Decision Support system

Learning objectives

- Assess how information systems support the activities of managers and management decision making.
- Demonstrate how decision-support systems (DSS) differ from MIS and how they provide value to the business.
- Describe components of DSS & GDSS
- Differentiate DSS& GDSS
- Demonstrate how DSS & GDSS helps in decision making
- Discuss Executive support system in the Enterprise

DSS-Background

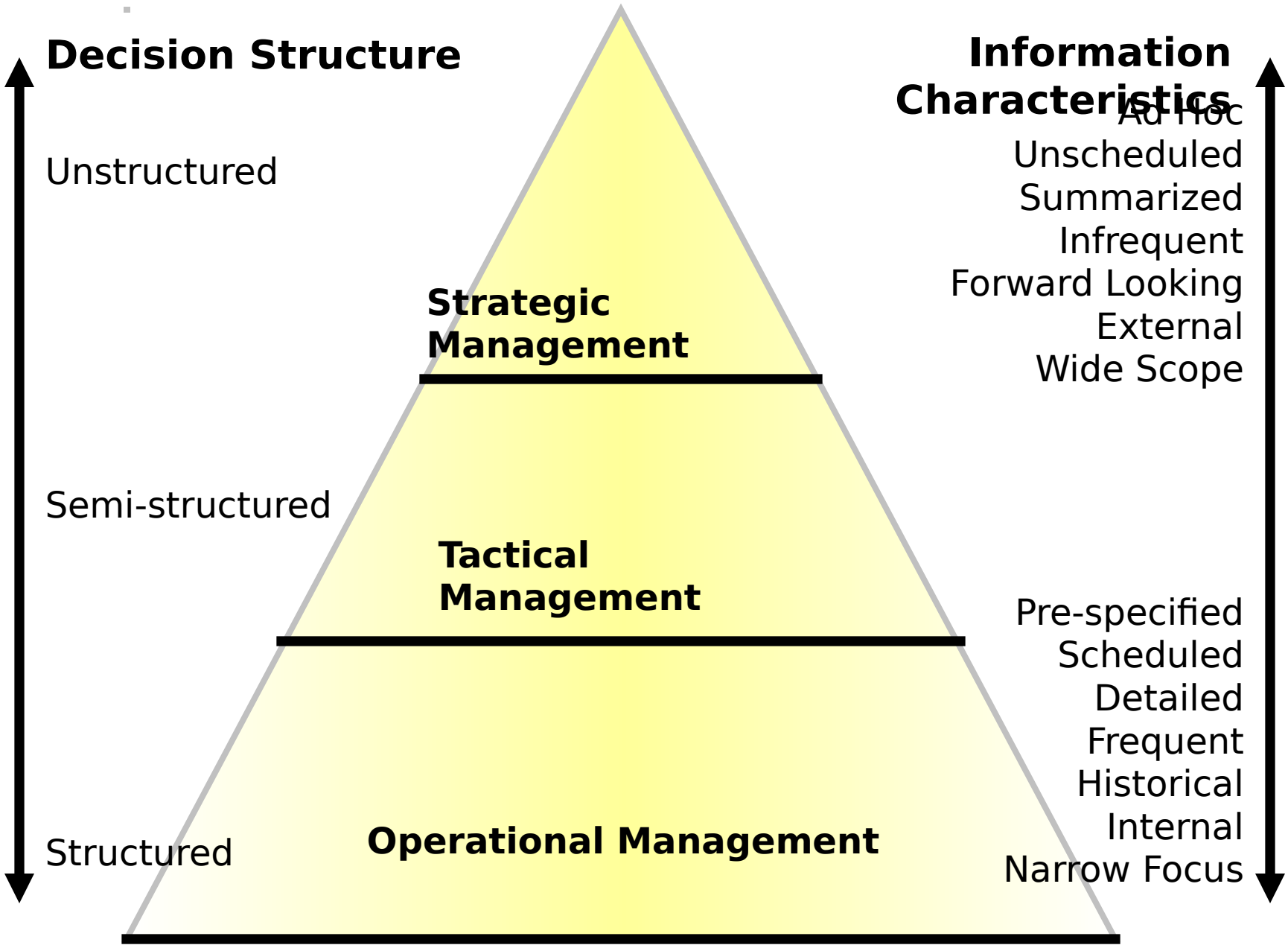
- Decision makers are faced with increasingly stressful environments
  - highly competitive,
  - fast-paced,
  - near real-time,
  - overloaded with information,
  - data distributed throughout the enterprise, and multinational in scope.

Contd…

- The combination of
  - the Internet enabling speed and access, and
  - the maturation of artificial intelligence techniques,
  - has led to sophisticated aids to support decision making under these risky and uncertain conditions.
- These aids in decision making by suggesting solutions that are better than those made by the human alone.
- Increasingly available in diverse fields from medical diagnosis to traffic control to engineering applications

Types of Decisions (Simon)

- *Structured decisions* are repetitive, routine, and involve a definite procedure for handling (e.g., restock inventory)
- *Unstructured decisions* are non routine decisions
- Where decision maker must provide judgment, evaluation, and insights
- There is no agreed-upon procedure for making the decision (e.g., decide on corporate objectives).
- *Semi structured decisions* are ones where only part of the problem has a clear-cut answer
- provided by an acceptable procedure (e.g., develop a marketing plan)


Decision Structure
Unstructured
Semi-structured
Structured
Strategic Management
Tactical Management
Operational Management
Information Characteristics
Ad Hoc
Unscheduled
Summarized
Infrequent
Forward Looking
External
Wide Scope
Pre-specified
Scheduled
Detailed
Frequent
Historical
Internal
Narrow Focus

DSS

- Assists the mgmt decision making by
  - combining data,
  - sophisticated analysis models, tools &
  - user friendly s/w into a single powerful system
- Can support semi structured & unstructured decision making
- DSS provides users with flexible set of tools & capabilities for analyzing important block of data

MIS vs. DSS

Management Information Systems vs. Decision Support Systems

MIS: The Big Picture

- **MIS** provides information about the performance of an organization
- Think of entire company (the firm) as **a system.**
- An MIS provides management with **feedback**

How is a DSS different?

