DEPLOYING BUSINESS INTELLIGENCE IN AN UNDERGRADUATE BUSINESS MANAGEMENT CURRICULUM

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ABSTRACT

Business Intelligence (BI) technologies unlock information by providing data to decision-makers in multiple perspectives. Organizations such as American Express, Procter & Gamble, NASA, and the United States Post Office, et al. have already gained competitive advantage by employing BI solutions. To better prepare graduates for cutting edge Decision Support System (DSS) technologies and to enhance the classroom learning experience, Robert Morris University has integrated a leading BI solution into its undergraduate curriculum. This article outlines a pilot implementation of BI and discusses evaluation techniques for determining the effectiveness of BI in the college classroom.

Keywords: Business Intelligence, Decision Support Systems, Undergraduate, Curriculum

INTRODUCTION

Business Intelligence (BI) is a state-of-the-art Decision Support System (DSS) technology that allows organizations in any industry to glean real value from collected information. Used effectively, BI holds the promise of providing strategic competitive advantage to insightful organizations worldwide. Experience with BI technologies, therefore, becomes an invaluable asset to college graduates entering a business management or Management Information Systems (MIS) profession.

BACKGROUND

During the 1990s, Enterprise Resource Planning (ERP) systems revolutionized modern organizations by tying together and automating the basic business processes (Minahan, 1998). Vendors such as SAP, Oracle, PeopleSoft, and J.D. Edwards have emerged as the leaders in an industry of extremely costly, complicated, and time-consuming systems.

Along with the high price tag of ERP systems came many lofty promises. ERP systems did change modern business but, despite their complexity and high price, ERP systems did not deliver all that they had promised. First and foremost, ERP systems are not able to communicate outside of the bounds of the organization. Supply chain industry author and editor Thomas Foster comments “. . . [external communication] is what companies need to work the systems of customers, suppliers and partners” (2000, p. 1). Also, ERP systems do not allow the analyses and reporting of real-time data (Foster, 2000). Most planning and decision making from such systems is based on historical information. Finally, and perhaps the most poignant limitation of ERP systems is the limited access to an organization’s stockpiles of collected data. After a large SAP implementation, consumer products giant Colgate-Palmolive noted, “The data is in there, but there’s this excruciatingly painful effort to make sure what you pull out is what you need” (Minahan, 1998, p. 122). Noted data expert Ralph Kimball concurs, “. . . it is possible to extract
data from an ERP . . . [however,] it requires specialized knowledge and powerful extraction software” (2000, p. 29).

**BUSINESS INTELLIGENCE (BI)**

How, then, can professional organizations unlock critical information that is shackled in the deepest caverns of ERP repositories? The answer is *Business Intelligence* (BI). Sometimes dubbed as an oxymoron, BI is actually a sophisticated Decision Support System that gives decision-makers the power to access and leverage critical organizational and industry data.

BI sits on top of the ERP system and allows meaningful information to be quickly and easily extracted and disseminated. Through its user-friendly graphical interface (in either a Microsoft Windows client-server platform or a platform-independent Internet environment) BI has revolutionized the reporting and analyses of organizational data. In industry, businesses such as BMW, Dow Chemical, and Bayer (Cognos, 2004) use BI for everything from financial reporting and analysis to tracking customer hits and buying behavior on e-Commerce sites.

Given the success of BI in industry, it is not surprising that BI has found its way into higher education. The use of Decision Support Systems (DSS) in colleges and universities is commonplace; however, its use is typically limited to Microsoft Office applications such as Excel and Access. Other DSS vendors, such as IBM (IBM, 2000) and SAS (SAS Institute, 1999) have made limited inroads into academia with their DSS offerings. DSS software in the higher education classroom, however, has been predominantly limited to spreadsheet applications (Palocsay & Markham, 2002).

When used in the classroom, DSS software has proven to be an effective teaching tool. A recent study by Michel Mitri at James Madison University found the use of DSS in the curriculum “. . . [gave] students practical experience in designing, implementing, and using support systems in realistic business domains” (2002, p. 93). The same study further revealed that “Students seem to consider [the use of DSS tools] to be a refreshing change of pace compared to the traditional multiple choice testing, case studies, and term paper assignments that [college students] normally receive” (Mitri, 2002, p. 93).

**PILOT IMPLEMENTATION**

The DSS tools in industry have become more sophisticated and academia has been forced to respond by broadening its DSS offerings. In addition, as previously discussed, college students welcome the use of new DSS technology in the classroom (Mitri, 2002). In an effort to better prepare students for industry and to provide a richer learning experience, schools such as Robert Morris University (RMU) have incorporated new DSS tools into their curricula. As a pilot implementation, RMU recently integrated a leading BI tool into the Hospitality and Tourism Management Program.

