BAIT 3013
Business Intelligence

Lecture 6

BUSINESS INTELLIGENCE SYSTEMS DEVELOPMENT

The Business Analytics (BA) Field: An Overview

- Business intelligence (BI)
  - The use of analytical methods, either manually or automatically, to derive relationships from data

The Business Analytics (BA) Field: An Overview

- The essentials of BA
  - Analytics
    - The science of analysis.
  - Business analytics (BA)
    - The application of models directly to business data. BA involves using MSS tools, especially models, in assisting decision makers; essentially a form of OLAP decision support

The Business Analytics (BA) Field: An Overview

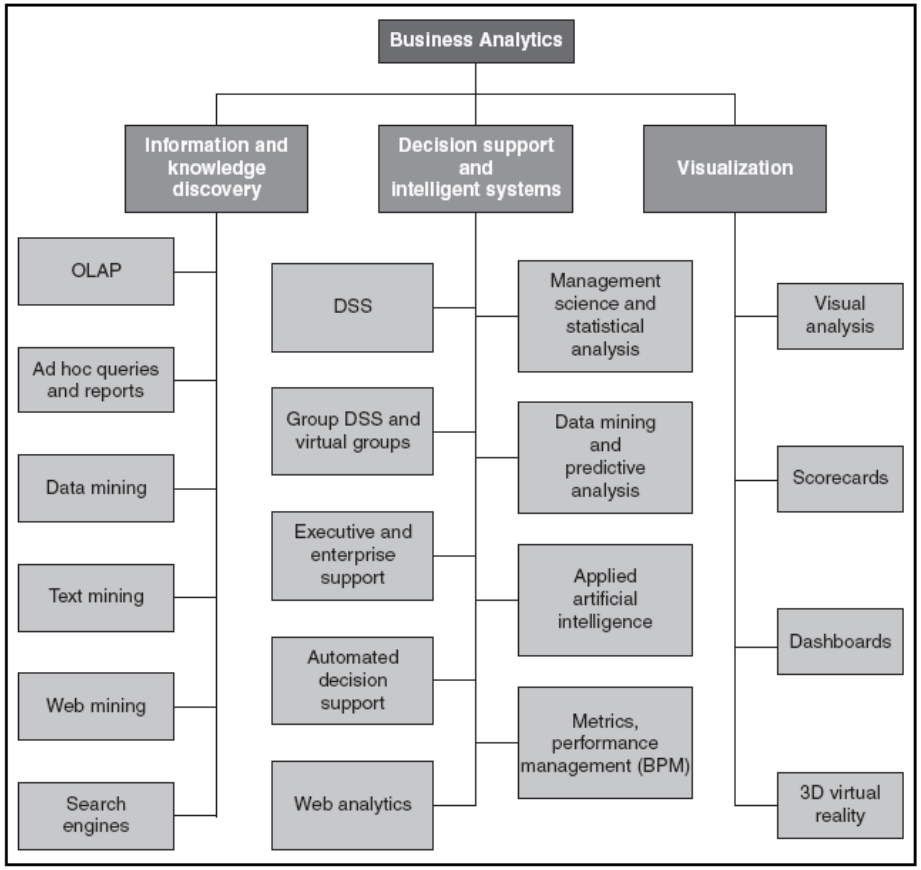
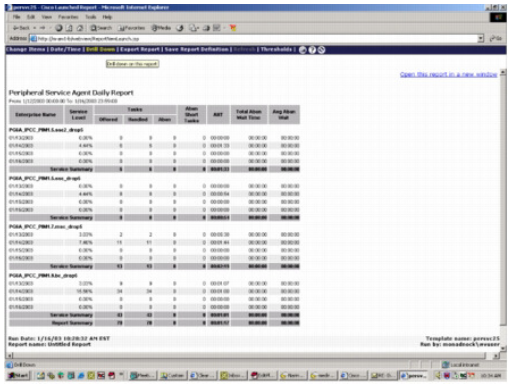


FIGURE 6.1 Categories of Business Analytics

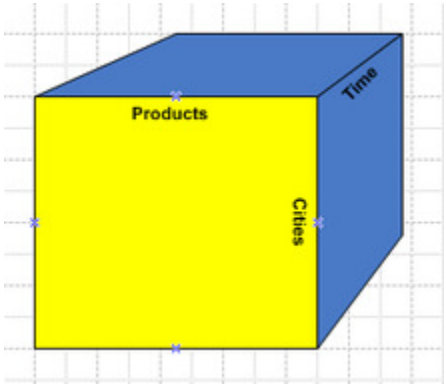
The Business Analytics (BA) Field: An Overview

- MicroStrategy's classification of BA tools
- The five styles of BI :
  - Enterprise reporting
    - ER products are used to generate highly formatted static reports destined for broad distribution to many people. They are pixel-perfect report formats for operational reporting and dashboards.



