Chapter 2
Decision-Making Systems, Models, and Support
Learning Objectives

• Learn the basic concepts of decision making.
• Understand systems approach.
• Learn Simon’s four phases of decision making.
• Understand the concepts of rationality and bounded rationality.
• Differentiate betwixt making a choice and establishing a principle of choice.
• Learn which factors affect decision making.
• Learn how DSS supports decision making in practice.
Standard Motor Products Shifts Gears Into Team-Based Decision-Making Vignette

- Team-based decision making
  - Increased information sharing
  - Daily feedback
  - Self-empowerment
- Shifting responsibility towards teams
- Elimination of middle management
Decision Making

• Process of choosing amongst alternative courses of action for the purpose of attaining a goal or goals.
• The four phases of the decision process are:
  – Intelligence
  – Design
  – Choice
  – implementation
Systems

- **Structure**
  - Inputs
  - Processes
  - Outputs
  - Feedback from output to decision maker

- **Separated from environment by boundary**
- **Surrounded by environment**
Figure 2.1 The System and Its Environment

- **Inputs**
  - Raw materials
  - Costs
  - Resources

- **Processes**
  - Procedures
  - Programs
  - Tools
  - Activities
  - Decisions

- **Outputs**
  - Performances
  - Consequences
  - Finished products
  - Services delivered

- **Feedback**

- **System boundary**

- **Environment**

- **Customers**

- **Vendors**

- **Stockholders**

- **Government**

- **Competitors**

- **Banks**
System Types

- Closed system
  - Independent
  - Takes no inputs
  - Delivers no outputs to the environment
  - Black Box

- Open system
  - Accepts inputs
  - Delivers outputs to environment
Models Used for DSS

- **Iconic**
  - Small physical replication of system

- **Analog**
  - Behavioral representation of system
  - May not look like system

- **Quantitative (mathematical)**
  - Demonstrates relationships between systems
<table>
<thead>
<tr>
<th>Phase</th>
<th>Web Impacts</th>
<th>Impacts On The Web</th>
</tr>
</thead>
</table>
| 1. Intelligence | Access to information to identify problems and opportunities from internal and external data sources  
Access to AI methods and other data-mining methods to identify opportunities  
Collaboration through GSS and KMS  
Distance learning can provide knowledge to add structure to problems | Identification of opportunities for e-commerce, Web infrastructure, hardware and software tools, etc.  
Intelligent agents lessen the burden of information overload  
Smart search engines |
| 2. Design     | Access to data, models, and solution methods  
Use of OLAP, data mining, data warehouses  
Collaboration through GSS and KMS  
Similar solutions available from KMS | Brainstorming methods (GSS) to collaborate in Web infrastructure design  
Models and solutions of Web infrastructure issues |
| 3. Choice     | Access to methods to evaluate the impacts of proposed solutions                                                                                                                                              | DSS tools examine and establish criteria from models to determine Web, intranet, and extranet infrastructure  
DSS tools determine how to route messages |
| 4. Implementation | Web-based collaboration tools (GSS) and KMS can assist in implementing decisions. Tools monitor the performance of e-commerce and other sites, intranet, extranet, and the Internet itself | Decisions were implemented on browser and server design and access: these ultimately determined how to set up the various components that have evolved into the Internet |
Phases of Decision-Making

- Simon’s original three phases:
  - Intelligence
  - Design
  - Choice
- He added fourth phase later:
  - Implementation
- Book adds fifth stage:
  - Monitoring
Decision-Making Intelligence Phase

• Scan the environment
• Analyze organizational goals
• Collect data
• Identify problem
• Categorize problem
  – Programmed and non-programmed
  – Decomposed into smaller parts
• Assess ownership and responsibility for problem resolution
Decision-Making Design Phase

