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# The Current State of Business Intelligence in Academia

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# The Current State of Business Intelligence in Academia

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Abstract:

Current trends suggest that academia may be behind the curve in delivering effective Business Intelligence programs and course offerings to students. In December 2009 and 2010, the AIS Special Interest Group on Decision Support, Knowledge and Data Management Systems (SIGDSS) and the Teradata University Network (TUN) cosponsored the Business Intelligence Congresses and conducted surveys to improve the understanding of the state of BI in academia. This panel report describes the key findings and best practices that were identified. The article also serves as a "call to action" for universities regarding the need to close a widening gap between the BI skills of university graduates in Information Systems and other fields and BI market needs. The IS field is well positioned to be the leader in creating the next generation BI workforce. To do so, it is important for IS to begin moving on this opportunity now. We believe the necessary first step is for BI and IS leaders to advance the BI curriculum.

**Keywords:** business intelligence, decision support systems, teaching, pedagogy, survey, IS field, curriculum development

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## I. BUSINESS INTELLIGENCE

> *Business intelligence (BI) is a broad category of applications, technologies, and processes for gathering, storing, accessing, and analyzing data to help business users make better decisions.*
>
> Hugh J. Watson [2009]

Business intelligence (BI) is the current stage in the evolution of decision support systems (DSS). In its original concept, a DSS consists of three interacting components: model base, data base, and interface [Sprague and Carlson, 1982]. Initial systems developed in the 1960s and 1970s focused on the model base and its algorithms. The next stage, Executive Information Systems, introduced improved user interfaces. That stage was followed in the 1990s by the introduction of data warehouses to provide large-scale databases that provide a "single version of the truth" [Power, 2007; Turban et al., 2011]. Today's business intelligence is the most comprehensive version of DSS thus far.

Analytics is an important component of BI. It provides the data analysis techniques used to deliver value from decision support data. Analytics is typically divided into (1) descriptive and (2) predictive techniques. The former refers to analyzing *what has happened,* and the latter analyzes *what will happen*. Throughout this article, we use the terms *business intelligence* and *analytics* interchangeably to refer to BI, consistent with current practice.

The importance and visibility of BI to practice has intensified as evidenced by recent publications from *The Economist* [2010] and The McKinsey Global Institute [Manyika et al., 2011]. Gartner reports that business intelligence consistently ranks as one of the top five search terms on their site [Schlegel, 2011]. BI business books, aimed at a business audience, such as *Analytics at Work* [Davenport et al., 2010], *The New Know* [May, 2009], and *Super Crunchers* [Ayres, 2007], are best sellers. CIOs are prioritizing business intelligence at the top of their technology agendas [Luftman and Ben-Zvi, 2009; Pettey and Goasduff, 2011]. Accenture, Deloitte Consulting, and IBM launched new analytics centers and practices in 2010.

This activity created a rapidly growing number of BI jobs in the marketplace. For example, Deloitte projects that they will hire 3,000 employees over three years to staff their emergent analytics practice [Griffin, 2010]. McKinsey Global Institute forecasts, in regard to big data[1]:

> *The United States alone faces a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts to analyze big data and make decisions....*
>
> Manyika et al., 2011, p. 3

The heightened interest in BI and growing BI job market present an opportunity for the IS community, to which the IS community is responding. In 2010, *MIS Quarterly* announced a special issue on Business Intelligence; the 2010 International Conference on Information Systems expanded its Knowledge Management Track to include Business Intelligence; the WITS 2011 theme is "Business Intelligence and Cloud Computing for Enterprise Competitiveness," and INFORMS changed the title of its 2011 and 2012 conferences on the practice of management science to the INFORMS Conference on Business Analytics and Operations Research. Further, BI is incorporated into IS 2010 curriculum guidelines for undergraduate degree programs as an important topic within the Data and Information Management knowledge area [Topi et al., 2010]. Unfortunately, as shown in this article, this allocation of a part of a course is not sufficient to create graduates who are BI employment ready.

In 2009, we were intrigued by the growing demand for BI skills in the marketplace. Given our roles as faculty who teach and research business intelligence, we wanted to better understand what further academic action would be needed to meet the expectations and needs of practice. Therefore, together with a number of other colleagues, we organized the two BI Congresses (in 2009 and 2010) and companion surveys to assess the state of BI in academia. The results of these efforts are reported in the sections that follow.

