

## Decisions and Decision Makers

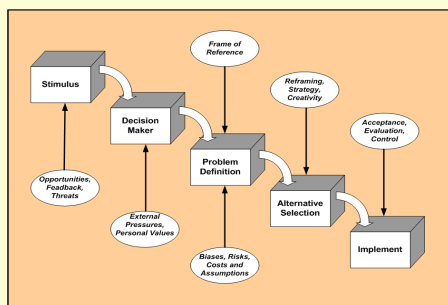
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### Decision Makers: Who Are They?

- Before focusing on the decision maker, we need a working model of what he is trying to accomplish.
- The decision maker plays an important role since he is considered both a step in the process and also a participant.

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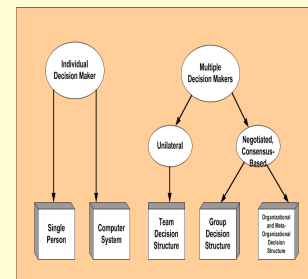
### Example of a Decision-Making Process



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### Classes of Decision Makers

Many different types of DSSs exist because there are many different types of decision makers.



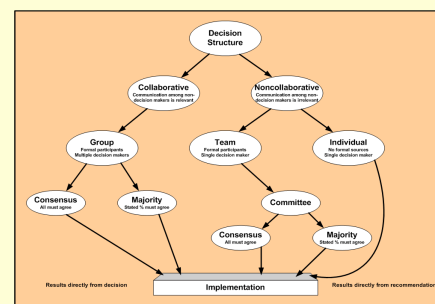
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### Decision Maker Classifications

- Individual decision makers can be a single person or a computer system.
- Multiple decision makers can be:
  - groups** where all members have a say in the decisions,
  - teams** where members support a single decision maker, or
  - organizational** where global agreement is needed.

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### Classification of Decision Structures



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## Decision Styles

- Style is the manner in which a manager makes decisions.
- The effect of a particular style depends on problem **context**, **perceptions** of the decision maker, and his own set of **values**.
- The complexity of these intertwine in the formation of decision style. The basic classes of styles are illustrated on the next slide.

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## Decision Style Model



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## Decision Style Categories

- Directive** – combines a high need for problem structure with a low tolerance for ambiguity. Often these are decisions of a technical nature that require little information.
- Analytical** – greater tolerance for ambiguity and tends to need more information.
- Conceptual** – high tolerance for ambiguity but tends to be more a “people person”.
- Behavioral** – requires low amount of data and demonstrates relatively short-range vision. Is conflict-averse and relies on consensus.

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## Decision Style in DSS Design

- Key issues are the decision maker’s reaction to stress and the method in which problems are usually solved.
- For example, to best serve a directive type who does not handle stress well, the interface needs to allow the decision maker to control the system without tedious input.
- For an analytic type, the DSS needs to allow access to many data sources which the decision maker will analyze.

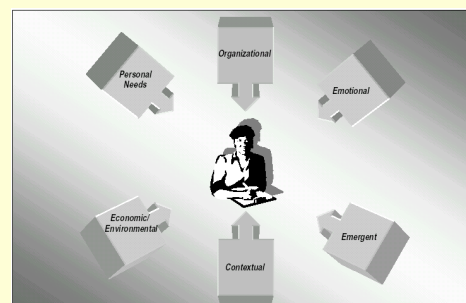
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## 2-3: Decision Effectiveness

- A good decision results in attainment of the objective within the constraints imposed.
  - Most decision models suggest that the decision maker must balance the forces acting upon the process and contend with the dynamics of them.
  - These forces can be of a several natures:
- |                   |                  |                       |
|-------------------|------------------|-----------------------|
| <i>Personal</i>   | <i>Emotional</i> | <i>Economic</i>       |
| <i>Contextual</i> | <i>Emergent</i>  | <i>Organizational</i> |

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## Forces Acting Upon A Decision Maker



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### How Can a DSS Help?

Some common types of support provided by a DSS:

- Explores multiple perspectives of a decision
- Generates multiple and higher quality alternatives
- Explores multiple strategies
- Facilitates brainstorming
- Provides guidance and reduction of bias
- Increases ability to tackle complex problems
- Improves response time
- Discourages premature decision-making
- Provides control over multiple sources of data

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### Why are Decisions So Hard?