MIS

- Periodic reports
- Pre-specified, generic reports

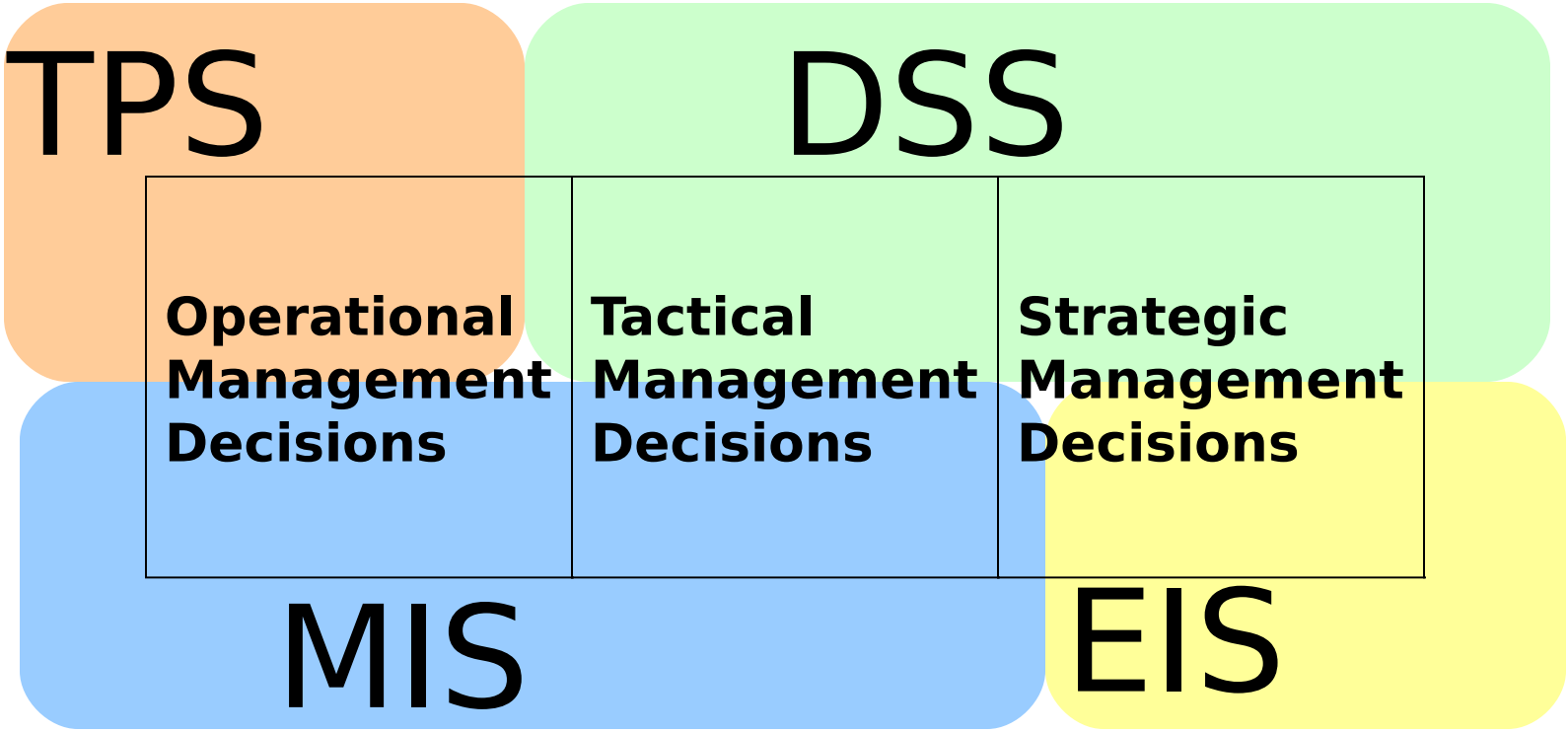
DSS

- Special reports that may only be generated once
- May not know what kind of report to generate until the problem surfaces; specialized reports.

MIS vs. DSS: Big Differences

- In a DSS, a manager generates the report through an interactive interface
  - Flexible & Adaptable reports
- DSS Reporting is produced through analytical modeling, not just computing an average, or plotting a graph.
  - Business Models are programmed into a DSS

MIS vs. DSS: Another Difference



Strategic Management

- The People
  - Board of Directors
  - Chief Executive Officer
  - President
- Decisions
  - Develop Overall Goals
  - Long-term Planning
  - Determine Direction
    - Political
    - Economic
    - Competitive

Tactical Management

- People
  - Business Unit Managers
  - Vice-President to Middle-Manager
- Decisions
  - short-medium range planning
  - schedules
  - budgets
  - policies
  - procedures
  - resource allocation

Operational Management

- People
  - Middle-Managers to
  - Supervisors
  - Self-directed teams
- Decisions
  - short-range planning
  - production schedules
  - day-to-day decisions
  - use of resources
  - enforce polices
  - follow procedures

MIS vs. DSS

	MIS	**DSS**
Support	**Info** about performance	**Info and modeling** to analyze problems
Report Form	Periodic reports or On Demand	Interactive Inquiries
Format	Pre-specified Fixed format	Flexible and Adaptable
Processing	Extract and manipulate data	Analytical modeling of data

Differences in System Characteristics

Dimensions	TPS	MIS	DSS
Type of users	**Clerical and supervisory**	**Middle Management**	**All levels including top mgmt. and professionals.**
Focus	**Data transactions**	**Information**	**Decision, flexibility**
Applications	**Payroll, sales data, inventory**	**Sales forecasting, Production control,**	**Strategic planning, integrated problems**

Differences in System Characteristics

Dimensions	TPS	MIS	DSS
Ease of use	Low	Moderate	High
Processing Interest	Expediency	Efficiency	Effectiveness
Reason for development	Cost saving, customer service	Reporting basic information	Improved decision making

What is Analytical Modeling?

Examples

- **Supply Chain Modeling** – Simulate what would happen if you reduced your inventory?
  - How many items would go out of stock?
  - How much would you save?
  - Is reducing inventory a good thing?

More Modeling

Price Point Modeling – model what would happen if you lowered or raised the price of your product

- uses information about
  - your customers income and
  - your competitors prices
- uses well-known supply and demand models

How is DSS reporting different?

- Modeling helps predict the outcome of a decision.
- This directly helps you make a decision
  - Possibly an optimal decision
- With a DSS you can explore possible alternatives.

Analytical Modeling is the key

Type of Modeling	Example
What-if analysis	What if we cut advertising by 10% what would happen to sales?
Sensitivity analysis	Let's cut advertising by 1% repeatedly so we can see its relationship to sales
Goal-seeking analysis	Let's try increasing advertising until sales reach $1 million
Optimization analysis	What level of advertising maximizes our overall profit?

Decision Support System

- Decision support systems are created to help people make decisions
- provides access to information & analysis tools
- Many stockbrokers now use programs that will automatically put in requests to sell shares once they reach a certain price
- Another example is a simple analytical tools that banks use to help formulate loans for perspective customers.

Decision Support System contd...

- DSS depends upon the accuracy of maths involved in creating the model &
- The ability of users to accurately interpret the resulting data
- DSS sometimes described as evolutionary step after MIS
- For this description to be valid; MIS must be defined narrowly as automating of routine & structured task to support decision making

Decision Support System contd...

