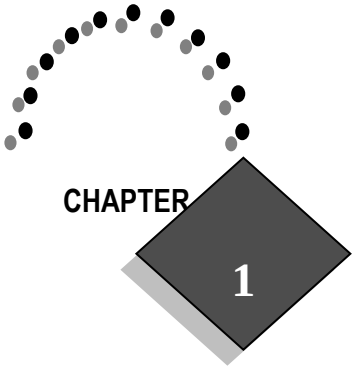

Introduction to Business Intelligence

Learning Objectives for Chapter 1

- 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
- Describe the business intelligence (BI) methodology and concepts and relate them to decision support systems (DSS)
- Understand the major issues in implementing business intelligence

CHAPTER OUTLINE

OPENING VIGNETTE: NORFOLK SOUTHERN USES BUSINESS INTELLIGENCE FOR DECISION SUPPORT TO REACH SUCCESS

- Questions for the Opening Vignette

A. WHAT WE CAN LEARN FROM THIS VIGNETTE

1.1 CHANGING BUSINESS ENVIRONMENTS AND COMPUTERIZED DECISION SUPPORT

A. THE BUSINESS PRESSURES–RESPONSES–SUPPORT MODEL
   1. The Business Environment
   2. Organizational Responses: Be Reactive, Anticipative, Adaptive, and Proactive
   3. Closing the Strategy Gap

- Section 1.1 Review Questions

1.2 A FRAMEWORK FOR BUSINESS INTELLIGENCE (BI)

A. DEFINITIONS OF BI
B. A BRIEF HISTORY OF BI
C. THE ARCHITECTURE OF BI
   1. Data Warehousing
   2. Business Analytics
      - Application Case 1.1: Location, Location, Location
   3. Business Performance Management
   4. The User Interface: Dashboards and Other Information Broadcasting Tools
E. STYLES OF BI
F. THE BENEFITS OF BI
   - Application Case 1.2: Alltel Wireless: Delivering the Right Message, to the Right Customers, at the Right Time
G. AUTOMATED DECISION MAKING (ADS)
   - Application Case 1.3: Giant Food Stores Prices the Entire Store
G. EVENT DRIVEN ALERTS
   - Section 1.2 Review Questions

1.3 INTELLIGENCE CREATION AND USE AND BI GOVERNANCE

A. A CYCLICAL PROCESS OF INTELLIGENCE CREATION AND USE
B. INTELLIGENCE AND ESPIONAGE
   - Section 1.3 Review Questions

1.4 TRANSACTION PROCESSING VERSUS ANALYTIC PROCESSING

- Section 1.4 Review Questions

1.5 SUCCESSFUL BI IMPLEMENTATION

A. THE TYPICAL BI USER COMMUNITY
B. APPROPRIATE PLANNING AND ALIGNMENT WITH BUSINESS STRATEGY

1.6 MAJOR TOOLS AND TECHNIQUES BUSINESS INTELLIGENCE

A. THE TOOLS AND TECHNIQUES
B. SELECTED BI VENDORS
   - Section 1.6 Review Questions

1.7 PLAN OF THE BOOK

A. CHAPTER 1: INTRODUCTION TO BUSINESS INTELLIGENCE
B. CHAPTER 2: DATA WAREHOUSING
C. CHAPTER 3: BUSINESS PERFORMANCE MANAGEMENT
D. CHAPTER 4: DATA MINING FOR BUSINESS INTELLIGENCE

E. CHAPTER 5: TEXT AND WEB MINING
F. CHAPTER 6: REALITY MINING
- Application Case 1.4: The Next Net

1.8 RESOURCES, LINKS, AND THE TERADATA UNIVERSITY NETWORK CONNECTION

A. RESOURCES AND LINKS
B. CASES
C. VENDORS, PRODUCTS, AND DEMOS
D. PERIODICALS
E. THE TERADATA UNIVERSITY NETWORK CONNECTION
F. THE BOOK'S WEB SITE

