Chapter 1: An Overview of Business Intelligence, Analytics, and Decision Support
Learning Objectives

- Understand today’s turbulent business environment and describe how organizations survive and even excel in such an environment (solving problems and exploiting opportunities)
- Understand the need for computerized support of managerial decision making
- Understand an early framework for managerial decision making
- ...

(Continued...)
Learning Objectives

- Learn the conceptual foundations of the DSS methodology
- Describe the BI methodology and concepts and relate them to DSS
- Understand the various types of analytics
- List the major tools of computerized decision support
Opening Vignette...

Magpie Sensing Employs Analytics to Manage a Vaccine Supply Chain Effectively and Safely

- Company background
- Problem
- Proposed solution and results
- Answer & discuss the case questions...
Questions for the Opening Vignette

1. What information is provided by the descriptive analytics employed at Magpie Sensing?
2. What type of support is provided by the predictive analytics employed at Magpie Sensing?
3. How does prescriptive analytics help in business decision making?
4. In what ways can actionable information be reported in real time to concerned users of the system?
5. In what other situations might real-time monitoring applications be needed?
Changing Business Environment & Computerized Decision Support

- Companies are moving aggressively to computerized support of their operations
  - Business Intelligence

- Business Pressures–Responses–Support Model
  - Business pressures result of today's competitive business climate
  - Responses to counter the pressures
  - Support to better facilitate the process
Business Pressures—Responses—Support Model

Business Environmental Factors
- Globalization
- Customer demand
- Government regulations
- Market conditions
- Competition
- Etc.

Organization’s Responses
- Strategy
- Partners’ collaboration
- Real-time response
- Agility
- Increased productivity
- New vendors
- New business models
- Etc.

Decisions and Support
- Analyses
- Predictions
- Decisions

- Integrated computerized decision support
- Business intelligence
The Business Environment

- The environment in which organizations operate today is becoming more and more complex, creating
  - opportunities, and
  - problems.
- Example: globalization.

- Business environment factors:
  - markets, consumer demands, technology, and societal...
## Business Environment Factors

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| Markets    | Strong competition  
Expanding global markets  
Blooming electronic markets on the Internet  
Innovative marketing methods  
Opportunities for outsourcing with IT support  
Need for real-time, on-demand transactions |
| Consumer   | Desire for customization  
Desire for quality, diversity of products, and speed of delivery  
Customers getting powerful and less loyal |
| demand     |                                                                                                                                               |
| Technology | More innovations, new products, and new services  
Increasing obsolescence rate  
Increasing information overload  
Social networking, Web 2.0 and beyond |
| Societal   | Growing government regulations and deregulation  
Workforce more diversified, older, and composed of more women  
Prime concerns of homeland security and terrorist attacks  
Necessity of Sarbanes-Oxley Act and other reporting-related legislation  
Increasing social responsibility of companies  
Greater emphasis on sustainability |
Organizational Responses

- Be Reactive, Anticipative, Adaptive, and Proactive

- Managers may take actions, such as
  - Employ strategic planning.
  - Use new and innovative business models.
  - Restructure business processes.
  - Participate in business alliances.
  - Improve corporate information systems.
  - ... more [in your book]
One of the major objectives of computerized decision support is to facilitate closing the gap between the current performance of an organization and its desired performance, as expressed in its mission, objectives, and goals, and the strategy to achieve them.
Managerial Decision Making

- Management is a **process** by which organizational goals are achieved by using resources.
  - **Inputs**: resources
  - **Output**: attainment of goals
  - **Measure of success**: outputs / inputs
- Management ≈ Decision Making
- Decision making: selecting the best solution from two or more alternatives
The Nature of Managers’ Work
Mintzberg's 10 Managerial Roles

**Interpersonal**
1. Figurehead
2. Leader
3. Liaison

**Informational**
4. Monitor
5. Disseminator
6. Spokesperson

**Decisional**
7. Entrepreneur
8. Disturbance handler
9. Resource allocator
10. Negotiator
Decision-Making Process

- Managers usually make decisions by following a four-step process (a.k.a. the scientific approach)
  1. Define the problem (or opportunity)
  2. Construct a model that describes the real-world problem.
  3. Identify possible solutions to the modeled problem and evaluate the solutions.
  4. Compare, choose, and recommend a potential solution to the problem.
Information Systems Support for Decision Making

- Group communication and collaboration
- Improved data management
- Managing data warehouses and Big Data
- Analytical support
- Overcoming cognitive limits in processing and storing information
- Knowledge management
- Anywhere, anytime support
An Early Decision Support Framework (by Gory and Scott-Morten, 1971)