- Such systems solves a specific problem or a class of problems such as scheduling, planning, resource allocation & forecasting
- They allow managers to ask adhoc queries & receive customized responses
- Although DSS initially targeted to top managers & middle managers, these systems are deployed at all the levels of the organization
- They support individual decision making to group decision making

DSS characteristics

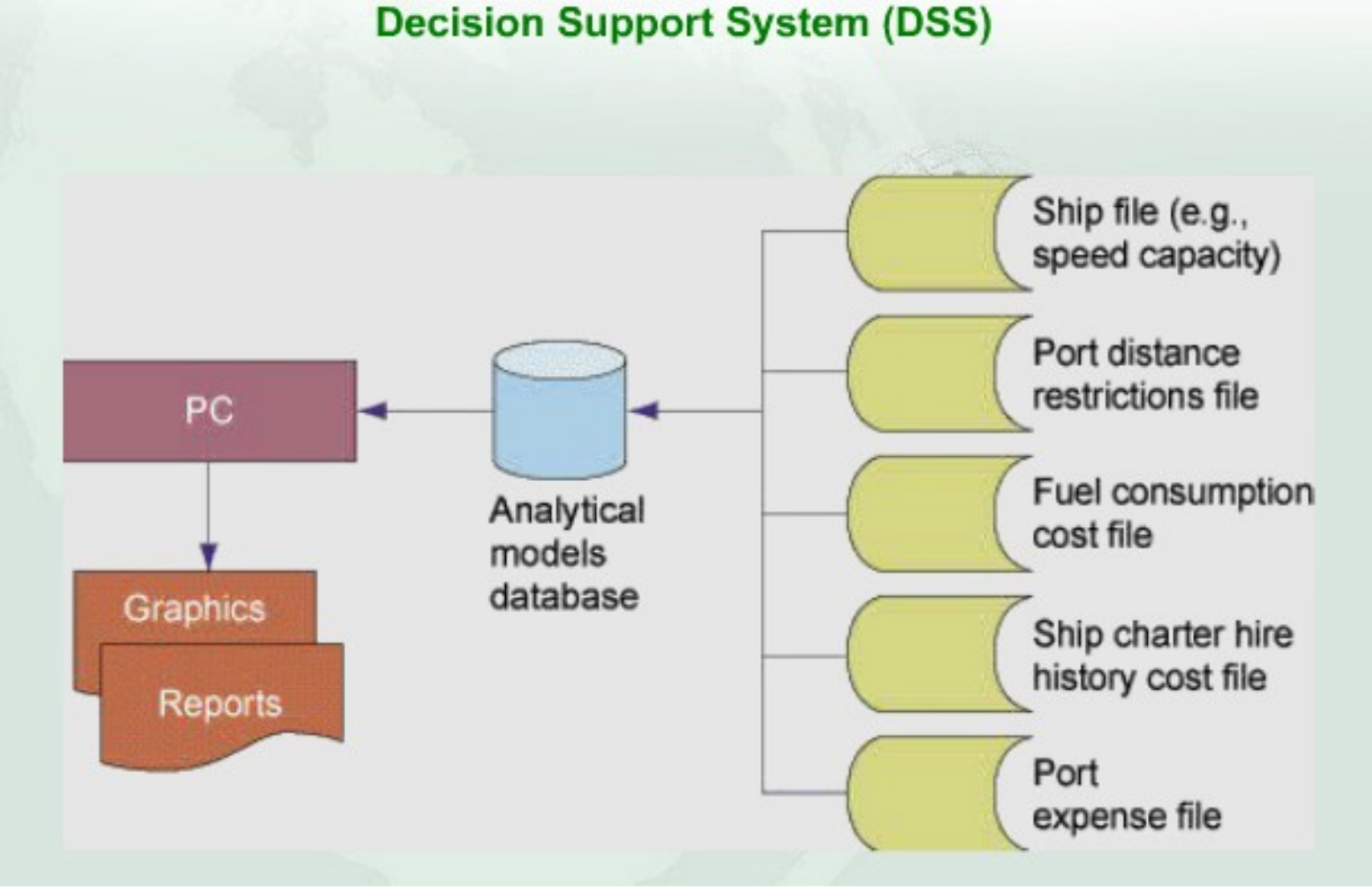
- Supports in decision making in both structured and unstructured problem environment
- Supports decision making at all the levels of the organization
- Provides decision support for several interdependent decisions.
- Supports all aspects of decision making process
- DSS are made of people, computers, procedures, databases, interactive query facility & so on
- Thus, they are intended to be evolutionary/adaptive & easy for people to use.

Example - DSS

Typical information that a decision support application might gather and present would be:

- Comparative sales figures between one week and the next
- Projected revenue figures based on new product sales assumptions
- The consequences of different decision alternatives, given past experience in a context that is described

Example -DSS


Decision Support System (DSS)
Ship file (e.g., speed capacity)
Port distance restrictions file
Fuel consumption cost file
Ship charter hire history cost file
Port expense file
Analytical models database
PC
Graphics
Reports

Types- DSS

- Two basic types of DSS
  - Model driven DSS
  - Data driven DSS

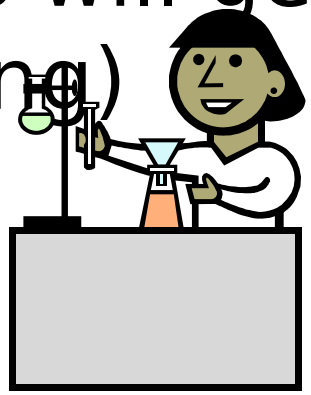
Model-driven DSS

What is a Model?

- A mathematical representation that relates variables for solving a decision problem
- Convert the decision problem into a model
- There can be multiple solutions to a model
- Use math techniques solve the model

Model driven DSS

- Analytical capabilities; Can answer ‘what-if’ scenarios
- Can be used for deciding which path to take (Goal seek)
- Can be used to determine what inputs will get you the desired output (Solving)



Model-driven DSS

- Primarily stand alone system isolated from major organizational Information systems
- Uses some type of model to perform “what-if “analysis & other kinds of analysis
- Such systems developed by end-user divisions or groups not under the control of central IS control
- Analysis capabilities based on the strong theory or model combined with easy to use UI

Contd…

- Dynamic module adjusts based on changing variables
- Pattern of behavior can become useful model
- Models often based on mathematical equations

Data-driven DSS

- These systems analyze large pool of data found in major organizational systems
- Supports decision making by allowing users to extract useful information that previously were buried in large quantities of data

Contd…

- Often data collected from TPS are collected in data warehouses
- Online analysis processing(OLAP) & data mining can then be used to analyze data
- Example : companies now build data driven DSS to mine customer data gathered from their web sites & enterprise systems

DSS - Components

- DSS Database
- DSS software system
- Model
- UI

DSS Database

- A collection of current or historical data from a number of application or groups
- Can be
  - a small DB residing in PC or
  - massive warehouse

DSS software system

- Contains the software tools that are used for data analysis
- May contain various OLAP tools, data mining tools or a collection of mathematical & analytical models
- Can be made easily accessible to the DSS user

