The State of Business Intelligence in Academia

In fall 2009, the Teradata University Network distributed a survey asking academics associated with the Association for Information Systems about business intelligence (BI) at their universities. The intent was to obtain a general feel for the current state of BI in academia. The following report summarizes the responses for your information. The report will be used as input for discussion during the 2009 BI Congress in Phoenix Arizona on December 15 (jointly sponsored by the Special Interest Group for Decision Support Systems and the Teradata University Network).

After the BI Congress, we hope to produce additional deliverables regarding the current (and future) state of BI for universities.

Many thanks to the universities who participated in this survey:

Arizona State University
Auburn University
BeiHang University
Ben Gurion University of the Negev, Beer-Sheva, Israel
Bentley University
Brigham Young University
Central University "Marta Abreu" of Las Villas, Cuba
Chapman University
Claremont Graduate University
CSU Monterey Bay
ESADE Business School
European Business School, Oestrich-Winkel, Germany
University of Sydney, Australia
Florida International University
Florida State University
George Washington University
Graziadio School of Business
Indian Institute of Technology, Delhi, India
Indiana University, Purdue University of Indianapolis
IT University of Copenhagen
Jaipuria Institute of Management, Lucknow, India
Lenoir Rhyne University
London Metropolitan University, UK
Loyola University Maryland
Loyola University Chicago
Maastricht University
Mercartor University, Duisburg, Germany
Monash University
Murdoch University
National University of Singapore
New Jersey Institute of Technology
Northeastern University
Oklahoma State University
Penn State University, Beaver Campus
Salisbury University
San Diego State University
San Jose State University
School of IS, Singapore Mgmt University
Stellenbosch University, Information Science
Stevens Institute of Technology
SUNY Empire State College
Syracuse University, Information School
Texas Tech University
TU Bergakademie Freiberg
UFRJ
University of North Carolina, Greensboro
University of California Irvine
Universite de Sherbrooke
University of Akron
University of Arkansas
University of Colorado Denver
University of Dayton
University of Georgia
University of Hawaii
University of Ljubljana
University of Louisville
University of Maryland, College Park
University of Maryland, University College
University of Michigan, Dearborn
University of Mississippi
University of Nevada, Las Vegas
University of New Orleans
University of North Florida
University of North Texas
University of Northern Iowa
University of Petrosani
University of St.Gallen, Switzerland
University of Texas Pan American
University of Toronto
University of Virginia
Vanderbilt University
Virginia Commonwealth University
Vlerick Leuven Gent Management School
Walden University
Washington State University
Winthrop University
Xavier University
Current BI Offerings

Based on the 85 schools who responded to the survey, the following graphs show the number of non-BI courses, BI courses, concentrations and degrees that have been in place for over a year, have just been introduced, and are under consideration.
Current BI Course Offerings

Note the diversity of offerings. Many of the highly specialized classes (e.g., Geo-Business Intelligence and Strategy, Multidimensional analysis) are offered within concentrations or degree programs.