The Hospitality and Tourism Management Program was selected as a pilot implementation for a number of reasons. First and foremost, the Hospitality and Tourism Management Program at RMU has been actively seeking a DSS to supplement classroom instruction. Past case studies
within the program were designed to be used with Microsoft Excel. Excel did aid students in completing case study assignments and making resulting recommendations, however, the pool of available case study data has been historically limited and the use of spreadsheet applications did not reflect the systems currently used in industry. Second, ample industry data and report templates already existed for the hospitality industry. As part of the purchasing agreement, RMU was able to buy prepackaged hospitality data bundled with the BI software licenses. The use of a state-of-the-art DSS also had strong support within the Hospitality and Tourism Management Program. Both the director of the program and the program faculty strongly supported the use of a DSS tool that was more powerful and flexible than traditional spreadsheet applications. Finally, the small size of the Hospitality and Tourism Management Program made it an ideal candidate for a pilot implementation. The current enrollment of 150 students in the program provided for a pilot implementation that was manageable and involved low cost and low risk.

**BI ROLLOUT IN HOSPITALITY AND TOURISM MANAGEMENT**

For the pilot implementation, RMU selected a BI tool from a vendor in the hospitality industry: Aptech Computer Systems, Inc. Aptech is the leader in providing BI solutions to the hospitality and tourism industry. The specific BI tool, Execuvue, is built on the well-established COGNOS OLAP (On-Line Analytical Processing) technology. Execuvue combines COGNOS multidimensional report and analysis capabilities with Aptech’s property management metrics and industry-wide hotel and property management data.

Execuvue was selected because of its success with clients such as Starwood Hotels and Resorts (parent company to Sheraton, Westin, St. Regis, Luxury Collection, Four Points, and W brands) and Host Marriott Corporation. Starwood uses Execuvue to reduce costs, provide better service, and make better decisions. According to Starwood’s Michael Morgan:

> Execuvue is a perfect fit, enabling us to make timely, responsive, and well-informed decisions based on current, accurate operations data. We are leveraging our global assets and taking advantage of the Company’s scale to reduce costs and improve service across our hotels worldwide.” (Aptech Computer Systems, 2000, p. 1)

Host Marriott Corporation uses Execuvue to increase profits by “...more proficient use of resources due to less time spent gathering and consolidating data and more time spent analyzing statistics” (Aptech Computer Systems, 2002, p. 1).

**Pre-Packaged Data**

One of the most essential elements of any DSS is timely access to quality data. In the case of Execuvue, the data are provided by Aptech. The data (which consist of *Smith Travel Research* data) are pre-packaged in a special file structure called a *multidimensional cube* (or just *cube*). Once in a cube structure, the data may be manipulated, analyzed, and viewed from endless perspectives by the hospitality and tourism management students.

Regarding other business management courses at Robert Morris University, multidimensional cubes could be purchased from other vertically integrated BI vendors. Multidimensional cubes
could also be built “in-house” by the BI system administrator or by undergraduate and/or graduate students in a relational database, or data mining/data-warehousing course.

**System Architecture**

The Execuvue Business Intelligence system is offered in a client-server configuration and a web-based configuration. RMU selected the web-based system because of its ease of use and its flexible access options. A key benefit of the web-based system is what is known as “zero footprint.” Zero footprint means that all vendor software is installed and maintained on the web server only. From the student’s perspective, the only software requirement for the BI system is an Internet browser (i.e., Internet Explorer or Netscape Navigator).

The zero footprint architecture also allows remote and platform-independent access. More specifically, RMU students may access the Execuvue BI system and complete homework assignments and projects from any Internet-enabled computer.

**Server Administration**

RMU hired a full-time server administrator to manage and maintain the server side of the BI system. A similar BI system (i.e., built on the same COGNOS technology) is used by RMU administration to report and analyze student matriculation data. The server administrator extracts student data files from the University’s proprietary student information system and uses the data to build and maintain specific multidimensional cubes. The same server administrator supports the administrative use of the system, as well as the classroom use. Currently, the two systems run independently on separate web servers.

**Integration into Curriculum**

For the pilot implementation, the Execuvue BI system has been introduced to undergraduate students in three distinct stages: introductory, intermediate, and advanced. The classes in the introductory stage give an overview to Decision Support Systems and stress the importance of timely financial and operational data in the decision making process. In the intermediate stage classes, students work with predefined reports that are specifically tailored to hospitality and tourism metrics. Students also use the predefined reports in the intermediate stage classes as a starting point to manipulate and explore hospitality data. In the advanced stage classes, students author their own Business Intelligence reports using multidimensional cubes.

