IT 304:
Management
Information System
(MIS)

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Why we need Information?

- To ensure effective and efficient decision.

- Helping in overall development of an organization.

- <u>Specific skills</u> are needed to its **effectiveness**.

- **Decision making** also requires <u>specific skills</u>.

- Effectiveness & Decision making are independent

- **Goal**: Effective Decision making
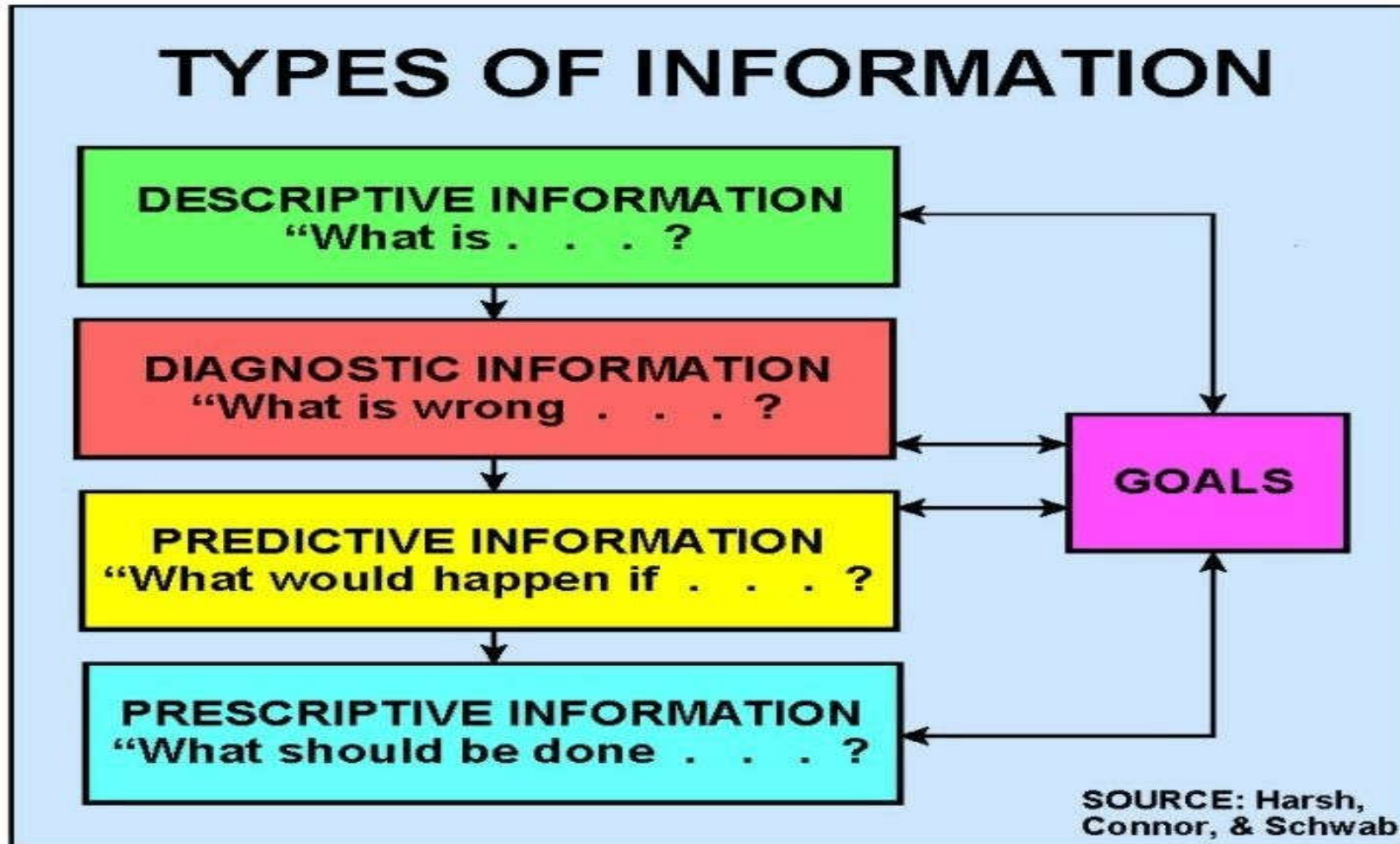
Data and Information

- Data is something that is given or provided.

- Data always corresponds to the 'fact'.

- Data represents something in the real world.

- Information is the data that have <u>a meaning within a context.</u>

- Accumulated data is always processed into a form that is <u>meaningful</u>.

Types of Information

- Descriptive information

- Diagnostic information

- Predictive information

- Prescriptive information

Types of Information

TYPES OF INFORMATION

DESCRIPTIVE INFORMATION
"What is . . . ?

DIAGNOSTIC INFORMATION
"What is wrong . . . ?

PREDICTIVE INFORMATION
"What would happen if . . . ?

PRESCRIPTIVE INFORMATION
"What should be done . . . ?

GOALS

SOURCE: Harsh, Connor, & Schwab

Information classification

- Action and No-action

- Recurring and Non-recurring

- Internal and External

- Planning information:

    ➢ Standards

    ➢ Norms

    ➢ Specifications

Information classification

- Control information

  ➢ Report status of an activity through feedback

- Knowledge information

  ➢ Library reports

  ➢ Research studies, etc.

Characteristics of useful Information

- Relevant

- Complete

- Accurate

- Current

- Economical

Relevant information

- Information must pertain to the problem at hand.

- For example,
  - Total number of years of education may not be relevant to a person's qualification for a job.
  - Rather the relevant information might be the experience that the person has in the related domain of work.

- Here context refers to: experience is more important than number of years of education.

- Similarly, this information should be presented to the person by the organization in such a way that, the person understands the context.

Complete information

- Partial information is often worse than no information.

- For example

  - Sales person is accumulating data from different sectors including surrounding households

  - Data collected would be used for analysing sale of a food product before the company plans to launch it in market

  - Following data is collected:
    - Demographics, Family income, Family strength (inferred)

  - Consumption habits of the targeted population

  - Without this data, relevant and complete information cannot be extracted by analysing the data.

Accurate information

- Erroneous information may lead to disastrous decisions

- For example:
  - Inaccurate record of a patient's reaction to a medicine

  - Can harm the patient's health unknowingly

  - Doctor may not always be responsible for this failure

- Absence of an information in a dataset is not considered as inaccurate.

Current information

- Decisions are often based on latest information.

- What was a fact (based on data) since yesterday, may not be valid for today.

- For example:

  - Investing in stock market

  - We should not look into yesterday's data

  - Instead look for today's data before investing.

- Analysing Trends belongs to Information processing part.

Economical information

- In a business setting, the cost of obtaining an information

- Must be considered as one cost element involved in any decision making.

- For example,
  - Demand for a new product must be researched

  - To reduce risk of marketing failure

  - But if market research is too expensive then the cost of obtaining an information may diminish the profit sales.

Information presentation

- Data may be collected in the best possible way

- And also processed analytically

- However, if it is not presented properly, then

- It may fail to communicate any value to the recipient.

Information communication

- How Information is communicated/ flown within an organization depends upon the following factors:

1. Methods employed for Information transmission

2. Manner of Information transmission

3. Limitations and Constraints of Information transmission/ deployment

Information communication

1. ## Methods of transmission

   - ❑ **Involved entities**
     - ▪ One to one
     - ▪ One to many
     - ▪ Many to many

   - ❑ **Verbal (Unofficial communications)**

   - ❑ **Electronic (Unofficial communications)**

   - ❑ **Documented (Official communications which can be referred later)**
     - ▪ Draft
     - ▪ Orders
     - ▪ Advisory, etc.

Information communication

2. Manner of information handling

   ❑ Action/ No-action

   ❑ Official/ Unofficial

   ❑ Individual action/ Group task/ Supervision

Information communication

3. Limitations and constraints of recipients

- ❑ Insufficient Information/ Data

- ❑ Limited workforce

- ❑ Knowledge

- ❑ Desire/ Involvement

- ❑ Organizational level (lowest tier/ middle tier/ top tier)
  - ◼ May not be having exact information
  - ◼ May be wants to hide the information

Improving communication

- Organizations generally opts for the following two methodologies to improve Information communication:

  - Summarization

  - Message routing

Summarization

- Too much information causes

  - Noise

  - Divert from context

  - Confusion

  - Misunderstanding

  - Missing purpose

- Summarization helps in suppressing the above.

Message routing

- Distribute information to all who are <u>accountable</u>

- Accountable persons can take subsequent action

- Achieved by sending copies of the reports

- Identifying the concerned/<u>responsible</u> persons

- Not all accountable persons could be responsible

- <u>Finding an accountable + responsible person is also a strategy in any organization</u>.

System

- Set of components that work together

- Works together for a common goal

- Example:

  - Computer-based information systems

  - Formation of a Committee

  - Club activities, etc.

- Any authorized group working together for a common cause.

Components of Information system

- Data

- Hardware

- Software

- Telecommunications

- **People**

- **Procedures**

Components of Information system

- **People**

  - ❑ Information system <u>professionals</u> and <u>Users</u>

  - ❑ Employees for <u>analysing organizational information needs</u>

  - ❑ Employees to <u>Design</u> and <u>Construct</u> new information systems

  - ❑ Employees to <u>code</u> computer programs

  - ❑ IT Administrators to <u>monitor</u> the hardware resources

  - ❑ IT Administrators to <u>maintain</u> necessary software resources.

Components of Information system

- **Procedures**

  - Guidelines for achieving <u>optimal</u> and secure operations of data

  - <u>Priorities</u> in running different applications

  - <u>Security</u> measures for a computer-based information system

  - <u>Abstraction</u> measures for an information system

  - Guidelines for Information <u>handling</u> in an organization.

