SPK : MODEL DAN PENDUKUNG

- Dasar Pengambilan Keputusan
- Pendekatan Sistem
- Proses pengambilan keputusan
- Fase proses pengambilan keputusan
- Metodologi pendukung keputusan

Referensi lihat SAP : [5] Bab 2, [7] Chapter 2

Konsep SPK/ DSS

- 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)

- How are decisions made???
- What methodologies can be applied?
- What is the role of information systems in supporting decision making?

DSS : *Decision – Support - Systems*

- *Decision Making*: a process of choosing among alternative courses of action for the purpose of attaining a goal or goals
- *Managerial Decision Making is synonymous with the whole process of management* (Simon, 1977)

Decision Making VS Problem Solving

Simon's 4 Phases of Decision Making

1. **Intelligence**
2. **Design**
3. **Choice**
4. **Implementation**

***Decision making* and *problem solving* are interchangeable**

Systems

- A *SYSTEM* is a collection of objects such as people, resources, concepts, and procedures intended to perform an identifiable function or to serve a goal

- System Levels (Hierarchy): All systems are *subsystems* interconnected through *interfaces*

Struktur Sistem :(Figure 2.1)

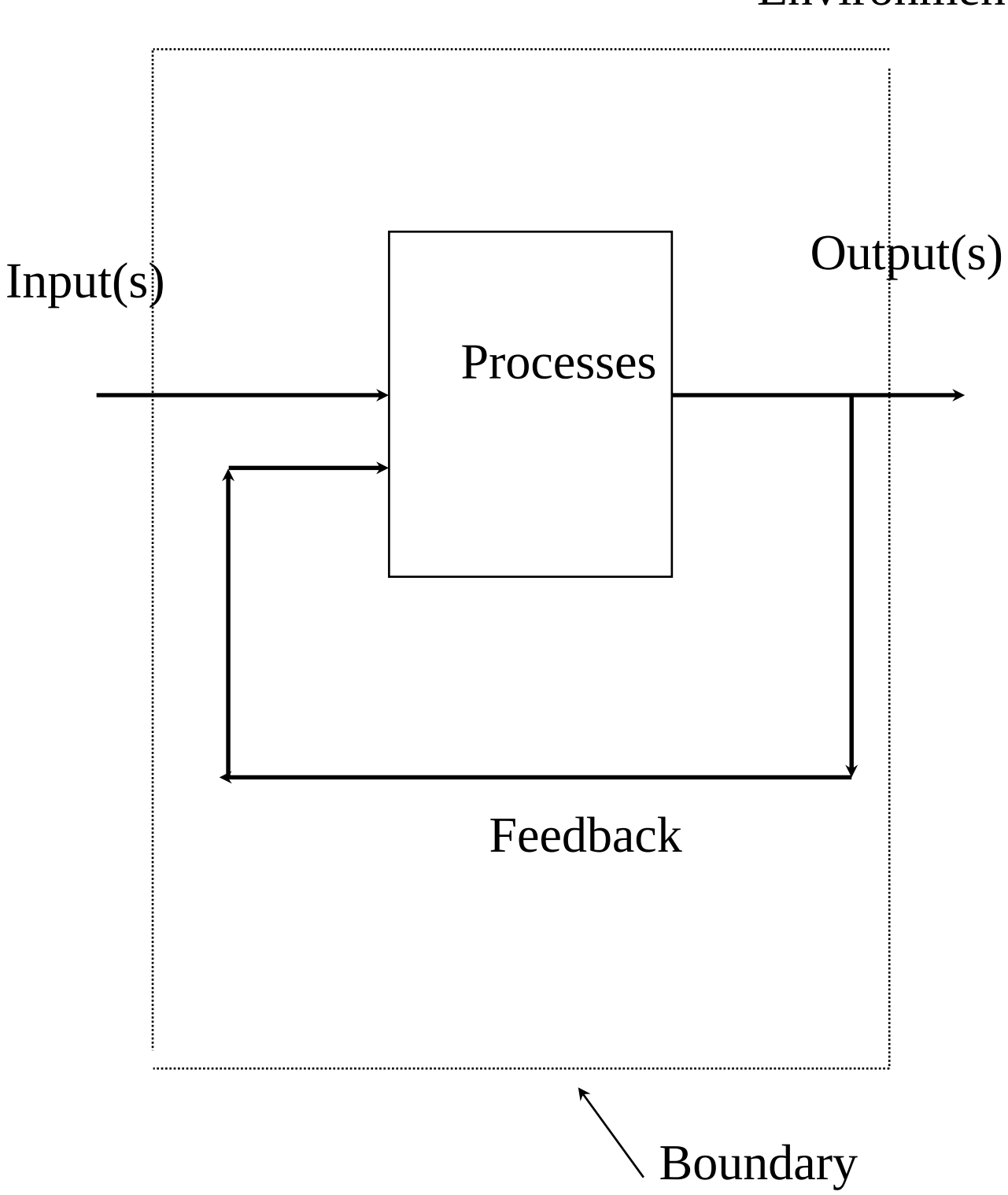
Inputs – Processes - Outputs

Systems

- Surrounded by an environment
- Frequently include feedback

The decision maker is usually considered part of the system

System (figure 2.1)



- Inputs are elements that enter the system
- Processes convert or transform inputs into outputs
- Outputs describe finished products or consequences of being in the system
- Feedback is the flow of information from the output to the decision maker, who may modify the inputs or the processes (closed loop)
- The Environment contains the elements that lie outside but impact the system's performance

The Boundary Separates a System From Its Environment

Boundaries may be physical or nonphysical (by definition of scope or time frame)

Information system boundaries are usually by definition!

How to Identify the Environment?

Two Questions (Churchman, 1975)

1. Does the element matter relative to the system's goals? [YES]

2. Is it possible for the decision maker to significantly manipulate this element? [NO]

Environmental Elements Can Be

- Social
- Political
- Legal
- Physical
- Economical
- Often Other Systems

An Information System