<table>
<thead>
<tr>
<th>Type of Decision</th>
<th>Operational Control</th>
<th>Managerial Control</th>
<th>Strategic Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structured</td>
<td>Accounts receivable</td>
<td>Budget analysis</td>
<td>Financial management</td>
</tr>
<tr>
<td></td>
<td>Accounts payable</td>
<td>Short-term forecasting</td>
<td>Investment portfolio</td>
</tr>
<tr>
<td></td>
<td>Order entry</td>
<td>Personnel reports</td>
<td>Warehouse location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make-or-buy</td>
<td>Distribution systems</td>
</tr>
<tr>
<td>Semistructured</td>
<td>Production scheduling</td>
<td>Credit evaluation</td>
<td>Building a new plant</td>
</tr>
<tr>
<td></td>
<td>Inventory control</td>
<td>Budget preparation</td>
<td>Mergers &amp; acquisitions</td>
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<tr>
<td></td>
<td></td>
<td>Plant layout</td>
<td>New product planning</td>
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<tr>
<td></td>
<td></td>
<td>Project scheduling</td>
<td>Compensation planning</td>
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<tr>
<td></td>
<td></td>
<td>Reward system design</td>
<td>Quality assurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inventory categorization</td>
<td>HR policies</td>
</tr>
<tr>
<td>Unstructured</td>
<td>Buying software</td>
<td>Negotiating</td>
<td>R &amp; D planning</td>
</tr>
<tr>
<td></td>
<td>Approving loans</td>
<td>Recruiting an executive</td>
<td>New tech. development</td>
</tr>
<tr>
<td></td>
<td>Operating a help desk</td>
<td>Buying hardware</td>
<td>Social responsibility</td>
</tr>
<tr>
<td></td>
<td>Selecting a cover for a magazine</td>
<td>Lobbying</td>
<td>planning</td>
</tr>
</tbody>
</table>

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An Early Decision Support Framework

- **Degree of Structuredness (Simon, 1977)**
  - Decisions are classified as
    - Highly structured (a.k.a. programmed)
    - Semi-structured
    - Highly unstructured (i.e., nonprogrammed)

- **Types of Control (Anthony, 1965)**
  - Strategic planning (top-level, long-range)
  - Management control (tactical planning)
  - Operational control
The Concept of DSS

- DSS - interactive computer-based systems, which help decision makers utilize data and models to solve unstructured problems.

  (Gorry and Scott-Morton, 1971)

- Decision support systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions.

- DS as an Umbrella Term

- Evolution of DS into Business Intelligence
A Framework for Business Intelligence (BI)

- BI is an evolution of decision support concepts over time
  - Then: Executive Information System
  - Now: Everybody’s Information System (BI)
- BI systems are enhanced with additional visualizations, alerts, and performance measurement capabilities
- The term BI emerged from industry
Definition of BI

- BI is an umbrella term that combines architectures, tools, databases, analytical tools, applications, and methodologies.
- BI is a content-free expression, so it means different things to different people.
- BI's major objective is to enable easy access to data (and models) to provide business managers with the ability to conduct analysis.
- BI helps *transform* data, to information (and knowledge), to decisions, and finally to action.
A Brief History of BI

- The term BI was coined by the Gartner Group in the mid-1990s
- However, the concept is much older
  - 1970s - MIS reporting - static/periodic reports
  - 1980s - Executive Information Systems (EIS)
  - 1990s - OLAP, dynamic, multidimensional, ad-hoc reporting -> coining of the term “BI”
  - 2010s - Inclusion of AI and Data/Text Mining capabilities; Web-based Portals/Dashboards, Big Data, Social Media, Analytics
  - 2020s - yet to be seen
The Evolution of BI Capabilities

- Querying and reporting
- ETL
- Metadata
- Data warehouse
- DSS
- Spreadsheets (MS Excel)
- EIS / ESS
- Financial reporting
- OLAP
- Digital cockpits and dashboards
- Scorecards and dashboards
- Workflow
- Alerts and notifications
- Data & text mining
- Predictive analytics
- Broadcasting tools
- Portals

Business Intelligence
The Architecture of BI

- A BI system has four major components
  - a data warehouse, with its source data
  - business analytics, a collection of tools for manipulating, mining, and analyzing the data in the data warehouse
  - business performance management (BPM) for monitoring and analyzing performance
  - a user interface (e.g., dashboard)
A High-Level Architecture of BI

Data Warehouse Environment
- Technical staff
  - Built the data warehouse
  - Organizing
  - Summarizing
  - Standardizing
- Data Warehouse