The Business Analytics (BA) Field: An Overview

- The five styles of BI :
  - Cube analysis
    - Cube-based BI tools are used to provide simple OLAP multidimensional slice-and-dice analytical capabilities to business managers in a limited-range environment.



The Business Analytics (BA) Field: An Overview

- Ad hoc querying and analysis
  - ROLAP tools are used to allow power users to query a database for any answer, slice-and-dice the entire database, and drill down to the lowest level of transactional information. This investigative querying is targeted to information explorers and power users.
- Statistical analysis and data mining
  - Statistical, mathematical, data mining tools are used to perform predictive analysis or to discover the cause-and-effect correlation between two metrics. Financial analysis and forecasts are also performed.

The Business Analytics (BA) Field: An Overview

- Report delivery and alerting
  - Report distribution engines are used proactively to send full reports or alerts to large populations (internal and external), based on subscriptions, schedules, or threshold events in the databases.

The Business Analytics (BA) Field: An Overview

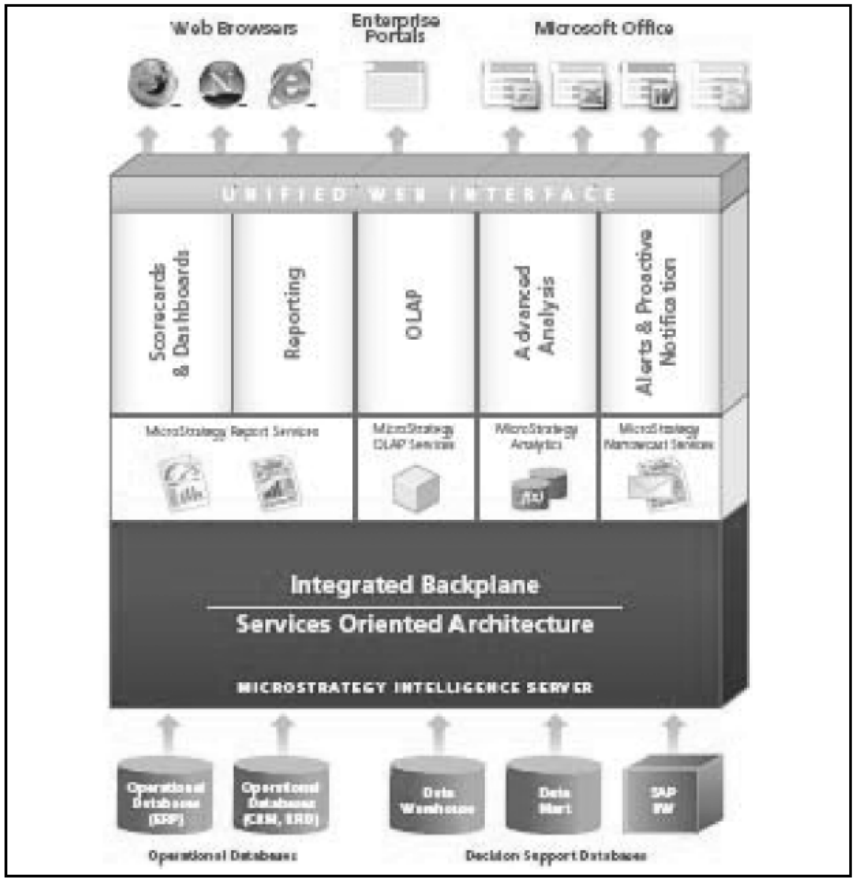


FIGURE 6.2 MicroStrategy 8 Architecture

The Business Analytics (BA) Field: An Overview

- SAP's classification of strategic enterprise management
  - Three levels of support:
    - Operational - ERP (SAP R/3) mainly support transaction processing on the operational level
    - Managerial - At the managerial level, middle managers can use SAP R/3 to access all reports, arranged by functional areas (e.g. marketing, finance). Managers can make queries and drill down.
    - Strategic - At the strategic level, the company offers products under the title SAP SEM (Strategic Enterprise Management), which includes BA (SAP SEM/BA).

