

Decision Support and Business Intelligence Systems

(9th Ed., Prentice Hall)



Chapter 3:

Decision Support Systems Concepts, Methodologies, and Technologies: An Overview



Learning Objectives

- Understand possible decision support system (DSS) configurations
- Understand the key differences and similarities between DSS and BI systems
- Describe DSS characteristics and capabilities
- Understand the essential definition of DSS
- Understand important DSS classifications
- Understand DSS components and how they integrate



Learning Objectives

- Describe the components and structure of each DSS component
- Explain Internet impacts on DSS (and vice versa)
- Explain the unique role of the user in DSS versus management information systems
- Describe DSS hardware and software platforms
- Become familiar with a DSS development language
- Understand current DSS issues



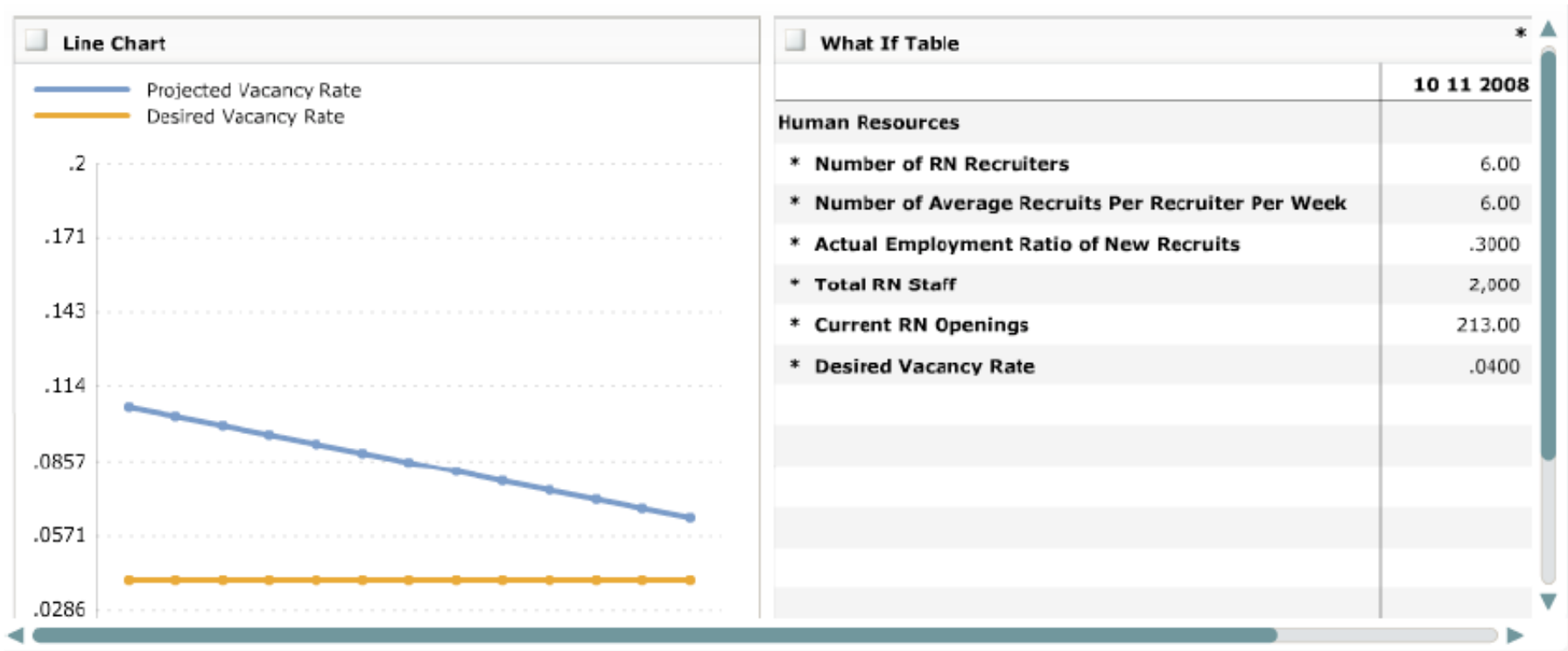
Opening Vignette:

“Decision Support System Cures for Health Care”

- Company background
- Problem
- Proposed solution
- Results
- Answer and discuss the case questions

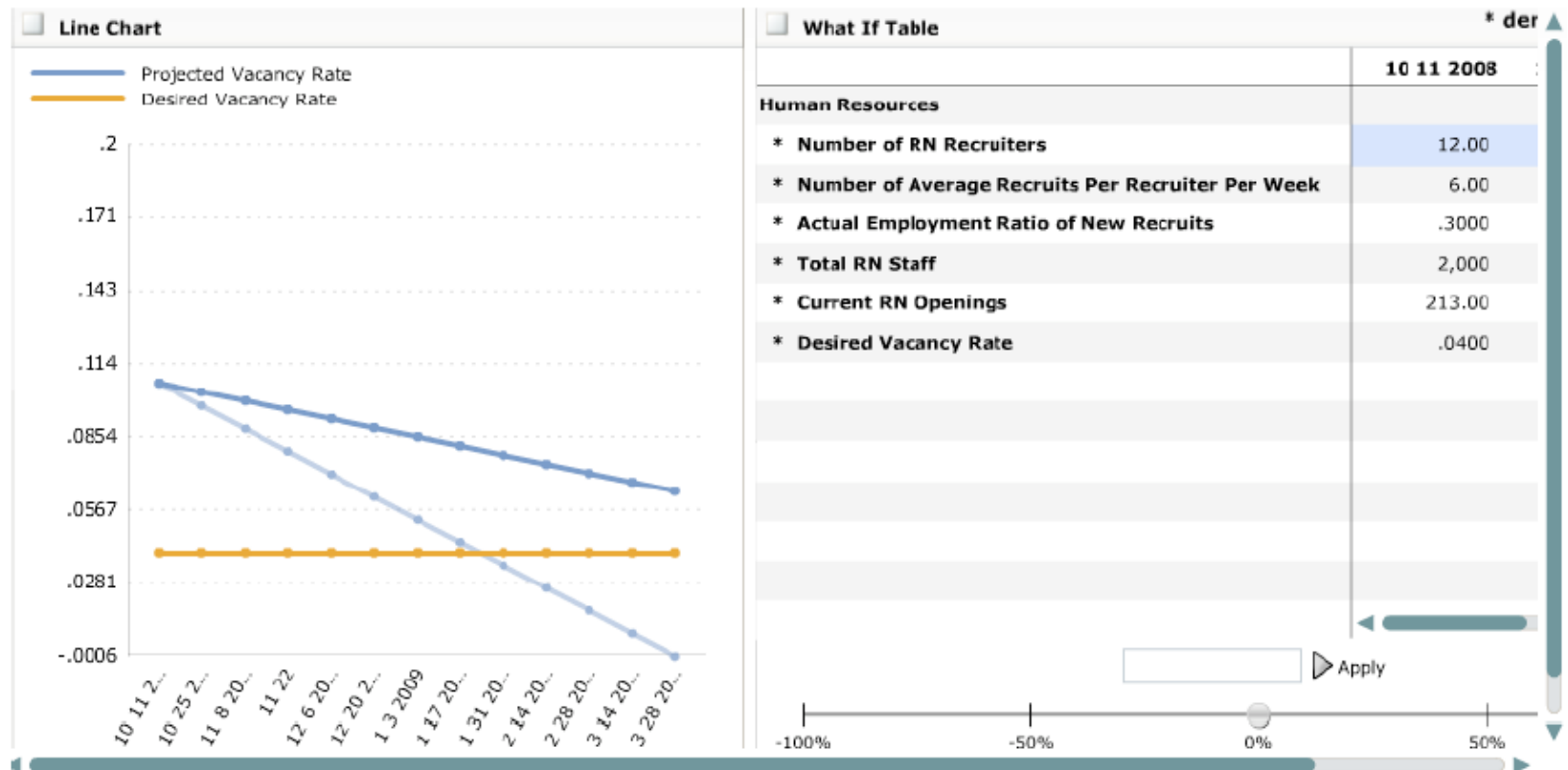
Opening Vignette:

“Decision Support System Cures for Health Care” - Projected Vacancy Rate versus Desired Vacancy Rate



Opening Vignette:

- Projected Vacancy Rate vs. Desired Vacancy Rate
"What-if" scenario with 6 additional RN recruiters



Opening Vignette:

- Demanded Hours versus Total Actual Hours versus Total Actual Hours with New Hires