Chapter Highlights
Key Terms
QUESTIONS FOR DISCUSSION
Exercises
Teradata Student Network (TSN) and Other Hands-On Exercises
Team Assignments and Role-Playing
Internet Exercises
- End of Chapter Application Case: Vodafone Uses Business Intelligence to Improve Customer Growth and Retention Plans
- Questions for the Case

References

TEACHING TIPS/ADDITIONAL INFORMATION

The purpose of any introductory chapter is to motivate students to be interested in the remainder of the course (and book). The real-life cases, beginning with Norfolk Southern and continuing with the others, will show students that business intelligence is not just an academic subject; it is something real companies use that makes a noticeable difference to their bottom line. So, try to relate the subject matter to these cases. For example, consider the types of actions managers take to counter pressures. The text says that Norfolk Southern used BI "for Decision Support to Reach Success." The other cases in the chapter, while not tied directly to this list, still have many examples of managerial actions taken in response to pressure. By referring back to this list when discussing other cases, you demonstrate the unity of the decision support field.

All this should show students that a new professional who understands how information systems can support decision making, and can help his or her employer obtain those benefits, has a bright career path. Since students in this course are typically within a year of graduation, that will get their attention!

ANSWERS TO END OF SECTION REVIEW QUESTIONS

Opening Vignette Review Questions

1. How are information systems used at Norfolk Southern to support decision making?

Norfolk Southern has always used a variety of sophisticated systems to run its business. Becoming a scheduled railroad, however, required new systems that would first use statistical models to determine the best routes and connections to optimize railroad performance, and then apply the models to create the plan that would actually run the railroad operations. These new systems were called TOP, short for Thoroughbred Operating Plan; TOP was deployed in 2002.

An enterprise data warehouse (EDW) makes data available to the applications used in departments throughout the organization—including engineering, human resources (HR), and strategic planning.

2. What type of information is accessible through the visualization applications?

Norfolk Southern built a TOP dashboard application that pulls data from the enterprise data warehouse and then graphically depicts actual performance against the trip plan for both train performance and connection performance. The application uses visualization technology so that field managers can more easily interpret the large volumes of data (e.g., there were 160,000 weekly connections across the network).

3. What type of information support is provided through AccessNS?

AccessNS allows more than 14,500 users from 8,000 customer organizations to log in and access predefined and custom reports about their accounts at any time. Users can access current data, which is updated hourly, or they can look at data from the past 3 years. accessNS provides alerting and RSS feed capabilities

4. How does Norfolk Southern use the data warehouse for HR applications?

Recently, the HR needed to determine where to locate its field offices in order to best meet the needs of Norfolk Southern's 30,000+ employees. By combining employee demographic data (e.g., zip codes) with geospatial data traditionally used by the Engineering Group, HR was able to visually map out the employee population density, making it easier to determine the best (optimal) locations for the field offices.

Can the same data warehouse be used for business intelligence and optimizationapplications?

Yes. The enterprise data warehouse (EDW) makes data available to all systems and applications. Norfolk Southern was the first railroad to offer self-service business intelligence, and its innovation is setting an example that other railroads have followed.

Section 1.1 Review Questions

1. List the components of and explain the Business Pressures–Responses–Support model.

The components of the pressure-response-support model are business **pressures**, companies' **responses** to these pressures, and computerized **support**. The model suggests that responses are made to counter the pressures or to take advantage of opportunities, support facilitates monitoring the environment (e.g., for opportunities) and enhances the quality of the responses.