The four key areas that determine the relative difficulty of a decision are:

1. **Structure** – in general, the more structure, the less information required
2. **Cognitive limitations** – the human mind is limited to handling 5 to 9 distinct pieces of information

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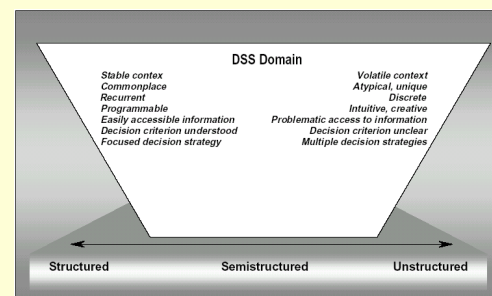
### Why are Decisions So Hard? (cont.)

The four key areas that determine the relative difficulty of a decision are:

3. **Uncertainty** – the amount is based on how complete and accurate the information is
4. **Alternatives and multiple objectives** – the selection of one alternative may impede the progress towards a different goal

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### Continuum of Decision Structures



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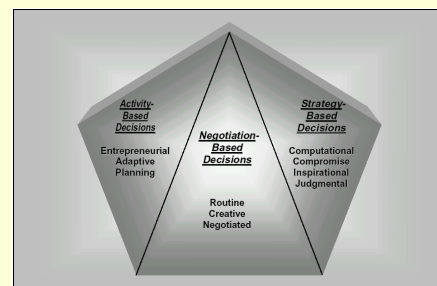
### A Typology of Decisions

No two decisions are alike, but they can be categorized:

- **Negotiation-based decisions** can be classified as routine, creative, or negotiated.
- **Activity-based decisions** can be typed as entrepreneurial, adaptive, or planning.
- **Strategy-based decisions** can be grouped into computational, judgmental, inspirational, or compromise.

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### Typology of Decisions



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### Decision Theory and Simon's Model

Keen and Scott Morton categorized decision theory into five perspectives.

1. Rational manager perspective
2. Process-oriented perspective
3. Organizational procedures perspective
4. Political perspective
5. Individual difference perspective

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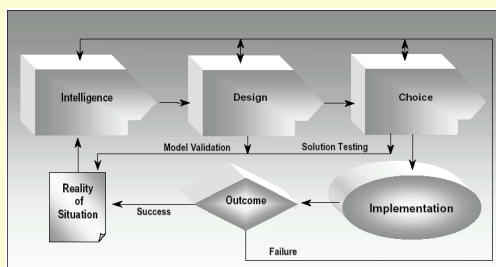
### Simon's Model of Problem Solving

Simon proposed a three-phase model of problem solving:

1. **Intelligence phase** – the decision maker looks for indications that a problem exists
2. **Design phase** – alternatives are formulated and analyzed
3. **Choice phase** – one of the alternatives is selected and implemented

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### Simon's Model of Problem Solving



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### Rational Decision Making

- Many decision strategies (next slide) attempt to find optimal solutions.
- In many circles, this is considered to be rational behavior.
- It is not always possible to optimize. Some problems have only qualitative solutions. Others may be quantitative but have multiple objectives at odds with others.
- In such situations, rational behavior would be to choose a "good" solution.

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### Modeling and Analysis Strategies

**Satisficing strategies:** **Optimizing strategies:**

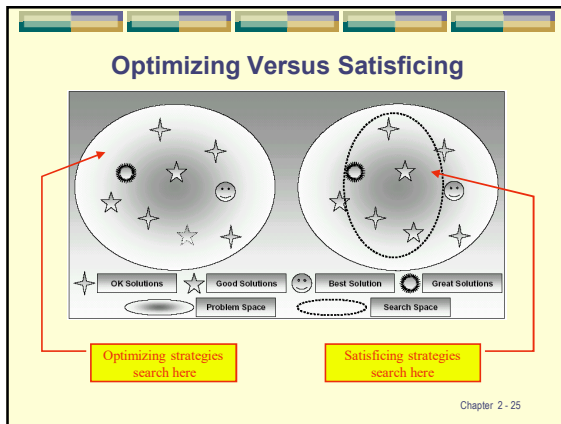
- |                                 |                         |
|---------------------------------|-------------------------|
| • Simulation                    | • Linear programming    |
| • Forecasting                   | • Goal programming      |
| • "What if" analysis            | • Simple queuing models |
| • Markov analysis               | • Investment models     |
| • Complex queuing methods       | • Inventory models      |
| • Environmental impact analysis | • Transportation models |

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### Bounded Rationality

- Simon argued that people don't always optimize because it is often impractical to consider all possible solutions to a problem.
- He notes that we often "simplify reality" by looking for a solution that is acceptable, a strategy he called **satisficing**.
- When people make rational decisions that are bounded by often uncontrollable constraints, he notes that they are operating inside **bounded reality**.