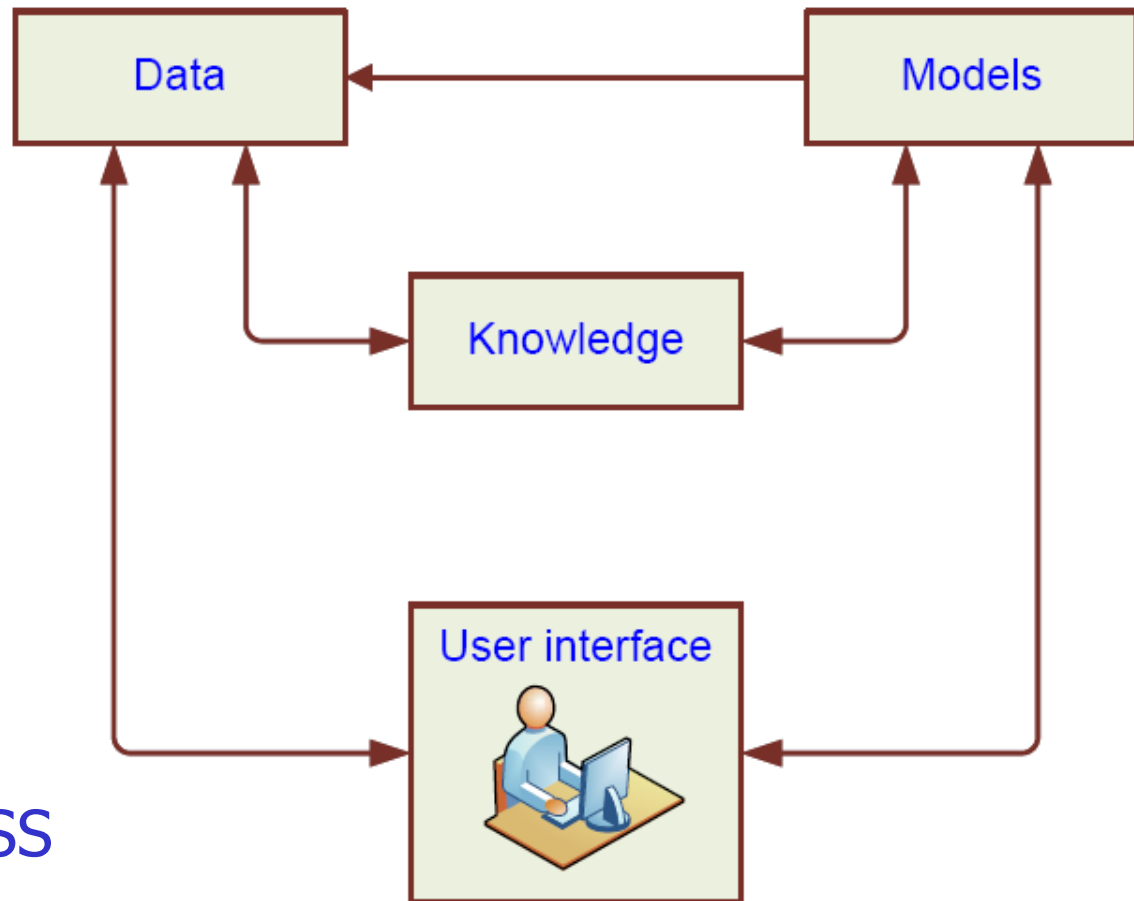


DSS Configurations

- Many configurations exist; based on
 - management-decision situation
 - specific technologies used for support
- DSS have three basic components
 1. Data
 2. Model
 3. User interface
 4. (+ optional) Knowledge

DSS Configurations

- Each component
 - has several variations; are typically deployed online
 - Managed by a commercial of custom software
- Typical types:
 - Model-oriented DSS
 - Data-oriented DSS





DSS Description

- An early definition of DSS
 - A system intended to support managerial decision makers in semistructured and unstructured decision situations
 - meant to be adjuncts to decision makers (extending their capabilities but not replacing their judgment)
 - aimed at decisions that required judgment or at decisions that could not be completely supported by algorithms
 - would be computer based; operate interactively; and would have graphical output capabilities...



DSS Description

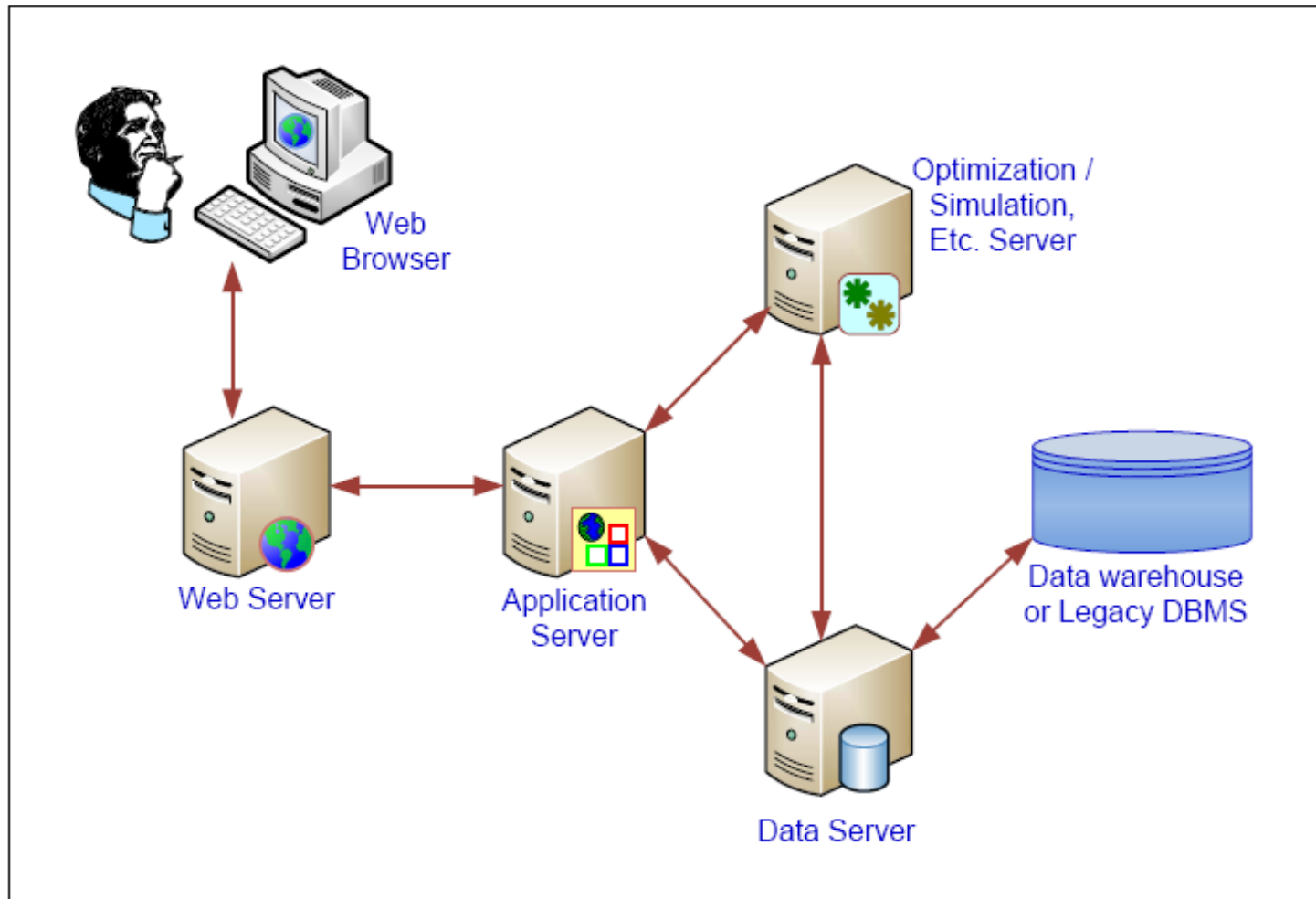
- A DSS is typically built to support the solution of a certain problem (or to evaluate a specific opportunity). This is a key difference between DSS and BI applications
 - BI systems monitor situations and identify problems and/or opportunities, using variety of analytic methods
 - The user generally must identify whether a particular situation warrants attention
 - Reporting/data warehouse plays a major role in BI
 - DSS often has its own database and models



DSS Description

- DSS is an approach (or methodology) for supporting decision making
 - uses an interactive, flexible, adaptable computer-based information system (CBIS)
 - developed (by end user) for supporting the solution to a specific nonstructured management problem
 - uses data, model and knowledge along with a friendly (often graphical; Web-based) user interface
 - incorporate the decision maker's own insights
 - supports all phases of decision making
 - can be used by a single user or by many people

A Web-Based DSS Architecture

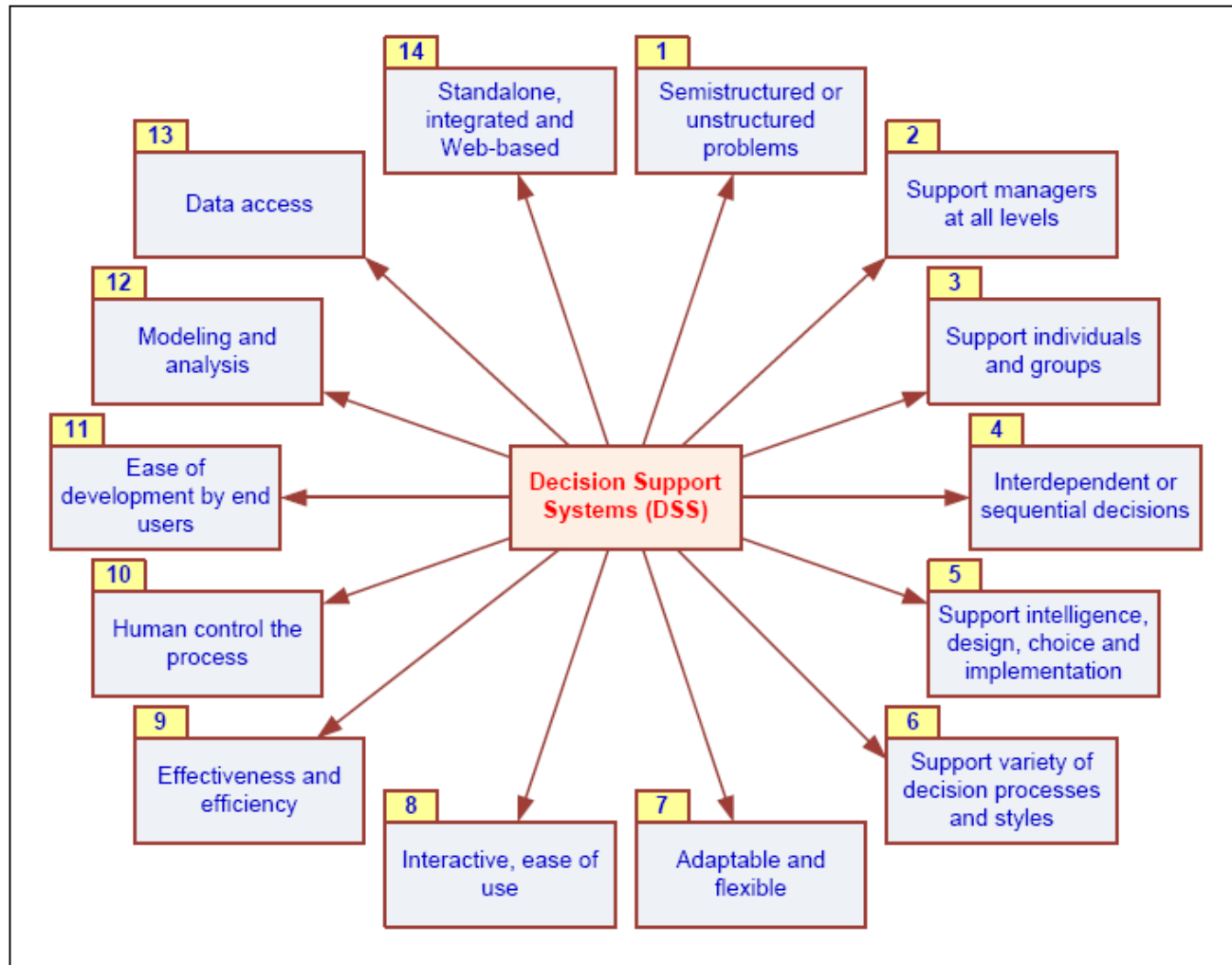




DSS Characteristics and Capabilities

- DSS is not quite synonymous with BI
 - DSS are generally built to solve a specific problem and include their own database(s)
 - BI applications focus on reporting and identifying problems by scanning data stored in data warehouses
 - Both systems generally include analytical tools (BI called **business analytics systems**)
 - Although some may run locally as a spreadsheet, both DSS and BI uses Web