Topics Covered

- Information

- Data

- Types of Information

- Classification of Information

- Useful Information

- Information Presentation

- Information Communication

- Summarization and Message Routing

- Components of Information System (Organization)

Organization Structure

Horizontal-cut of Information pyramid

- Information pyramid is Horizontally cut in three levels

- Based on the <u>3-tier working architecture</u> of an organization

- Employees are <u>segregated</u> according to the three tiers

- <u>Work is divided</u> according to the three tiers

- <u>Separate tasks or roles</u> are assigned to the employees in each level

Functional areas Information system

- Vertical partition of Information Pyramid is done

- Based on the number of departments/sections in an Organization

  - Sales and marketing

  - Manufacturing and production

  - Finance and accounting

  - Human resources, etc.

Levels of Information system

- Operational level

- Management level

- Strategic level

Managers of Information system

- Operational managers

- Middle managers

- Senior managers

Why Information System?

Departments of Information system

- ❏ Sales and marketing

- ❏ Manufacturing and production

- ❏ Finance and accounting

- ❏ Human resources, etc.

Managers of Information system

- Operational managers

- Middle managers

- Senior managers

Managers of Information system

- **Operational managers**

  ❑ Works for the operational level systems

  ❑ Supervising employees at the operational level of an organization

  ❑ <u>Supervising</u> employees at the lowest tier of an organization

  ❑ Assigned tasks such as <u>data collection</u>, requirement analysis from clients, survey, sales, manufacturing, development, etc.

Managers of Information system

- **Middle managers**

  - Works for the management level systems

  - Supervising employees at the middle tier/ level of an organization

  - Handles tasks such as Data Analysis, Algorithm design, Decision making, Report generation, etc.

  - *Follow orders from the highest tier employees and enforces them to the lowest tier employees*

  - *Monitors lowest tier employees and provides feedback to the highest tier employees*

Managers of Information system

- **Senior managers**

  - ❑ Works for the strategic level systems

  - ❑ Orders/ enforces procedures to the management level systems

  - ❑ Decides how organization would run

  - ❑ New rules are presented to middle tier managers. Middle tier managers finalizes various strategies for implementation. Middle tier managers enforces tasks to lowest tier managers for functioning the new strategy.

- All stakeholders are not considered in the Information pyramid, as stakeholders can be from outside Organization as well.

Levels of Information system

- Operational level

- Management level

- Strategic level

Types of Information Systems

- **Operational-level systems**

  - ❑ Support operational managers

  - ❑ Keeps track of elementary activities and transactions

  - ❑ Monitors; sales, receipts, payroll, credits, etc.

- **Management-level systems**

  - ❑ Supports middle-level managers

  - ❑ Tasks: monitoring, controlling, decision-making, etc.

  - ❑ Responsible for smooth working of a system.

Types of Information Systems

■ Strategic-level systems

- ❑ Support senior management

- ❑ Tackle and address strategic issues

- ❑ Analyze long term trends

- ❑ Analyze long term approaches/strategies which the organization would follow

- ❑ Estimate the long term goals of the organization.

Why Information System?
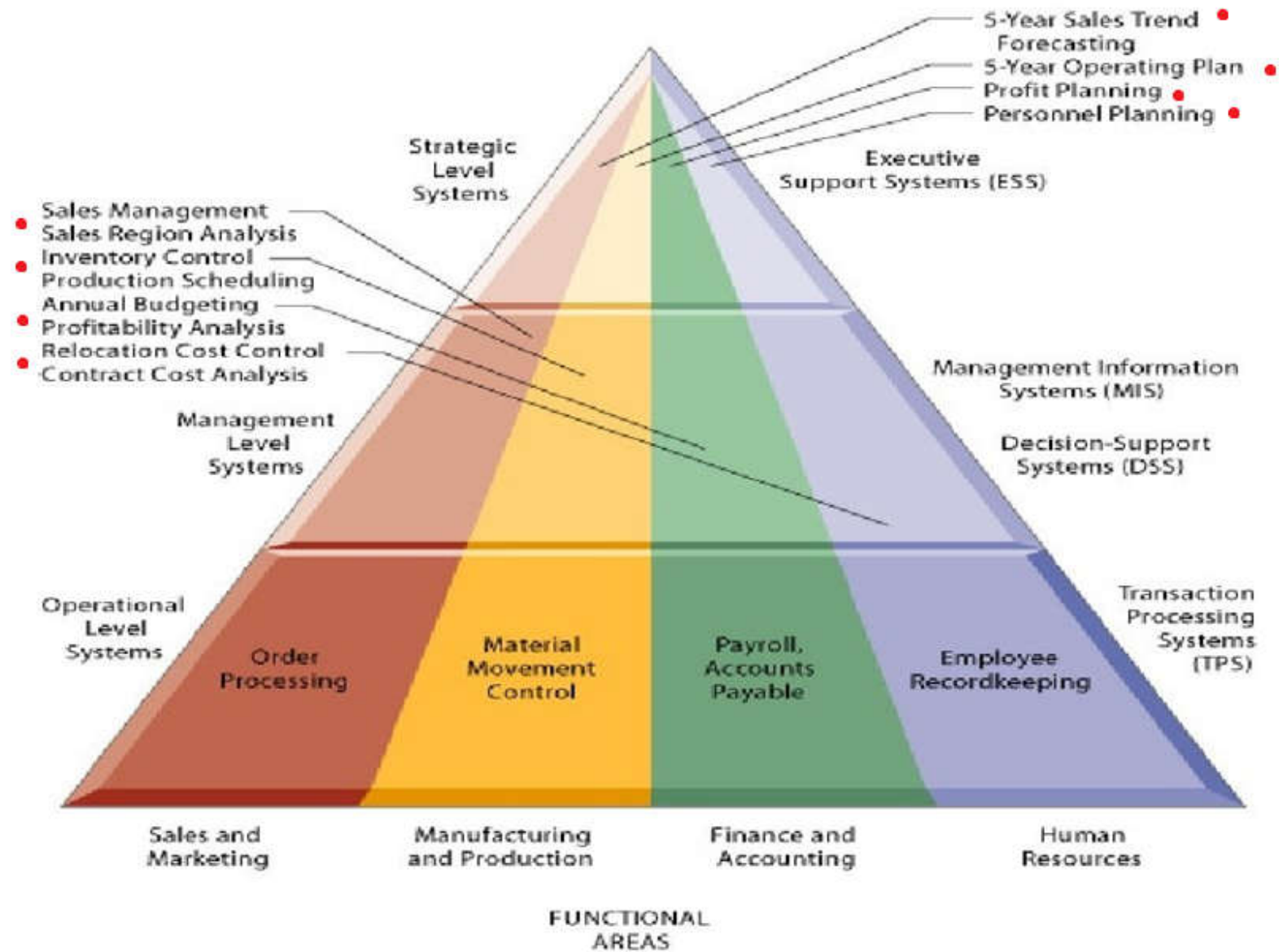
Organization Structure
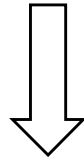
Information system divisions

Level	Manager	Support system	Department	
Strategic level	Senior managers	ESS	Sales & Marketing	
			Manufacturing Production	
			Finance & Accounting	
			Human resources	
Management level	Middle managers	MIS and DSS	Sales & Marketing	
			Manufacturing Production	
			Finance & Accounting	
			Human resources	
Operational level	Operational managers	TPS	Sales & Marketing	
			Manufacturing Production	
			Finance & Accounting	
			Human resources	

Types of Information Systems

5-Year Sales Trend Forecasting
5-Year Operating Plan
Profit Planning
Personnel Planning

Strategic Level Systems

Executive Support Systems (ESS)

Sales Management
Sales Region Analysis
Inventory Control
Production Scheduling
Annual Budgeting
Profitability Analysis
Relocation Cost Control
Contract Cost Analysis

Management Level Systems

Management Information Systems (MIS)

Decision-Support Systems (DSS)

Operational Level Systems

Order Processing

Material Movement Control

Payroll, Accounts Payable

Employee Recordkeeping

Transaction Processing Systems (TPS)

Sales and Marketing

Manufacturing and Production

Finance and Accounting

Human Resources

FUNCTIONAL AREAS

Tasks based Work flow

Task definition

⇓

Identify the **Level** (strategic, management, operational)
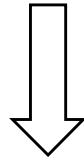
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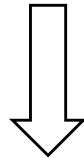
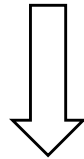Identify the **Managers** (senior, middle, operational)

⇓
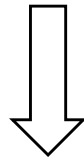
Select the **Department** (sales, production, finance, HR)
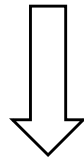
Task-based Work flow - Example

5-year Sales trend and Forecasting

⬇

Strategic level

⬇

Senior managers

⬇

Sales and Marketing Department

Support systems - Information system

- Executive support system

- Management information system

- Decision support system

- Transaction processing system

Transaction Processing System

- Basic business systems serve the operational level

- TPS: A system that helps to perform and record the daily routine transactions which is necessary to conduct run an organization

- Examples:
  - Point of sale systems
  - Payroll systems
  - Stock control systems (Logistics management)
  - Booking system
  - Branch-based banking systems

Transaction Processing System

- TPS is a type of Information system which

  ❑ Collects, Stores, Modifies, Retrieves all data transactions of an enterprise

- The transaction in TPS refers to any event or activity related to <u>doing business</u>, such as sales, purchases, deposit, withdrawals, refunds and payments

- Type of transaction varies based on organization type

Transaction Processing System

- TPS stages:

  - Data entry

  - Transaction processing

  - File and database processing

  - Document and report generation

  - Inquiry processing activities.

Transaction Processing System

- Transaction processing is carried in two ways

  - Batch processing

  - Real-time processing

- **Batch Processing:**

  - Data is accumulated over a period of time and processed periodically

  - Usually cyclic: daily, weekly, monthly, etc.