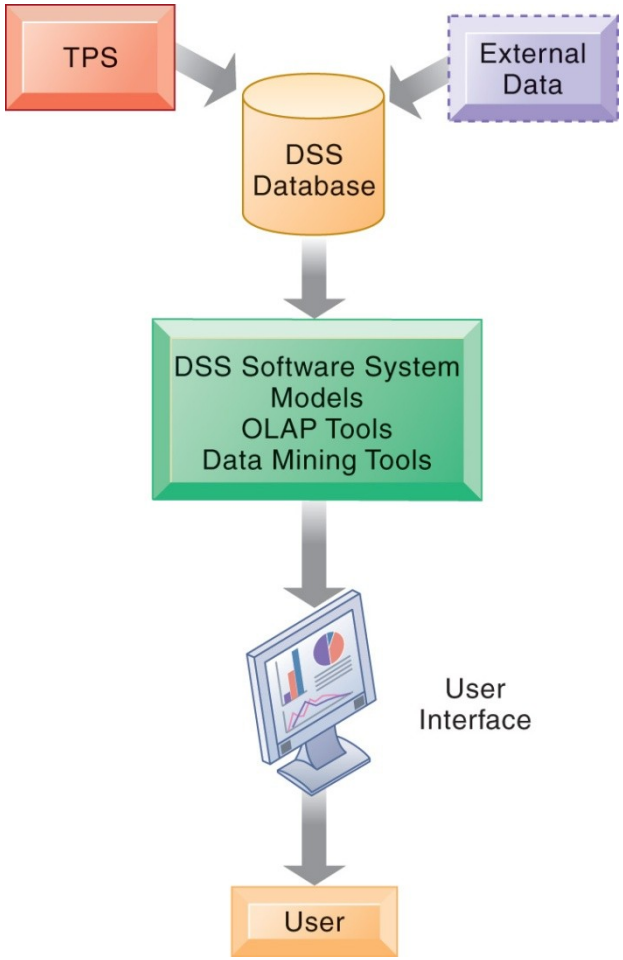
Model

- Abstract representation that illustrates components or relationships of phenomenon;
- may be physical(airplane), mathematical(equation), or verbal model (procedure for writing an order)
  - Statistical models
  - Optimization models
  - Forecasting models

User interface

- DSS user interface controls the interaction between the user and the tools
  - graphical, flexible, and easy to use (e.g., Wizards)

Overview of a Decision Support System



Example : DSS

- Statistical modeling s/w can be used to help establish relationships
- Libraries of statistical models
- Contains full range of expected statistical functions including mean, median, deviations & scatter plots
- s/w has the ability to project future outcomes by analyzing the series of data
- Optimization models helps to determine optical resource allocation to maximize/minimize cost & time etc- aims to maximize profit
- Forecasting models

DSS-Perceived benefits

- decision quality
- improved communication
- cost reduction
- increased productivity
- time savings
- improved customer and employee satisfaction

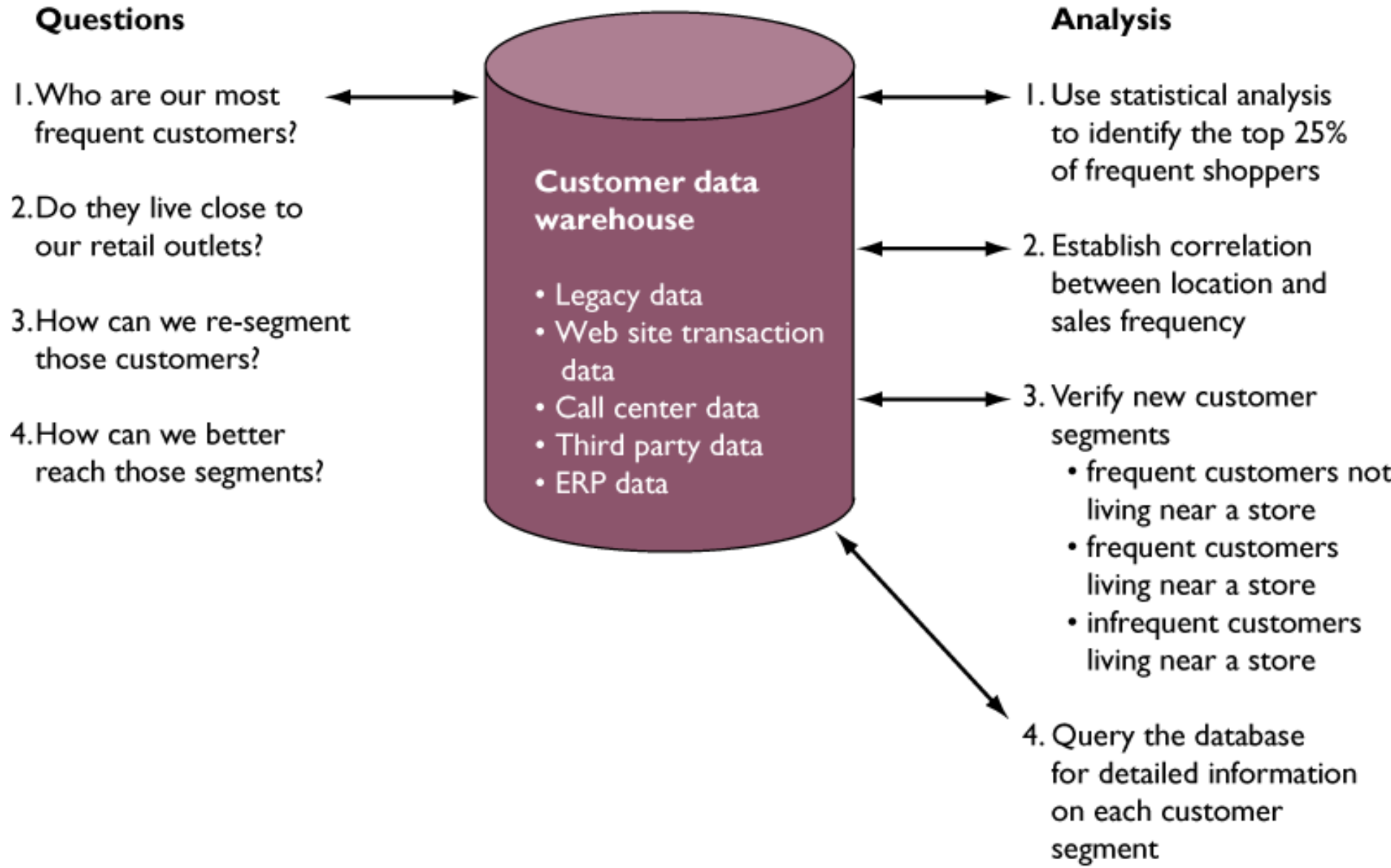
DSS- Applications

- **Business value of DSS**
- **Burlington Coat Factory: DSS for pricing**
  - DSS manages pricing and inventory nationwide, considering complex interdependencies between initial prices, promotions, markdowns, cross-item pricing effects and item seasonality
- **Syngenta: DSS for profitability analysis**
  - DSS determines if freight charges, employee sales commissions, currency shifts, and other costs in proposed sale make that sale or product unprofitable
- **Compass Bank: DSS for customer relationship management**
  - DSS analyzes relationship between checking and savings account activity and default risk to help it minimize default risk in credit card business