- Collects, processes, stores, analyzes, and disseminates information for a specific purpose
- Is often at the heart of many organizations
- Accepts inputs and processes data to provide information to decision makers and helps decision makers communicate their results

Two Major Classes of Performance Measurement

- *Effectiveness* is the degree to which goals are achieved
  Doing the right thing!
- *Efficiency* is a measure of the use of inputs (or resources) to achieve outputs
  Doing the thing right!
- MSS emphasize *effectiveness*
  Often: several non-quantifiable, conflicting goals

Models

- Major component of DSS
- Use models instead of experimenting on the real system

- A *model* is a simplified representation or abstraction of reality.
- Reality is generally too complex to copy exactly
- Much of the complexity is actually *irrelevant* in problem solving

Degrees of Model Abstraction

(Least to Most)

- *Iconic (Scale) Model*: Physical replica of a system

- *Analog Model* behaves like the real system *but* does *not* look like it (symbolic representation)

- *Mathematical (Quantitative) Models* use mathematical relationships to represent complexity
  Used in most DSS analyses

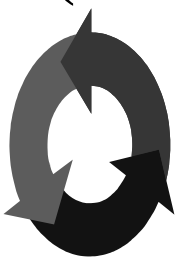
Benefits of Models

1. Time compression
2. Easy model manipulation
3. Low cost of construction
4. Low cost of execution (especially that of errors)
5. Can model risk and uncertainty
6. Can model large and extremely complex systems with possibly infinite solutions
7. Enhance and reinforce learning, and enhance training.

   Computer graphics advances: more iconic and analog models (visual simulation)

Proses Pengambilan Keputusan

Systematic Decision-Making Process (Simon, 1977)

(Figure 2.2) 

- Intelligence phase
  - Reality is examined
  - The problem is identified and defined
- Design phase
  - Representative model is constructed
  - The model is validated and evaluation criteria are set
- Choice phase
  - Includes a proposed solution to the *model*
  - If reasonable, move on to the
- Implementation phase
  - Solution to the original problem

Failure: Return to the modeling process

Often Backtrack / Cycle Throughout the Process

The Intelligence Phase

Scan the environment to identify problem situations or opportunities

Find the Problem

- Identify organizational goals and objectives
- Determine whether they are being met
- Explicitly define the problem