Transaction Processing System

- **Batch Processing:**

  - Usually less costly in comparison to real-time TPS

  - Usually easier to manage in comparison to real-time TPS

  - Limitation: Database constantly gets out of date, requires more processing power

- Example:
  - A company may want to process the payroll of its employees in a weekly or bi-weekly manner, thus the batches of employee salaries will be processed over a span of one and two weeks respectively.

Transaction Processing System

- **Real-Time Processing:**

  - ❑ data is processed immediately after they are generated

  - ❑ immediate output to end users

  - ❑ More costly in comparison to Batch processing

  - ❑ Requires POS to be connected with internet

  - ❑ Less power required in the POS, if done in real-time mode

  - ❑ Database is always up-to-date.

Transaction Processing System

- **Examples:**

  - Batch processing = AR

  - Real-time = POS

Transaction Processing System

- **Features:**

  - Reliability
    - TPS is highly reliable in handling transactional data of an organization

  - Fast response (for real-time TPS)

  - Integrity of the TPS
    - data fields should be consistent

  - Authorized control

  - User friendly

  - Quick recovery from failure.
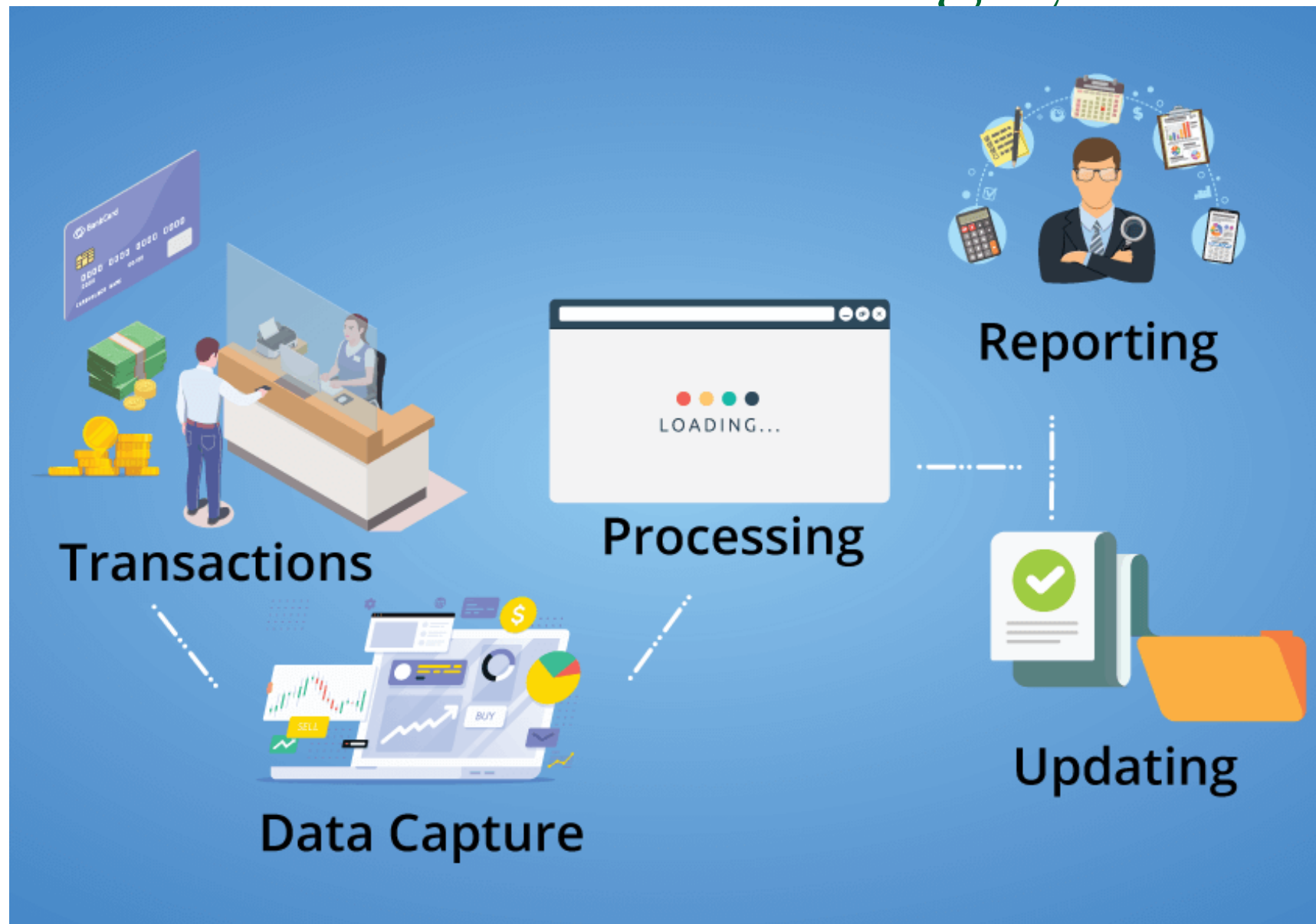
Transaction Processing System

- **Examples**:

  - POS

  - Hostel reservation

  - Airline reservation / check-in at Airport

  - Bank cheque clearance (Batch processing).

TPS: Branch-based banking systems

Types of TPS

	TYPE OF TPS SYSTEM				
	Sales/ marketing systems	Manufacturing/ production systems	Finance/ accounting systems	Human resources systems	Other types (e.g., university)
Major functions of system	Customer service Sales management Promotion tracking Price changes Dealer communications	Scheduling Purchasing Shipping/receiving Operations	General ledger Billing Cost accounting	Personnel records Benefits Compensation Labor relations Training	Admissions Grade records Course records Alumni records
Major application systems	Sales order information system Sales commission system Sales support system	Machine control systems Purchase order systems Quality control systems	General ledger Payroll Accounts receivable/payable Funds management systems	Employee records Benefit systems Employee skills inventory	Registration system Student transcript system Curriculum class control systems Alumni benefactor system

Transaction Processing System

- The goals, tasks, and resources are pre-defined

- Defined by the middle-level management

- Example: Payroll System

  - Accounting transaction processing system
  - Tracks money spend for employees and stakeholders
  - Generates reports for Middle-level management
  - **Does all transaction requires to be incorporated in report for Middle-level?**

- Who generates the Reports. Characteristics of Reports from TPS?

Management Reporting Systems (MRS)

- Assists middle and strategic tier personnel with reports based on data recorded in TPS

- Such reports help in maintaining operational and managerial control on the organization

- MRS is usually developed by specialized developers who understands the requirement of organization

- MRS is not developed by end users and lower-tier employees

- MRS may be developed by managers in lower-tier.

Management Reporting Systems (MRS)

- MRS is not always available in all TPS
  - Example: AR

- MRS is possible only if:
  - Requirements of middle/strategic level experts are known

  - Requirements are expected to remain stable/consistent for a longer duration

- MRS is not typically meant for analyzing data

- MRS is not used for decision making.

Management Reporting Systems (MRS)

- MRS is not used for future prediction

- MRS is only used to fetch recorded data as per requirement of the upper-tier managers

- Operational level generates MRS based on recorded data from the associated TPS and send them to the middle-level experts, who may start analyzing the received information

MRS: Report Types

- Scheduled report

- Exceptional report

- Demand report.

- **Special Types of TPS (as per organization need)**

- Tracking systems for project progress/ product development
- Location systems for Tracking commodities
- Asset management
  - Asset refers to Employees, raw materials, equipment, etc.

Management Support Systems

- Serves the middle management

- Structured decision making

- Guideline for TPS working

- Report on firm's current performance, based on the Transaction support system

- The past and present data

- Internal orientation related to managing employees

- Provide answers to routine questions with predefined procedure for answering them

- <u>Typically MIS level have little analytical capability</u>.

Management Support Systems

- Report generation based on Operational level employee performance

- Online/remote access to management level information

- Historical record of organization

- MIS summarizes the basic operations performed in an organization

- MIS reports are generally weekly, monthly, quarterly, or yearly. However they can be daily/hourly if required

Decision Support System

- Serves the middle management.

- Support non-routine decision making

- Non-routine example:

  - What is the impact on production schedule if February sales are doubled?

- Uses external information as well as information from TPS and MSS

- Output in the form of Decision analysis.

Decision Support System

- Takes decisions what are

  - Unique
  - Rapidly changing
  - Emergency situation

- DSS most important in scenarios which is new to the organization

- Highest analytical power is with DSS

- What about senior level ?

Decision Support System

- DSS narrows down the data and analysis in a <u>easily understandable</u> form for the decision takers