DSS Characteristics and Capabilities





DSS Characteristics and Capabilities

- **Business analytics** implies the use of models and data to improve an organization's performance and/or competitive posture
- **Web analytics** implies using business analytics on real-time Web information to assist in decision making; often related to e-Commerce
- **Predictive analytics** describes the business analytics method of forecasting problems and opportunities rather than simply reporting them as they occur



DSS Classifications

- Other DSS Categories
 - Institutional and ad-hoc DSS
 - Personal, group, and organizational support
 - Individual support system versus group support system (GSS)
 - Custom-made systems versus ready-made systems



DSS Classifications

- Holsapple and Whinston's Classification
 1. The text-oriented DSS
 2. The database-oriented DSS.
 3. The spreadsheet-oriented DSS
 4. The solver-oriented DSS
 5. The rule-oriented DSS (include most knowledge-driven DSS, data mining, management, and ES applications)
 6. The compound DSS



DSS Classifications

■ Alter's Output Classification

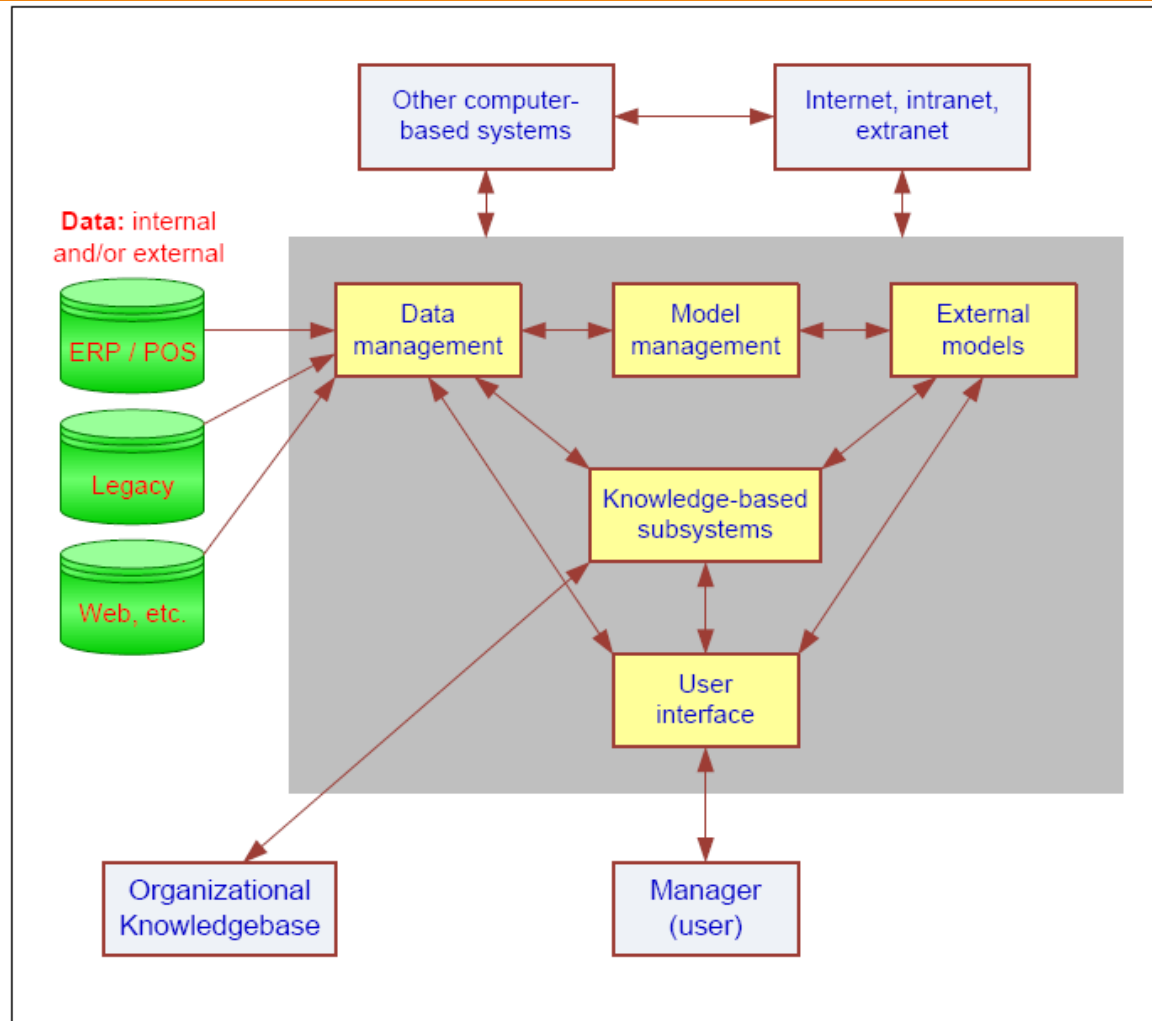
Orientation	Category	Type of Operation
Data	File drawer systems	Access data items
	Data analysis systems	Ad hoc analysis of data files
Data or models	Analysis information systems	Ad hoc analysis involving multiple databases and small models
Models	Accounting models	Standard calculations that estimate future results on the basis of accounting definitions
	Optimization models	Calculating an optimal solution to a combinatorial problem



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Components of DSS





Components of DSS

- Data Management Subsystem
 - Includes the database that contains the data
 - Database management system (DBMS)
 - Can be connected to a data warehouse
- Model Management Subsystem
 - Model base management system (MBMS)
- User Interface Subsystem
- Knowledgebase Management Subsystem
 - Organizational knowledge base



Overall Capabilities of DSS

- Easy access to data/models/knowledge
- Proper management of organizational experiences and knowledge
- Easy to use, adaptive and flexible GUI
- Timely, correct, concise, consistent support for decision making
- Support for all who needs it, where and when he/she needs it

- See Table 3.2 for a complete list...



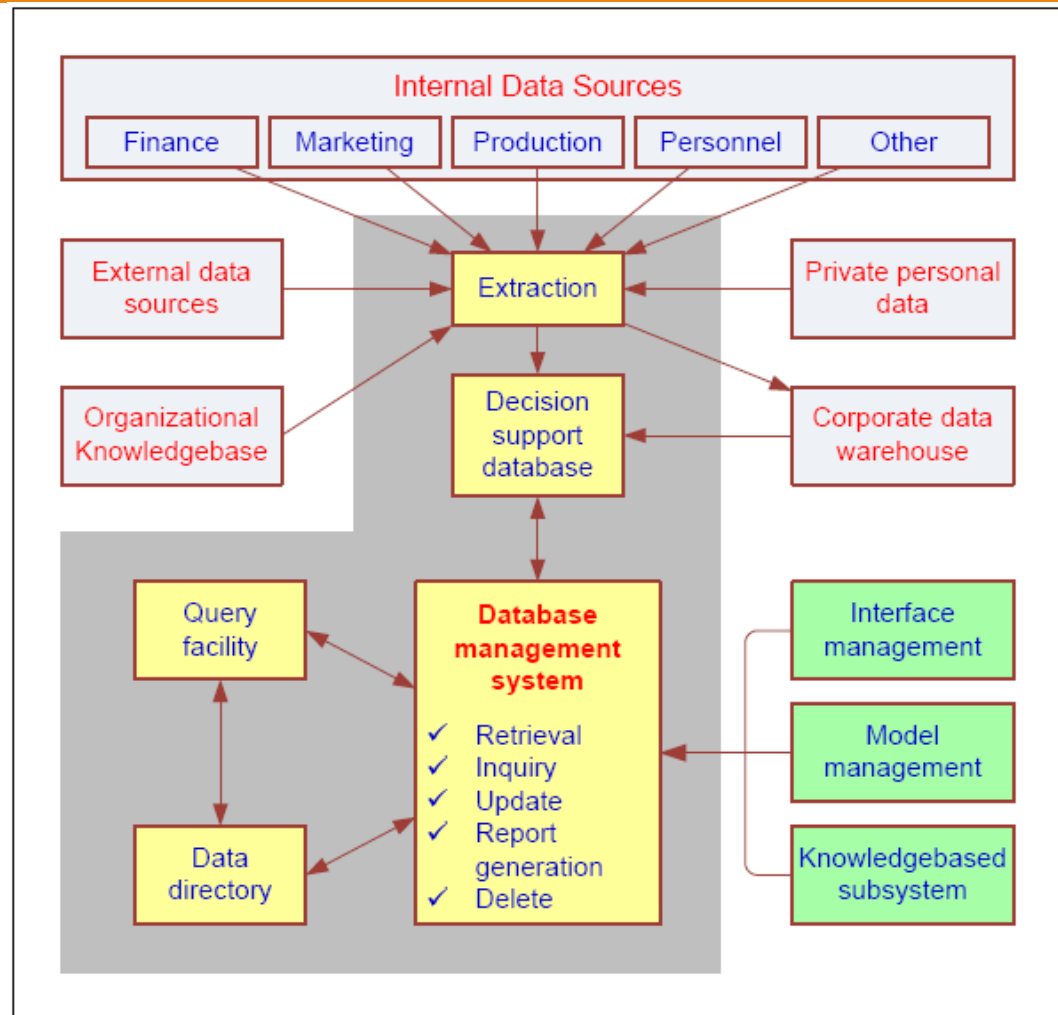
DSS Components and Web Impacts

- Impacts of Web to DSS
 - Data management via Web servers
 - Easy access to variety of models, tools
 - Consistent user interface (browsers)
 - Deployment to PDAs, cell phones, etc. ...
- DSS impact on Web
 - Intelligent e-Business/e-Commerce
 - Better management of Web resources and security, ... (see Table 3.3 for more...)