The Design Phase

- Generating, developing, and analyzing possible courses of action

Includes

- Understanding the problem
- Testing solutions for feasibility
- A model is constructed, tested, and validated

Modeling

- Conceptualization of the problem
- Abstraction to quantitative and/or qualitative forms

Problem Classification

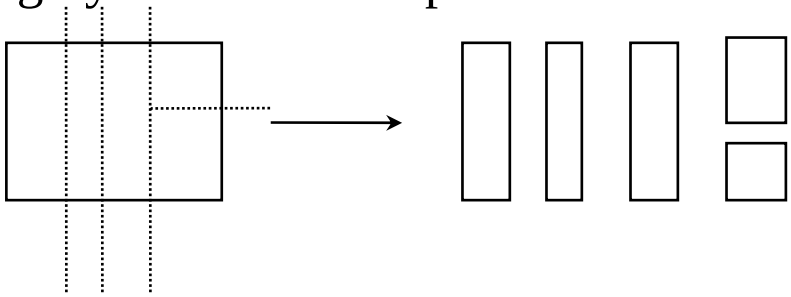
Structured versus Unstructured

Programmed versus Nonprogrammed Problems
Simon (1977)

Nonprogrammed Problems ⟷ **Programmed Problems**

- Problem Decomposition: Divide a complex problem into (easier to solve) subproblems
  Chunking (Salami)

- Some seemingly poorly structured problems may have some highly structured subproblems



- Problem Ownership

  Outcome: Problem Statement

Mathematical Model

- Identify variables
- Establish equations describing their relationships
- Simplifications through *assumptions*
- Balance model simplification and the accurate representation of reality

Modeling: an art and science

Quantitative Modeling Topics

- Model Components
- Model Structure
- Selection of a Principle of Choice (Criteria for Evaluation)
- Developing (Generating) Alternatives
- Predicting Outcomes
- Measuring Outcomes
- Scenarios

LP Example

The Product-Mix Linear Programming Model

- MBI Corporation
- Decision: How many computers to build next month?
- Two types of computers
- Labor limit
- Materials limit
- Marketing lower limits

Constraint	CC7	CC8	Rel	Limit
Labor (days)	300	500	<=	200,000 / mo
Materials $	10,000	15,000	<=	8,000,000/mo
Units	1		>=	100
Units		1	>=	200
Profit $	8,000	12,000	Max	

Objective: Maximize Total Profit / Month

- ***Solution***
  ***X*1 = 333.33 ; *X*2 = 200 ; Profit = $5,066,667**

The Principle of Choice

- What criteria to use?
- Best solution?
- Good enough solution?

Selection of a Principle of Choice

Not the choice phase

A decision regarding the acceptability of a solution approach

Normative

The chosen alternative is demonstrably the best of all (normally a good idea)

- *Optimization* process
- Normative decision theory based on *rational* decision makers

Descriptive

- Describe things as they are, or as they are believed to be
- Extremely useful in DSS for evaluating the consequences of decisions and scenarios
- No guarantee a solution is optimal
- Often a solution will be good enough
- *Simulation*: Descriptive modeling technique

Predicting the Outcome of Each Alternative

- Must predict the future outcome of each proposed alternative
- Consider what the decision maker knows (or believes) about the forecasted results

- Classify Each Situation as Under
  - Certainty
  - Risk
  - Uncertainty

Decision Making Under Certainty

- *Assumes* complete knowledge available (deterministic environment)
- Example: U.S. Treasury bill investment

- Typically for structured problems with short time horizons
- Sometimes DSS approach is needed for certainty situations

Decision Making Under Risk (Risk Analysis)

- Probabilistic or stochastic decision situation
- Must consider several possible outcomes for each alternative, each with a probability
- Long-run probabilities of the occurrences of the given outcomes are assumed known or estimated

- Assess the (*calculated*) degree of risk associated with each alternative

Decision Making Under Uncertainty

- Several outcomes possible for each course of action
- *BUT* the decision maker does not know, or cannot estimate the probability of occurrence

