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In this issue:

Business Intelligence in the Information System Curriculum

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Abstract: The focus of Business Intelligence is the strategic application of information to provide value to an organization. But every information system should provide value to an organization! The typical information system focuses on day-to-day operational systems. With Moore's law of expanding CPU capacity there is a parallel explosion of data generated by operational information systems. Business Intelligence is unique from traditional operational systems in that it takes a strategic view of the massive amount of operational data, and transforms this data into information that is used as a strategic resource by the organization. Business Intelligence is based on the data warehouse technology which strives for a single, integrated version of the historical data in an organization. The data warehouse is necessary, but not sufficient, for the successful delivery of information to all potential end users. Business intelligence emphasizes the need to create an information system in the context of the organization. Thus Business Intelligence should be incorporated into courses which emphasis information systems theory, business design, and database technology.

Keywords: Business Intelligence, Curriculum, Information, IS 2002, Information Systems, Data Warehouse

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Business Intelligence in the Information System Curriculum

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ABSTRACT

The focus of Business Intelligence is the strategic application of information to provide value to an organization. But every information system should provide value to an organization! The typical information system focuses on day-to-day operational systems. With Moore's law of expanding CPU capacity there is a parallel explosion of data generated by operational information systems. Business Intelligence is unique from traditional operational systems in that it takes a strategic view of the massive amount of operational data, and transforms this data into information that is used as a strategic resource by the organization. Business Intelligence is based on the data warehouse technology which strives for a single, integrated version of the historical data in an organization. The data warehouse is necessary, but not sufficient, for the successful delivery of information to all potential end users. Business intelligence emphasizes the need to create an information system in the context of the organization. Thus Business Intelligence should be incorporated into courses which emphasis information systems theory, business design, and database technology.

Keywords: Business Intelligence, curriculum, information, IS 2002, Information Systems, data warehouse

1. LOSING SIGHT OF INFORMATION

Moore's Law states that "the number of transistors doubles about every two years" (Moore, 1965) which means that computers and the associated technologies get faster, cheaper, and eventually, easier to use. This constant change in tools means that the people in charge of information systems must constantly maintain and update the underlying information system infrastructure, and is one of the reasons such departments are often called information technology (IT).

Ken Karacsony notes that IT department mission and vision statements focus on delivering technology but fail to mention the underlying information (Karacsony, 2005). "The quality of the information – completeness, accuracy, timeliness, and so on – is far more important to the customer than the delivery mechanism." From a customer's perspective, information systems should be as simple as using a phone, and the underlying technology that makes it work should be as transparent as the complex switching network that is hidden from a person making a phone call. The focus on technology can have grave consequences if the data stored in an information system is mishandled.

The importance of information is emphasized in a recent article by Peter Denning (2007) which reviews his efforts to develop a "principle framework" for all of the computations that occur in the real world, be it biology or business, rather than the focus on artificial abstraction found in computer science. Four fundamental questions are listed for this field of computation:

(1) What is information?

(2) What is computation?

(3) How does computation expand what we know?

(4) How does computation limit what we know?

The main focus is on information, not the underlying technology. The technology could be computers or DNA. The seven underlying principles in this framework are found on the Great Principles web site (Denning and Martell, 2007). These principles are meant to cut across all fields that investigate information processing.

The two main functions of business information system departments are the management of the information stored in the system and the underlying technology that delivers the information. These two functions compete for the resources of an organization. Business Intelligence (BI) is a trend that elevates the importance of information processing and delivery.

2. BUSINESS INTELLIGENCE

BI is a large and growing segment for software vendors. Estimates of BI revenue are $5.7 billion and 6.25 billion in 2005 and 2006 respectively, and growing 11.5% each year (Vesset and McDonough, 2006; IDC, 2007). The 2005 estimates include two major segments: a standalone 'Query, Reporting, and Analysis' segment with $4,023 billion in revenues; and an 'Advanced Analytics' segment with $1,157 billion in revenue. In the 2005 estimate the top 3 'Query, Reporting, and Analysis' vendors were Business Objects, Cognos, and Microsoft, while the top 3 'Advanced Analytic' vendors were SAS Institute, SPSS, and Visual Numerics.