DSS Components

Data Management Subsystem

- DSS database
- DBMS
- Data directory
- Query facility





Database Management Subsystem

Key Data Issues

- Data quality
 - “Garbage in/garbage out” (GIGO)
- Data integration
 - “Creating a single version of the truth”
- Scalability
- Data Security
- Timeliness
- Completeness, ...



10 Key Ingredients of Data (Information) Quality Management

1. Data quality is a business problem, not only a systems problem
2. Focus on information about customers and suppliers, not just data
3. Focus on all components of data: definition, content, and presentation
4. Implement data/information quality management processes, not just software to handle them
5. Measure data accuracy as well as validity



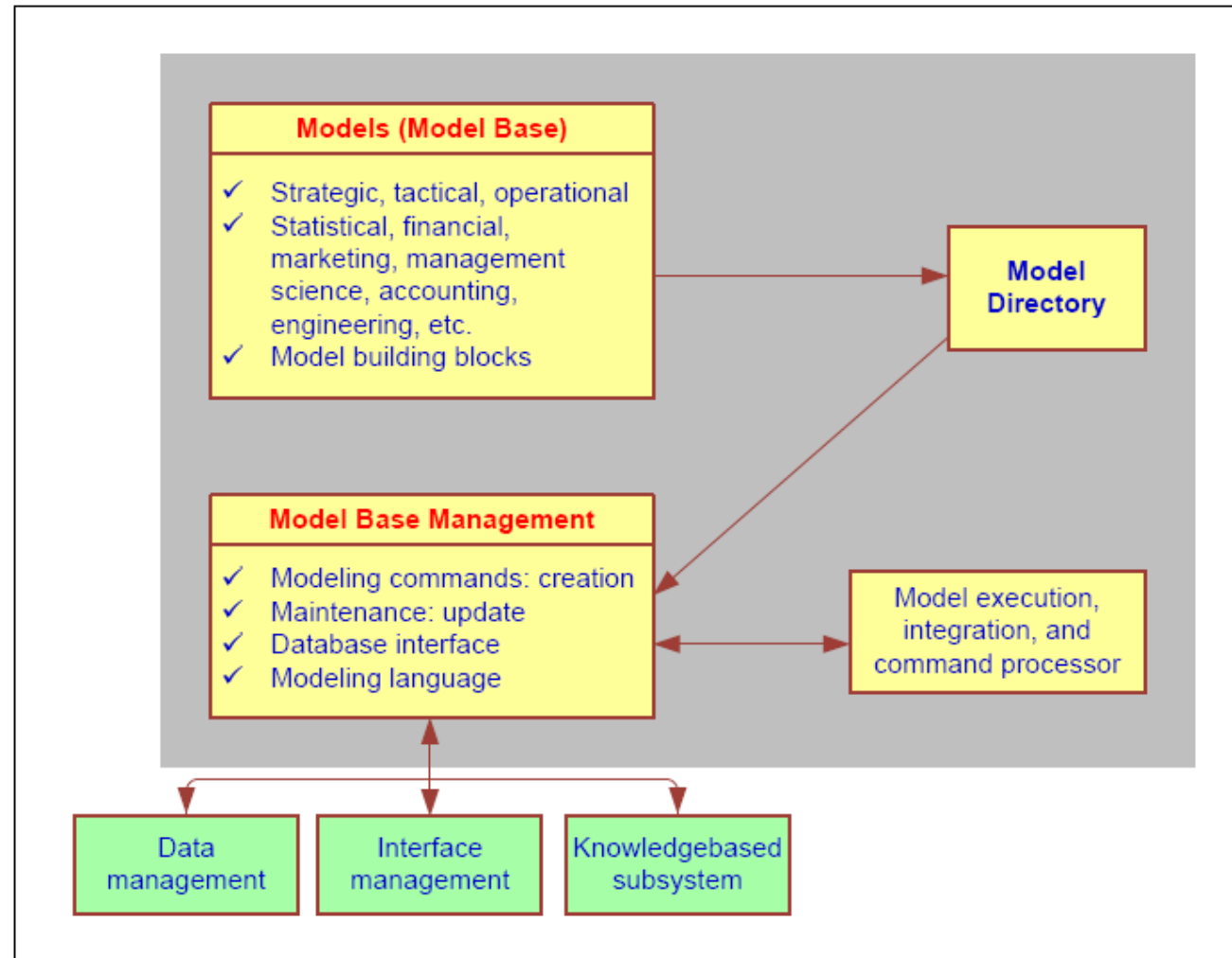
10 Key Ingredients of Data (Information) Quality Management

6. Measure real costs (not just the percentage) of poor quality data/information
7. Emphasize process improvement/preventive maintenance, not just data cleansing
8. Improve processes (and hence data quality) at the source
9. Educate managers about the impacts of poor data quality and how to improve it
10. Actively transform the culture to one that values data quality

DSS Components

Model Management Subsystem

- Model base
- MBMS
- Modeling language
- Model directory
- Model execution, integration, and command processor





DSS Components

Model Management Subsystem

- Model base (= database ?)
- Model Types
 - Strategic models
 - Tactical models
 - Operational models
- Analytic models
- Model building blocks
- Modeling tools



DSS Components

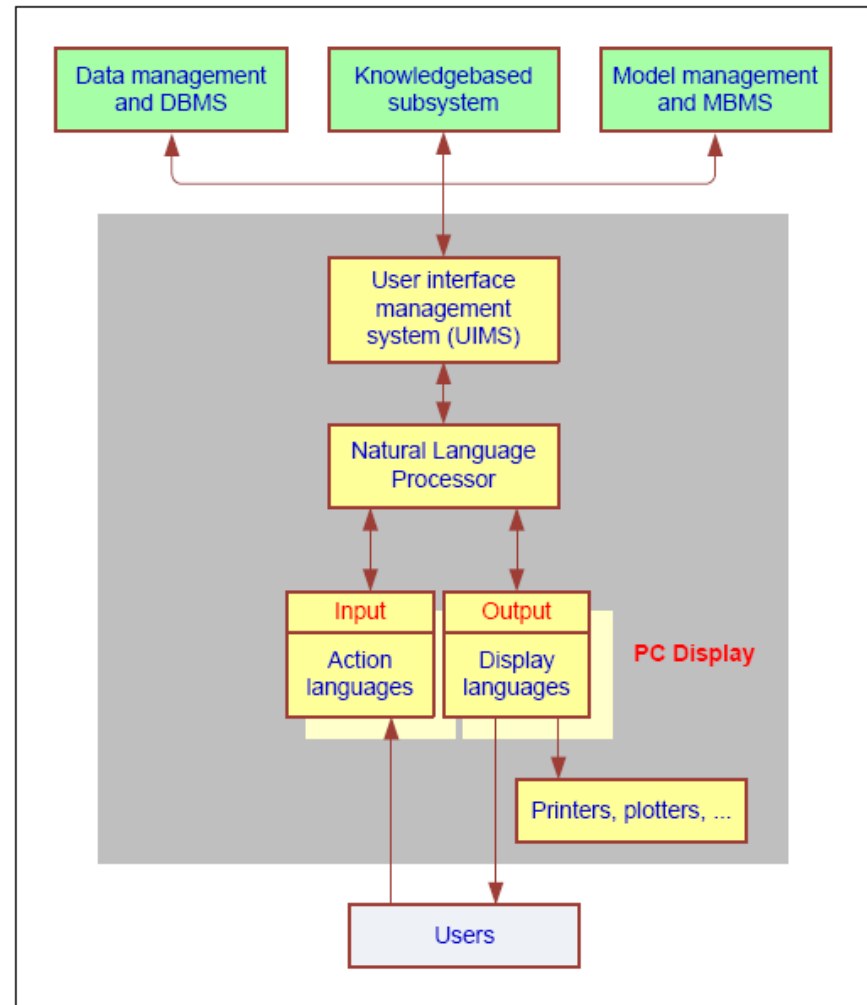
Model Management Subsystem

- The four (4) functions
 1. Model creation, using programming languages, DSS tools and/or subroutines, and other building blocks
 2. Generation of new routines and reports
 3. Model updating and changing
 4. Model data manipulation
- Model directory
- Model execution, integration and command

DSS Components

User Interface (Dialog) Subsystem

- Interface
 - Application interface
 - User Interface
 - Graphical User Interface (GUI)
- DSS User Interface
 - Portal
 - Graphical icons
 - Dashboard
 - Color coding
- Interfacing with PDAs, cell phones, etc.





DSS Components

Knowledgebase Management System

- Incorporation of intelligence and expertise
- Knowledge components:
 - Expert systems,
 - Knowledge management systems,
 - Neural networks,
 - Intelligent agents,
 - Fuzzy logic,
 - Case-based reasoning systems, and so on
- Often used to better manage the other DSS components



DSS Components

Future/current DSS Developments

- Hardware enhancements
 - Smaller, faster, cheaper, ...
- Software/hardware advancements
 - data warehousing, data mining, OLAP, Web technologies, integration and dissemination technologies (XML, Web services, SOA, grid computing, cloud computing, ...)
- Integration of AI -> smart systems



DSS User

- One faced with a decision that an MSS is designed to support
 - Manager, decision maker, problem solver, ...
- The users differ greatly from each other
 - Different organizational positions they occupy; cognitive preferences/abilities; the ways of arriving at a decision (i.e., decision styles)
- User = Individual versus Group
- Managers versus Staff Specialists [staff assistants, expert tool users, business (system) analysts, facilitators (in a GSS)]



DSS Hardware

- Typically, MSS run on standard hardware
- Can be composed of mainframe computers with legacy DBMS, workstations, personal computers, or client/server systems
- Nowadays, usually implemented as a distributed/integrated, loosely-coupled Web-based systems
- Can be acquired from
 - A single vendor
 - Many vendors (best-of-breed)

A DSS Modeling Language Planners Lab (plannerslab.com)

- Generating Assumptions

The screenshot displays the Planners Lab software interface. The main window is titled "Model: Introduction Model". On the left, a tree view shows "Model Design" and "Expenses". The "Columns" section at the top right shows "FORECAST COLUMNS = 2010 THRU 2012". Below this, a table displays data for the years 2010, 2011, and 2012. The "Equations" section at the bottom right lists the assumptions for the "Expenses" model.