Online Analytical Processing (OLAP)

- Drill-down
  - The investigation of information in detail (e.g., finding not only total sales but also sales by region, by product, or by salesperson). Finding the detailed sources.
- Online analytical processing (OLAP)
  - An information system that enables the user, while at a PC, to query the system, conduct an analysis, and so on. The result is generated in seconds

Online Analytical Processing (OLAP)

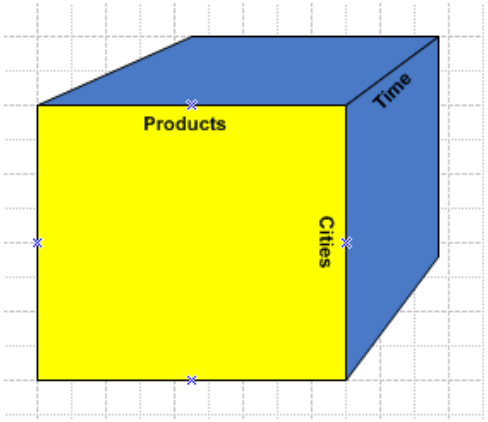
- OLAP versus OLTP
  - OLTP concentrates on processing repetitive transactions in large quantities and conducting simple manipulations
  - OLAP involves examining many data items *complex relationships*
  - OLAP may analyze relationships and look for patterns, trends, and exceptions
  - OLAP is a direct decision support method

Online Analytical Processing (OLAP)

- Types of OLAP
  - Multidimensional OLAP (MOLAP)
  - Relational OLAP (ROLAP)
  - Hybrid OLAP (HOLAP)

Multidimensional OLAP (MOLAP)

- OLAP implemented via a specialized multidimensional database (or data store) that summarizes transactions into multidimensional views ahead of time



Relational Online Analytical Processing (ROLAP)

- Data is stored in relational databases.

- Submit a request for multidimensional analysis and then the engine converts the request to SQL and it's submitted to the database.
- Then the database sends the information back, the ROLAP / Relational Online Analytical Processing converts it from SQL to a multidimensional format and get the answer.

Hybrid OLAP (HOLAP)

- Combine the strengths of the MOLAP and ROLAP

Comparison between MOLAP, ROLAP and HOLAP

Basic Storage Mode	Storage Location for Detail Data	Storage Location for Summary/ Aggregations	Storage space requirement	Query Response Time	Processing Time	Latency
MOLAP	Multidimensional Format	Multidimensional Format	Medium Because detail data is stored in compressed format.	Fast	Fast	High
HOLAP	Relational Database Medium	Multidimensional Format	Small	Medium	Fast	Medium
ROLAP	Relational Database	Relational Database	Large	Slow	Slow	Low

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Multidimensional conceptual view for formulating queries
    - view an enterprise as being multidimensional in nature - for example, profits could be viewed by region, product, time period, or scenario (such as actual, budget, or forecast).

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Transparency to the user
    - should be part of an open systems architecture which can be embedded in any place desired by the user without adversely affecting the functionality of the host tool.

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Easy accessibility
    - should be capable of applying its own logical structure to access heterogeneous sources of data and perform any conversions necessary to present a coherent view to the user.

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Consistent reporting performance
    - Provide consistent reporting

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Client/server architecture: the use of distributed resources
    - The server should be capable of mapping and consolidating data between disparate databases.

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Generic dimensionality
    - Every data dimension should be equivalent in its structure and operational capabilities.

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Dynamic sparse matrix handling
    - The OLAP server's physical structure should have optimal sparse matrix handling.

Row \ Column	1	2	3	4	5	6	7
1	11	15	5				
2							
3						7	
4			20				
5							
6							
7							

Sparse Matrix

Value

Row	Col	Value
1	1	11
1	2	15
1	3	5
4	3	20
3	6	7

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Multi-user support rather than support for only a single user
    - OLAP tools must provide concurrent retrieval and update access, integrity and security.

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Unrestricted cross-dimensional operations
    - Computational facilities must allow calculation and data manipulation across any number of data dimensional and must not restrict any relationship between data cells.

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Intuitive data manipulation
    - Data manipulation inherent in the consolidation path, such as drilling down or zooming out, should be accomplished via direct action on the analytical model's cells, and not require use of a menu or multiple trips across the user interface.

