides to its customers.
> From the stakeholder (e.g. customer) point of view, value is linked to things such as:
> > # to end result(s), the outcome(s), a stakeholder gets when using, choosing, contributing or funding a certain service or product (in some phase of its life-cycle)


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**MIS Questions_ UNIT4:**
1.  **1)** Identify various applications where knowledge bases can be used for problem solving.
2.  2. Define decision support system. Classify the types of DSS.
3.  3.Explain various tools or models that are used in DSS.
4.  4.Explain the structure of AI systems in DSS.
5.  5.How knowledge based expert system (KBES) is useful for problem solving?
6.  6.Explain the basic components of Enterprise Management Systems (EMS).
7.  7.How Enterprise resource planning (ERP) is implements in MIS for achieving goals?
8.  8.Explain the structure of model EMS that uses MIS.
9.  9.Explain How Business Process Reengineering (BPR) supports ERP implementation.
10. 10.Explain value stream model of the organization in MIS.          (CO4)


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