	2010	2011	2012
1 Salary per employee	95,000	95,000	95,000
2 People cost	190,000	380,000	570,000
4 Number of employees	2.00	4.00	6.00
5 Square feet per employee	150.00	150.00	150.00
6 Space cost per square foot	24.00	24.00	24.00
7 Space cost	7,200	14,400	21,600
9 Total cost	197,200	394,400	591,600

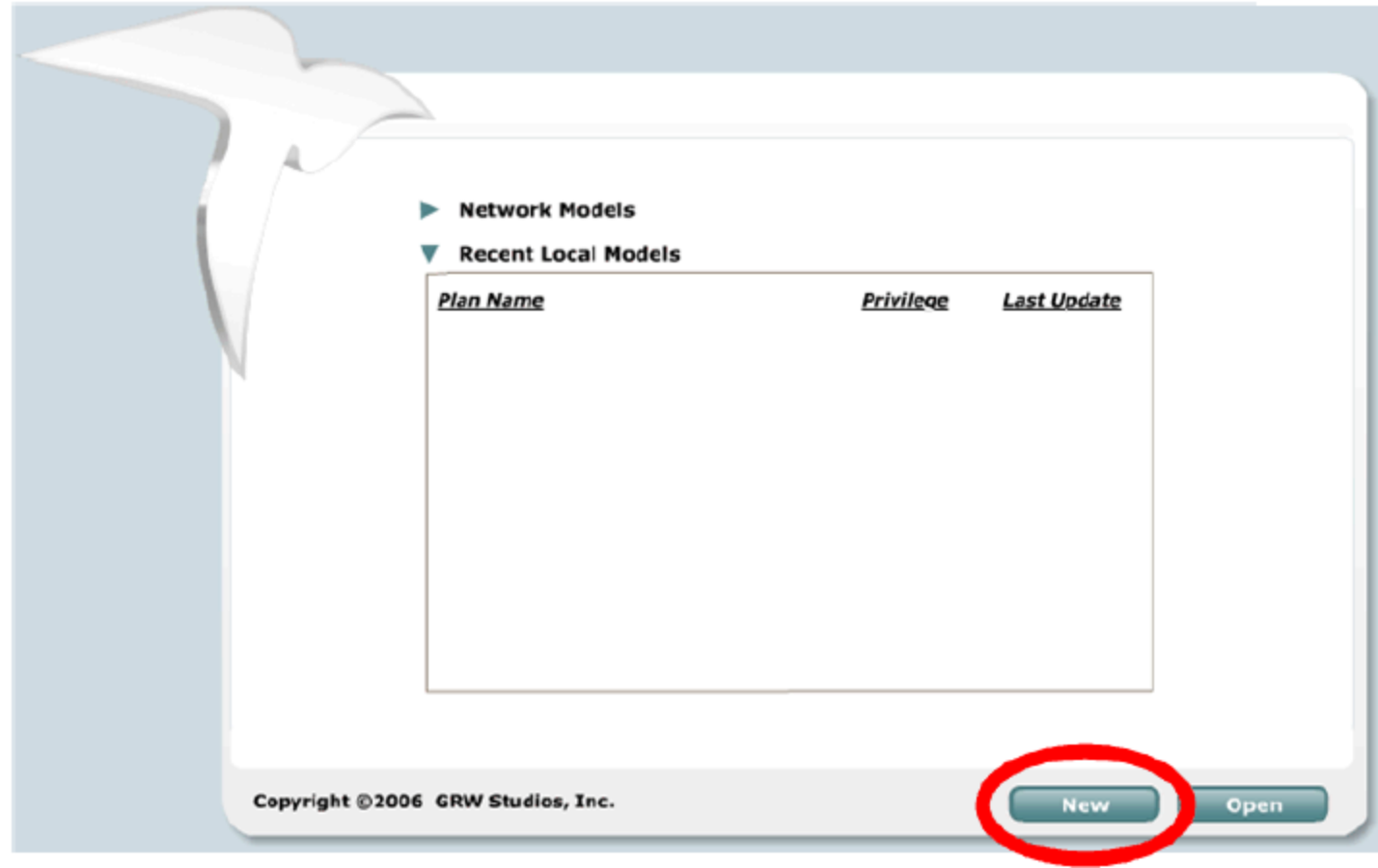
Equations:

Expenses

- 1 Salary per employee = 95000
- 2 People cost = Number of employees * Salary per employee
- 3
- 4 Number of employees = 2, 4, 6
- 5 Square feet per employee = 150
- 6 Space cost per square foot = 24
- 7 Space cost = Space cost per square foot * Square feet per employee * Number of employees
- 8
- 9 Total cost = People cost + Space cost

A DSS Modeling Language Planners Lab (plannerslab.com)

- Creating a new model



A DSS Modeling Language Planners Lab (plannerslab.com)

The screenshot displays the Planners Lab software interface. On the left is a 'Model Design' tree with a hierarchical structure. The main area is divided into three sections: 'Columns', 'Data', and 'Equations'. The 'Columns' section shows a list of forecast columns. The 'Data' section contains a table with three rows of data. The 'Equations' section lists three equations. Red circles with numbers 1 through 5 are overlaid on the interface to highlight specific elements.

Model Design Tree:

- Model Design
 - Staffing Revenues and Expenses
 - Professional
 - Billings Professional**
 - Expenses Professional
 - Profit Professional
 - Associates
 - Billings Associates
 - Expenses Associates
 - Profit Associates
 - Administrative
 - Billings Administrative
 - Expenses Administrative
 - Profit Administrative
 - Other Expenses
 - Summary
 - Overall Revenue
 - Overall Expenses
 - Profit

Columns:

FORECAST COLUMNS = Q1 10, Q2 10, Q3 10, Q4 10, Q1 11, Q2 11, Q3 11, Q4 11

Data:

	Q1 10	Q2 10	Q3 10	Q4 10	Q1 11	Q2 11	Q3 11	Q4 11
1 Forecast Professional Days Billed	250.00	275.00	300.00	325.00	350.00	350.00	350.00	350.00
2 Professional Billing Rate	1,400	1,400	1,400	1,400	1,500	1,500	1,500	1,500
3 Forecast Professional Revenue	350,000	385,000	420,000	455,000	525,000	525,000	525,000	525,000

Equations:

Billings Professional

- Forecast Professional Days Billed = 250, 275, 300, 325, 350
- Professional Billing Rate = 1400 FOR 4, 1500
- Forecast Professional Revenue = Forecast Professional Days Billed * Professional Billing Rate

A DSS Modeling Language Planners Lab (plannerslab.com)

The screenshot displays the Planners Lab software interface. On the left is a 'Model Design' tree with a hierarchical structure: Staffing Revenues and Expenses (Professional, Expenses Professional, Profit Professional), Associates (Billings Associates, Expenses Associates, Profit Associates), Administrative (Billings Administrative, Expenses Administrative, Profit Administrative), Other Expenses, and Summary (Overall Revenue, Overall Expenses, Profit). The 'Expenses Professional' node is highlighted with a red circle and arrow labeled '2'. The main area shows 'Columns' with the formula 'FORECAST COLUMNS = Q1 10, Q2 10, Q3 10, Q4 10, Q1 11, Q2 11, Q3 11, Q4 11'. Below this is a table with columns for quarters Q1 10 through Q4 11. Row 1 is 'Professional Person Salary Per Day' with values 500.00, 500.00, 500.00, 500.00, 550.00, 550.00, 550.00, 550.00. Row 2 is 'Forecast Professional Expense' with values 0, 0, 0, 0, 0, 0, 0, 0. A red circle and arrow labeled '4' points to the 'Forecast Professional Expense' row. Below the table is the 'Equations' section with two equations: '1 Professional Person Salary Per Day = 500 FOR 4, 550' and '2 Forecast Professional Expense = Professional Person Salary Per Day * Forecast Professional Days Billed IN Billings professional'. A red circle and arrow labeled '1' points to the first equation, and a red circle and arrow labeled '3' points to the second equation. At the bottom, the 'Errors' section shows 'Errors: 1' and 'Expenses Professional: Line 2: Invalid Node Reference "Billings professional"'. A red circle and arrow labeled '5' points to the error message. At the bottom left, there are buttons for 'Add', 'Copy', 'Rename', and 'Delete', with a red circle and arrow labeled '2' pointing to the 'Add' button. At the bottom center is a 'Validate Model' button, and at the bottom right is a 'Playground' button.

	Q1 10	Q2 10	Q3 10	Q4 10	Q1 11	Q2 11	Q3 11	Q4 11
1 Professional Person Salary Per Day	500.00	500.00	500.00	500.00	550.00	550.00	550.00	550.00
2 Forecast Professional Expense	0	0	0	0	0	0	0	0

Equations:

Expenses Professional

1 Professional Person Salary Per Day = 500 FOR 4, 550

2 Forecast Professional Expense = Professional Person Salary Per Day * Forecast Professional Days Billed IN Billings professional

Errors: 1

Expenses Professional:
Line 2: Invalid Node Reference "Billings professional".

A DSS Modeling Language Planners Lab (plannerslab.com)

The screenshot displays the Planners Lab software interface. On the left is a 'Model Design' tree with categories like 'Staffing Revenues and Expenses', 'Associates', 'Administrative', and 'Summary'. The main area is divided into three sections: 'Columns', 'Data', and 'Equations'.

