Chapter 6
Enhancing Business Intelligence Using Information Systems

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Learning Objectives

1. Describe the concept of business intelligence and how databases serve as a foundation for gaining business intelligence.

2. Explain the three components of business intelligence: information and knowledge discovery, business analytics, and information visualization.

Types of Decisions You Face

- Structured
- Unstructured
- Recurring
- Nonrecurring

Scenario – Warehouse Manager

- You know you have too much cash tied up in inventory. You want to reduce inventory levels.
- You get a lot of heat when orders are placed and you can’t fill the order from inventory.
- What information do you need, how would you like to see it and how do you make decisions about adjusting inventory levels?
- Are these structured or unstructured decisions?

Decision Support vs. Artificial Intelligence

<table>
<thead>
<tr>
<th>Decision Support</th>
<th>Artificial Intelligence</th>
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<tr>
<td>Helps you analyze information</td>
<td>Makes or recommends a decision for you</td>
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- Decision support systems
- Geographical information systems

- Expert systems
- Neural networks
- Genetic algorithms
- Intelligent agents

Business Intelligence (BI)

- Business Intelligence (BI) is the use of information systems to gather and analyze information from internal and external sources in order to make better business decisions.
- BI is used to integrate data from disconnected:
  - Reports
  - Databases
  - Spreadsheets
- Integrated data helps to monitor and fine-tune business processes.
Databases & Data Warehouses

Operational Databases

What Is a Hypercube?

Create multi-dimensional “cubes” of information that summarize transactional data across a variety of dimensions.

OLAP vs. OLTP

Envisioned by smart businesspeople, built by the IT pros

Data Marts

Data Marts

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Business Intelligence Components

- Three types of tools
  - Information and knowledge discovery
  - Business analytics
  - Information visualization

- Information and Knowledge Discovery
  - Search for hidden relationships.
  - Hypotheses are tested against existing data.
    - For example: Customers with a household income over $150,000 are twice as likely to respond to our marketing campaign as customers with an income of $60,000 or less.

Ad Hoc Reports and Queries

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Online Analytical Processing (OLAP)

- Complex, multidimensional analyses of data beyond simple queries
- OLAP server — main OLAP component
- Key OLAP concepts:
  - Measures and dimensions
  - Cubes, slicing, and dicing
  - Data mining
  - Association discovery
  - Clustering and classification
  - Text mining and Web content mining
  - Web usage mining

Cubes

- Cube—an OLAP data structure organizing data via multiple dimensions.
- Cubes can have any number of dimensions.

Slicing and Dicing

- Slicing and dicing—analyzing the data on subsets of the dimensions

Data Mining

- Used for discovering "hidden" predictive relationships in the data
  - Patterns, trends, or rules
  - Example: identification of profitable customer segments or fraud detection
  - Any predictive models should be tested against “fresh” data.
- Data-mining algorithms are run against large data warehouses.
  - Data reduction helps to reduce the complexity of data and speed up analysis.

Text mining the Internet

- Textual Analysis Benefits
  - Marketing—learn about customers’ thoughts, feelings, and emotions.
  - Operations—learn about product performance by analyzing service records or customer calls.
  - Strategic decisions—gather competitive intelligence.
  - Sales—learn about major accounts by analyzing news coverage.
  - Human resources—monitor employee satisfaction or compliance to company policies (important for compliance with regulations such as the Sarbanes-Oxley Act).
Web Usage Mining

- Used by organizations such as Amazon.com
- Used to determine patterns in customers’ usage data.
  - How users navigate through the site
  - How much time they spend on different pages
- Clickstream data—recording of the users’ path through a Web site.
- Stickiness—a Web page’s ability to attract and keep visitors.

Presenting Results

- Analytics to support human and automated decision making
  - Business Analytics—predict future outcomes
  - Decision Support Systems (DSS)—support human unstructured decision making
  - Intelligent systems
  - Enhancing organizational collaboration

Decision Support Systems (DSS)

- Decision-making support for recurring problems
- Used mostly by managerial level employees (can be used at any level)
- Interactive decision aid
- What-if analyses
  - Analyze results for hypothetical changes
  - Example: Microsoft Excel

Architecture of a DSS

Common DSS Models

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**Artificial Intelligence**

- Is Nicholas’ robot “intelligent”? Will it become “intelligent” over the summer?
- Be wary of “Artificial” anything?

**Expert Systems**

**Could You Use an Expert System?**

- Talk to the person next to you about the various jobs that you have had.
- Discuss situations where a decision tree could be used to lead an employee who wasn’t really an expert through a series of questions and eventually to the answer they are looking for.
- Where is the intelligence…in the employee or the decision tree?

**Can you recognize patterns and be trained?**

- You see a new breed of dog
- How do you know it is a dog?
- How do you know it is an animal?
- How do you know if an animal is a mammal?
- How about a whale?
- How about a platypus?

**Scenario – Loan Officer**

- You need to make approval/rejection decisions on loan applications?
- What information do you look at to make your decisions?
- Do you make decisions based on individual pieces of information or combinations of information?
- What combinations correlate with good/bad loans?

**Example: Neural Network System**

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Intelligent Agent Systems

- Program working in the background
- Bot (software robot)
- Provides service when a specific event occurs

Types of Intelligent Agent Systems

- User agents
  - Performs a task for the user
- Buyer agents (shopping bots)
  - Search for the best price
- Monitoring and sensing agents
  - Keep track of information and notifies users when it changes
- Data-mining agents
  - Continuously browse data warehouses to detect changes
- Web crawlers (aka Web spiders)
  - Continuously browses the Web
- Destructive agents
  - Designed to farm e-mail addresses or deposit spyware

Knowledge Management

Benefits and Challenges of Knowledge-Based Systems

Benefits
- Enhanced innovation and creativity
- Improved customer service, shorter product development, and streamlined operations
- Enhanced employee retention
- Improved organizational performance

Challenges
- Getting employee buy-in
- Focusing too much on technology
- Forgetting the goal
- Dealing with knowledge overload and obsolescence

Information Visualization

- Display of complex data relationships using graphical methods
  - Enables managers to quickly grasp results of analyses
  - Visual analytics
  - Dashboards
  - Geographic information systems

Digital Dashboards
Dashboards

- Dashboards use various graphical elements to highlight important information.

Thematic Maps

- A thematic map showing car thefts in a town

Geographic Information System (GIS)