Executive Support Systems

- Serves the senior management

- Helps in Strategic level

- Addresses non-routine decisions
  - Judgement
  - Evaluation
  - Insight

- Incorporate data about external events
  - New Tax laws
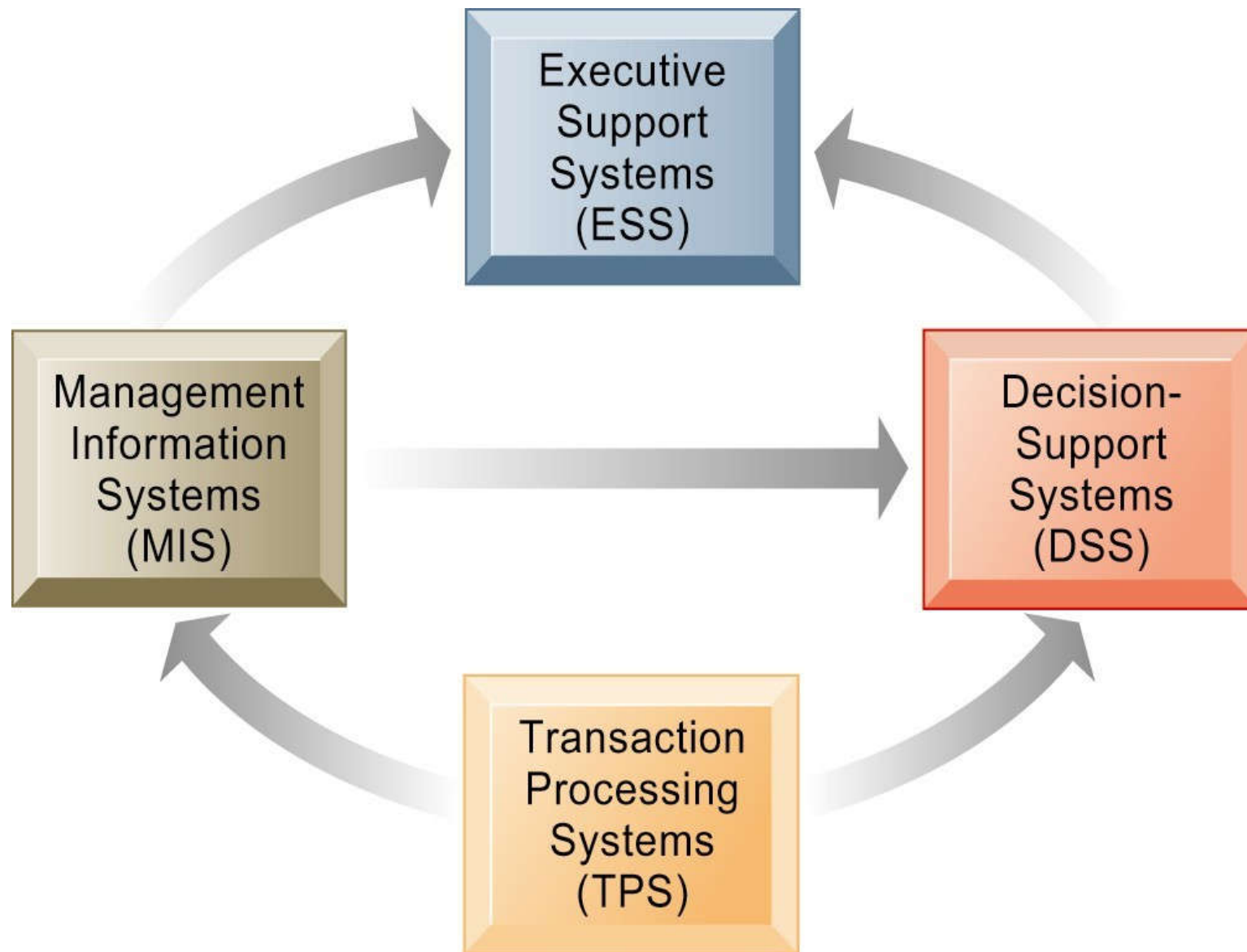 - New Business competitors
  - New Market developments

Executive Support Systems

- Collect summarized information from MSS & DSS

- Provides Input in form of Aggregated data

- Processing by ESS is interactive with MSS & DSS

- Output is in the form of Projections.

Types of Information Systems

Interrelationship among Systems

Interrelationship among Systems

- All systems are interrelated

  - MIS
  - DSS
  - ESS
  - TPS

- TPS is the major producer of information.

- Information from TPS is collectively used by MSS, DSS, ESS.

- Usually these systems are loosely coupled.

- Recently, technologies are being developed to closely integrate information residing in each system.

Internal Organization Structure-Sample
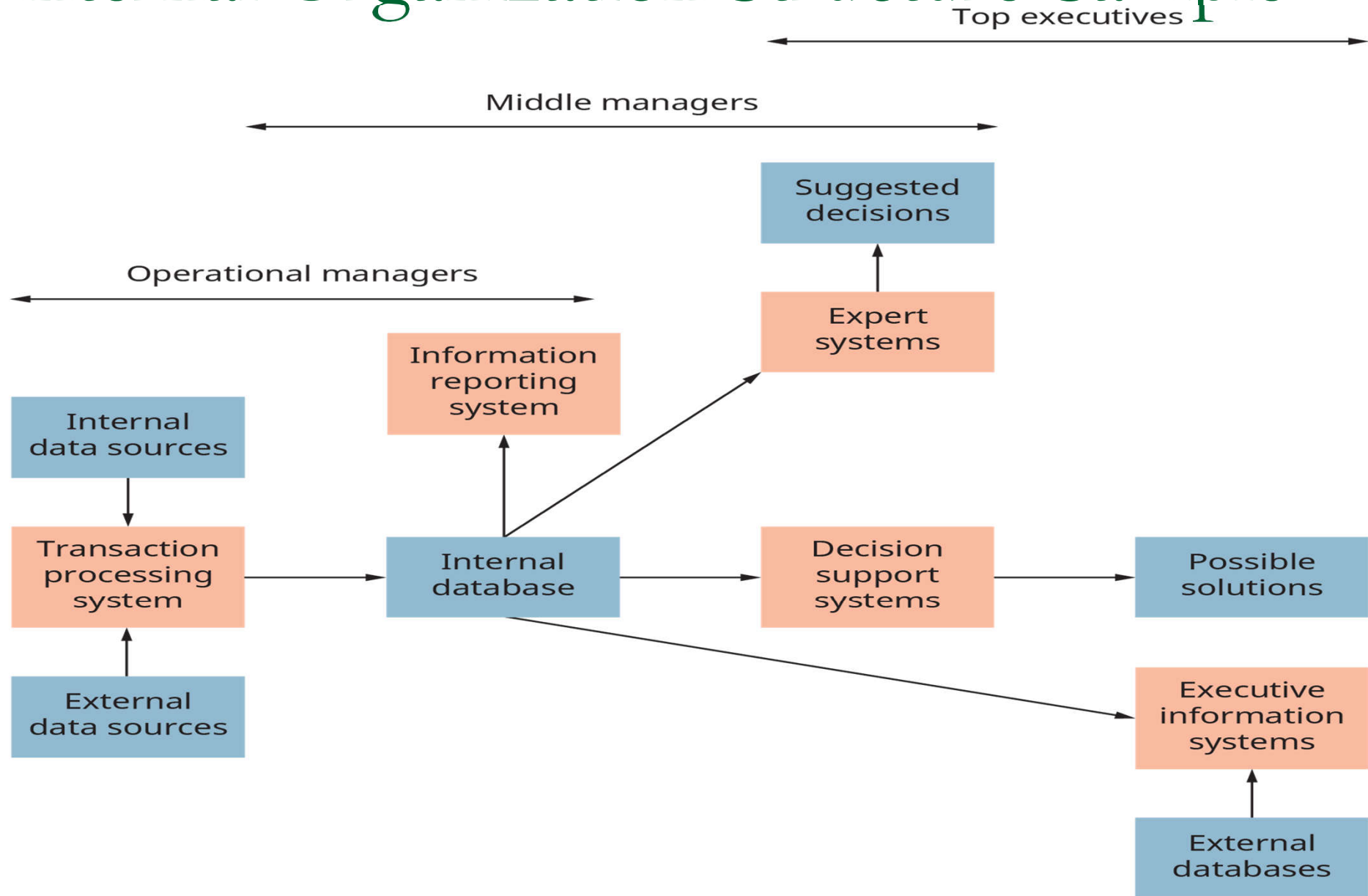
Middle Level of an Organization _ Decision Making

- ## Phases:

  - ❑ Intelligence Phase

  - ❑ Design Phase

  - ❑ Choice Phase

  - ❑ Implementation Phase

Intelligence Phase

- Decision maker examines the organization's environment for conditions that need decisions

- Data is collected from a variety of sources and processed

- Decision maker can discover ways to approach the problem

- Steps:

    - Determine the reality of the scenario
    - Collects data and information to better understand the scenario
        - Primarily from fellow employees at the same level and lower level
    - Define alternatives….. Not solution!!

Design Phase

- Define outcome for the decision

- Generate alternatives for meeting the outcome

- Define association between alternatives and outcome

- Information Technology doesn't typically help at this stage of decision making.

Choice Phase

- Experience of decision maker is the important criteria at this stage

- Estimate the best possible alternative which can be selected as the solution

- Declare the suitable outcome with respect to the selected solution.

Implementation Phase

- Plan for implementing the selected solution or decision within the organization or with the stakeholder/s

- List out the resources required

- Time to be taken

- Enrich expertise of employees, if required.

Members involved in DSS

- Managerial Designer

- Technical Designer

- Model Builder

- Users

Members involved in DSS

- **Managerial Designer**
  - Deals with designing the alternatives
  - Handle the related managerial issues

- **Technical Designer**
  - Implementation of the selected solution

- **Users**
  - Employees who would be affected by the decision

- **Model Builder**
  - Liaison between users and designers

Capabilities of DSS

- What-if analysis

- Goal seeking

- Sensitivity analysis

- Exception reporting analysis, etc.

Types of Decisions

- Programmed decisions
  - It represents a **structured** decision
  - Some decisions that occur **frequently**
  - Can be a combination of both (structured + frequent)

- Non-programmed decisions
  - An **unstructured** decision
  - Occurs less frequently than a programmed decision.

- Most often both are needed for a Decision maker.