Columns: FORECAST COLUMNS = Q1 10, Q2 10, Q3 10, Q4 10, Q1 11, Q2 11, Q3 11, Q4 11

Data:

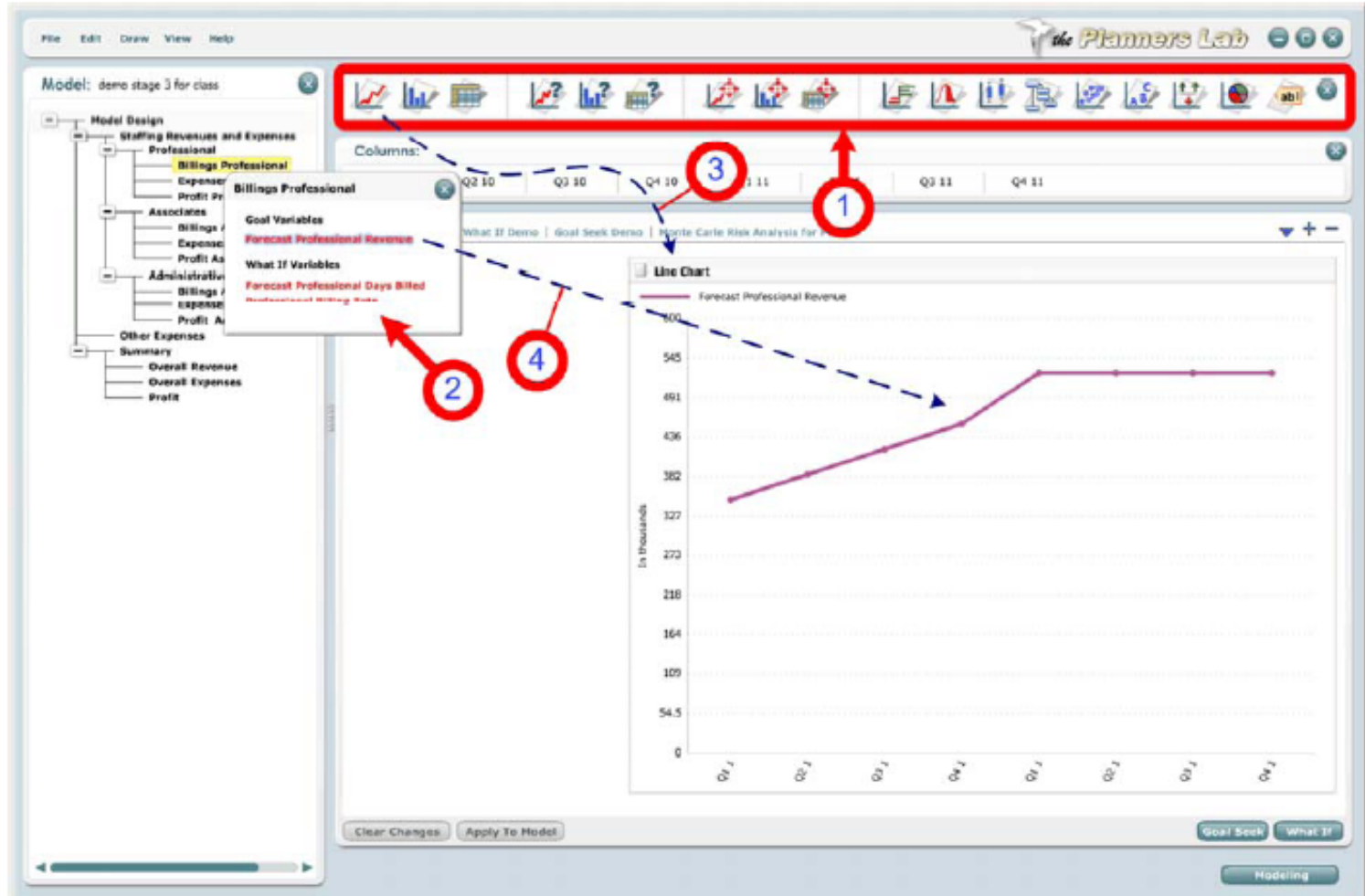
	Q1 10	Q2 10	Q3 10	Q4 10	Q1 11	Q2 11	Q3 11	Q4 11
1 Forecast Professional Days Billed	250.00	275.00	300.00	325.00	350.00	350.00	350.00	350.00
2 Professional Billing Rate	1,400	1,400	1,400	1,400	1,500	1,500	1,500	1,500
3 Forecast Professional Revenue	350,000	385,000	420,000	455,000	525,000	525,000	525,000	525,000

Equations:

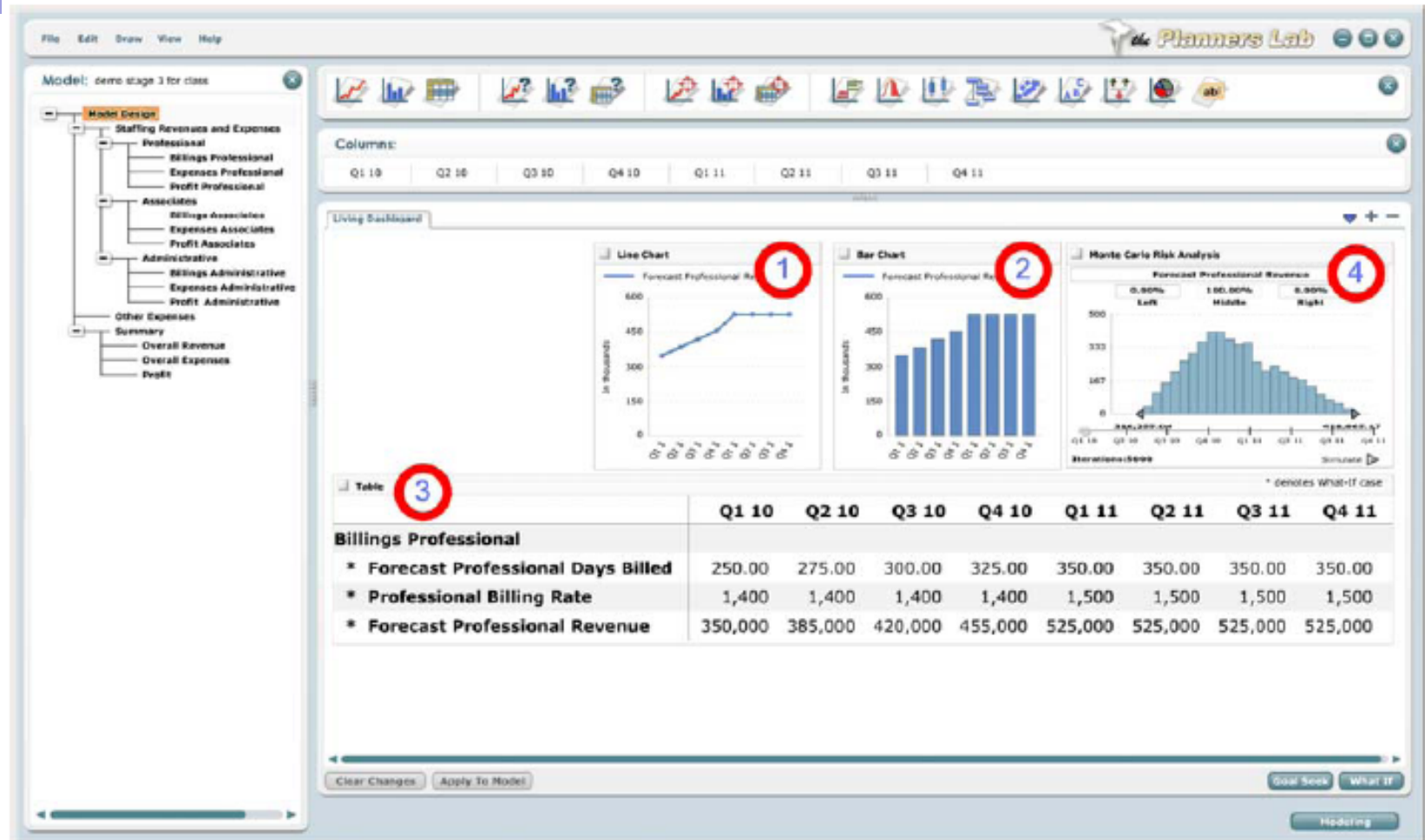
Billings Professional

- Forecast Professional Days Billed = **TRIRAND** (225,250,300), **TRIRAND** (250,275, 325), **TRIRAND** (275,300,350), **TRIRAND** (300,325,400), **TRIRAND** (325,350,425)
- Professional Billing Rate = 1400 FOR 4, 1500
- Forecast Professional Revenue = Forecast Professional Days Billed * Professional Billing Rate

