Module 2: Decision Support and Expert Systems

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Decision Support Systems: Advantages

- Improved effectiveness in making strategic and tactical decisions
- Greater timeliness in collecting and processing the needed data that bear on unstructured and semi-structured decisions
- Broader understanding by the decision makers of the array of factors involved in problems requiring complex decisions and their relationships to each other
Key Components of a Decision Support System

- DSS data base
- DSS model base
- DSS user interface
- Terminal or microcomputer
- User

Figure M2-1
A Comprehensive Data Base that Spans a Firm’s Decision Needs

<table>
<thead>
<tr>
<th>Environmental Data</th>
<th>Internal Planning Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Model Data</td>
<td>Summaries</td>
</tr>
</tbody>
</table>

**Chart of Accounts**

- Customer Data
- Inventory Data
- Supplier Data
- Employee Data
- Property (plant assets) Data
- Sales Order
- Production & Shipping Records
- Purchase Orders
- Time Records
- Disbursement Records

* = Planning data base
** = Operational data base
DSS Model Base

- Decision Models
  - Decision models
  - Optimization models
- Firm-wide Planning Models
  - Corporate models
  - Financial planning models
- Modeling Languages
- Model Base Management Systems
A Variety of Models Used by Decision Support Systems

<table>
<thead>
<tr>
<th>Model Description</th>
<th>Typical Function Aided</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Regression</td>
<td>1) Sales forecasting</td>
</tr>
<tr>
<td>2) Exponential smoothing</td>
<td>2) Sales forecasting</td>
</tr>
<tr>
<td>3) PERT</td>
<td>3) Engineering design</td>
</tr>
<tr>
<td>4) Linear programming</td>
<td>4) Production scheduling</td>
</tr>
<tr>
<td>5) Line-of-balance</td>
<td>5) Production routing</td>
</tr>
<tr>
<td>6) Economic order quantity</td>
<td>6) Inventory control</td>
</tr>
<tr>
<td>7) Supplier evaluation</td>
<td>7) Purchasing</td>
</tr>
<tr>
<td>8) Transportation</td>
<td>8) Physical distribution</td>
</tr>
<tr>
<td>9) Discounted cash-flow</td>
<td>9) Investment planning</td>
</tr>
<tr>
<td>10) Production cost-variance</td>
<td>10) Cost analysis</td>
</tr>
<tr>
<td>11) Cash-flow</td>
<td>11) Financing</td>
</tr>
<tr>
<td>12) Budget</td>
<td>12) Accounting control</td>
</tr>
<tr>
<td>13) Manpower planning</td>
<td>13) Personnel planning</td>
</tr>
</tbody>
</table>

Figure M2-3
Model Manipulation Techniques Used with Financial Models

- Time-Based Simulation
- "What-If" Analysis
- Sensitivity Analysis
- Goal-seeking Analysis
More on Model-Base Management Systems

- This is a modeling counterpart to a DBMS
- Its functions usually consist of providing
  - Links between models in a DSS
  - A model definition language
  - Mechanisms for modifying decision models
  - A user-friendly means of executing and manipulating models
User Interfaces

- Query Languages
  - Command language approach
  - Menu approach
  - GUI
Group Decision Support Systems

- GDSSs allow for the rapid dissemination of information and support collaboration among group members
  - Electronic mail software
  - Lotus Notes
An Expert System is a computerized software model that simulates the thinking process of one or more human experts in solving a complex problem or in making a decision.
Components of an Expert System

- Knowledge Base
- Task-specific Data Base
- Inference Engine
  - Forward chaining
  - Backward chaining
- Development Engine
Components of an Expert System

- Inference Engine
- Knowledge Base
- User Interface
- Task Specific Data Base
- Users
Decision Situations and DSSs

- Expert Systems
- Neural Network Technology
- Conventional Software
- Statistics
- Structured
- Semi-structured
- Unstructured
- Completely Random