2. What are the major factors in today's business environment?

The major factors in today's business environment are:

- **Market-related**: strong competition, expansion of global markets, electronic markets blooming on the Internet, innovative marketing methods, opportunities for outsourcing with IT support, and need for real time on-demand transactions
- **Consumer demand-related**: the desire for customization, quality, diversity of products, and speed of delivery; more powerful and less loyal customers.
- **Technology-related**: more innovations, new products and services, obsolescence rate is increasing, information overload is increasing
- **Societal**: growth of government regulations and deregulation, work force becoming more diversified, older, and composed of more women; homeland security and terrorist attacks are prime concerns; compliance with the Sarbanes-Oxley Act and other reporting-related legislation is a must; social responsibility of companies is increasing

3. What are some of the major response activities organizations take?

Responses taken by organizations include the following reactive, anticipative, adaptive and proactive activities:

- Employing strategic planning

- Using new and innovative business models
- Restructuring of business processes
- Participating in business alliances
- Improving corporate information systems
- Improving partnership relationships
- Encouraging innovation and creativity
- Improving customer service and relationships
- Moving to electronic commerce (e-commerce)
- Moving to make-to-order production and on-demand manufacturing and services
- Using new IT to improve communication, data access (discovery of information) and collaboration
- Responding quickly to competitors' actions (e.g., in pricing, promotions, new products and services)
- Automating many tasks of white-collar employees
- Automating certain decision processes especially those dealing with customers
- Improving decision making

Since the question reads "some," a correct answer need not list all of these.

Section 1.2 Review Questions

1. Define *BI*.

Business Intelligence (BI) is an umbrella term that combines architectures, tools, databases, applications, and methodologies. Its major objective is to enable interactive access (sometimes in real time) to data, enable manipulation of these data, and provide business managers and analysts the ability to conduct appropriate analysis.

2. List and describe the major components of BI.

BI systems have four major components: the data warehouse (analogous to the data in the DSS architecture), business analytics and business performance management (together, analogous to models in the DSS architecture), and the user interface (which corresponds to the component of the same name in the DSS architecture). One could also list the user as a component.

3. Identify some typical applications of BI.

Typical applications of BI are data mining, forecasting, predictive marketing, optimization, and business performance management (BPM).
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4. Give examples of ADS.

A relatively new approach to supporting decision making is called automated decision systems (ADS), also known as *decision automation systems* (DAS; see Davenport and Harris, 2005). An ADS is a rule-based system that provides a solution, usually in one functional area (e.g., finance, manufacturing), to a specific repetitive managerial problem, usually in one industry. Examples are deciding whether to approve or not to approve a request for a loan, or determining the price of an item in a store.

Application Case 1.3 shows an example of applying ADS to a problem that every organization faces—how to price its products or services.

ADS initially appeared in the airline industry, where they were called *revenue* (or *yield*) *management* (or revenue optimization) systems. Airlines use these systems to dynamically price tickets based on actual demand. Today, many service industries use similar pricing models. In contrast with management science approaches, which provide a model-based solution to generic structured problems (e.g., resource allocation, inventory level determination), ADS provide rule-based solutions.

5. Give examples of event-driven alerts.

One example of ADS is an event-driven alert, which is a warning or action that is activated when a predefined or unusual event occurs. For example, credit card companies have built extensive predictive analysis models to identify cases of possible fraud and automatically alert credit card customers for verification of transactions when unusual activity is noted (e.g. large purchase in an atypical or foreign location when the customer does not have a history of such transactions).

Section 1.3 Review Questions

1. List the steps of intelligence creation and use?

See Figure 1.5 for the process and steps of Intelligence creation and use.

2. What is BI governance?

Some organizations refer to the project prioritization process as a form of **BI governance** (Matney and Larson, 2004). A major governance issue is who should serve as decision makers involved in prioritizing BI projects. The two critical partnerships required for BI governance are: (1) a partnership between functional area heads and/or product/service area leaders (Middles), and (2) a partnership between potential Customers and Providers (representatives of the business side and representatives from the IT side).

3. What is intelligence gathering?

Modern companies must ethically and legally organize themselves to glean (learn) as much as they can from their customers, their business environment, their stakeholders, their business processes, their competitors, and other such sources of potentially valuable information. But collecting data is just the beginning. Vast amounts of that data need to be cataloged, tagged, analyzed, sorted, filtered, and must undergo a host of other operations to yield usable information that can impact decision making and improve the bottom line. The importance of these topics increases every day as companies track and accumulate more and more data.