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Flexible reporting
    - Reporting facilities should present information in any way the user wants to view it.

Online Analytical Processing (OLAP)

- Codd's 12 Rules for OLAP
  - Unlimited dimensions and aggregation level
    - The number of data dimensions supported should, to all intents and purposes, be unlimited.

Reports and Queries

- Reports
  - Routine reports
  - Ad hoc (or on-demand) reports
  - Multilingual support
  - Scorecards and dashboards
  - Report delivery and alerting
    - Report distribution through any touch point
    - Self-subscription as well as administrator-based distribution
    - Delivery on-demand, on-schedule, or on-event
    - Automatic content personalization

Reports and Queries

- Ad hoc query
  - A query that cannot be determined prior to the moment the query is issued
- Structured Query Language (SQL)
  - A data definition and management language for relational databases. SQL front ends most relational DBMS

Multidimensionality

- Multidimensionality
  - The ability to organize, present, and analyze data by several dimensions, such as sales by region, by product, by salesperson, and by time (four dimensions)
- Multidimensional presentation
  - Dimensions
  - Measures
  - Time

Multidimensionality

- Multidimensional database
  - A database in which the data are organized specifically to support easy and quick multidimensional analysis
- Data cube
  - A two-dimensional, three-dimensional, or higher-dimensional object in which each dimension of the data represents a measure of interest

Multidimensionality

- Cube
  - A subset of highly interrelated data that is organized to allow users to combine any attributes in a cube (e.g., stores, products, customers, suppliers) with any metrics in the cube (e.g., sales, profit, units, age) to create various two-dimensional views, or *slices*, that can be displayed on a computer screen

