## Building Knowledge-Driven DSS and Mining Data

*We can organize knowledge and make it available for business uses*

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## Knowledge-driven DSS

- Knowledge-driven DSS, suggestion DSS, rule-based DSS and intelligent DSS are overlapping terms for DSS built using artificial intelligence technologies
- KDSS provide suggestions for business decision makers

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## KDSS/Expert Systems

- Three Components
  - Knowledge of symptoms and indicators related to a particular topic or domain
  - Understanding of the relations among symptoms and of problems and solutions within that domain
    - "Skill" or methods for solving some of the problems
- A KDSS/ES can give the reasoning behind a conclusion it has reached

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## Data Mining and Knowledge Discovery

- Helps companies discover hidden relationships and patterns in their data
  - Some feel Data Mining can help a company gain a competitive advantage
- Knowledge Discovery is the broader term

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## AI Vocabulary

- Knowledge Acquisition -- The extraction and formulation of knowledge derived from various sources, especially from experts
- Development environment -- software for creating and maintaining a knowledge base and software called an inference engine
- *Inference engine* processes a set of rules
- Domain expert -- person who has expertise in the task for which a specific system is being developed.

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## Knowledge Base

- A knowledge base is a collection of organized facts, rules, and procedures
- Knowledge base has a description of the elements in the process along with their characteristics, functions, and relationships
- Also contains rules about actions to implement as a result of certain events

## Characteristics of KDSS

- Aids/assists managers in problem solving
- Use knowledge stored as rules, frames, or probabilities
- People interact with a Knowledge-Driven DSS when performing a specific task
- Knowledge-Driven DSS and Expert Systems base recommendations on human knowledge and assist in performing very limited tasks
- KDSS does NOT "thinks"

## Components of a KDSS
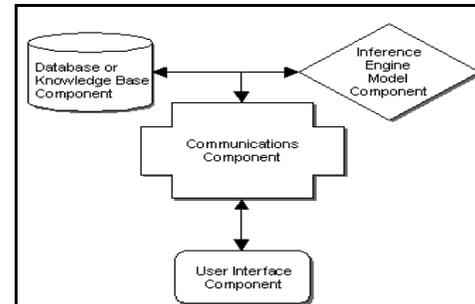
## Knowledge-Driven vs. Model-Driven DSS

- Knowledge-Driven DSS based on Expert System technologies attempts to reason about an input using its knowledge base and logical rules for problem solving
- Model-Driven DSS has a sequence of predefined instructions (a model) for responding to a change in inputs

## Comparing KDSS to MDSS

- Knowledge-Driven DSS = Knowledge base + Inference Engine (rule processor)

- Model-Driven DSS = Structured Data + Quantitative Models

## Knowledge-Driven DSS Design and Development

- Involves a development team and a domain expert creating a knowledge base for a target user group
  - Waterman proposed a widely accepted approach:
    - Identification of domain
    - Conceptualization
    - Formalization
    - Implementation
    - Testing

## Choosing a project -- Telephone test

- Can a domain expert solve the problem and support decision making using a telephone exchange with a decision maker?"
- Ask structured rather than open-ended questions.
- "Yes" the telephone exchange works; then a KDSS can be developed
- "No" development of a KDSS will likely be unsatisfactory

## Advantages and Limitations of Rules

- Rules are easy to understand
- Explanations are easy to provide when knowledge is stored as rules
- Modification and maintenance are relatively easy
- Major limitation
  - The most important complex knowledge is difficult to represent using rules

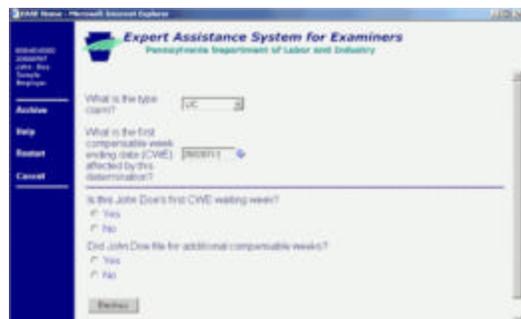## Knowledge-Driven DSS Examples

- TAXADVISOR
  - Designed to assist with large estate planning
- XCON
  - Developed to configure VAX 11/780 computer systems
- Customer Support Intelligent System
  - Designed by Compaq to provide expert diagnosis and recommendations to computer users who were having computer problems

## Ease Screen Shot

## Data Mining

- Predictive
  - Can be used to forecast explicit values, based on patterns determined from known results
    - Example: From a database of customers who have already responded to a particular offer
- Descriptive
  - Describe patterns in existing data and are generally used to create meaningful subgroups such as demographic clusters

## Data Mining Tools

- Case-Based Reasoning - similarity
- Data Visualization - graphical presentation
- Fuzzy Query and Analysis - "close"
- Genetic Algorithms - optimization
- Neural Networks - learn patterns from data

Data Mining techniques are **NOT** fundamentally different from earlier quantitative and statistical analysis techniques -- they are still used

## Data Mining Process

- As defined by the Gartner Group
  - Select and prepare the data to be mined
  - Qualify the data via cluster and feature analysis
  - Select one or more data mining tools
  - Apply the data mining tool
  - Apply the knowledge discovered to the company's specific line of business to achieve a business goal

## Data Mining Examples

- Credit risk analysis
- Siemens Technical Customer support -- case based reasoning
- Beer and Diapers - check Ask Dan!

## Evaluating Development Packages

- Cost
- Scalability
- Security
- Development Features
- Ease of Installation and Use

## Questions?

- What is a Rule?
- What are 5 characteristics common to Expert Systems and KDSS?
- Why do managers need the support provided by KDSS
- What are the steps in data mining?
- How does KDSS differ from Data Mining?