Section 1.4 Review Questions

1. Define OLTP.

OLTP (online transaction processing) is a type of computer processing where the computer responds immediately to user requests. Each request is considered to be a *transaction*, which is a computerized record of a discrete event, such as the receipt of inventory or a customer order.

2. Define OLAP.

OLAP (online analytical processing) is processing for end-user ad hoc reports, queries, and analysis.

Separating the OLTP from analysis and decision support provided by OLAP enables the benefits of BI that were described earlier and provides for competitive intelligence and advantage as described next.

Section 1.5 Review Questions

1. Describe the major types of BI users.

BI may have a larger and more diversified user community. One of the most important aspects of a successful BI is that it must be of benefit to the enterprise as a whole. This implies that there are likely to be a host of users in the enterprise—many of whom should be involved from the outset of a DW investment decision.

Not surprisingly, there are likely to be users who focus at the strategic level and those who are more oriented to the tactical level.

2. List some of the implementation topics addressed by Gartner's report.

One framework, developed by Gartner, Inc. (2004), decomposes planning and execution into *business*, *organization, functionality*, and *infrastructure* components. At the business and organizational levels, strategic and operational objectives must be defined while considering the available organizational skills to achieve those objectives. Issues of organizational culture surrounding BI initiatives and building enthusiasm for those initiatives and procedures for the intra-organizational sharing of BI best practices must be considered by upper management—with plans in place to prepare the organization for change.

3. List some other success factors of BI.

If the company's strategy is properly aligned with the reasons for DW and BI initiatives, and if the company's IS organization is or can be made capable of playing its role in such a project, and if the requisite user community is in place and has the proper motivation, it is wise to start BI and establish a BI Competency Center (BICC) within the company. The center could serve some or all of the following functions (Gartner, 2004).

- The center can demonstrate how BI is clearly linked to strategy and execution of strategy.
- A center can serve to encourage interaction between the potential business user communities and the IS organization.

- The center can serve as a repository and disseminator of best BI practices between and among the different lines of business.
- Standards of excellence in BI practices can be advocated and encouraged throughout the company.
- The IS organization can learn a great deal through interaction with the user communities such as knowledge about the variety of types of analytical tools that are needed.
- The business user community and IS organization can better understand why the data warehouse platform must be flexible enough to provide for changing business requirements.
- It can help important stakeholders like high-level executives see how BI can play an important role.

Another important success factor of BI is its ability to facilitate a real-time, on-demand agile environment.

3. Why is it difficult to justify BI applications?

This is not an easy task due to the large number of intangible benefits.

Both direct and intangible benefits need to be identified. Of course, this is where the knowledge of similar applications in other organizations and case studies is extremely useful. For example, the Data Warehousing Institute (**tdwi.org/**) provides a wealth of information about products and innovative applications and implementations. Such information can be useful in estimating direct and indirect benefits.

Section 1.6 Review Questions

1. List the six major categories of decision support tools.

The six major categories are: data management, reporting status tracking, visualization, strategy and performance management, business analytics, social networking.

2. Identify some companies that are major vendors in BI.

Recently there has been a major surge in BI software and application providers. Some of these company names will become quite familiar after completing this book: Teradata, MicroStrategy, Microsoft, IBM+Cognos+SPSS, SAP+Business Objects, Oracle+Hyperion, and SAS/

ANSWERS TO QUESTIONS FOR DISCUSSION

1. Give examples for the content of each cell in Figure 1.2.

Portals: corporate websites, common sites such as yahoo, MSN, search engines,

Broadcasting Tools: bulletin boards, listserv, Email marketing systems

Predictive analytics: event-driven alert or activity, which is a warning or action that is activated when a predefined or unusual event occurs.