- Develop alternative courses of action
- Analyze potential solutions
- Create model
- Test for feasibility
- Validate results
- Select a principle of choice
  - Establish objectives
  - Incorporate into models
  - Risk assessment and acceptance
  - Criteria and constraints
Decision-Making Choice Phase

- **Principle of choice**
  - Describes acceptability of a solution approach

- **Normative Models**
  - Optimization
    - Effect of each alternative
  - Rationalization
    - More of good things, less of bad things
    - Courses of action are known quantity
    - Options ranked from best to worse
  - Suboptimization
    - Decisions made in separate parts of organization without consideration of whole
Descriptive Models

- Describe how things are believed to be
- Typically, mathematically based
- Applies single set of alternatives
- Examples:
  - Simulations
  - What-if scenarios
  - Cognitive map
  - Narratives
Developing Alternatives

- **Generation of alternatives**
  - May be automatic or manual
  - May be legion, leading to information overload
  - Scenarios
  - Evaluate with heuristics
  - Outcome measured by goal attainment
Problems

- Satisficing is the willingness to settle for less than ideal.
  - Form of suboptimization
- Bounded rationality
  - Limited human capacity
  - Limited by individual differences and biases
- Too many choices
Decision-Making Choice Phase

- Decision making with commitment to act
- Determine courses of action
  - Analytical techniques
  - Algorithms
  - Heuristics
  - Blind searches
- Analyze for robustness
Decision-Making Implementation Phase

• Putting solution to work
• Vague boundaries which include:
  – Dealing with resistance to change
  – User training
  – Upper management support
**Figure 2.3 DSS Support**

Decision Support Systems

- Intelligence Phase
  - Automatic
    - Data Mining
      - Expert systems, CRM, neural networks
  - Manual
    - OLAP
    - KMS
  - Reporting
    - Routine and ad hoc
Decision Support Systems

• Design Phase
  – Financial and forecasting models
  – Generation of alternatives by expert system
  – Relationship identification through OLAP and data mining
  – Recognition through KMS
  – Business process models from CRM, RMS, ERP, and SCM
Decision Support Systems

• Choice Phase
  – Identification of best alternative
  – Identification of good enough alternative
  – What-if analysis
  – Goal-seeking analysis
  – May use KMS, GSS, CRM, ERP, and SCM systems
Decision Support Systems

• Implementation Phase
  – Improved communications
  – Collaboration
  – Training
  – Supported by KMS, expert systems, GSS
Decision-Making In Humans

• Temperament
  – Hippocrates’ personality types
  – Myers-Briggs’ Type Indicator
  – Kiersey and Bates’ Types and Motivations
  – Birkman’s True Colours

• Gender
Decision-Making In Humans

- Cognitive styles
  - What is perceived?
  - How is it organized?
  - Subjective

- Decision styles
  - How do people think?
  - How do they react?
  - Heuristic, analytical, autocratic, democratic, consultative
<table>
<thead>
<tr>
<th>Problem-solving Dimension</th>
<th>Heuristic</th>
<th>Analytic</th>
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<tbody>
<tr>
<td>Approach to learning</td>
<td>Learns more by acting than by analyzing the situation and places more emphasis on feedback</td>
<td>Employs a planned sequential approach to problem solving; learns more by analyzing the situation than by acting and places less emphasis on feedback</td>
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<tr>
<td>Search</td>
<td>Uses trial and error and spontaneous action</td>
<td>Uses formal rational analysis</td>
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<tr>
<td>Approach to analysis</td>
<td>Uses common sense, intuition, and feelings</td>
<td>Develops explicit, often quantitative, models of the situation</td>
</tr>
<tr>
<td>Scope of analysis</td>
<td>Views the totality of the situation as an organic whole rather than as a structure constructed from specific parts</td>
<td>Reduces the problem situation to a set of underlying causal functions</td>
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<tr>
<td>Basis for inferences</td>
<td>Looks for highly visible situational differences that vary with time</td>
<td>Locates similarities or common alities by comparing objects</td>
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