Multidimensionality

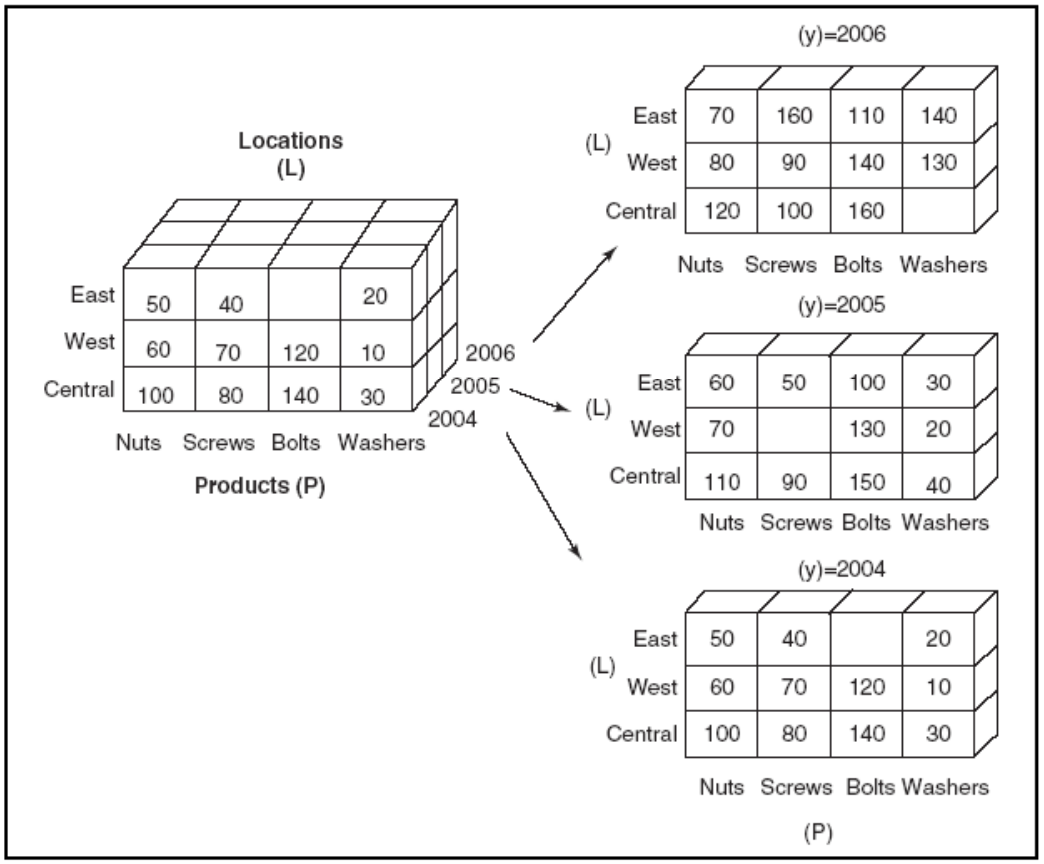


FIGURE 6.4 Cube Analysis and Views

Multidimensionality

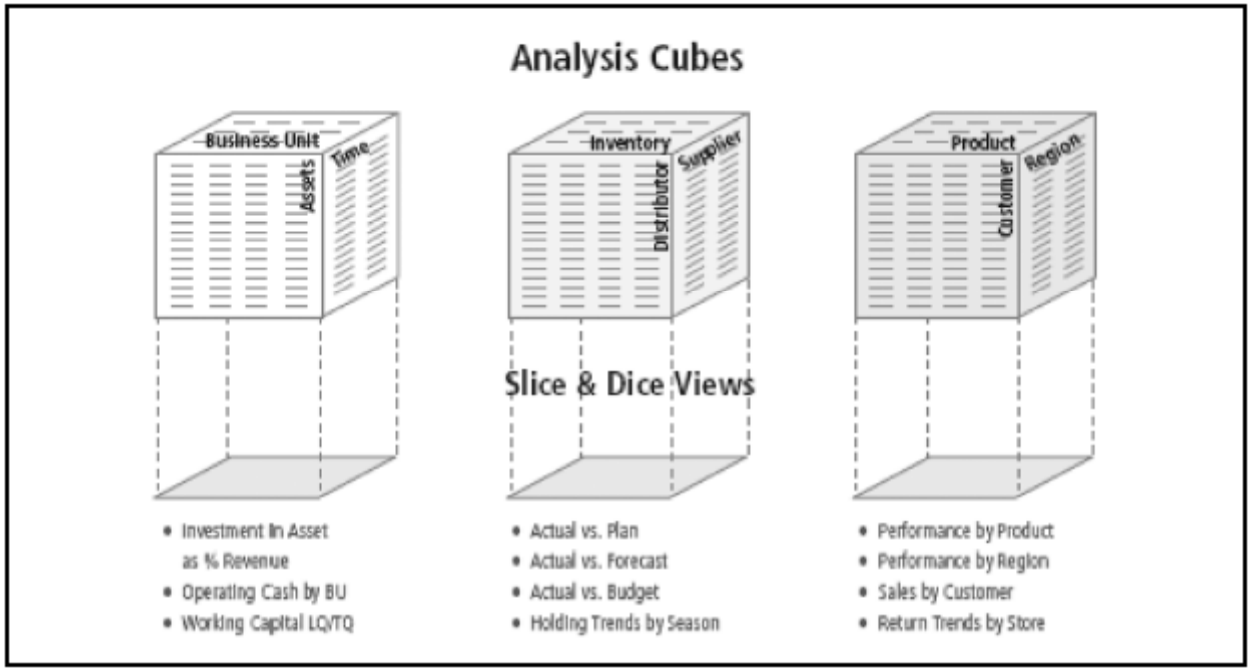


FIGURE 6.5 Slice-and-Dice Cubes

Multidimensionality

- Limitations of multidimensionality
  - The multidimensional database can take up significantly more computer storage room than a summarized relational database
  - Multidimensional products cost significantly more than standard relational products
  - Database loading consumes significant system resources and time, depending on data volume and the number of dimensions
  - Interfaces and maintenance are more complex in multidimensional databases than in relational databases