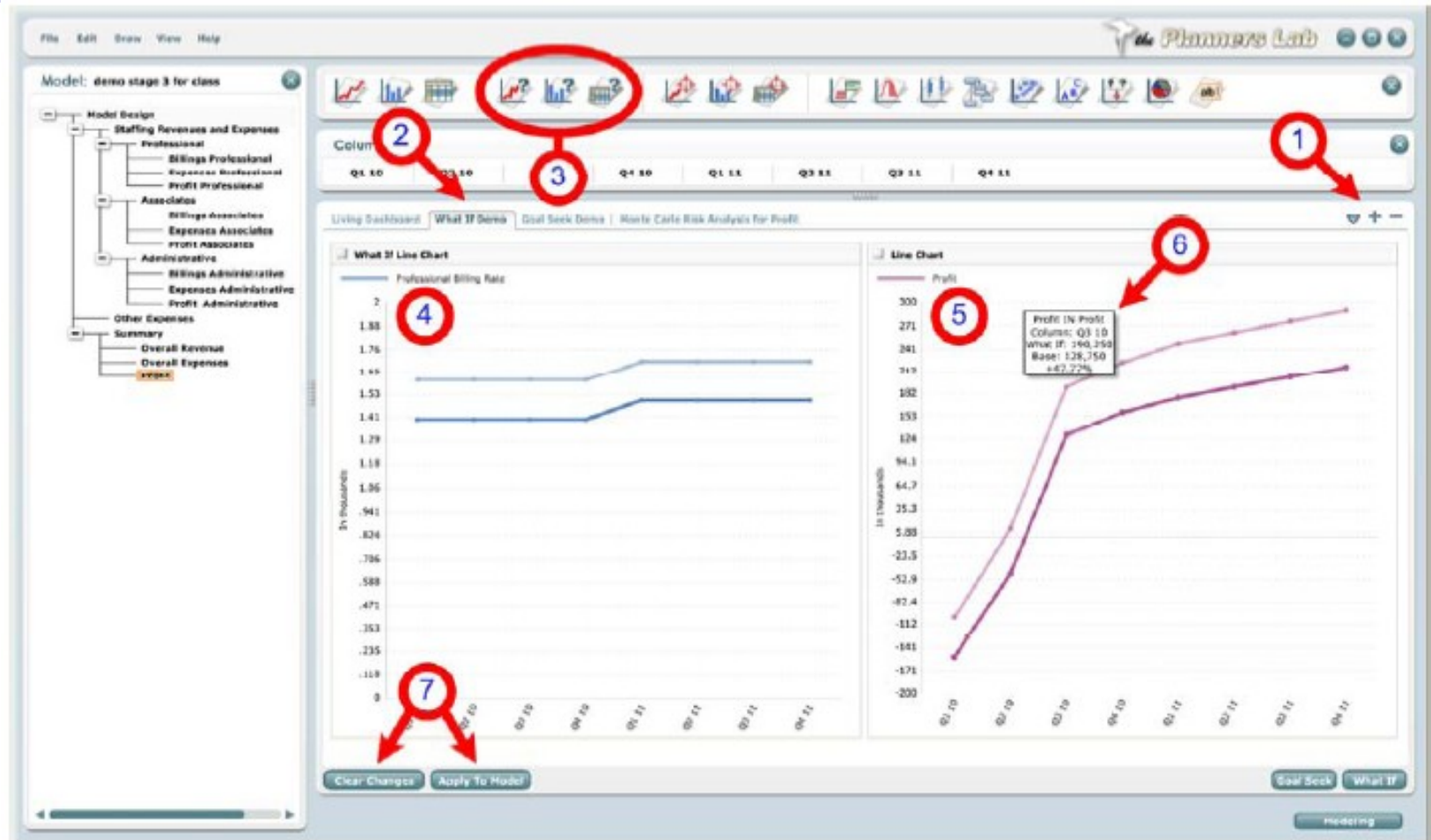
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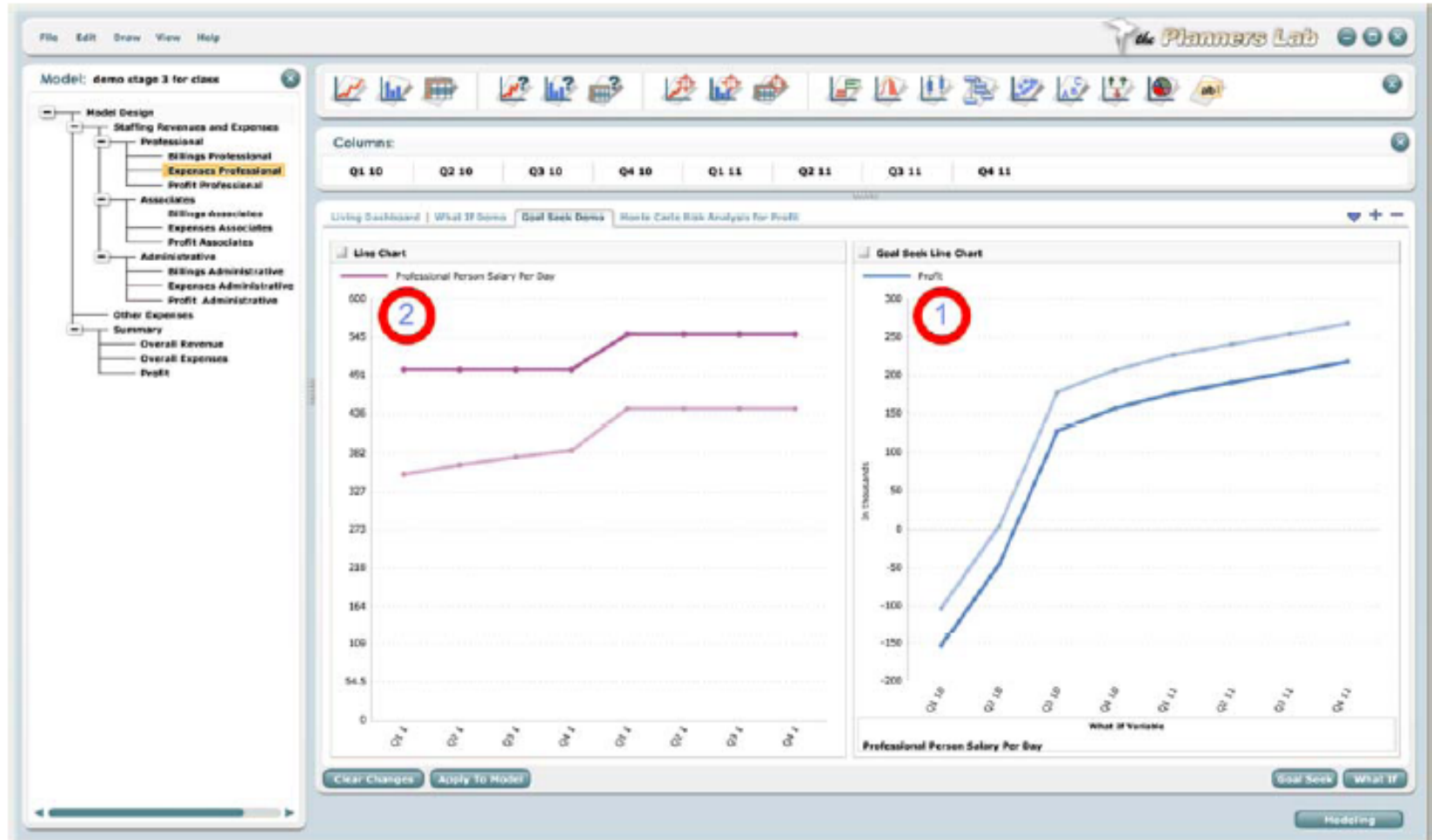
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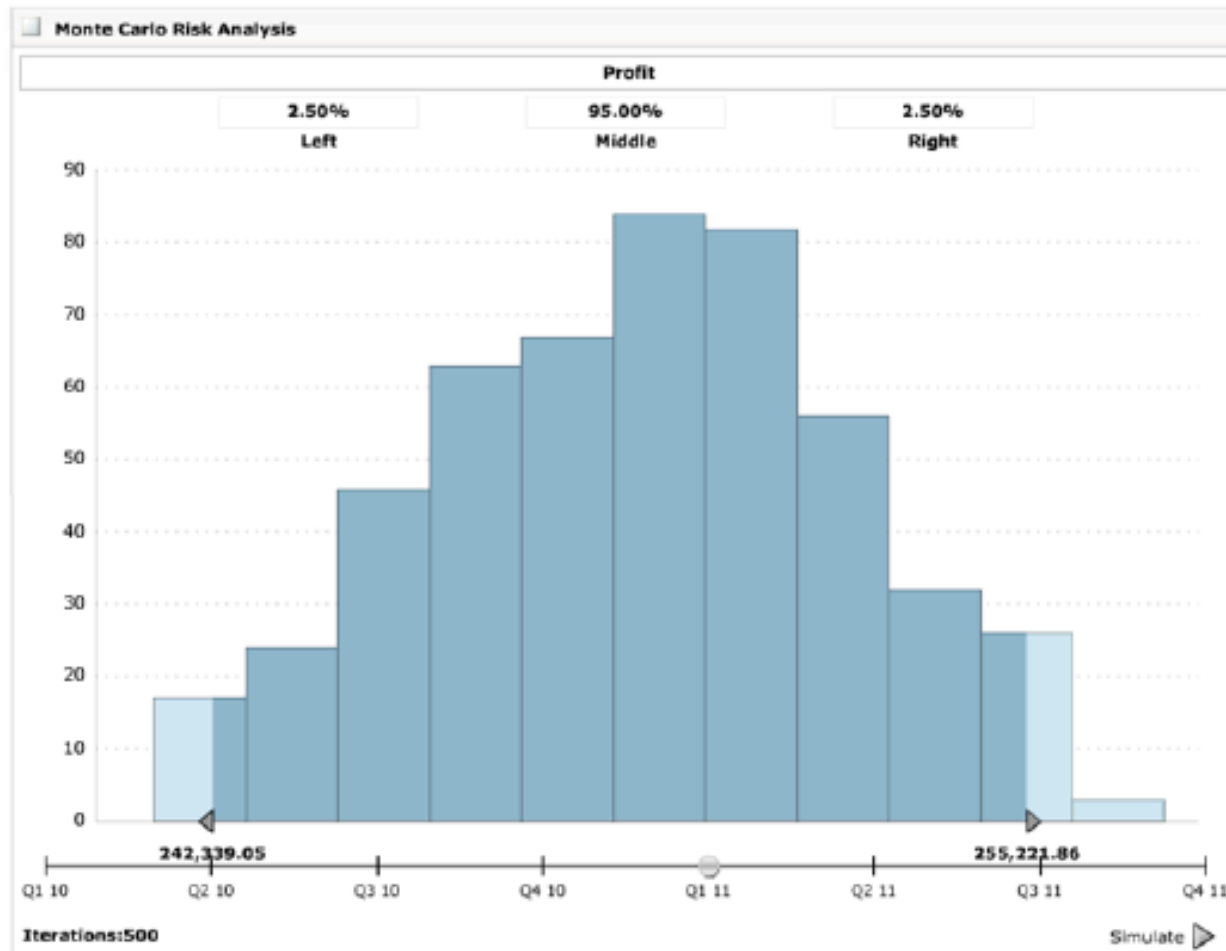