Figure M2-7
Factors to Consider when Selecting Accounting ES Applications - I

- Problems or decisions requiring judgment are moderately complex to very complex and well-defined
- Operational and tactical problems are highly structured to somewhat semi-structured, recurring, and repetitive
- Expertise is difficult to acquire. Human experts are expensive and in short supply. Non-human expertise is available in the form of authoritative pronouncements, such as APBs, FASBs, and IRS tax regulations
- The accounting problem can be solved in a relatively short period of time
- The accounting problem is rule-intensive and can be solved with "if-then" rules

Figure M2-8
Factors to Consider when Selecting Accounting ES Applications - II

- Common sense or intuition is not required to solve the problems
- The accounting problem cannot be solved efficiently with traditional or conventional computer software programs, such as COBOL or FORTRAN
- The body of knowledge is being continually updated
- The problem’s conversion to a computer-based expert system must result in a high payoff
- The expert system must produce clearly identified solutions with which most experts must agree among themselves

Figure M2-8 Continued
Areas of Accounting Expert Systems: Auditing (Internal & External)

- Deciding whether to accept a prospective auditee
- Evaluating risks and the internal control structure in computer systems
- Reviewing prior years’ working papers
- Issuing audit reports and forming audit opinions
- Writing audit programs
- Assisting in making a going-concern judgment
- Scheduling audit personnel
- Analyzing the adequacy of the allowance for doubtful accounts
- Analyzing unusual transactions
Areas of Accounting Expert Systems: Taxation

- Advising on potential acquisitions and mergers
- Claiming a dependent
- Auditing deferred tax accruals
- Determining corporate tax status
- Determining if a firm qualifies for Subchapter S tax status
- Offering personal and corporate tax planning advice

Figure M2-9 Continued
Areas of Accounting Expert Systems: Cost/Managerial

- Analyzing significant variances and explaining the variation
- Assisting in monthly closings
- Allocating revenue and expenses
- Analyzing performance of projects
- Reviewing trial balances

- Accounting for non-monetary transactions (APB No. 29)
- Accounting for contingencies (FAS No. 5)
- Purchasing vs. pooling (APB No. 16)
- Accounting for futures contracts (FAS No. 80)
- Developing expert systems for other professional pronouncements
- Classifying financial transactions correctly
- Evaluating credit worthiness
# Examples of ES in Accounting: Auditing

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose</th>
<th>Developer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan Probe</td>
<td>To assist banks in assessing commercial loan portfolios</td>
<td>KPMG Peat Marwick</td>
</tr>
<tr>
<td>Auditor</td>
<td>To assist in evaluating the adequacy of the allowance for bad debts</td>
<td>Dungan (University of South Florida)</td>
</tr>
<tr>
<td>EDP-XPERT</td>
<td>To aid audit specialists in evaluating the reliability of controls in computer systems</td>
<td>Hansen and Messier (University of Florida)</td>
</tr>
<tr>
<td>GC-X</td>
<td>To aid in making going-concern judgments</td>
<td>Biggs and Selfridge (University of Connecticut)</td>
</tr>
<tr>
<td>Audit Planner</td>
<td>To aid in making materiality judgments</td>
<td>Steinbart (Arizona State University)</td>
</tr>
</tbody>
</table>
Examples of ES in Accounting: Tax

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose</th>
<th>Developer</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAXADVISOR</td>
<td>To aid tax specialists in rendering estate planning advice</td>
<td>Michaelson (University of North Texas)</td>
</tr>
<tr>
<td>ExperTAX</td>
<td>To aid in tax planning and corporate tax accruals</td>
<td>Coopers and Lybrand</td>
</tr>
<tr>
<td>Taxpayer Service Assistant</td>
<td>To aid IRS agents in answering taxpayer questions on complex tax issues</td>
<td>IRS</td>
</tr>
</tbody>
</table>
Emerging Developments

- Intelligent Agent Software
- Integrating DSSs with other support systems
- Fuzzy Logic
- Developments in Multimedia and Hypertext