Turban, Aronson, and Liang
Decision Support Systems and Intelligent Systems, Seventh Edition

# 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

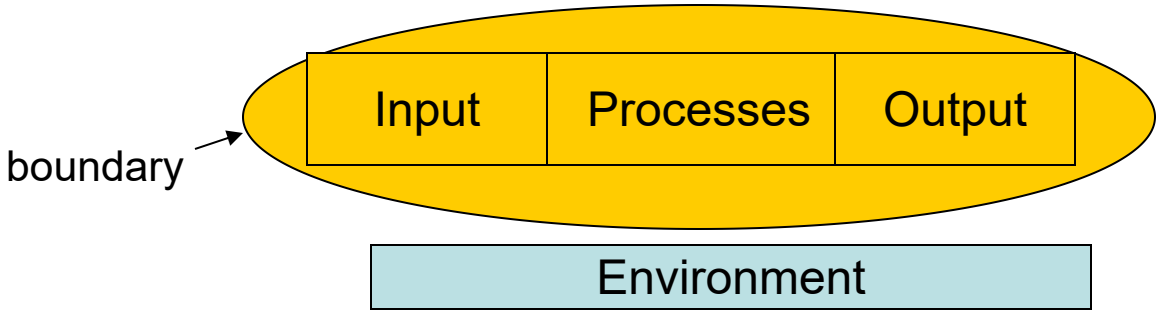
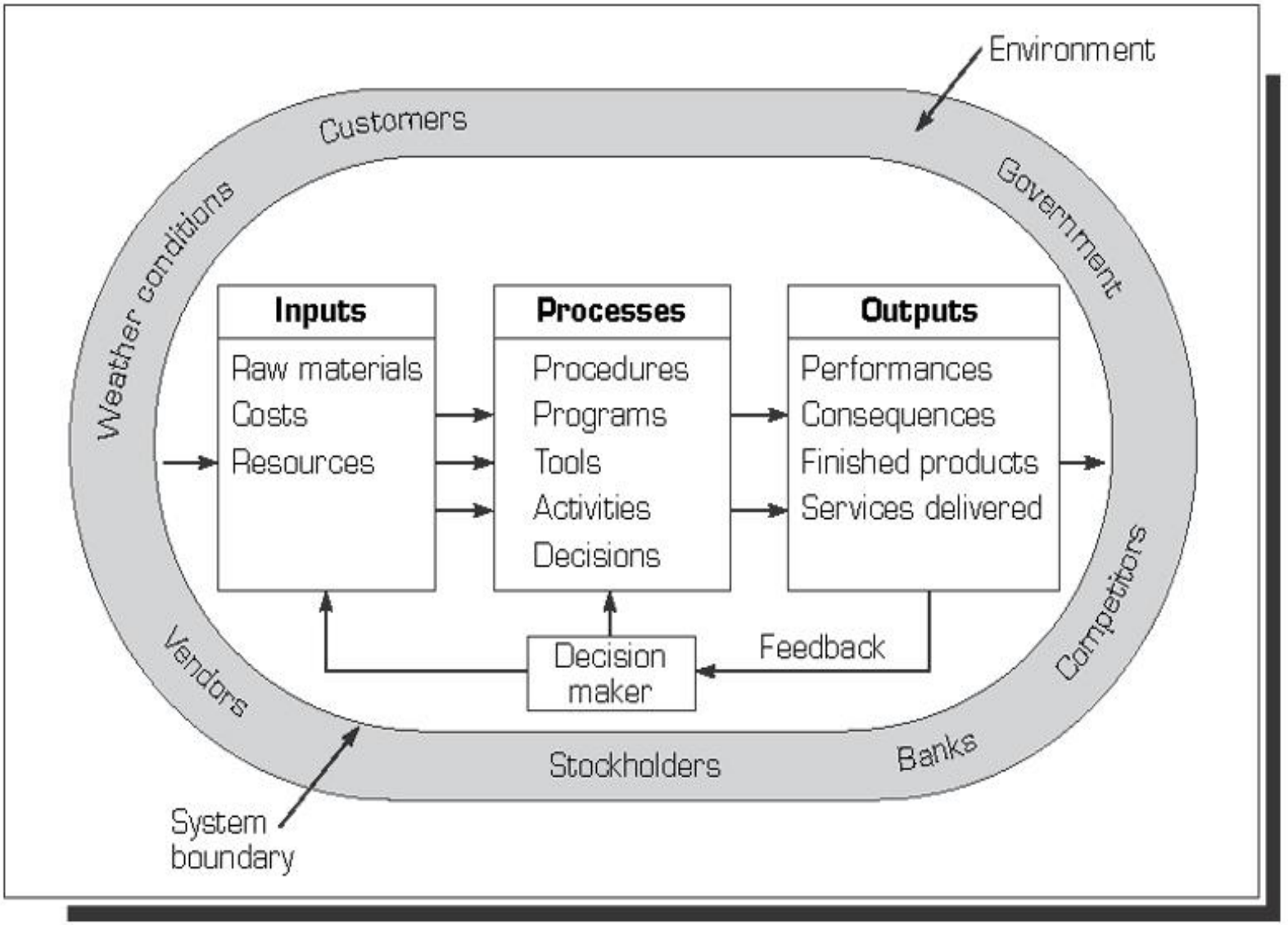