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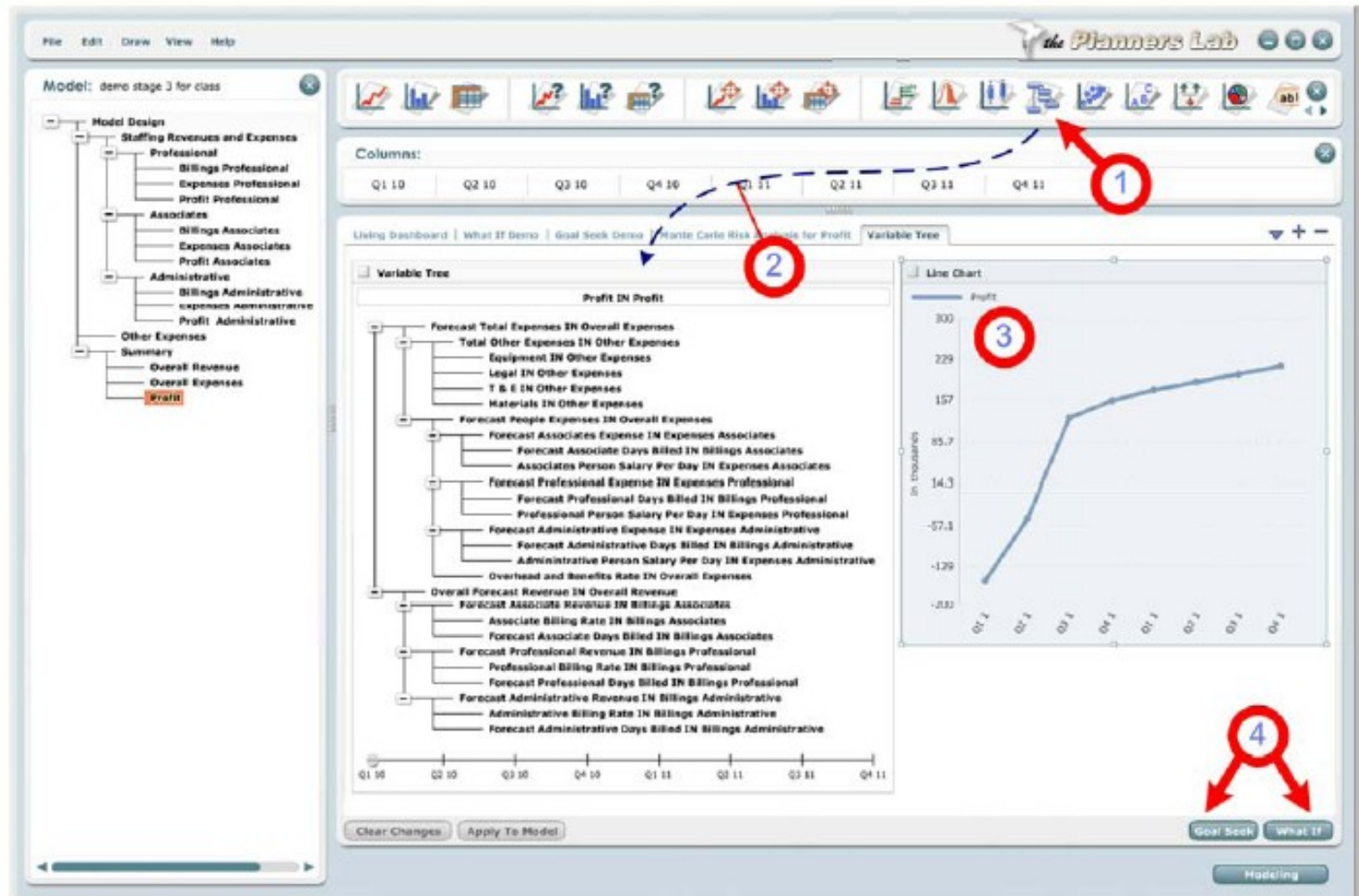




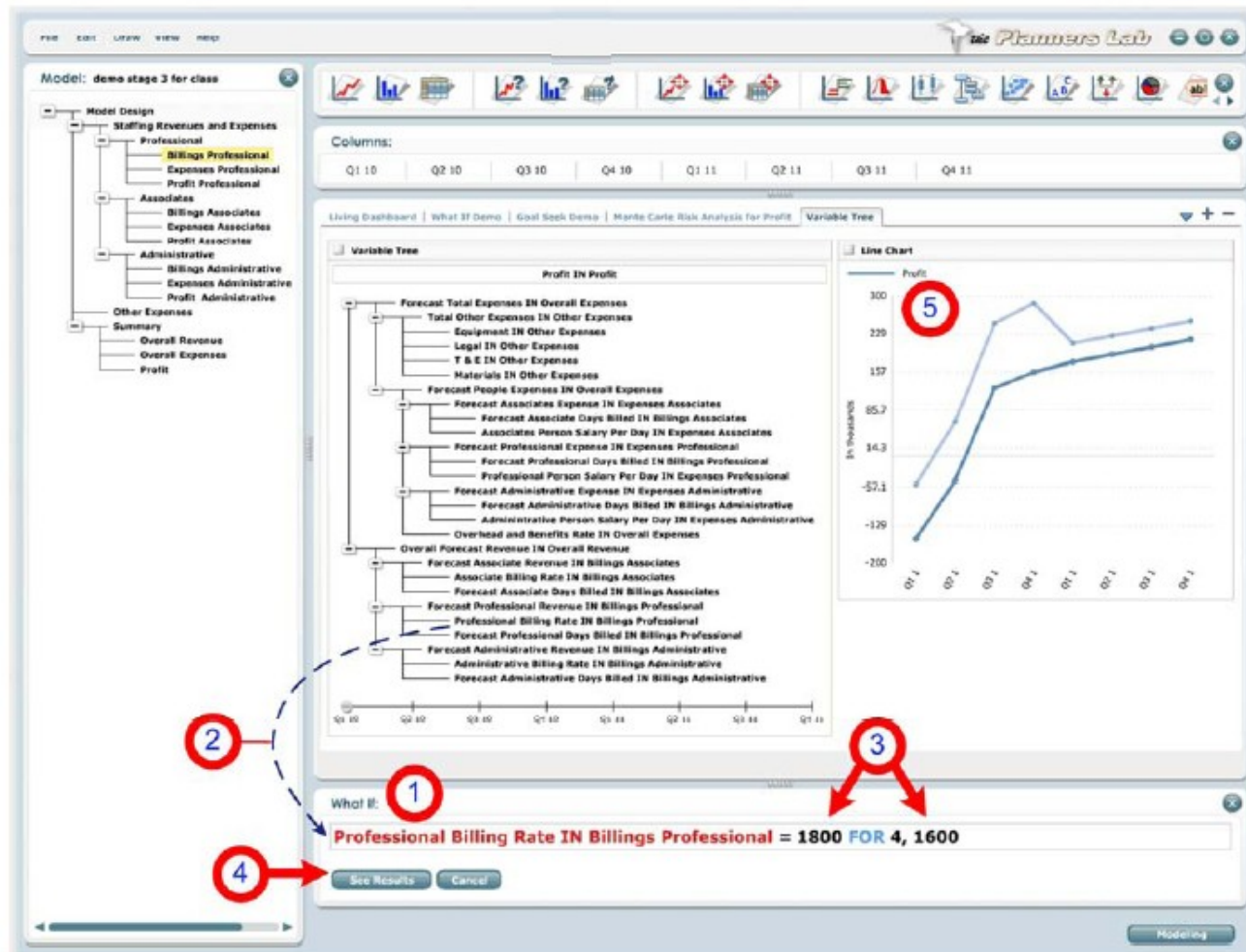
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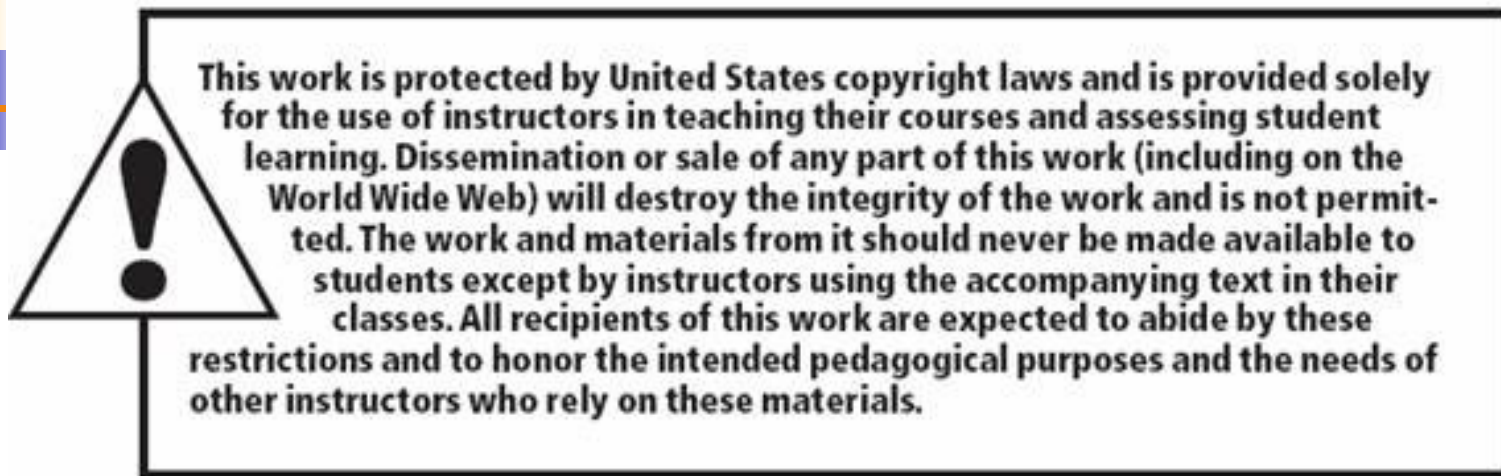
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	Line Chart		What If Line Chart		Goal Seek Line Chart
	Bar Chart		What If Bar Chart		Goal Seek Bar Chart
	Table		What If Table		Goal Seek Table
	Impact Analysis		Risk Analysis		Variable Tree
	Pie Chart		Sticky Note		



End of the Chapter

- Questions / Comments...



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