Decision Support Systems and Intelligent Systems

DECISION MAKING AND COMPUTERIZED SUPPORT

- Management Support Systems (MSS)
  Computerized technologies

- Objectives
  - Support managerial work
  - Support decision making
Management Support Systems
An Overview

Emerging and Advanced Computer Technologies for Supporting Managerial Problem Solution

- Changing Organizational Structure
- Enabling Business Transformation
- Changing Management Methods

Managers and Decision Making: Why Computerized Support?

- Competition
- Speed

The MANAGERS are always responsible for decision making
The Nature of Managers’ Work

[Make Decisions!] Mintzberg (1980) (Table 1.1) Roles

- **Interpersonal**
  - Figurehead
  - Leader
  - Liaison

- **Informational**
  - Monitor
  - Disseminator
  - Spokesperson

- **Decisional**
  - Entrepreneur
  - Disturbance Handler
  - Resource Allocator
  - Negotiator

Managers *need* information and *use* computers to support decision making

Managerial Decision Making and Information Systems

*Management* is a process by which organizational goals are achieved through the use of resources

- Resources: *Inputs*
- Goal Attainment: *Output*
- Measuring Success:

\[ \text{Productivity} = \frac{\text{Outputs}}{\text{Inputs}} \]
Management

- Management is decision making
- The manager is a decision maker
- Now fast changing, complex environment
- Trial-and-error: not a great approach
- Factors affecting decision making (Figure 1.1)

Factors Affecting Decision Making (Figure 1.1)

- Technology / Information/Computers
- Structural Complexity / Competition
- International markets / Political Stability / Consumerism
- Changes, Fluctuations
Managers and Computerized Support

- **Information Technology**: vital to the business
- Support technologies extensively implemented

Computer Applications Evolving from TPS and MIS to **Proactive** Applications (DSS)

New modern management tools in

- Data access
- On-line analytical processing (OLAP)
- Internet / Intranet / Web

for decision support
Need for Computerized Decision Support and the Supporting Technologies

- Speedy computations
- Overcome cognitive limits in processing and storage
- Cognitive limits may restrict an individual’s problem solving capability
- Cost reduction
- Technical support
- Quality support
- Competitive edge

Decision Support Technologies

Management Support Systems (MSS)
- Decision Support Systems (DSS)
- Group Support Systems (GSS)
- Enterprise (Executive) Information Systems (EIS)
- Enterprise Resource Planning (ERP) and Supply-Chain Management (SCM)
- Knowledge Management Systems
- Expert Systems (ES)
- Artificial Neural Networks (ANN)
- Hybrid Support Systems
- Intelligent DSS
Framework for Decision Support

- Figure 1.2 (Gorry and Scott Morton, 1971)

Combination of
- Simon (1977) Taxonomy
- Anthony (1965) Taxonomy

Decision Support Framework

<table>
<thead>
<tr>
<th>Type of Decision</th>
<th>Operational Control</th>
<th>Managerial Control</th>
<th>Strategic Control</th>
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<tbody>
<tr>
<td>Structured</td>
<td></td>
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<tr>
<td>Semistructured</td>
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<tr>
<td>Unstructured</td>
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Decision-making Along a Continuum (Simon)

Highly Unstructured (Nonprogrammed) Decisions

Highly Structured (Programmed) Decisions

Semistructured Decisions

Three Phase Decision-making Process (Simon)

- **Intelligence**--searching for conditions that call for decisions
- **Design**--inventing, developing, and analyzing possible courses of action
- **Choice**--selecting a course of action from those available
- **Unstructured problem** has no structured phases

- **Semistructured problem** has some (or some parts with) structured phases

- **Structured problem** has all structured phases
  - Procedures for obtaining the best solution are known
  - Objectives are clearly defined
  - Management support systems can be useful

- **Unstructured problems** often solved with human intuition

- **Semistructured problems** in between
  Solve with standard solution procedures and human judgment

- A **Decision Support System** can help managers understand problems in addition to providing solutions

- **Goal of DSS**: Increase the effectiveness of decision making
Anthony’s Taxonomy (1965)

- Encompass *ALL* managerial activities
  - Strategic planning
  - Management control
  - Operational control

- Combine Anthony and Simon’s Taxonomies
- DSS for semistructured and unstructured decisions
- MIS and management science approaches insufficient

Computer Support for Structured Decisions

- Since the 1960s
- Repetitive in nature
- High level of structure
- Can abstract and analyze them, and classify them into prototypes
- Solve with quantitative formulas or models
- Management Science (MS) / Operations Research (OR)
Management Science

Scientific approach to automate managerial decision making
1. Define problem
2. Classify problem
3. Construct mathematical model
4. Find and evaluate potential solutions
5. Choose and recommend a solution

Modeling: Transforming the real-world problem into an appropriate prototype structure

Decision Support Systems Concept

- DSS are interactive computer-based systems, which help decision makers utilize data and models to solve unstructured problems (Scott Morton, 1971)

- Decision support systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision makers who deal with semi-structured problems (Keen and Scott Morton, 1978).

Content-free expression

*There is no universally accepted definition of DSS
*Umbrella term vs. narrow definition (specific technology)*
Major DSS Characteristics

(DSS In Action 1.5: Houston Minerals Case)

- Initial risk analysis (management science)
- Model scrutiny using experience, judgment, and intuition
- Initial model mathematically correct, but incomplete
- DSS provided very quick analysis
- DSS: flexible and responsive. Allows managerial intuition and judgment

Why Use DSS?

Perceived benefits
- decision quality
- improved communication
- cost reduction
- increased productivity
- time savings
- improved customer and employee satisfaction
Major Reasons

- Unstable economy
- Difficulty in tracking numerous business objectives
- Increased competition
- Electronic commerce
- Existing systems did not support decision making
- IS Department is too busy
- Special analysis
- Need accurate information
- Organizational winner
- New or timely information needed
- Mandated by management
- Cost reductions
- End-user computing

Group Support Systems (GSS)

- Decisions often made by groups
- Supports groupwork, anytime, anyplace

Also called

- Groupware
- Electronic meeting systems
- Collaborative computing
Executive Information (Support) Systems (EIS, ESS)

- Organizational view
- Information needs of executives / managers
- Customized user seductive interface
- Timely and effective tracking and control
- Drill Down
- Filter, compress, and track critical data / information
- Identify problems / opportunities

EIS

- Mid-1980s - large corporations
- Now Global
- Affordable to smaller companies
- Serves managers as enterprise-wide systems
Expert Systems (ES)

- Experts solve complex problems
- Experts have specific knowledge and experience
- Expert systems mimic human experts
- ES performance comparable to or better than experts in a specialized and usually narrow problem area

Intelligent Agents

- Help automate various tasks
- Increase productivity and quality
- Learn how you work
Artificial Neural Systems

- Artificial Neural Networks (ANN):
  - Mathematical models of the human brain
  - ANN Learn patterns in data
  - ANN can work with partial, incomplete, or inexact information

Knowledge Management Systems (KMS)

- Capture and reuse knowledge at the organizational level
- Knowledge repository for storage
- Organizational impacts can be dramatic
ERP and SCM

- Enterprise Resource Planning (Management)
- Supply Chain Management including Customer Resource Management (CRM)
- Enterprise-level cost cutters

Cutting Edge Intelligent Systems

- Genetic Algorithms
  Work in an evolutionary fashion

- Fuzzy Logic
  Continuous logic (NOT just True / False)

- Intelligent Agents
  In search engines, email, electronic commerce
Summary

- DSS has many definitions
- Complexity of managerial decision making is increasing
- Computer support for managerial decision making
- Several MSS technologies including hybrids