BI is typically defined as "getting the right information to the right people at the right time" (Miller, Bräutigam, and Gerlach, 2006). At its core, BI is an all encompassing philosophy that promises to deliver information to everyone in an organization. The all encompassing nature of BI can be seen in a more formal definition:

> "*Business Intelligence is the conscious, methodical transformation of data from any and all data sources into new forms to provide information that is business driven and results oriented*. It will often encompass a mixture of tools, databases, and vendors in order to deliver an infrastructure that not only will deliver the initial solution, but will incorporate the ability to change with the business and current marketplace.
>
> The purpose of investing in BI is to transform from an environment that is reactive to data to one that is proactive. A major goal of the solution is to automate and integrate as many steps and functions as possible. Another goal is to provide data for analytics that are as tool-independent as possible." (Biere, 2003)

The notion that BI uses "data from any and all data sources" shows the reliance of BI on data warehouse concepts and technology. The data warehouse is conceptualized as a source of historical data integrated from many operational sources of data (Inmon, 1992) and thus is a good foundation for generating information for anyone who needs it. This definition also shows how BI is more than a data warehouse in that it stresses the cultural elements of BI. No technology or information system by itself can change an organization from being reactive to proactive. One recommendation for creating an effective Business Intelligence Competency Center is to think of BI as "a process, not a project"; as the organization starts to use BI and find success in initial projects, it will find new uses for BI methodologies (Miller, Bräutigam, and Gerlach, 2006).

A final definition of BI is a "…'combination of' products, technology, and methods to organize key information that management needs to improve profit and performance" (Williams and Williams, 2007). This definition emphasizes the practical nature of BI and the need to create information that is useful to an organization. If no one accesses or uses the information generated by a BI system, no matter how sophisticated the analysis, then there is no economic value generated. In order to deliver on the promise of business value, the BI process must include "strategic alignment", "process engineering", and "change management" in addition to any technical and analytical improvements to the organizational data infrastructure (Williams and Williams, 2007).

Every information system project must add value to an organization. BI differs from past information system projects in its scope. It strives to be more democratic and deliver value to all individuals in an organization rather than the 'elite' power users

with the right combination of technical skills, access to databases, and patience. BI has a wider organizational scope rather than a departmental scope. And BI is seen as a long term process rather than a short term information system project. The BI philosophy recognizes the iterative nature of advanced analysis.

3. IS 2002 EXIT CHARCTERISTICS

The IS 2002 model curriculum (Gorgone et al., 2003) identifies four general exit characteristics for information system graduates: (I) Analytical and Critical Thinking, (II) Business Fundamentals, (III) Interpersonal, Communication, and Team Skills, and (IV) Technology. BI taps into the required skills of all four areas.

The output of analytical and critical thinking is a prime motivator for creating BI systems. Intelligence in this context refers to the ability to collect, process, and analyze data for the production of actionable information. The analytical aspects of BI mirror the scientific method of hypothesis testing which is taught in statistic courses. Companies which have developed a culture of analyzing and using data, such as Harrah's, Dell, Capital One, and Progressive, to name a few, have been very successful (Davenport, 2006). The compliance with legal and regulatory standards is another analytical and critical thinking factor (listed under the sub category of Ethics and Professionalism) which motivates the pursuit of BI systems.

A solid understanding of business fundamentals is essential to BI. The BI opportunity analysis (Williams and Williams, 2007) is a methodology to identify BI initiatives with the greatest changes of success. It starts with a top down analysis of a company's business context (its customers, suppliers, and competitors; its strategies and goals), then how the company operates (its value discipline and core business processes), and finally a list of BI opportunities in specific operational units (management, revenue generating, or resource consumption processes). These opportunities are rated on two scales: potential business impact and risk. Those projects with low risk and high impact are worked on first. Without a firm grounding in business fundamentals, developers cannot implement successful BI systems.