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### Bounded Reality and DSS Design

- Left alone, a decision maker preconceives the structure of a desired solution before the search for it begins.
- By using a DSS, the decision maker can learn to avoid placing too many constraints too early on the solution.
- In short, using a DSS would at least "loosen the bounds".
- Using a DSS can also help the decision maker solve the problem rather than simply treating the problem's symptom.

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### The Process of Choice

- In Simon's model, the choice phase represents the climax of the decision process.
- It is important, however, to NOT focus all the energy here because it will not do justice to the other phases.
- The choice phase focuses mainly on decisions of the semistructured and unstructured types where there is uncertainty.

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### Normative versus Descriptive Choice

- In normative models of decision making, choice is the theory in itself. In a behavioral or descriptive model, choice is one step in a process.
- A DSS will handle uncertainty by assigning probabilities to the expected decision outcome -- an activity more a part of a normative rather than behavioral process.

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### Cognitive Processes

Decision makers face a formidable task if they are to overcome all the factors contributing to cognitive limitations:

- Humans can only retain a few bits of information in short-term memory.
- Decision makers display differing intelligence.
- Some decision makers tend to restrict their search.
- Decision makers that employ concrete thinking tend to be limited information processors.

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### Cognitive Processes (cont.)

Decision makers face a formidable task if they are to overcome all the factors contributing to cognitive limitations:

- Propensity for risk varies among decision makers.
- Decision maker's level of aspiration is positively correlated with desire for information.
- In general, older decision makers appear to be more limited than younger ones.

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## Perception

This is a special type of cognitive limitation.

Common perception blocks are:

- Difficulty in isolating the problem.
- Delimiting the problem space too closely.
- Inability to see the problem from different perspectives.
- Stereotyping.
- Cognitive saturation or overload.

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## Judgment

- Although numerous strategies exist for evaluation of solution alternatives, judgment appears to be the most favored.
- Compared to detailed analysis, judgment is faster, more convenient, and less stressful.
- When applied in isolation, however, judgment may be nothing but a guess.
- One reason why it may not be used exclusively is that it relies heavily on the decision maker's recollection, which may fail.

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## Biases and Heuristics In Decision Making

- We all have "rules of thumb" that we rely on in making decisions. Another term for such rules is *heuristics*.
- Heuristic search techniques follow a series of steps based on "rules" developed by experience.
- These searches can often provide solutions very close to those found by exhaustive search.

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## Advantages of Heuristics in Problem Solving

- Simple to understand
- Easy to implement.
- Requires less conception time.
- Requires less cognitive effort.
- Can produce multiple solutions.

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## Appropriate Uses of Heuristics in Problem Solving

- Input data are inexact or limited.
- High computation time for an optimal solution.
- Problems are solved frequently and repeatedly.
- Symbolic processing is involved.
- A reliable, exact method is not available.
- Optimization is not economically feasible.

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## Heuristic Bias

Sometimes the use of heuristics can hamper finding a solution. The four major categories of bias are:

1. **Availability** – people tend to estimate probability based on past experience, which may not be representative.
2. **Adjustment and anchoring** – people often pick a starting value and then adjust up and down from it. They tend to underestimate the need for adjustments.

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### Heuristic Bias (cont.)

Sometimes the use of heuristics can hamper finding a solution. The four major categories of bias are:

3. **Representativeness** – people tend to misestimate probabilities of belonging to a group.
4. **Motivational** – incentives often lead decision makers to estimate probabilities that do not reflect their true beliefs.

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### Effectiveness and Efficiency

Effectiveness of DSS:

- Easier access to information
- Faster problem recognition and identification
- Easier access to computing tools
- Greater ability to evaluate large choice sets

Efficiency from DSS:

- Reduction in decision costs
- Reduction in decision time
- Better quality in feedback supplied

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