- More difficult - insufficient information
- Assessing the decision maker's (and/or the organizational) attitude toward risk
- Example: poker game with no cards face up (5 card stud or draw)

The Choice Phase

- The CRITICAL act - decision made here!
- Search, evaluation, and recommending an appropriate *solution* to the model
- Specific set of values for the decision variables in a selected alternative

  The problem is considered solved only after the recommended solution to the model is *successfully implemented*

Measuring Outcomes

- Goal attainment
- Maximize profit
- Minimize cost
- Customer satisfaction level (minimize number of complaints)
- Maximize quality or satisfaction ratings (surveys)

Evaluation: Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking

- Evaluation (with the search process) leads to a recommended solution
- Multiple goals
- Complex systems have multiple goals
  Some may conflict

- Typically, quantitative models have a single goal

- Can transform a multiple-goal problem into a single-goal problem

Sensitivity Analysis

- Change inputs or parameters, look at model results

  Sensitivity analysis checks relationships

Types of Sensitivity Analyses

- Automatic
- Trial and error

Trial and Error

- Change input data and re-solve the problem
- Better and better solutions can be discovered
- How to do? Easy in spreadsheets (Excel)
  - What-if
  - Goal seeking

What-If Analysis

- Figure 2.9 - Spreadsheet example of a what-if query for a cash flow problem

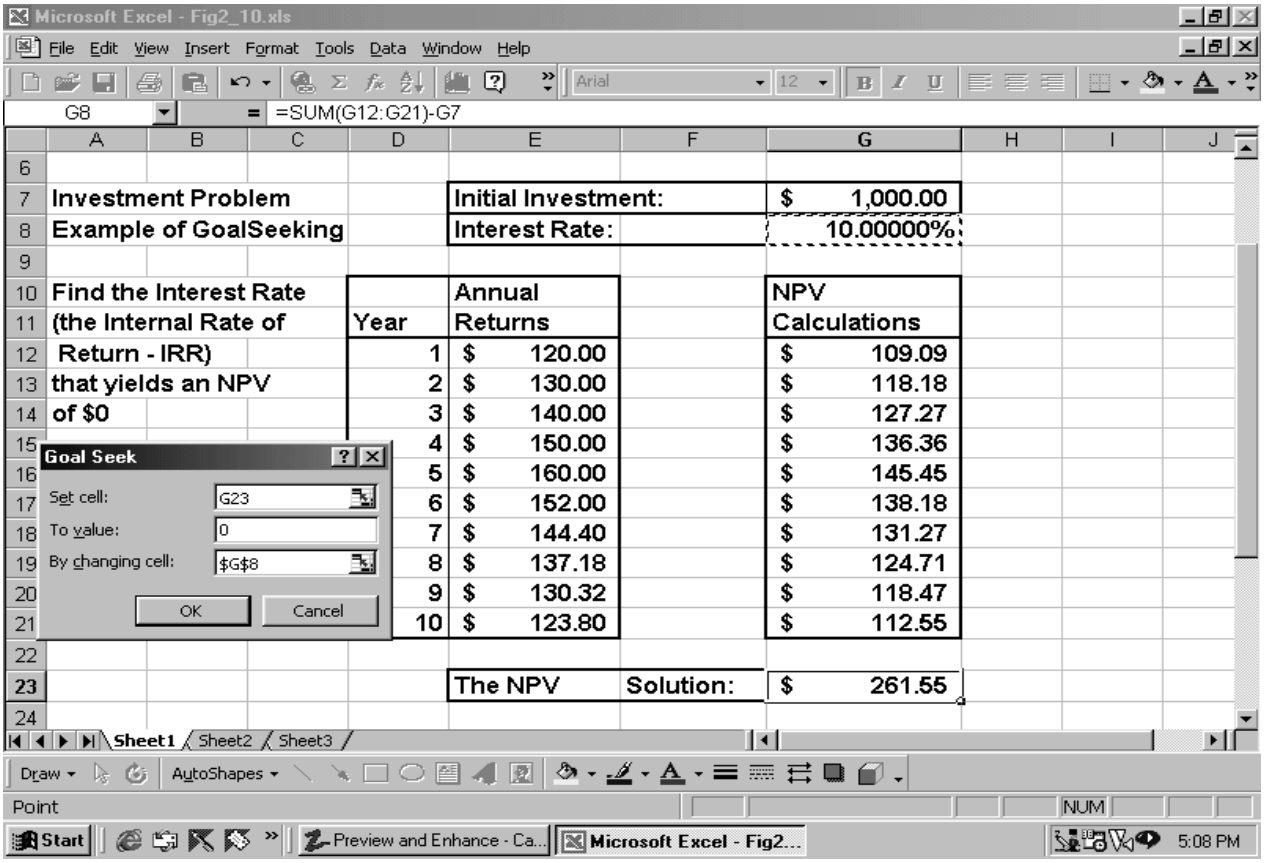
Goal Seeking

- Backward solution approach
- Example: Figure 2.10

  What interest rate causes an the net present value of an investment to break even?

- In a DSS the what-if and the goal-seeking options *must* be easy to perform

Goal Seeking



Common Methods

- Utility theory
- Goal programming
- Expression of goals as constraints, using linear programming
- Point system

- Computerized models can support multiple goal decision making

The Implementation Phase

There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things

(Machiavelli, 1500s)

*** The Introduction of a *Change* ***

Important Issues

- Resistance to change
- Degree of top management support
- Users' roles and involvement in system development
- Users' training

How Decisions Are Supported

Specific MSS technologies relationship to the decision making process (see Figure 2.10)

- Intelligence: DSS, ES, ANN, MIS, Data Mining, OLAP, EIS, GSS
- Design and Choice: DSS, ES, GSS, Management Science, ANN