Interpersonal, Communication, and Team skills are important in the development of any information system project. With BI it is also important to understand how the information system can facilitate interactions of people working in the organization. To create a BI system that will deliver information to all workers it is important to create a system that is easy to use and will advance group decision making. Thus developers must have a wide range of skills, from the ability to work in interdisciplinary teams to understanding the elements needed to create effective output displays.

The skills identified in these general characteristics are useful for understanding an end user profile that Biere (2003) has suggested as a guide to designing BI initiatives. Knowledge of the target audience is essential for building effective BI systems. There are three independent end user segmentations in this profile.

1. User Attributes (Skills): Consumer, Casual & Ad-Hoc, Heavy Analyst
2. BI Application Type Requirements: Query & Reporting, OLAP, Data Mining
3. User Business Influence: Informative, Decision Influencing, Significant Business Impact

Most employees will fall in the Consumer skill level, be they executives or customer support personnel. However an employee can use any combination of the three application types depending on how the information benefits their job. Knowing the influence of potential end users can help developers design a BI system that will have an impact justified by the development costs. Understanding the business needs of end users will lead to information tailored to their specific skill levels and tasks.

4. IS 2002 LEARNING UNIT MAPPING TO BI CONCEPTS

The technological elements of a BI system cover all technical sub-elements listed in the IS 2002 curriculum (application development, internet systems architecture and development, database design and administration, and systems infrastructure and integration). First and foremost are the data warehouse elements that make BI possible. Data warehouse technology uses the same rela-

tional database management systems as operational databases and deals heavily with the integration of separate operational systems. But infrastructure concerns are also a high priority for handling the large volumes of data and getting information to people in a timely manner. Of final note is the strong emphasis in BI of data quality and management (Dyché and Levy 2006). Data is a valuable resource for any company, and the management of data becomes even more important when it is the input for enterprise wide strategic initiatives.

There are eleven information system courses found in IS 2002 curriculum (IS 2002.P0, IS 2002.1 - .10), and each course has a unique set of associated learning units. A review of the learning units was done to indicate which units are important to BI concepts and skills. The 'Information Systems Fundamentals' Area has the highest percent of Learning units covered: IS 2002.1 Fundamentals of Information Systems (100%) and IS 2002.2 Electronic Business Strategy, Architecture and Design (66%). The area of 'Information Systems Theory and Practice' also had a high overlap with BI topics: IS 2002.3 Information Systems Theory and Practice (72%). The strong overlap of BI with general information system topics is not surprising given the importance of business topics in BI. The final two courses with strong correlations to BI are from the 'Information Systems Development' Area: IS 2002.8 Physical Design and Implementation with DBMS (62%) and IS 2002.9 Physical Design and Implementation in Emerging Environments (64%). Therefore introduction of BI concepts fits well in information system courses designed to build a foundation of information system knowledge, especially in the context of business practices. Detailed coverage of BI can occur in Design and Implementation courses.

5. CONCLUSION

Information systems are an efficient, technical way to provide technical methods to improve business efficiencies. With the rapid change in technology it is easy to loss track of the reason to have an information system: to store data and create information. BI is a growing segment for software vendors and an important tool for businesses to create value from the data collected in their daily operations. While updating our information system curriculum it is important to understand where business intelligence fits into the spectrum of topics. BI is not a revolutionary idea, it is an evolution of past information systems and objectives found in business. BI is the idea of taking reports and making them easier to understand with dash boards and interactive visual displays, of making information available to more then a select few, of making information available sooner rather than later, of making it easier to access and analyze data. Finally, business intelligence is a process that incorporates all of the characteristics expected of Information Systems major; critical thinking and knowledge of business fundamentals for determining system requirements, technology skills in database design and development, analytical skills to aid in the creation of appropriate applications, and the interpersonal, communication, and team work skills needed to implement changes to an organizations business processes. These are skills that are covered primarily in the following IS 2002 course:

- Fundamentals of Information Systems
- Information Systems Theory and Practice
- E-Business Strategy, Architecture and Design
- Physical Design and Implementation with DBMS
- Physical Design and Implementation in Emerging Environments

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