To further enhance the learning process, students in the advanced stage classes assume the role of business managers and create reports and analyses to address “real-world” business scenarios. For example, some students (playing the role of food and beverage managers) compare their hypothetical department’s expenses with those of similar hotel properties. The students use this comparative information to make recommendations for reducing food and beverage expenses. Students also perform numerous “what if” analyses to test their recommendations for decreasing expenses or increasing revenues under various internal or external business conditions.
EVALUATION METHODOLOGY

Initiated in the Fall of 2003, the Hospitality and Tourism Management pilot is planned to last one academic year. At the end of each of the semesters within the pilot, the effectiveness of the BI software will be assessed by surveying the undergraduate students. In addition to capturing background information on the students (e.g., gender, age, year in school, et al.), the written questionnaire will attempt to solicit the following information:

- “Was the use of the BI software relevant to the course?”
- “Did the use of the BI software reinforce course topics and concepts?”
- “Did the use of the BI software help to create interest in the subject matter?”
- “Did the use of the BI software enhance the learning experience in the course?”
- “Would the BI software be applicable to other courses at Robert Morris University?”

The questionnaire will contain a combination of Likert-like objective questions (e.g., using a six point scale ranging from “Very Effective” to “Ineffective”), closed-ended, and open-ended questions. The results of the questionnaire will be tabulated and analyzed using statistical software (e.g., SPSS – Statistical Package for the Social Sciences). The results will be shared with other Robert Morris University faculty and submitted as subsequent research findings. The actual questionnaire instrument is presented in Appendix A: BI Software Questionnaire.

CONCLUSION / NEXT STEPS

Historically, Decision Support Systems (DSS) have played a limited role in the undergraduate curriculum (Palocsay & Markham, 2002). The latest offering of DSS, the Business Intelligence (BI) system, has helped to introduce, explain, and reinforce DSS concepts in the classroom. BI has also provided students with access to analysis and reporting capabilities that are widely used and accepted in industry.

To enhance the learning process and to better prepare students for business management careers, Robert Morris University (RMU) has implemented BI software into its undergraduate curriculum. Preliminary reactions indicate that the BI pilot at RMU, involving the Hospitality and Tourism Management program, has successfully enabled students to learn the elements of decision making and effectively analyze information. Most importantly, BI software in the classroom seems to aid students in grasping complex business management concepts and making more informed business decisions.

Although the study is still in progress, the preliminary results of the RMU pilot are consistent with the findings of other researchers in regard to the classroom use of a DSS. As in the Mitri study, undergraduate students at RMU gained decision support skills while working with realistic business management situations (2002). Parallel to the aforementioned study, RMU undergraduates also enjoy the “hands-on” problem solving approach to learning afforded by the BI software (Mitri, 2002).

If the pilot implementation proves to be successful, RMU will continue to use Business Intelligence software in its undergraduate Hospitality and Tourism Management curriculum.
Further, RMU is currently investigating the applicability of BI tools in other management-based undergraduate and graduate curricula. Specifically, Managerial Accounting, Financial Modeling, and Decision Support Systems have been cited by RMU faculty as the next logical collection of business/information management courses in which students could leverage and learn from BI technologies.

In summary, BI is quickly becoming a valuable addition to the RMU business management classroom. If the preliminary (but positive) reactions to BI technology in the classroom prove to be accurate, the University will continue to provide this asset to students, as well as expand its use, where appropriate, to other business management and information management curricula.

REFERENCES

APPENDIX A: BI SOFTWARE QUESTIONNAIRE

BI Software Questionnaire

The following questionnaire is designed to solicit your perceptions of the Execuvue® Business Intelligence Software. For purposes of this questionnaire, the Execuvue® Business Intelligence System will be referred to as “the BI software.” Thank you for your participation.

Section 1: Software Effectiveness

Rate the effectiveness of each practice or statement as it contributed to your learning in this course.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Very Effective</th>
<th>Moderately Effective</th>
<th>Somewhat Effective</th>
<th>Ineffective</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The ability of the BI software to enhance learning.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2. The ability of the BI software to reinforce course topics and concepts.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. The ability of the BI software to create interest in the course subject matter.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4. The ability of the BI software to enhance case studies within the course.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5. The overall effectiveness of the BI software in the course.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Section 2: Software Relevancy

Use the rating scale on the right to note your level of agreement or disagreement with the following items.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Agree Strongly</th>
<th>Agree Somewhat</th>
<th>Disagree Somewhat</th>
<th>Disagree</th>
<th>Disagree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The BI software was relevant to the course.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2. The BI software would be relevant in other Hospitality and Tourism Management courses.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. The BI software would be relevant in other RMU courses.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Section 3: Demographics

For each question below, fill in the blank or circle the appropriate response:

1. Are you employed (part-time or full-time)? Yes No
2. If ‘Yes’ to question #1, what is your area of employment? ______________
3. What is your current area of study in school? _______________________
4. What is your gender? Male Female
5. What is your age? ________ years