DSS for Customer Relationship Management

- Uses data mining to guide decisions
- Consolidates customer information into massive data warehouses
- Uses various analytical tools to slice information into small segments

DSS for Customer Relationship Management



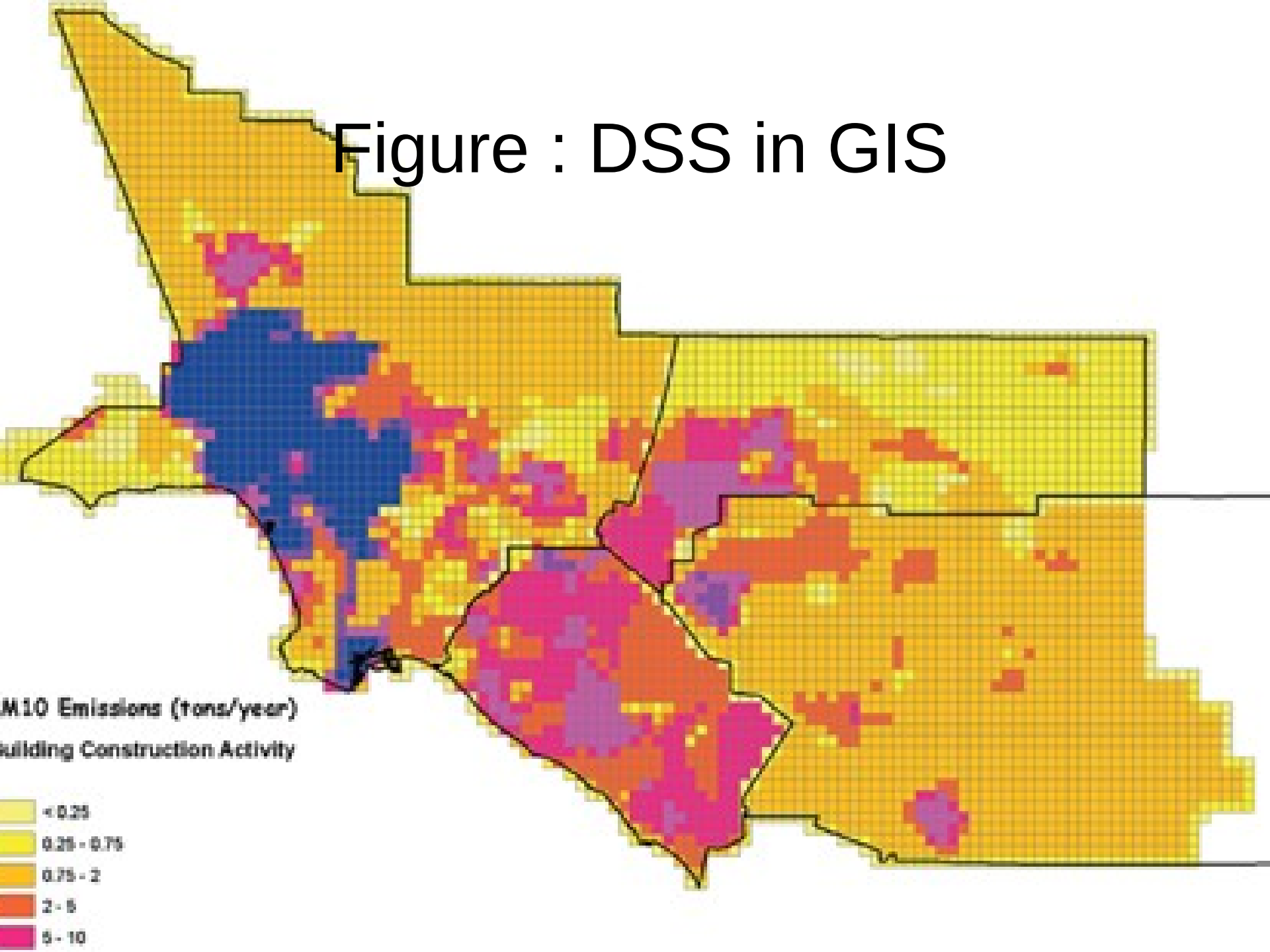
DSS for Supply Chain Management

- Comprehensive examination of inventory, supplier performance, logistics data
- To help managers search alternatives and decide on the most efficient and cost-effective combination
- Reduces overall costs
- Increases speed and accuracy of filling customer orders

DSS other examples.....

- **Data visualization tools:**
  - Help users see patterns and relationships in large amounts of data that would be difficult to discern if data were presented as traditional lists of text
- **Geographic information systems (GIS):**
  - Category of DSS that use data visualization technology to analyze and display data in form of digitized maps
  - Used for decisions that require knowledge about geographic distribution of people or other resources, e.g.:
    - Helping local governments calculate emergency response times to natural disasters
    - Help retail chains identify profitable new store locations

Figure : DSS in GIS



Web-based customer decision-support systems (CDSS)

- Support decision-making process of existing or potential customer
- Automobile companies that use CDSS to allow Web site visitors to configure desired car
- Financial services companies with Web-based asset-management tools for customers; Fidelity Investments: customer portfolio allocations, retirement savings plans...

Group DSS(GDSS) - Background

Need of GDSS

- Early DSS focused largely on supporting individual decision making
- In recent days much work is accomplished in groups within an organization
- System developers & scholars began to focus on how computers can support group & organization decision making.

What Is a GDSS?

- Interactive, computer-based system used to facilitate solution of unstructured problems by set of decision makers working together as group
- Primary focus on communication
- Designed to improve quality and effectiveness of decision-making meetings
- Make meetings more productive by providing tools to facilitate:
  - Planning, generating, organizing, and evaluating ideas
  - Establishing priorities

Elements that GDSS addresses.....

- Improved preplanning
- Increased participation
- Open, collaborative meeting atmosphere
- Criticism free idea generation
- Idea organization & evaluation
- Setting priorities & making decisions
- Documentation of meeting
- Access to external information
- Preservation of “ organizational memory”

Components of GDSS

- **Hardware**
  - Facility: Appropriate facility, furniture, layout
  - Electronic hardware: Audiovisual, computer, networking equipment
- **Software**
  - Electronic questionnaires, electronic brainstorming tools, idea organizers
  - Tools for voting or setting priorities, stakeholder identification and analysis tools, policy formation tools
  - Tools ensure anonymity
  - Group dictionaries
- **People**

GDSS software tools

- Electronic questionnaires
- Electronic brainstorming tools
- Idea organizers
- Questionnaires tools
- Tools for voting & setting priorities
- Stakeholder & analysis tools
- Policy formation tools
- Group dictionaries