Decision making conditions
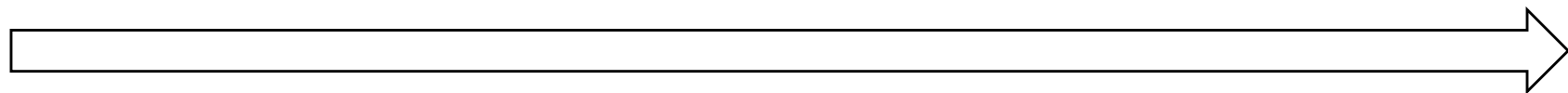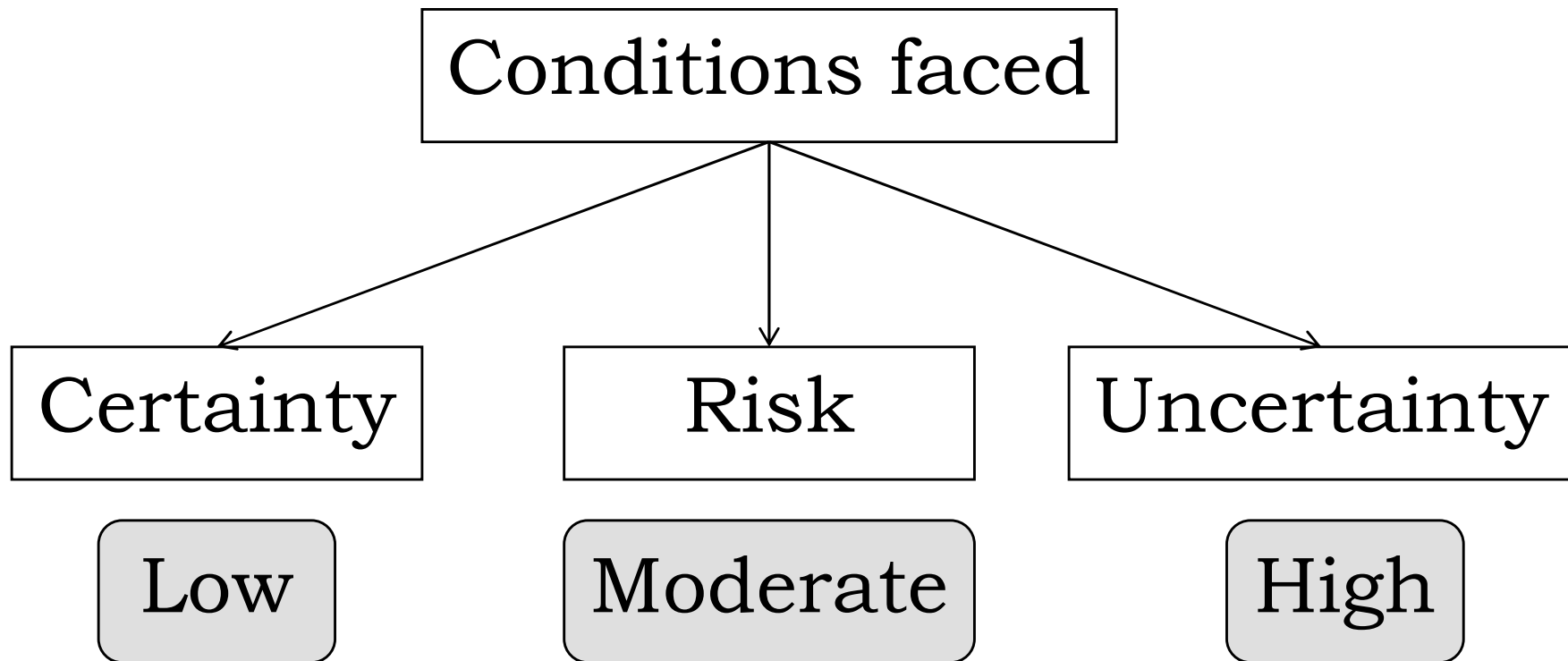
Decision making under certainty

- Alternatives
  - Known with certainty

- Outcomes
  - Known with certainty

- Decision making is straightforward as there is no ambiguity in resources and condition

- All the possible alternatives and outcomes are known prior to taking decision.

Decision making under risk

- Set of Alternatives and Outcomes are known.

- <u>Probability of what Alternative may lead to which Outcome is known.</u>

- Probability is of primary importance in such decision making

- Decision making is thus at RISK

- Need to <u>study the probabilities</u> before taking decisions.

Decision making under uncertainty

- Set of Alternatives and Outcomes are <u>not known</u>

- There can be more number of possible alternatives than those decided by DSS

- There can be more number of outcomes than those taken by DSS

- <u>Probability of what alternative will lead to which outcome is also not known</u>

- Such problem is called a Stochastic problem, that changes dynamically.

Types of Decision making model

- Rational or Normative decision maker model

- Administrative or descriptive decision maker model

Classical Rational Decision Model

- Following are considered while taking a decision

  - Obtain complete and perfect information

  - Eliminate uncertainty

  - Evaluate everything rationally and logically

- Finally, takes a decision that is supports all stakeholders of an organization and for the organization as well.

Steps in Rational Decision Model

1. Identify problem

2. Identify decision criteria

3. Allocate weights to criteria

4. Develop alternatives

5. Analyse alternatives w.r.t stakeholders

6. Select the best choice

7. Implementation

8. Evaluate effectiveness

Administrative Decision Model

- Following are considered while taking a decision

    - Use incomplete or imperfect information
    - Constrained by bounded rationality
    - Tend to satisfy immediate concerns

- Finally, takes a decision that is may be satisfactory for all stakeholders, but <u>not optimum for the organization</u>

- Usually do not get much time and resource to analyse

- Decisions are quick and is taken when really quick decision is on demand.

Administrative Decision Model Factors

- **Bounded Rationality**
    - Thought, Knowledge, Skills, Values, Ethics, Habits
    - Are very restricted in administrative decision model
    - Knowledge of decision maker at the time of decision making dominates.

- **Satisficing**
    - Decision makers look for alternatives
    - Never targets to find all alternatives
    - Chooses the first available alternative
    - To satisfy the current need of organization
    - Compromises long-term effects.

Administrative Decision Model Factors

- Coalition
  - A political force in decision making
  - Group formed with <u>informal</u> <u>alliance</u> among employees
  - All experts do not participate in this group
  - Group is formed to find a quick solution to a problem.

- Intuition
  - Belief on something without conscious consideration
  - Often taken by non-experts
  - Group formed with non-experts (coalition) often leads to quick but unstable decisions for an organization.

Administrative Decision Model Factors

- Escalation of Commitment
  - Decision maker often <u>sticks</u> to its decision
  - Even if the decision is proven to be <u>wrong</u>.

- Risk Propensity
  - The <u>extent</u> to which a decision maker can take a risk
  - Its <u>willingness</u> to take the risk is very important
  - Data Analytics may help in supporting risk taking.

Group Decision Making

- **Interacting groups**
  - Consists of an existing group
  - Sometimes new groups are formed for a quick solution
  - Decisions taken by groups are very fast but unstable.

- **Delphi**
  - This term is used to represent a situation
  - When opinions are taken from Experts
  - Where Experts are always anonymous.

- **Nominal group**
  - A structured technique designed to generate creative and innovative ideas.

Normal group technique

- Collective enquiry

- Idea generation collectively

- Identify problems

- Establish priority

- Postulate and standardizes new policies

- Removes controversies and uncertainties

- Neutralizes dominant individuals

- Voting on final decision.

Limitations of Interacting Groups

- Halo Effect
    - Presence of a dominating person in a group
    - Leads to one way directed decision making from the group
    - Initial impression of an employee drives future decision/course of action on him/her.

- Bandwagon Effect
    - Group member only following other members
    - Never gives any input to decision making
    - Often decisions given by them are <u>overlooked</u> by group members
    - Such a member tends to be Passive in the group
    - Induces <u>biasness</u> towards popular thoughts
    - <u>Never</u> participates in <u>progressive</u> thinking.

Delphi group characteristics

- Complete anonymity among participants

- Statistical assessment of the group response is done by the co-ordinator

- Final feedback (that is analysed) is given as response to experts who participated in the group, by maintaining anonymity of members

- Such a method often helps to obtain an unbiased review of a decision.

Delphi group requirements

- Anonymous team

- Identifying the Panellists or Experts

- Rounds of questionnaire

- Collecting anonymous group response

- Statistical assessment of anonymous responses

- Group consensus as reports.

Advantages of Group decision making

- <u>Availability</u> of more <u>information</u> and <u>knowledge</u>

- Generation of <u>more alternatives</u>

- More <u>likelihood of the acceptance</u> of the final decision

- Enhanced communication of the decision

- Better decisions are taken from Group of experts.

Disadvantages - Group decision making

- <u>Longer</u> process leading to additional costs

- Compromise decisions because of <u>indecisiveness</u>

- Halo and Bandwagon effects.

Challenges of Information Systems

- **Strategic Business Challenge:**

  - How can businesses use IT to design competitive and successful organizations?

- **Globalization Challenge:**

  - How can firms understand the business and system requirements of a global economic environment?

- **Information architecture challenge:**

  - How can organizations develop an information architecture that supports their business goals?

Challenges of Information Systems

- **Information system investment challenge**
  - How can organizations determine the business value of information systems? [1]

- **Responsibility and control challenge**
  - How can organizations design systems that people can control and understand?

  - How can organizations ensure that the information systems are used ethically and in a socially responsible manner?

[1] Bakis, Nick, Mike Kagioglou, and Ghassan Aouad. "Evaluating the business benefits of information systems." *Proceeding of 3rd International SCRI Symposium, Salford Centre for Research and Innovation, University of Salford, Salford, UK*. 2006.

Pointers for MIS Design

- <u>Address</u> data problems, such as <u>Bias</u> and <u>Errors</u>.

- Done using high level validations, checking and controlling the <u>procedures</u>.

- Procedures needed for transmitting the information from the source to the destination.

- <u>Handling of noise and distortion </u>by summarization and message routing

- Ensuring that <u>no information is suppressed</u> and <u>important information is emphasized.</u>

Pointers for MIS Design

- To provide specific attention to <u>quality parameters</u>, such as Utility, Satisfaction, Privacy.

- By controlling inputs to the MIS on the factors of impartiality, validity, reliability, and consistency.

- Should make a distinction between the different kinds of information for the purpose of communication.

- <u>A decision oriented information should be distinguished from a non action/knowledge-oriented information</u>.

- To recognize some aspects of <u>human capabilities</u> as a decision maker.

Pointers for MIS Design

- It should meet the needs of the total organization.

- MIS design should have the features of filtering, blocking, and delayed delivery.

- MIS is required to ensure that the information within organization is never misused.