Business Analytics Environment
- Business users
  - Access
  - Manipulation
  - Results
- Data Warehouse

Performance and Strategy
- Managers / executives
- BPM strategy

Data Sources
- Future component intelligent systems
- User Interface
  - browser
  - portal
  - dashboard
Business Value of BI Analytical Applications

- Customer segmentation
- Propensity to buy
- Customer profitability
- Fraud detection
- Customer attrition
- Channel optimization
Application Case 1.1

Sabre Helps Its Clients Through Dashboards and Analytics

Questions for Discussion

1. What is traditional reporting? How is it used in the organization?
2. How can analytics be used to transform the traditional reporting?
3. How can interactive reporting assist organizations in decision making?
A Multimedia Exercise in Business Intelligence

- Teradata University Network (TUN)
  www.teradatauniversitynetwork.com

- BSI Videos (Business Scenario Investigations)
  www.youtube.com/watch?v=NXEL5F4_aKA

- Also look for other BSI Videos at TUN
DSS-BI Connections

- Similarities and differences?
  - Similar architectures, data focus, ...
- Direct vs. indirect support
- Different target audiences
- Commercially available systems versus in-house development of solutions
- Origination – Industry vs. Academia
- So, is DSS = BI?
Analytics Overview

- Analytics?
  - Something new or just a new name for ...?

- A Simple Taxonomy of Analytics (proposed by INFORMS)
  - Descriptive Analytics
  - Predictive Analytics
  - Prescriptive Analytics

- Analytics or Data Science?
Analytics Overview

Business Analytics

Descriptive
- What happened?
- What is happening?
- Business reporting
- Dashboards
- Scorecards
- Data warehousing
- Well defined business problems and opportunities

Predictive
- What will happen?
- Why will it happen?
- Data mining
- Text mining
- Web/media mining
- Forecasting
- Accurate projections of the future states and conditions

Prescriptive
- What should I do?
- Why should I do it?
- Optimization
- Simulation
- Decision modeling
- Expert systems
- Best possible business decisions and transactions
Application Case 1.2

Eliminating Inefficiencies at Seattle Children’s Hospital

Questions for Discussion

1. Who are the users of the tool?
2. What is a dashboard?
3. How does visualization help in decision making?
4. What are the significant results achieved by the use of Tableau?
Application Case 1.3

Analysis at the Speed of Thought

Questions for Discussion

1. What are the desired functionalities of a reporting tool?
2. What advantages were derived by using a reporting tool in the case?
Application Case 1.4

Moneyball: Analytics in Sports and Movies

Questions for Discussion

1. How is predictive analytics applied in Moneyball?
2. What is the difference between objective and subjective approaches in decision making?
Application Case 1.5
Analyzing Athletic Injuries

Questions for Discussion
1. What types of analytics are applied in the injury analysis?
2. How do visualizations aid in understanding the data and delivering insights into the data?
3. What is a classification problem?
4. What can be derived by performing sequence analysis?
Application Case 1.6

Industrial and Commercial Bank of China (ICBC) Employs Models to Reconfigure Its Branch Networks

Questions for Discussion

1. How can analytical techniques help organizations to retain competitive advantage?
2. How can descriptive and predictive analytics help in pursuing prescriptive analytics?
3. What kind of prescriptive analytic techniques are employed in the case study?
4. Are the prescriptive models once built good forever?
Introduction to Big Data Analytics

- Big Data?
  - Not just big!
  - Volume
  - Variety
  - Velocity

- More of Big Data and related analytics tools and techniques are covered in Chapter 13.
Application Case 1.7

Gilt Groupe’s Flash Sales Streamlined by Big Data Analytics

Questions for Discussion

1. What makes this case study an example of Big Data analytics?

2. What types of decisions does Gilt Groupe have to make?
End-of-Chapter Application Case

Nationwide Insurance Used BI to Enhance Customer Service

Questions for Discussion
1. Why did Nationwide need an enterprise-wide data warehouse?
2. How did integrated data drive the business value?
3. What forms of analytics are employed at Nationwide?
4. With integrated data available in an enterprise data warehouse, what other applications could Nationwide potentially develop?
Plan of the Book

- Part I - Decision Making and Analytics: An Overview
  - (Chapters 1 & 2)
- Part II - Descriptive Analytics
  - (Chapters 3 & 4)
- Part III - Predictive Analytics
  - Chapters 5 - 8
- Part IV - Prescriptive Analytics
  - Chapter 9 - 12
- Part V - Big Data and Future Directions for Business Analytics
  - Chapters 13 & 14
- PLUS - Online Supplements
  - ...
End of the Chapter

- Questions / Comments...
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