Advanced BA

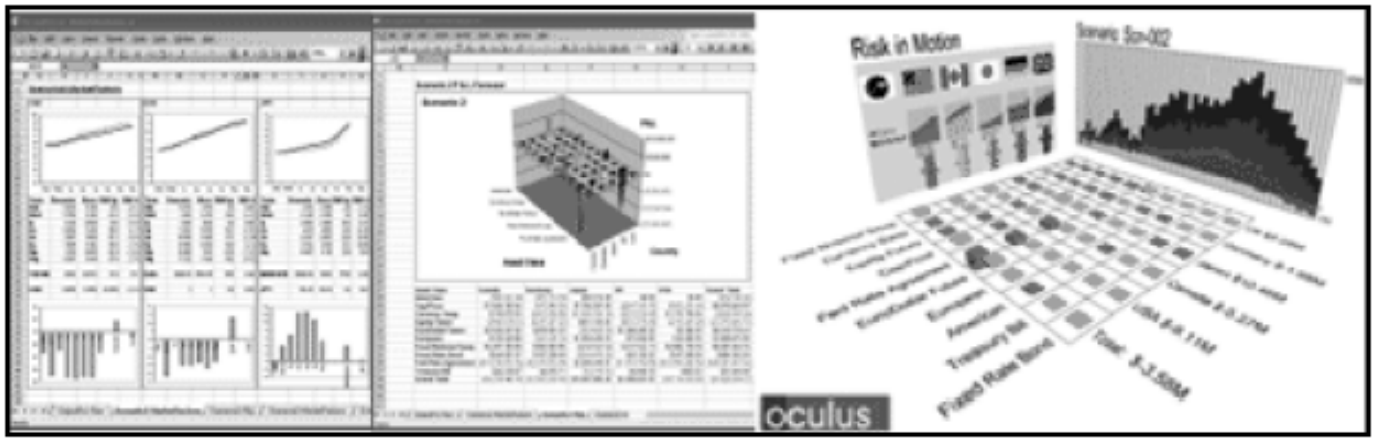
- Data mining and predictive analysis
  - Data mining
  - Predictive analysis
    - Use of tools that help determine the probable future outcome for an event or the likelihood of a situation occurring. These tools also identify relationships and patterns

Data visualization

- Data visualization
  - A graphical, animation, or video presentation of data and the results of data analysis
    - The ability to quickly identify important trends in corporate and market data can provide competitive advantage
    - Check their magnitude of trends by using predictive models that provide significant business advantages in applications that drive content, transactions, or processes

Data visualization

FIGURE 6.6 Visual Spreadsheet of Risk Analysis



Data visualization

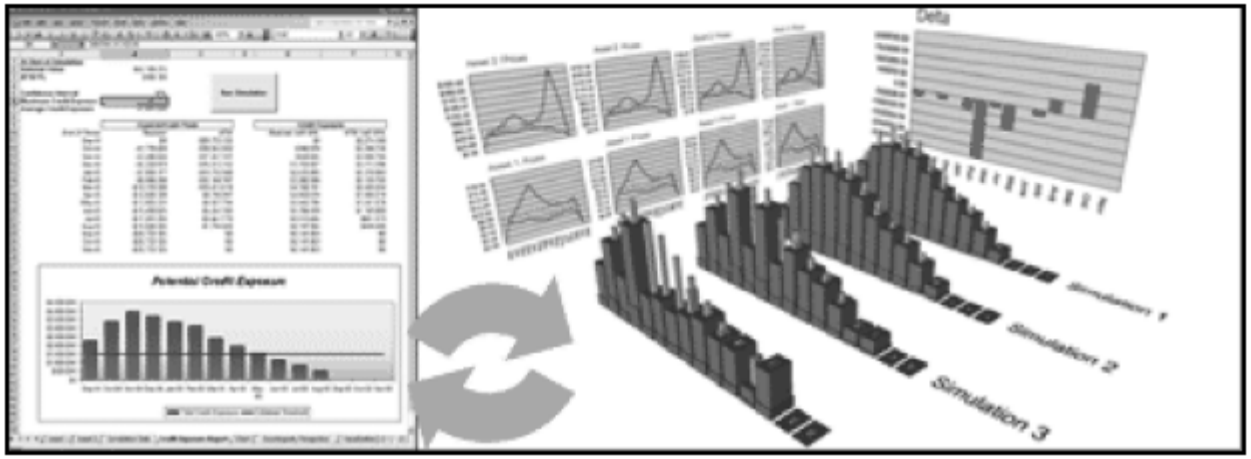
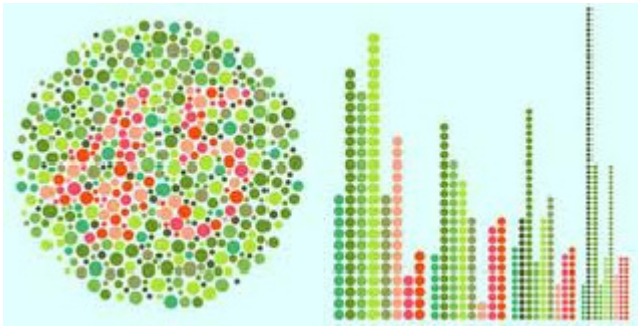