Planning for MIS

- Organization's <u>strategic plan</u> (Business plan) should be followed by MIS.

- MIS planning depends solely on <u>decisions, guidelines</u> implemented by the Organization.

- Strategy planned for MIS should follow Organization strategy.

- The <u>Information Master Plan</u> establishes a framework for all detailed information system planning.

- Information Master Plan typically has one   long-range plan for three to five years (or more) and one a short-range plan for one year.

Planning for MIS

- The <u>long-range</u> plan provides general guidelines towards long-term goal.

- The <u>short-range</u> plan provides a basis for specific accountability as to operational and financial performance.

- MIS plan contains four main sections

  - Information system goals

  - Objectives and architecture (assessment of organizational context)

  - Inventory of current capabilities

  - Forecast of development

Quality of Information

- Information may be <u>presented</u> ethically

- Information may be <u>transmitted</u> efficiently

- Information may be <u>interpreted</u> correctly

- However, *information <u>may not be</u> **<u>used efficiently</u>***.

Quality of Information

- **Quality of information:**
  - Determined by how it <u>motivates a human action</u>
  - How much it <u>contributes to decision making</u>

- **Perception of Decision-maker on Quality Information**
  - <u>Utility</u> of Information
  - Information <u>satisfaction</u>
  - <u>Error</u>
  - <u>Bias</u>

Utility of Information

- **Form utility**
  - Format in which Information is provided.

- **Time utility**
  - Timing of Information delivery

- **Place utility**
  - Availability of Information

- **Possession utility**
  - Location of Information. <u>Who holds the Information</u>.

Information Satisfaction

- Information is a combination of specific items

- Importance of each item is often not disclosed (on purpose)

- Organization/Decision maker usually look at the context of the information

- Therefore, Information satisfaction should be measured based on <u>degree of Satisfaction of the Decision–maker</u>

- This degree actually indicates satisfaction level of the overall Information.

Problems with Poor-Quality Data

- Wastage of resources

- Fund wastage

- Effects quality of analysis

- Negative customer experience

- Delay in deliverables

- Hinders compliance with outside organizations or Govt. standards.

Data Quality Dimensions

- Accuracy

- Completeness

- Consistency

- Timeliness

- Validity

- Uniqueness

Data collection types

- Quantitative

  - Data that can be counted.

- Qualitative

  - Factors other than numerical values

  - Observations, Descriptions, etc.

Qualitative vs Quantitative Data

Quantitative Data

- Countable or measurable, relating to numbers.
- Tells us how many, how much, or how often.
- Fixed and universal, "factual."
- Gathered by measuring and counting things.
- Analyzed using statistical analysis.

Qualitative Data

- Descriptive, relating to words and language.
- Describes certain attributes, and helps us to understand the "why" or "how" behind certain behaviors.
- Dynamic and subjective, open to interpretation.
- Gathered through observations and interviews.
- Analyzed by grouping the data into meaningful themes or categories.

Quantitative Data

- <u>Nominal</u>: labeled data (color name)

- <u>Ordinal</u>: ordered (rating score)

- <u>Interval</u>: range (temperature)

- <u>Ratio</u>: height, income, annual sales

Quantitative Data Analysis

- Regression

- Simulation

- Cohort

- Clustering

- Time-series

Qualitative Data Analysis

- Content analysis

- Narrative analysis

- Disclosure analysis

- Thematic analysis

- Grounded theory analysis.

Data collection methods

- Interviews

- Questionnaires and surveys

- Observations

- Documents and records

- Focus groups

- Verbal histories

- Subjective tests

Type of reports from MIS

- Scheduled report

- Key indicator report

- Demand report

- Exception report

Type of reports from MIS

- Scheduled report

  - Produced periodically

  - Schedule (daily, weekly, monthly)

- Key indicator report

  - Summarizes the previous day's critical activities

- Demand report
  - Gives certain report at manager's request

- Exception report
  - Produced when a situation is unusual or requires management action.

Error and Bias

- Error and Bias reduces Quality of Information

- A detected biasness can be adjusted by a Decision-maker (Decision support system)

- Errors cannot be addressed by Decision-makers

- Goal is to focus on Quality, rather on Quantity of Information

- Goal is to focus on Error free data and Bias free analysis.

Error addressing part of TPS

- Why Error occurs in Information?

  - Incorrect data measurement and collection

  - Wrong processing procedures

  - Wrong recording/correcting

  - Incorrect master file

  - **Deliberate Falsification**

Avoiding Errors

- Internal control

- Internal / External Auditing

- Addition of confidence limits

- Instructions in measuring or processing of data

Types of Bias in Information System

- **Uncertainty bias:**
  - Remove recipient from contact of detailed data.

- **Presentation bias:**
  - Bias by order and grouping.
  - Bias by selection of the limits.
  - Bias by the selection of the Graphic layout.

Presentation Bias

- ## Ordering and Grouping

  - Biasness may be introduced due to various grouping strategies.

  - Biasness may be introduced based on the type of ordering strategy selected.

- ## Choice of limits:

  - Use of too low or too wide limits may introduce bias.

- ## Choice of Graphics:

  - Presentation graphics selection may introduce bias

  - Different types of graphs may lead to biasness

Presentation Bias

- **Choice of Scale:**
  - Affects the perception of differences in trend charts.

- **Choice of Size:**
  - Size of every element should be nearly same as much possible.

- **Choice of Color:**
  - Red may be used to draw attention
  - May lead to mis-information
  - May be used to forge information
  - To deviate from the actual context.

Cause of Bias

- Data Acquisition

- Processing of Information

- Related to Output

- Related to Feedback

Biases related to Data Acquisition

- ### Availability Bias:

  - Number of subjects are very important

  - Data collected over a large population may be misleading

  - A highly publicized event/element/subject may always get higher reach with respect to other not so publicized event/subject.

- ### Selective Perception

  - Own experience bias

  - Data acquired based on what one expected as outcome

  - Survey taken on Cricketers to decide whether Indian citizens to play outdoor games.   like

- ### Frequency bias

  - Absolute number of success are more important than their relative number; Lottery example.

Biases related to Data Acquisition

- **Concrete information**
  - People reply more on concrete information rather than on statistical data.

- **Illusory correlation**
  - People usually choose inappropriate variable for prediction.

- **Data presentation bias**
  - Mode of presentation
  - Mixture of Quantitative/Qualitative data
  - Etc.

Bias during Information Processing

- **Inconsistency**
  - People are sometimes inconsistent in their processing of information

- **Conservation**
  - Decision-makers are often conservative

- **Non-linear extrapolation**
  - Decision-makers are unable to visualize exponential growth or decay.

  - **Decision environment**
    - Complexity of the information
    - Emotional stress
    - Social pressure

Bias related to Output

- Response mode

- Question format

- Scale effects

- Wishful thinking
  - Our thought should not lead towards the final output

- Illusion of control
  - Situation that has gone out of control
  - We may change parameters to direct output towards desired outcome

Bias related to Feedback

- Personnel feedback
  - Selected candidates are notified
  - Rejected candidates never gets acknowledgement

- Success Attribution
  - On success refer to the Hard work done

- Failure Attribution
  - On failure refer to the Hard luck !!

- Feedback from eye witness of a scene may be wrong

- Decision-makers may always find some problems in a scenario.
  - Even though past results are good.

Decision-making

- The process of

    - Recognizing and defining the <u>nature of a decision</u>

    - Decision is always Goal oriented

    - Decision needs to be continuous

    - Identifying alternatives

    - Choosing the "best" alternative

    - Enrolling the alternative into practice within the organization.

Knowledge

- It refers to the fact, feelings, or **experience** known by a person or group of people

- It is richer and more meaningful than an information.

- It involves <u>mental processes of comprehension, understanding, and learning gained through experience or study</u>

- It is an outcome of <u>making comparisons and identifying consequences</u>.

Types of Knowing

- **Explicit and Implicit knowledge**
    - Knowledge expressed in words or numbers
    - Knowledge shared through discussion
    - Explicit knowledge is already written on documents, reports, models or databases
    - Implicit knowledge can be written down but not yet written.

- **Tacit knowledge**
    - Knowledge carried in mind
    - Example – skills, experiences, insight, intuition, and judgement
    - Knowledge that is difficult to articulate or written in documents
    - Can be shared through discussion and interactions.

Types of Conversation

- Socialization (Tacit to Tacit)

- Externalization (Tacit to Explicit)

- Internalization (Explicit to Tacit)

- Combination (Explicit to Explicit)

Types of Conversation

- Externalization conversation is most important

- i.e. discussion between Tacit and Explicit

- One shares ideas and another drafts them

- Both are equally important and responsible

- Tacit knowledge generates Explicit knowledge

- Proper drafting of Explicit knowledge could help in bringing new Tacit ideas in turn.

Organizational Learning

- Organizational learning is needed for

    - Creation of new **standard operating procedures (SOP)** and business processes

- Knowledge management in this regard helps in

    - Preparing set of processes required to

    - Create, gather, store, maintain, and disseminate knowledge

Learning Types

- **Single loop learning**

  - Using knowledge to solve specific problems

  - that are based on existing assumptions

  - and which has proved to work in the past

- **Double loop learning**

  - Questions existing assumptions

  - To create new insights

IT for Knowledge Management

- Sharing Knowledge

- Distributing Knowledge

- Capture and Codify Knowledge

- Create Knowledge

IT for Knowledge Management

- Sharing Knowledge

  - Group collaborations

  - Virtual platforms

    - Google Meet

    - Microsoft Teams

    - Zoom

    - Cisco Webex

    - Skype

IT for Knowledge Management

- Distribute Knowledge

  - Office systems

  - Word processing

  - Imaging and Video services

  - Databases

  - Electronic Calendar

IT for Knowledge Management

- Capture and Codify Knowledge

  - Artificial intelligence

  - Expert systems

  - Neural networks

  - Algorithms

  - Intelligent agents

IT for Knowledge Management

- ## Create Knowledge

  - Knowledge Work Systems

  - Computer Aided Design (CAD)

  - Workstations

  - Virtual reality

  - Augmented reality

Expert Systems

- Computer program that <u>simulates human decisions</u> on a specific field

- Usually they are <u>knowledge-intensive</u> programs that solves problem that requires human experts

- Use such knowledge in form of <u>Rules</u>

- May come up with <u>multiple hypothesis</u>

- AI, ML, and Neural networks aid in design of Expert Systems.