<table>
<thead>
<tr>
<th>Advanced Database Management</th>
<th>Forecasting Methods</th>
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</thead>
<tbody>
<tr>
<td>Advanced statistics</td>
<td>Geo-Business Intelligence and Strategy</td>
</tr>
<tr>
<td>Advanced Topics (2)</td>
<td>Information Management (2)</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
<td>Integrated Decision Making</td>
</tr>
<tr>
<td>Business analysis</td>
<td>Intelligence Decision-Making</td>
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<tr>
<td>Business Analytics (4)</td>
<td>Intelligent Systems</td>
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<tr>
<td>Business Intelligence (34)</td>
<td>IT for Management Decision Making</td>
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<tr>
<td>Business intelligence and Strategy</td>
<td>Knowledge Discovery (2)</td>
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<tr>
<td>Business Intelligence Applications (Tools) (2)</td>
<td>Knowledge management (alone or with BI) (5)</td>
</tr>
<tr>
<td>Business intelligence case study (required in BI master)</td>
<td>Managing Business Intelligence</td>
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<tr>
<td>Business Intelligence in Healthcare</td>
<td>MicroStrategy Tools and Techniques</td>
</tr>
<tr>
<td>Business Intelligence in Marketing &amp; Finance</td>
<td>Multidimensional analysis</td>
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<tr>
<td>Business Intelligence Modeling</td>
<td>Natural Language Processing</td>
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<tr>
<td>Business Objects and Teradata RDBMS</td>
<td>Organizational Sense-making</td>
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<tr>
<td>Business Process Management and BI</td>
<td>Predictive Analytics</td>
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<tr>
<td>Campaign management</td>
<td>Principles of Competitive Intelligence</td>
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<tr>
<td>Cognos and Teradata RDBMS</td>
<td>Research Methods in Business Intelligence</td>
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<tr>
<td>Customer Relationship Management</td>
<td>SAS and Teradata</td>
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<tr>
<td>Dashboard and business intelligence reporting</td>
<td>Statistical Treatment of Data</td>
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<tr>
<td>Data collection in business intelligence</td>
<td>Statistics</td>
</tr>
<tr>
<td>Data Management and Business Intelligence</td>
<td>Supply Chain Operations</td>
</tr>
<tr>
<td>Data mining (14)</td>
<td>Turning Data into Dollars</td>
</tr>
<tr>
<td>Data Mining Algorithms</td>
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<tr>
<td>Data Warehousing (14)</td>
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<tr>
<td>Data Warehousing (or BI) and Data Mining (2)</td>
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<tr>
<td>Database Marketing Strategy</td>
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<td>Decision Analytics</td>
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<td>Decision Models</td>
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<td>Decision Support (Systems) (7)</td>
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<td>Designing the Knowledge Organization</td>
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<td>ERP and Decision Support Systems (2)</td>
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What Disciplines Teach BI?

Other includes:
Accounting (3); Business Information Technology Management; Data analytics; Decision Sciences; Economics; Finance; Information Management; Information Science; Industrial Engineering; School of Computing; Statistics (2); Strategic Management; Supply Chain

What are the Challenges in Teaching BI?

The survey respondents identified a wide variety of challenges in teaching BI. The challenges can be loosely organized into six broad categories. The most often mentioned challenges are access to BI software, data sets, and textbooks. Clearly, there is work to be done in developing high quality technology and pedagogical support for BI courses.

**Technology Issues**
access to (affordable, reliable) software (16); access to data sets, especially real-world (11); lack of technical support, training (5); keeping technologies up-to-date (2)

**Programmatic Issues:**
expanding from a MIS concentration into a full BI program; competing with other courses and specializations; overlap with other classes; integration with the computer science department; funding
Staffing Issues:
finding faculty who can teach BI well (4)

Curriculum Issues:
meeting diverse student needs (backgrounds, ages, expectations, goals, experiences, nationalities; not putting too much computer science/technical content into the curriculum; having enough time to teach concepts (3); working BI content/courses into the existing curriculum (3); deciding what to teach and what to leave out (2)

Pedagogy Issues:
finding a suitable textbook (6); providing realistic, meaningful, hands on experiences (7); meaningful cases (4); locating current examples; access to lab exercises; availability of teaching materials; creating innovative learning experiences; access to vendor-neutral advice and educational content; having to make up our own course material, readings, and cases; integration with business functional areas

BI Student Market Issues:
marketing BI to students (3); BI students’ reluctance/inability to apply statistics (2); growing demand vs. insufficient resources; convincing non-IT colleagues in the business school of the BI student demand

What Technology is Used or Needed to Teach BI?

<table>
<thead>
<tr>
<th>Anything available as a service</th>
<th>Technologies delivered via Teradata</th>
</tr>
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<tbody>
<tr>
<td>Artificial Intelligence</td>
<td>University Network</td>
</tr>
<tr>
<td>Business Activity Monitoring</td>
<td>Tools to analyze consumer behavior</td>
</tr>
<tr>
<td>Business Intelligence (9)</td>
<td></td>
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<tr>
<td>Business Performance Management</td>
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<tr>
<td>Case studies mapped to technology experiences</td>
<td>Specific technologies mentioned:</td>
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<tr>
<td>CASE tool</td>
<td>Access (2)</td>
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<tr>
<td>Dashboards</td>
<td>Business Objects</td>
</tr>
<tr>
<td>Data Mining (3)</td>
<td>Clementine</td>
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<tr>
<td>Data Modeling</td>
<td>CSS/PHP</td>
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<tr>
<td>Data Sets</td>
<td>DB2 (2)</td>
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<tr>
<td>DBMS (large, enterprise) (4)</td>
<td>EIDOS</td>
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<tr>
<td>ERP</td>
<td>E-view</td>
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<tr>
<td>ETL 2</td>
<td>Excel (9)</td>
</tr>
<tr>
<td>OLAP (6)</td>
<td>IMHO</td>
</tr>
<tr>
<td>Statistical Package (3)</td>
<td>ithink</td>
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<tr>
<td></td>
<td>J-Map</td>
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<td></td>
<td>Microsoft OLAP services (3)</td>
</tr>
</tbody>
</table>