FIGURE 6.7 Visual Spreadsheet of Credit Modeling

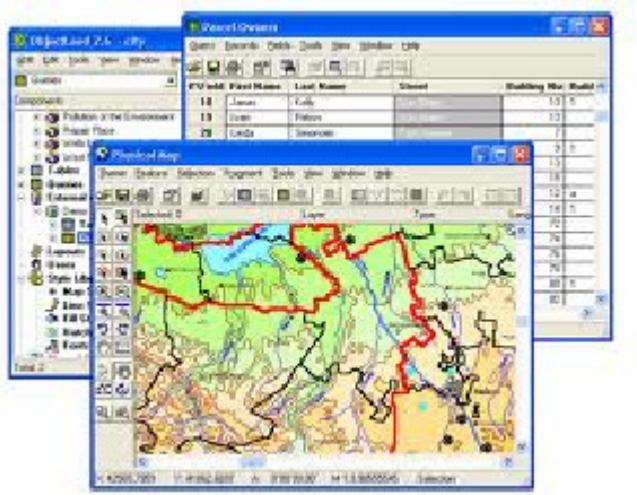
Data visualization

- New directions in data visualization
  - Dashboards and scorecards
  - Visual analysis
  - Financial data visualization



Geographical information system (GIS)

- An information system that uses spatial data, such as digitized maps. A GIS is a combination of text, graphics, icons, and symbols on maps



Geographical information system (GIS)

- As GIS tools become increasingly sophisticated and affordable, they help more companies and governments understand:
  - Precisely where their trucks, workers, and resources are located
  - Where they need to go to service a customer
  - The best way to get from here to there

Geographical information system (GIS)

- GIS and decision making
  - GIS applications are used to improve decision making in the public and private sectors including:
    - Dispatch of emergency vehicles
    - Transit management
    - Facility site selection
    - Drought risk management
    - Wildlife management
  - Local governments use GIS applications for used mapping and other decision-making applications

Geographical information system (GIS)

- GIS combined with GPS
  - Global positioning systems (GPS)
    - Wireless devices that use satellites to enable users to detect the position on earth of items (e.g., cars or people) the devices are attached to, with reasonable precision

Real-Time BI, Automated Decision Support (ADS), and Competitive Intelligence

- Real-time BI
  - The trend toward BI software producing real-time data updates for real-time analysis and real-time decision making is growing rapidly
  - Part of this push involves getting the right information to operational and tactical personnel so that they can use new BA tools and up-to-the-minute results to make decisions

Real-Time BI, Automated Decision Support (ADS), and Competitive Intelligence

- Real-time BI
  - Concerns about real-time systems
    - An important issue in real-time computing is that not all data should be updated continuously
    - when reports are generated in real-time because one person's results may not match another person's causing confusion
    - Real-time data are necessary in many cases for the creation of ADS systems

Real-Time BI, Automated Decision Support (ADS), and Competitive Intelligence

- Real-time BI
  - Automated decision support (ADS) or enterprise decision management (EDM)
    - A rule-based system that provides a solution to a repetitive managerial problem. Also known as enterprise decision management (EDM)

Real-Time BI, Automated Decision Support (ADS), and Competitive Intelligence

- Real-time BI
  - Business rules
    - Automating the decision-making process is usually achieved by encapsulating business user expertise in a set of *business rules* that are embedded in a rule-driven workflow (or other action-oriented) engine

Real-Time BI, Automated Decision Support (ADS), and Competitive Intelligence

- Real-time BI
  - Characteristics and benefits of ADS
    - ADS are most suitable for decisions that must be made frequently and/or rapidly, using information that is available electronically

Real-Time BI, Automated Decision Support (ADS), and Competitive Intelligence

- Implementing ADS
  - Software companies provide these components to ADS:
    - Rule engines
    - Mathematical and statistical algorithms
    - Industry-specific packages
    - Enterprise systems
    - Workflow applications

BA and the Web: Web Intelligence and Web Analytics

- Using the Web in BA
- Web analytics
  - The application of business analytics activities to Web-based processes, including e-commerce

BA and the Web: Web Intelligence and Web Analytics

- Click-stream analysis
  - The analysis of data that occur in the Web environment.
- Click-stream data
  - Data that provide a trail of the user's activities and show the user's browsing patterns (e.g., which sites are visited, which pages, how long)