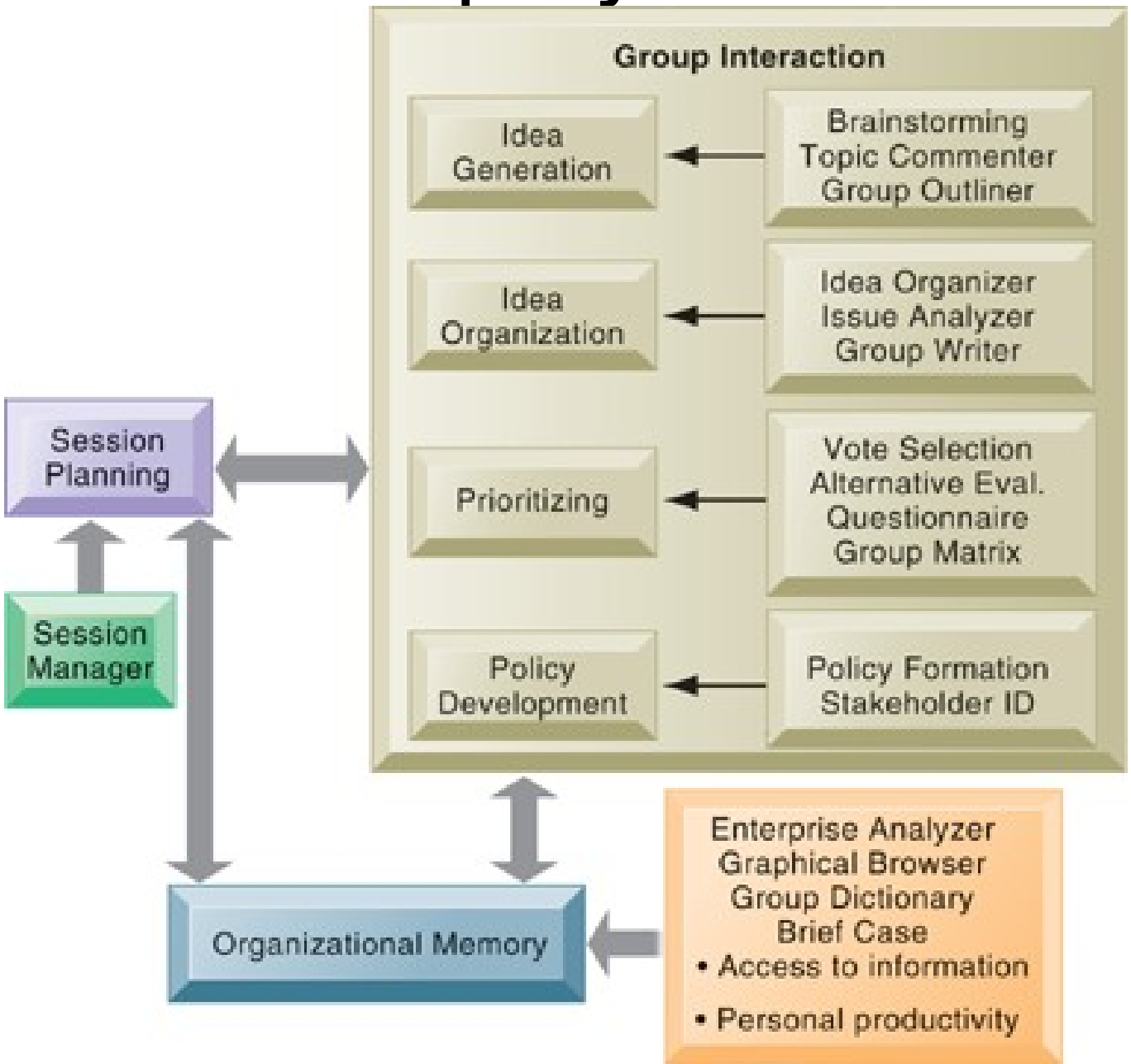
Overview of GDSS meeting

- **Electronic meeting system(EMS)-**used to make group meetings more productive by facilitating communication & decision making
- Each attendee has workstation, networked to facilitator’s workstation and meeting’s file server
- Whiteboards on either side of projection screen
- Seating arrangements typically semicircular, tiered
- Facilitator controls use of tools during meeting
- All input saved to server, kept confidential

Figure : Group System Tools

The sequence of activities and collaborative support tools used in an electronic meeting system facilitate communication among attendees and generate a full record of the meeting.

Source: From Nunamaker et al., “Electronic Meeting Systems to Support Group Work,” Communications of the ACM, July 1991. Reprinted by



Business value of GDSS

- Supports greater numbers of attendees
  - Without GDSS, decision-making meeting process breaks down with more than 5 attendees
- More collaborative atmosphere
  - Guarantees anonymity
- Can increase number of ideas generated and quality of decisions made

Contd…

- Most useful for idea generation, complex problems, large groups
- Successful use of GDSS depends on many factors
  - Facilitator’s effectiveness, culture and environment, planning, composition of group, appropriateness of tools selected, etc.

Group Decision Support System

- Group Decision Support System (GDSS)
  - Contains most of the elements of DSS plus software to provide effective support in group decision-making settings

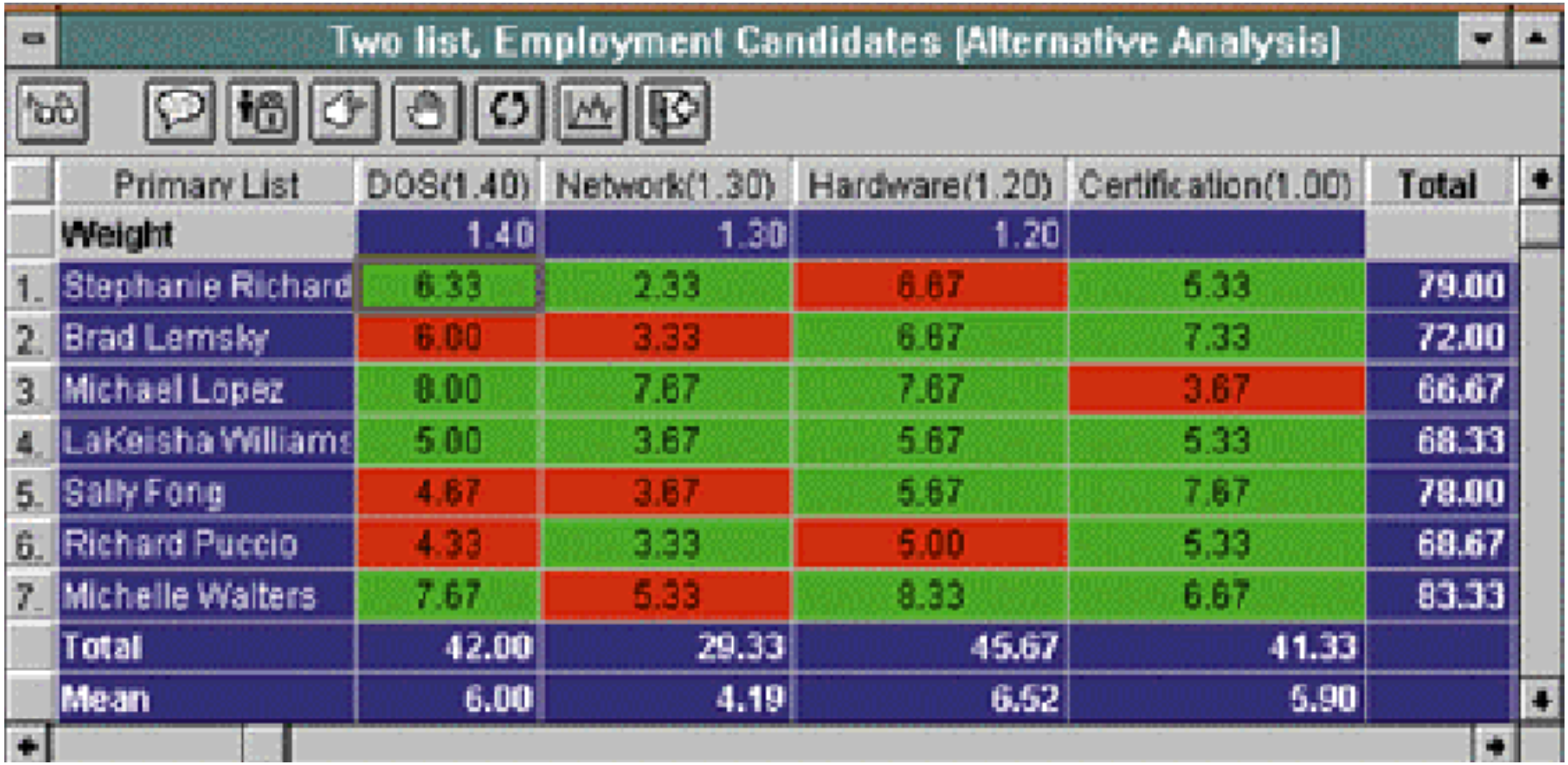
Characteristics of a GDSS (1)