- Implementation: DSS, ES, GSS

Alternative Decision Making Models

- Paterson decision-making process
- Kotter's process model
- Pound's flow chart of managerial behavior
- Kepner-Tregoe rational decision-making approach
- Hammond, Kenney, and Raiffa smart choice method
- Cougar's creative problem solving concept and model
- Pokras problem-solving methodology
- Bazerman's anatomy of a decision
- Harrison's interdisciplinary approaches
- Beach's naturalistic decision theories

Naturalistic Decision Theories

- Focus on how decisions are made, not how they should be made
- Based on behavioral decision theory

- Recognition models
- Narrative-based models

Recognition Models

- Policy
- Recognition-primed decision model

Narrative-based Models (Descriptive)

- Scenario model
- Story model
- Argument-driven action (ADA) model
- Incremental models
- Image theory

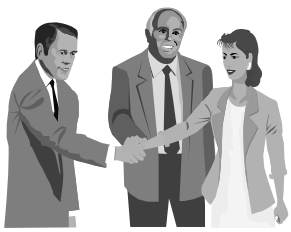
Other Important Decision- Making Issues

- Personality types
- Gender
- Human cognition
- Decision styles

The Decision Makers

Individuals

- May still have conflicting objectives
- Decisions may be fully automated



- **Groups**

  Most major decisions made by groups

  Conflicting objectives are common

  Variable size

  People from different departments

  People from different organizations

  The group decision-making process can be very complicated

  Consider Group Support Systems (GSS)

  Organizational DSS can help in enterprise-wide decision-making situations

Kesimpulan

- Managerial decision making is the whole process of management
- Problem solving also refers to opportunity's evaluation
- A system is a collection of objects such as people, resources, concepts, and procedures intended to perform an identifiable function or to serve a goal
- DSS deals primarily with open systems
- A model is a simplified representation or abstraction of reality
- Models enable fast and inexpensive experimentation with systems
- Modeling can employ optimization, heuristic, or simulation techniques
- Decision making involves four major phases: intelligence, design, choice, and implementation
- What-if and goal seeking are the two most common sensitivity analysis approaches
- Computers can support all phases of decision making by automating many required tasks
- Personality (temperament) influences decision making
- Gender impacts on decision making are inconclusive
- Human cognitive styles may influence human-machine interaction
- Human decision styles need to be recognized in designing MSS