Expert Systems

- Knowledge engineer plays the most important role in an expert system

- Collects relevant information

- Gathers experience from <u>experts</u>

- <u>Translates information into Rules</u>

- Designs the Expert system based on the Rules.

Categories of Expert System Applications

- **Classification**: identify an object based on stated characteristics

- **Monitoring**: compare data from a continually observed system to prescribe behaviour

- **Process Control**: control a physical process based on monitoring

- **Design**: configure a system according to specifications

Categories of Expert System Applications

- **Scheduling & Planning**: develop or modify a plan of action

- **Generation of Options**: generate alternative solutions to a problem

How Expert Systems Work

- Strength of expert system derives from knowledge base

- **Knowledge base**: organized collection of facts and heuristics about a system's domain

- Knowledge base contains both factual and heuristic knowledge

- Knowledge representation is the method used to organize the knowledge in knowledge base.

How Expert Systems Work

- **Knowledge base must contain**

  - Actions to be taken under specific circumstances

  - Time and dependencies

  - Goals and high level concepts

- **Two types:**

  - Frame-based systems

  - Production rules

Production Rules

- Most common expert system approach

- Used for knowledge representation

- Expert systems which uses production rules are mentioned as:

  - Rule-based expert system : knowledge represented in terms of rules

  - Consists of: IF part and THEN part

  - IF Condition THEN action

Expert System Strategy

- Forward chaining:

  - Data driven strategy

  - Inferencing process moves from facts to goal/conclusion

  - Driven by the available facts and conclusion that can be satisfied

  - Attempts to match the condition part of every rule with the available fact

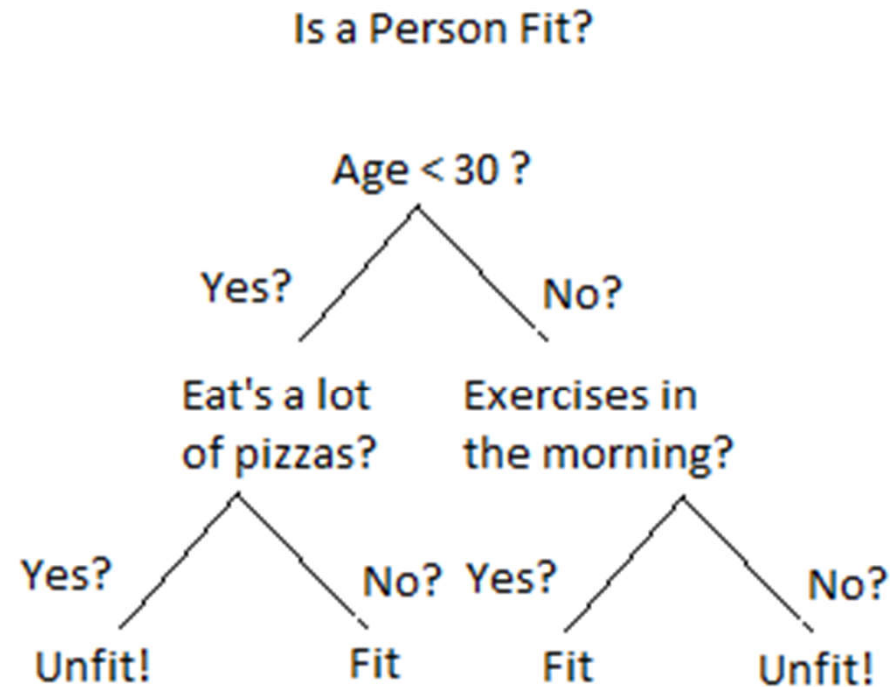 - Used to solve open-ended problems in decision making.

Expert System Strategy

- Backward chaining:

  - Attempts to match the assumed hypothesis or goal with the conclusion

  - Matches the assumed conclusion with the THEN (actual conclusion) in the production rules

  - If a rule is found then the concept/idea/premise becomes the new sub-goal

  - Backward chaining is popular in those scenarios where possible conclusions are limited and well defined.

Decision Analysis

- Process logic embedded within a Data Flow Diagram can be represented using

  - Structured English

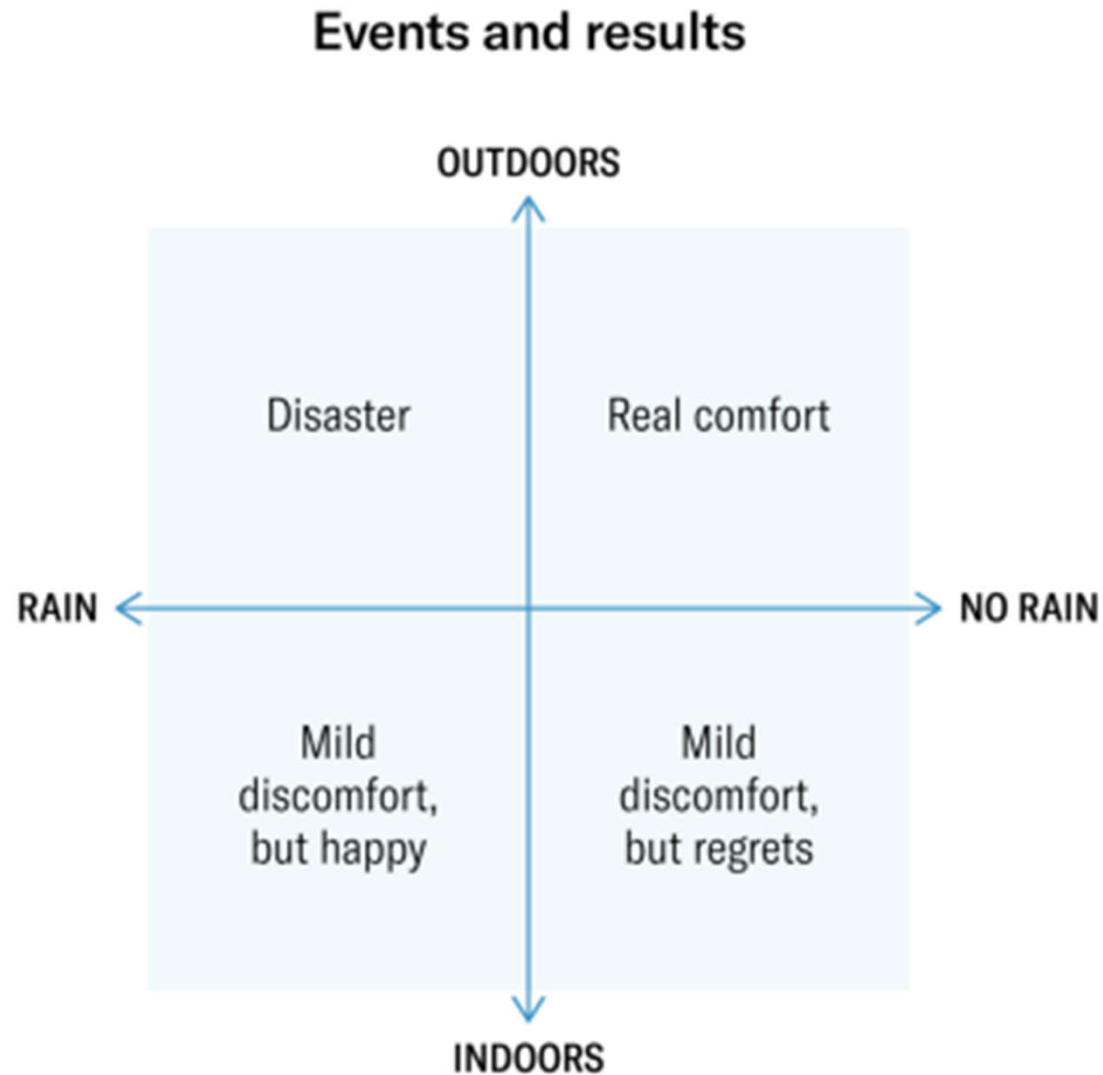 - Decision Trees

  - Decision Table, etc.

Decision Trees

Is a Person Fit?

Age < 30 ?

Yes?   No?

Eat's a lot   Exercises in
of pizzas?   the morning?

Yes?   No? Yes?   No?

Unfit!   Fit   Fit   Unfit!