Data & Text Mining: using intelligent tools such as neural computing, predictive analytics techniques, or advanced statistical methods. For example, predicting creditworthiness of loan customers, identifying email messages as spam

Alerts and Notifications: issued as a result of predictive analytics, e.g., issuing an alert when a possible fraudulent credit card charge has been posted

Workflow: self explanatory

Scorecards and Dashboards: Dashboards (which resemble automobile dashboards) provide a comprehensive visual view of corporate performance measures, showing comparative values or differences between goals and achievements

Digital cockpits and Dashboards: Dashboards (which resemble automobile dashboards) provide a comprehensive visual view of corporate performance measures

OLAP: Online Analytical Processing – generating ad hoc queries from a system for any specific analysis

Financial Reporting: self explanatory – monthly/quarterly financial reports

EIS/ESS: Executive Information System/Expert Support Systems – proving reports and visual displays such as dashboards

Querying and Reporting: self explanatory – using OLAP or preformatted specific reports

Metadata: data about data – data dictionary of a database

ETL: Extraction, transformation and load (raw data) – taking data from a transactions processing system, cleaning it up, and moving to a data warehouse.

Data Warehouse: Mostly historical data for analysis of corporate performance, can contain current data for online transaction processing – e.g. Teradata warehouse system

Data Marts: Smaller (particular subject or department) and more focused than a data warehouse **- marketing data mart as a subset of a corporate data warehouse**

DSS: Decision Support System - System to help managers in decision making, e.g., for mortgage loan decisions, project selections, etc.

Spreadsheets: MS Excel

2. Differentiate intelligence gathering from espionage.

*Intelligenc*e sounds like a cloak-and-dagger acronym for clandestine operations dedicated to stealing corporate secrets, or the government's CIA, this couldn't be further from the truth. While such *espionage* does of course occur, we are interested in how modern companies ethically and legally organize themselves to glean as much as they can from their customers, their business environment, their stakeholders, their business processes, their competitors, and other such sources of potentially valuable information. But collecting data is just the beginning.

BI has adapted a set of nomenclature, systems, and concepts that clearly distinguish it from its espionage-oriented counterpart of national and international intelligence! That said, there are many analogies between the two, including the fact that major effort must be expended to achieve the collection of reputable sources of intelligence, the processing of that intelligence for purity and reliability, the analysis of raw intelligence to produce usable and actionable information, and the mechanisms for the appropriate dissemination of that information to the right users.

3. What is BI governance?

See Review question 2 of Section 1.3

4. Discuss the major issues implementing BI?

Major issues implementing BI are:

- Properly appreciating the different classes of potential users of the BI applications.
- Properly aligning BI with the business strategy.
- Developing BI applications that meet users' needs for real-time, on-demand capabilities.
- Determining whether to develop or acquire BI systems, and how to do so.

- Justifying the BI investment using cost-benefit analysis.
- Insuring the security and privacy protection
- Integrating BI applications with organizational systems, databases, and e-commerce.

ANSWERS TO END OF CHAPTER APPLICATION CASE QUESTIONS

1. What were the challenges for Vodafone New Zealand?

Challenges were how to increase profit margins; how to add revenue streams from customers; and how to keep them as customers? Vodafone needed to make better decisions based on real-time knowledge of its market, customers, and competitors.

2. How did it address these issues?

First, Vodafone formed a customer knowledge and analysis department to conduct analysis, modeling, market research and competitive intelligence. Vodafone then implemented an enterprise data warehouse (EDW) to obtain a single view of all of the information in the organization. EDW permits a well-integrated view of all of the organization's information to allow generation of predefined or ad hoc queries and reports, online analytical processing, and predictive analysis.

3. List the tools used by Vodafone's applications.

In addition to the Teradata data warehouse platform, many other software tools, such as KXEN, SAS, and SPSS, were also used to build models and generate insights.

4. What benefits are being derived from this initiative?

Perhaps the biggest benefit of the EDW is that the analysts can spend more time generating insights than managing data. The system also provides better information to decision makers to support the decision-making process.

5. What can we learn from this case?

The goal is "to get the best possible return . . . from the process of campaigning and contacting customers."