BA and the Web: Web Intelligence and Web Analytics

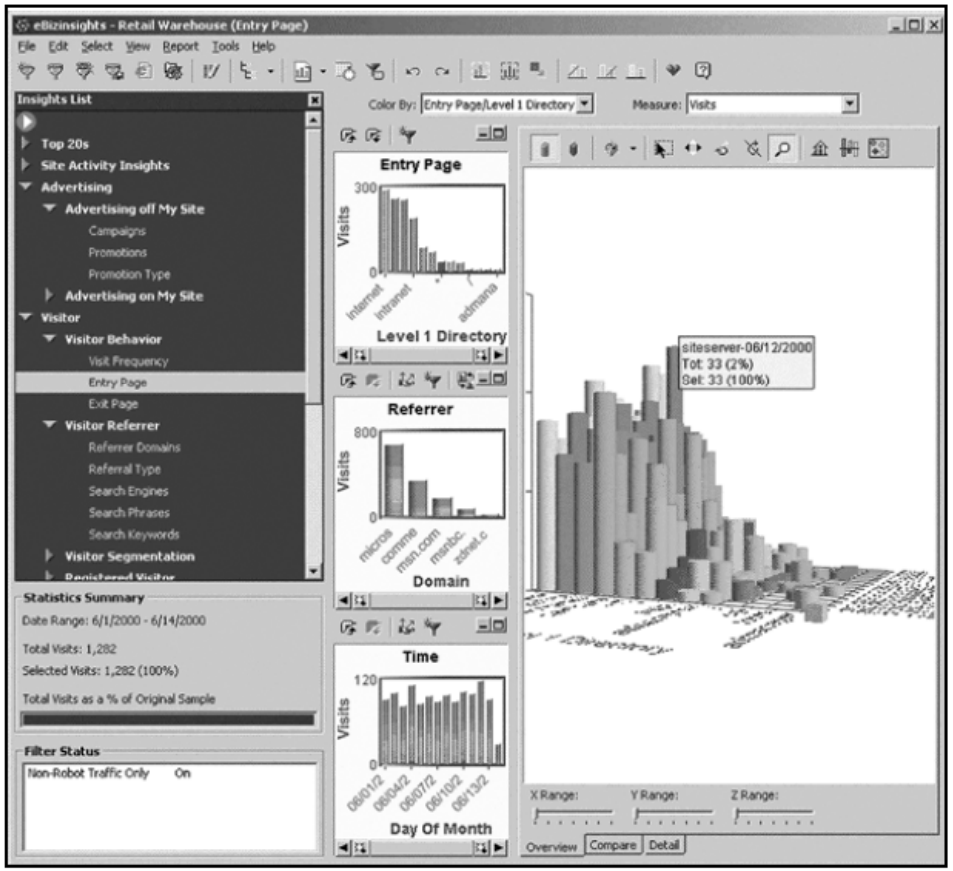


FIGURE 6.8 Screen Shot from the eBizInsights Visual Portal Analysis of Web Performance

Usage, Benefits, and Success of BA

- Usage of BA
  - Almost all managers and executives can use some BA systems, but some find the tools too complicated to use or they are not trained properly.
  - Most businesses want a greater percentage of the enterprise to leverage analytics; most of the challenges related to technology adoption involve culture, people, and processes

Usage, Benefits, and Success of BA

- Success and usability of BA
  - Performance management systems (PMS) are BI tools that provide scorecards and other relevant information that decision makers use to determine their level of success in reaching their goals

Usage, Benefits, and Success of BA

- Why BI/BA projects fail
  - Failure to recognize BI projects as cross-organizational business initiatives and to understand that, as such, they differ from typical standalone solutions
  - Unengaged or weak business sponsors
  - Unavailable or unwilling business representatives from the functional areas

Usage, Benefits, and Success of BA

- Why BI/BA projects fail
  - Lack of skilled (or available) staff, or suboptimal staff utilization
  - No software release concept (i.e., no iterative development method)
  - No work breakdown structure (i.e., no methodology)

Usage, Benefits, and Success of BA

- Why BI/BA projects fail
  - No business analysis or standardization activities
  - No appreciation of the negative impact of “dirty data” on business profitability
  - No understanding of the necessity for and the use of metadata
  - Too much reliance on disparate methods and tools

Usage, Benefits, and Success of BA

- System development and the need for integration
  - Developing an effective BI decision support application can be fairly complex
  - Integration, whether of applications, data sources, or even development environment, is a major CSF for BI

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