- Special design
- Ease of use
- Flexibility
- Decision-making support
  - Delphi approach (decision makers are geographically dispersed)
  - Brainstorming
  - Group consensus
  - Nominal group technique

Characteristics of a GDSS (2)

- Anonymous(secret) input
- Reduction of negative group behavior
- Parallel communication
- Automated record keeping
- Cost, control, complexity factors

Group Results Matrix



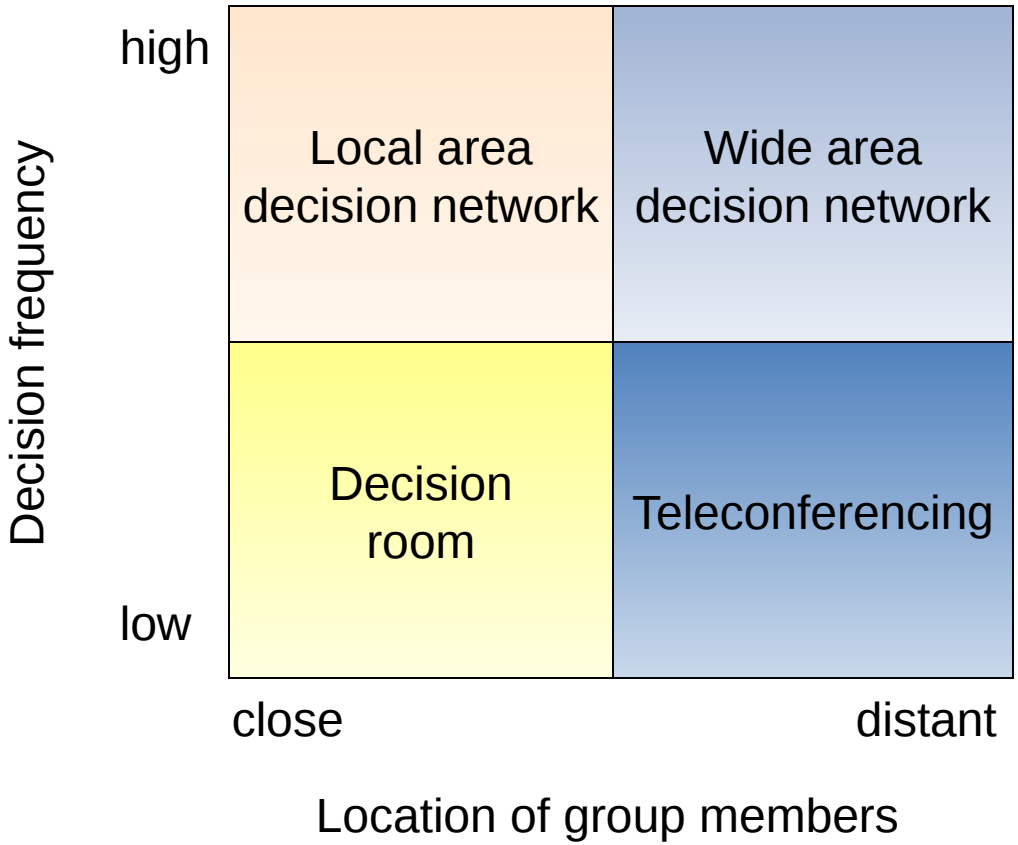
Two list, Employment Candidates [Alternative Analysis]

	Primary List	DOS(1.40)	Network(1.30)	Hardware(1.20)	Certification(1.00)	Total
	Weight	1.40	1.30	1.20		
1.	Stephanie Richard	6.33	2.33	6.67	5.33	79.00
2.	Brad Lemsky	6.00	3.33	6.67	7.33	72.00
3.	Michael Lopez	8.00	7.67	7.67	3.67	66.67
4.	LaKeisha Williams	5.00	3.67	5.67	5.33	68.33
5.	Sally Fong	4.67	3.67	5.67	7.67	78.00
6.	Richard Puccio	4.33	3.33	5.00	5.33	68.67
7.	Michelle Walters	7.67	5.33	8.33	6.67	83.33
	Total	42.00	29.33	45.67	41.33	
	Mean	6.00	4.19	6.52	5.90	