Microstrategy (7)
MOSS
Oracle (5)
PASW Modeler 13
Qliktech
SAP (4)
SAS (7)
SPSS (4)
SQL (5)
SQL Server (7)
Tableau (3)
Talend
Teradata (2)
UML
WEKA (2)
XLMiner
Comments from Survey Respondents:

- BI technologies (unless they are remotely hosted) are resource-intensive in terms of computing hardware, software, and trained personnel. All of these resources are usually scarce at many schools.
- It can be hard to get a new BI course approved as part of the entrenched curriculum and occasional resistance from 'owners' of current courses in an IS program.
- Due to the fast development of the field, often the practical application of BI is more advanced than the academic foundation. I wonder if there are more fundamental topics to teach than technology and data modeling. I think it is an important topic that more and more companies will want people with this knowledge so we need to figure out how to teach it in more ways.
- In 5 semesters (two and a half years) that I teach the course, the structure of students changed from almost only young Danish students to almost half international and more than a half older students.
- More universities should consider partnerships with companies such as Oracle and SAP to get access to new technology that is relevant to the business world.
- Most of industry has shifted to the term Business Analytics to capture both the "former generation" of cubes, tables and reports that was much of the BI efforts until recently AND the more recently emerging efforts with multiple types of data (text, numbers), more real-time information, and more predictive analysis. So using BI itself represents a state of mind that is trailing industry. For our track, we use Business Intelligence & Analytics, to keep the link with the old plus the connection with the new.
- Academia in the BI field is not recognized in Universities. It needs to be promoted both in academic journal and highly prestigious conferences.
- We adopted Base SAS, SAS Enterprise Miner, and SAS Enterprise Guide to train BI students for five years. We believe the skills in using the tools improve students’ competence in the job market. We also realized that traditional MIS curriculum is obsolete. Many IS people start to realize this but majority of them have a hard time with the new learning process.
- BI is still not mature enough or covered as well as other topics or areas in IS.
- We need a set of interesting datasets for data mining. I’d especially like to see financial data. We've made some progress in talking about forensic accounting, but we need data for students to use.
- It is hard to find schools that offer a BI-focused curriculum. We are in the process of launching an undergraduate focus area in data management.
- I think it is a good opportunity for cross-disciplinary applications and, thus, inter-departmental linkages.
- Students have responded very well to these classes, so they are worth the effort to teach. However, the audience has been limited because of the database prerequisite. Our plans to have marketing students take the data warehousing/mining class has faltered.
- Need to stress more on BI in academia as it utility in areas like marketing, finance, insurance.
- Software companies offering BI solutions need to release cheaper (affordable) education version of BI modules.
- BI has great future!
- BI is woefully underserved.
• I think that BI is a critical area, but for the most part it is still in its infancy, pedagogically speaking. It is still primarily data mining and data warehousing focused. While these are critical pieces of a BI program, they are not the only pieces needed to truly prepare students to be BI professionals and to bring substantive leadership in BI to companies that hire them.

• The importance of BI is well recognized by the students and by the industry

• If possible in the future, I would like to extend this survey and ask additional questions about the types of learning activities people use in their classes (both BI and introductory MIS), learning objectives they aim to achieve, and also about different types of industry/academia collaboration (if any) they and/or their students engage in, in the context of their BI subjects (e.g. student internships, industry advisory boards, industry-based projects etc.). I would welcome an opportunity to participate in such a project, if anyone is interested to join forces and share their experiences. I certainly am!

• It's really hard to create a realistic decision making situation for decision making. Need good case situations within which to use the technology.

• The challenge is finding hands on activities that can be done in small chunks as examples.

• Generally, our students need more preparation in quantitative subjects than is currently required in our graduate degrees.

• BI is gaining popularity, faster than most anticipated. We need to define the boundaries of BI. Should we go beyond business reporting (which is the original definition of BI) into advanced modeling, knowledge discovery (via data/text mining).

For more information about this survey, please contact Barbara Wixom, University of Virginia at bwixom@virginia.edu.