**Figure 2.1** The System and Its Environment



# 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 2.2 Simon's Four Phases of Decision-Making and the Web

| *Phase* | *Web Impacts* | *Impacts On The Web* |
|---|---|---|
| 1. Intelligence | Access to information to identify problems and opportunities from internal and external data sources | Identification of opportunities for e-commerce, Web infrastructure, hardware and software tools, etc. |
| | Access to AI methods and other data-mining methods to identify opportunities | Intelligent agents lessen the burden of information overload |
| | Collaboration through GSS and KMS | Smart search engines |
| | Distance learning can provide knowledge to add structure to problems | |
| 2. Design | Access to data, models, and solution methods | Brainstorming methods (GSS) to collaborate in Web infrastructure design |
| | Use of OLAP, data mining, data warehouses | Models and solutions of Web infrastructure issues |
| | Collaboration through GSS and KMS | |
| | Similar solutions available from KMS | |
| 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. | 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 |
| | Tools monitor the performance of e-commerce and other sites, intranet, extranet, and the Internet itself | |

# 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

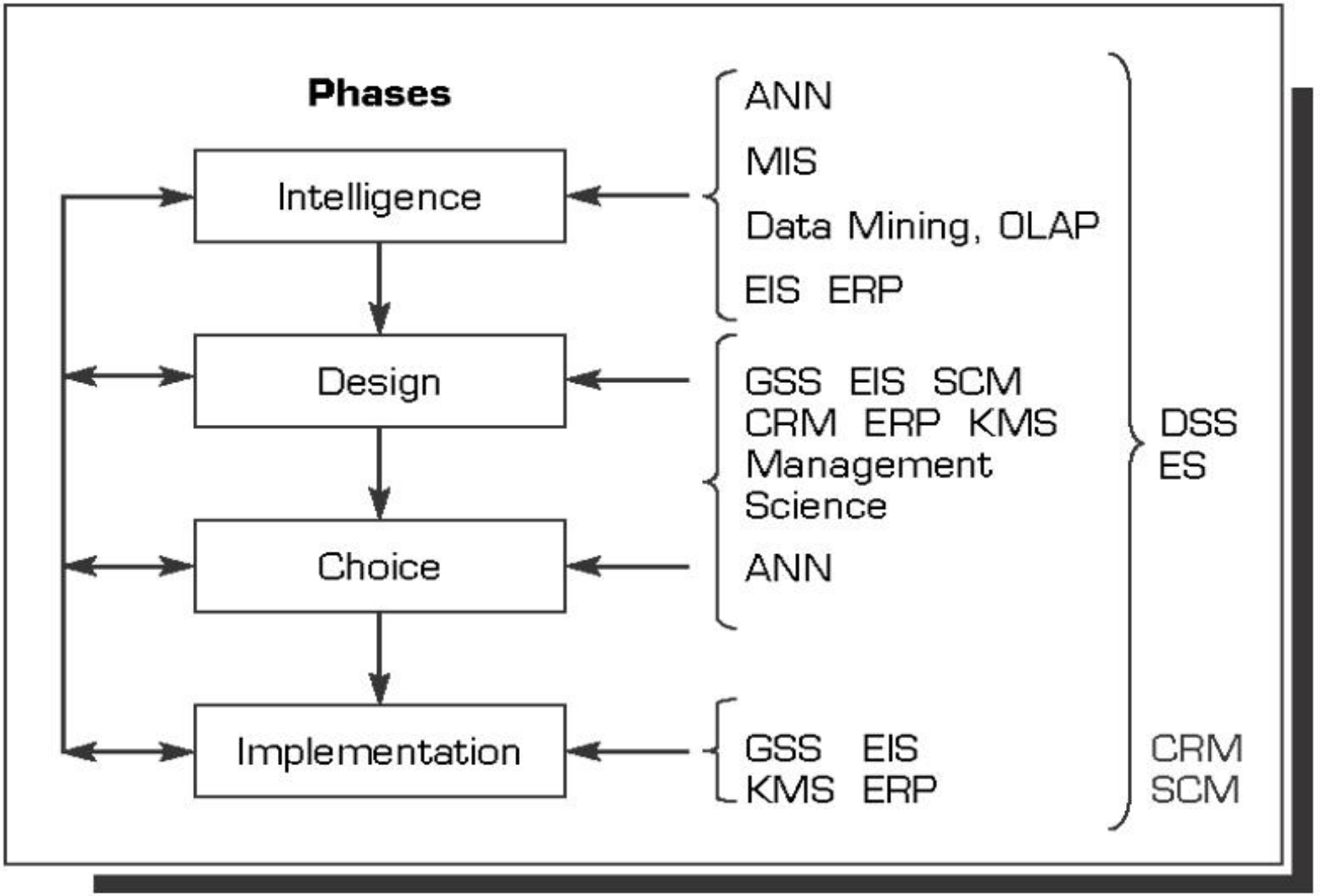
# Decision-Making Choice Phase

- 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




Source: Based on Sprague, R.H., Jr., "A Framework for the Development of DSS." MIS Quarterly, Dec. 1980, Fig. 5, p. 13.

# 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 2.4 Cognitive-style Decision Approaches

| *Problem-solving Dimension* | *Heuristic* | *Analytic* |
|---|---|---|
| Approach to learning | Learns more by acting than by analyzing the situation and places more emphasis on feedback | Employs a planned sequential approach to problem solving; learns more by analyzing the situation than by acting and places less emphasis on feedback |
| Search | Uses trial and error and spontaneous action | Uses formal rational analysis |
| Approach to analysis | Uses common sense, intuition, and feelings | Develops explicit, often quantitative, models of the situation |
| Scope of analysis | Views the totality of the situation as an organic whole rather than as a structure constructed from specific parts | Reduces the problem situation to a set of underlying causal functions |
| Basis for inferences | Looks for highly visible situational differences that vary with time | Locates similarities or common alities by comparing objects |