Components of a GDSS Software

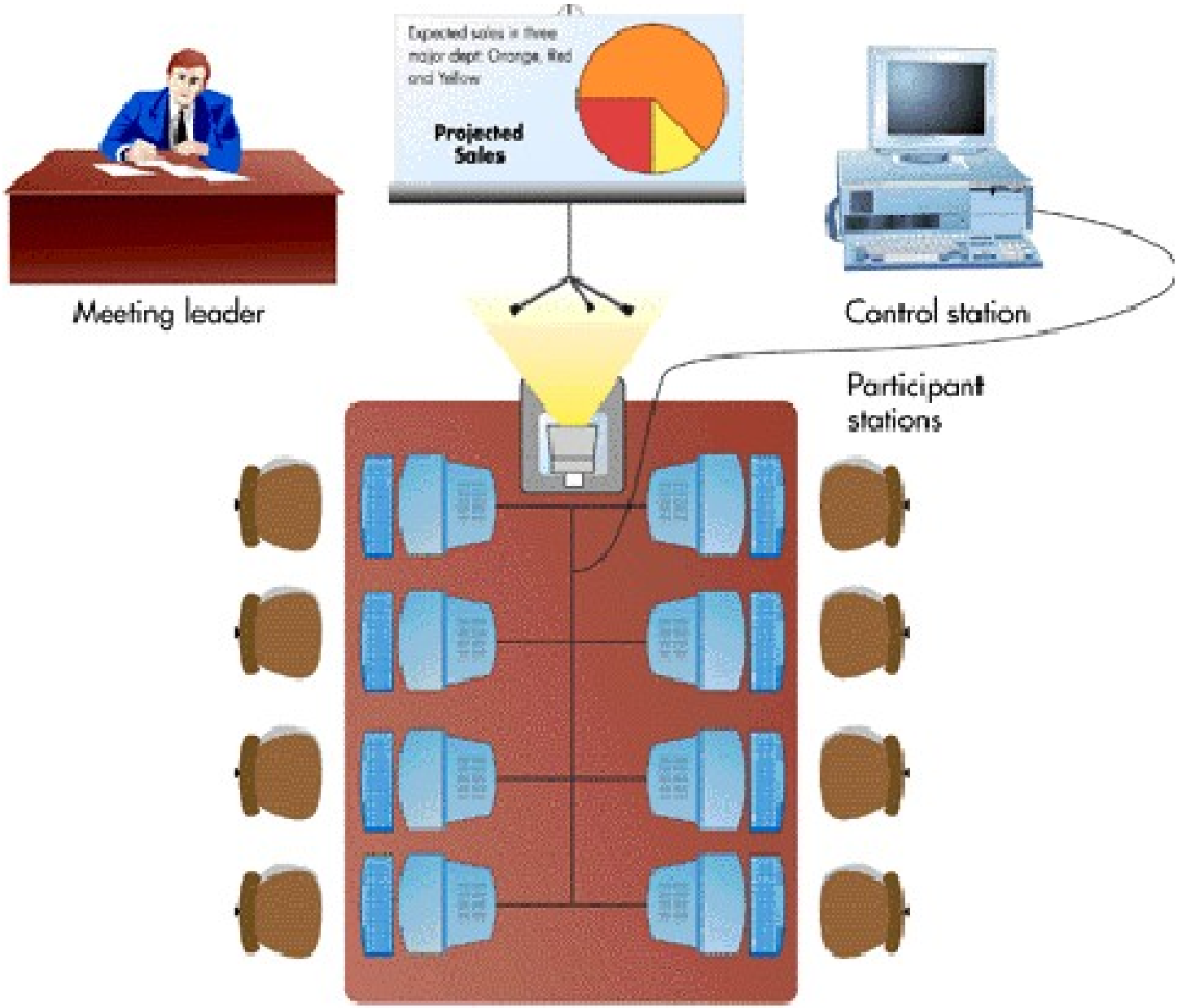
- Database
- Model base
- Dialogue manager
- Communication capability
- Special software (also called GroupWare)
- E.g., Lotus Notes
  - people located around the world work on the same project, documents, and files, efficiently and at the same time

GDSS Alternatives



Decision Room

- Decision Room
  - For decision makers located in the same geographic area or building
  - Use of computing devices, special software, networking capabilities, display equipment, and a session leader
  - Collect, coordinate, and feed back organized information to help a group make a decision
  - Combines face-to-face verbal interaction with technology-aided formalization


Expected sales in three major dept: Orange, Red and Yellow
Projected Sales
Meeting leader
Control station
Participant stations

Wide Area Decision Network

- Characteristics
  - Location of group members is distant
  - Decision frequency is high
  - Virtual workgroups
    - Groups of workers located around the world working on common problems via a GDSS

Enterprise Decision Support Systems

- DSS to provide enterprise-wide support
- Supports Executives
- Many decision makers in different locations
- Enterprise Resource Planning (ERP) systems
- Solves unstructured problems

EXECUTIVE SUPPORT IN THE ENTERPRISE

The Role of Executive Support Systems in the Firm

- ESS can bring together data from all parts of the firm and enable managers to select, access, and tailor them as needed.
- Uses easy-to-use desktop analysis tools & online data display
- It tries to avoid the problem of data overload so common in paper reports.
  - Here, data can be filtered & viewed in the graphical format

EXECUTIVE SUPPORT IN THE ENTERPRISE

The Role of Executive Support Systems in the Firm (Continued)

- The ability to drill down(from summery to detailed) is useful not only to senior executives but also to employees at lower levels of the firm who need to analyze data.
- OLAP tools provide the ability to drill down
- Major challenge is to integrate data from systems designed for very different purposes
- So that senior executives review organizational performance from a firm wise perspective
- Inclusion of modeling and analysis tools usable with a minimum of training

EXECUTIVE SUPPORT IN THE ENTERPRISE

Business Value of Executive Support Systems

- Ability to analyze, compare, and highlight trends
- Graphical interface enables users to review data more quickly and with more insight, speeding decision making.
- Timeliness and availability of data enables more timely decision making, helping businesses move toward a “sense-and-respond” strategy.
- Increases upper management span of control, better monitoring

OPPORTUNITIES & CHALLENGES

MANAGEMENT OPPORTUNITIES, CHALLENGES, AND SOLUTIONS

- Management Opportunities:
- DSS, GDSS and ESS provide opportunities for increasing precision, accuracy, and speed of decisions made by managers and employees
- Management Challenges:
- Building systems that can actually fulfill executive information requirements
- Changing management thinking to make better use of systems for decision support
- Organizational resistance

SOLUTIONS GUIDELINES

MANAGEMENT OPPORTUNITIES, CHALLENGES, AND SOLUTIONS

- Flexible design and development
- Information requirements are less structured and therefore require more user involvement during development
- The system must be flexible, easy to use, and capable of supporting alternative decision options
- Training and management support
- User training, involvement, and experience; top management support; and length of use are the most important factors in the success of management support systems

Executives' Role and Their Information Needs

- Decisional Executive Role (2 Phases)
  1. Identification of problems and/or opportunities
  2. The decision of what to do about them

- Flow chart and information flow

- Use phases to determine executives' information needs

Methods for Finding Information Needs

- Wetherbe's Approach
  1. Structured Interviews
     - IBM's Business System Planning (BSP)
     - Critical Success Factors (CSF)
     - Ends/Means (E/M) Analysis
  2. Prototyping
- Watson and Frolick's Approach
  - Asking (interview approach)
  - Deriving the needs from an existing information system
  - Synthesis from characteristics of the systems
  - Discovering (Prototyping)
    - Ten methods
- Other Methods

Future of Executive and Enterprise Support Systems

- Toolbox for customized systems
- Multimedia support
- Better access (via PDFs and cell phones)
- Virtual Reality and 3-D Image Displays
- Merging of analytical systems (OLAP / multidimensional analysis)) with desktop publishing
- Client/server architecture
- Web-enabled EIS
- Automated support and intelligent assistance
- Integration of EIS and Group Support Systems
- Global EIS
- Integration and deployment with ERP products