- A Tree structure that represents

  - series of decisions

  - their possible consequences

Decision Trees

- Invited friends over dinner at home

- You have a nice garden which can be used for dinning

- The indoor house would be insufficient to accommodate all friends

- Your hypothesis says that friends would like the outdoor setup

- In case it rains outside, then party is ruined

- Assumption: You are committed to provide dinner in any case.
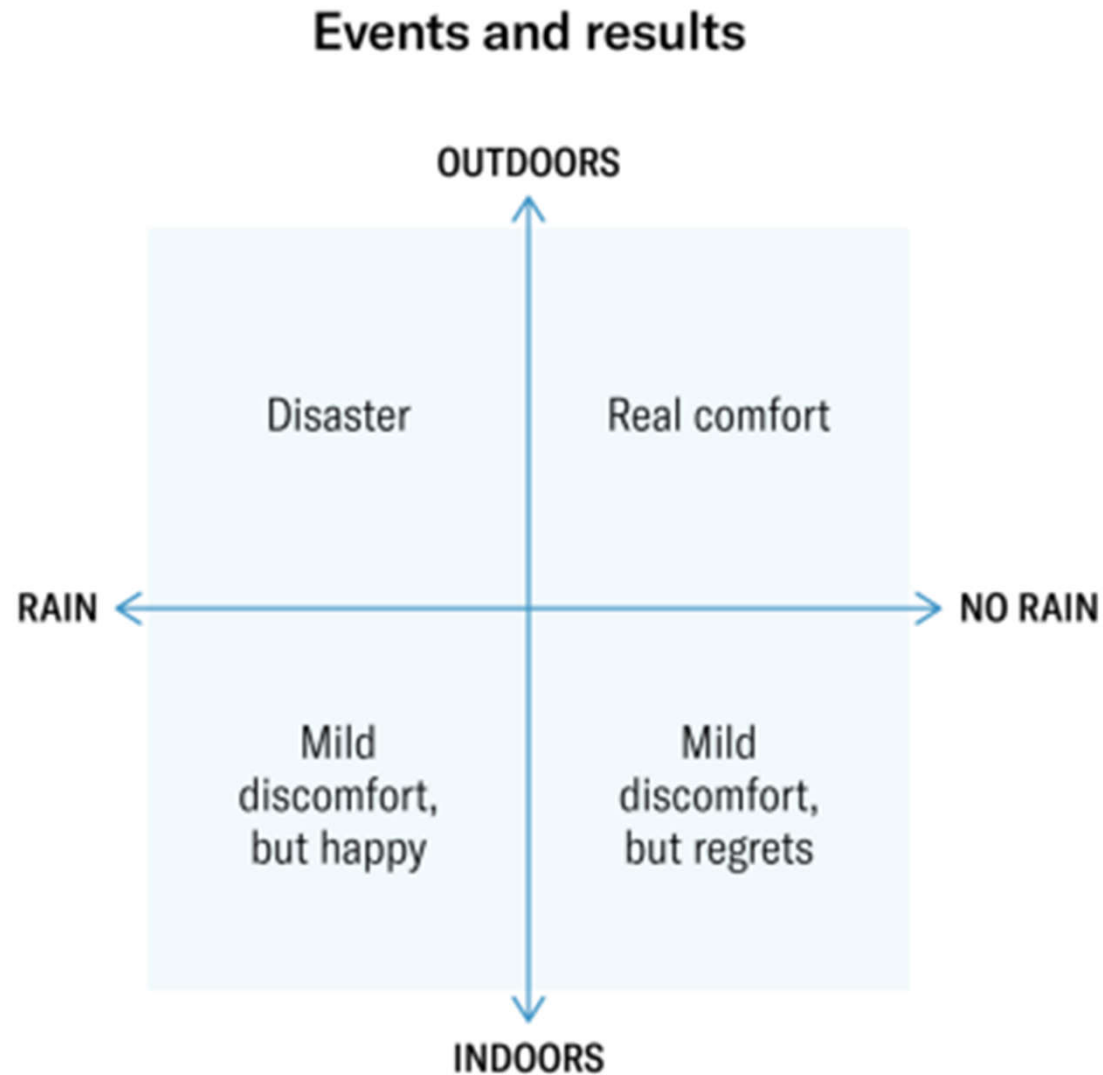
Decision Trees _ Payoff Table
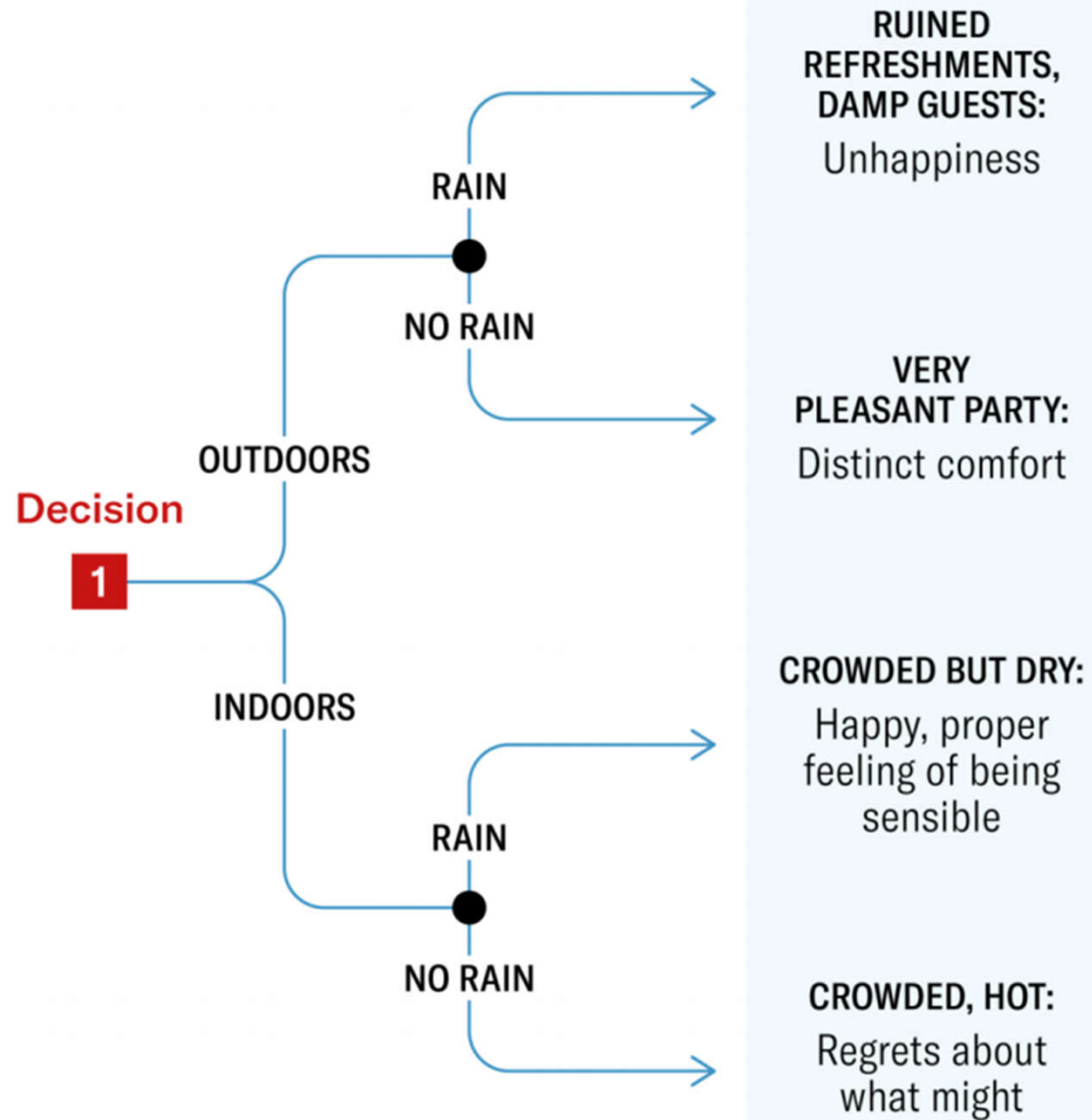

Events and results

Decision Trees

- Payoff table is an initial representation of the complexity of the situation

- However, more complex scenario cannot be represented using a payoff table, such as inclusion of factors which drives a decision. Decision tree is a suitable option

- **Decision taking problem is not an isolated scenario**

- **Since today's decision could shape tomorrow's decision**

- **Sequence of decisions on a specific scenario is also important**

- **Since for uncertain situation what we learned during the sequence of decisions could help.**

Decision Trees _ Payoff Table

Events and results

Key: ■ — DECISION POINT   ● — CHANCE EVENT (WEATHER)

Decision 1

OUTDOORS

RAIN → **RUINED REFRESHMENTS, DAMP GUESTS:** Unhappiness

NO RAIN → **VERY PLEASANT PARTY:** Distinct comfort

INDOORS

RAIN → **CROWDED BUT DRY:** Happy, proper feeling of being sensible

NO RAIN → **CROWDED, HOT:** Regrets about what might

Decision Trees

- Product manufacturing or development scenario

- Decision need to be taken on:

  - Whether to approve a development budget for an improved product

- Situation and Conditions

  - Decision can be taken considering the domain: DEVELOPMENT

  - If successful: company gets a competitive edge in market

  - Chances of failure exists

  - If not developed then your competitor in marker will develop

    - Your company looses market control.

Key: ■ DECISION POINT   ● CHANCE OR COMPETITIVE MOVE

Decision point

1

Your present decision

AUTHORIZE PROJECT

KILL PROJECT

DEVELOPMENT SUCCEEDS

DEVELOPMENT FAILS

Decision point

2 A

YOU PRODUCE COMMERCIALLY

YOU SHELVE

COMPETITOR INTRODUCES → Expand market, hold your share

COMPETITOR DOES NOT INTRODUCE → Expand market, and your share

COMPETITOR INTRODUCES → Introduce late, slight market loss

COMPETITOR DOES NOT INTRODUCE → No change in market

Cost of development

COMPETITOR INTRODUCES → License process, or try again to develop

COMPETITOR DOES NOT INTRODUCE → No change in situation

COMPETITOR INTRODUCES → License process, or try then to develop

COMPETITOR DOES NOT INTRODUCE → No change

Decision Trees

- At every decision point you take a decision based on

  - What alternatives are important to you at that time

  - Outcomes are presented accordingly

  - Thus outcomes are based on your present information

- Decisions in a Decision Tree is based on:

  - If what I know now is true then this is what will happen

- Decision trees are built based on data/ information that we have now!!

Decision Trees

- You do not identify all the events that can happen

- Neither you consider all the decision that are possible

- You just concentrate on the instant or available set of events and outcomes and include them in the decision tree

- Identifying all events, and all possible outcomes are part of analysis task

- Decision tree is not developed for analysis

- Decision tree showcase only those decisions, events and outcomes that are important to you now!!