[1] "Big data refers to datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze" [Manyika et al., 2011, p. 1].

## II. BUSINESS INTELLIGENCE CONGRESSES

### BI Congress Events

In 2009, leadership of two overlapping groups of BI faculty—the AIS Special Interest Group on Decision Support, Knowledge and Data Management Systems (SIGDSS) and the Teradata University Network (TUN)[2]—determined a growing need to:

1. Assess the current state of business intelligence in academia
2. Identify innovative practices in leading universities
3. Understand the gaps that exist between academic offerings and the needs of practice
4. Forge grassroots consensus on how to best leverage collective efforts to address the gaps identified

The two groups jointly hosted the first BI Congress[3] as a pre-ICIS 2009 meeting in Phoenix, Arizona, U.S. This BI Congress, attended by seventy-five academics and practitioners, included keynote addresses by BI thought leaders, industry and academic panel discussions, presentations of teaching pedagogy, and presentations on BI research. The forum established a community of academics and practitioners that seeks to collaboratively move business intelligence forward as a major component of the IS field.

The BI Congress community believed that a follow-up event was desirable to continue the strong momentum that was initiated in 2009. Therefore, SIGDSS and TUN organized BI Congress II,[4] which was held as a pre-ICIS 2010 meeting in St. Louis, Missouri, U.S. The event attracted one hundred attendees. It included two concurrent half-day tracks of research and teaching presentations, and papers from these sessions were published in the BI Congress II proceedings. BI Congress II also featured keynote presentations and panels, innovation in BI teaching awards, and a half-day workshop on academic BI software resources offered by IBM, SAS, and Teradata.[5]

### BI Congress Surveys

Surveys were conducted prior to each BI Congress. In fall 2009, the BI Congress committee distributed a survey asking academics associated with the Association for Information Systems about business intelligence at their universities. The intent was to understand the current state of BI education as input for BI Congress discussions. Eight-five faculty members provided survey responses[6] that were discussed at the 2009 BI Congress.

The BI Congress II committee re-administered the original survey in fall 2010 and created two additional instruments to capture student and practitioner/recruiter perspectives. The student survey was sent to the study's professors to hand out to their students. Recruiters and practitioners were reached through the BI Congress II sponsor[7] channels, mainstream BI professional channels (e.g., TDWI, B-Eye Network[8]), and the authors' university recruiters. The responses[9] from 173 faculty, 219 practitioners, and 339 students were incorporated into BI Congress II discussions in the same way as was done in 2009.

## III. BUSINESS INTELLIGENCE CONGRESS FINDINGS

The two BI Congresses and the surveys resulted in four key findings about the state of BI in academia:

1. Universities should provide a broader range of BI skills within BI classes and programs.
2. Universities can produce students with a broader range of BI skills using an interdisciplinary approach.
3. Instructors believe they need better access to BI teaching resources.
4. Academic BI offerings should better align with the needs of practice.

These ideas are developed further in this section.

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[2] The Teradata University Network (TUN) is an academic-led university alliance program that offers free BI teaching software and materials through a website (www.TeradataUniversityNetwork.com) to faculty and students around the world. At the time of publication, TUN supported 2,560 faculty members in 1,262 colleges and universities located in eighty-five countries.

[3] Michael Goul and Uday Kulkarni (Arizona State University) co-chaired the first BI Congress.

[4] Barbara Wixom (University of Virginia) and Gloria Phillips-Wren (Loyola College Maryland) co-chaired BI Congress II.

[5] For the complete program, go to http://www2.commerce.virginia.edu/bicongress/.

[6] The complete report of survey results can be downloaded at www.TeradataUniversityNetwork.com.

[7] Sponsors included Teradata, IBM, Deloitte, SAS, EMC, MicroStrategy, and Baseline Consulting.

[8] The B-Eye Network is now part of Information Management Direct.

[9] The complete report of survey results can be downloaded at www.TeradataUniversityNetwork.com.



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## Universities Should Provide a Broader Range of BI Skills Within BI Classes and Programs

*[It's hard finding students with] a good mix of technical and business skills. Too often, students are skewed too far one way or the other.*

BI Recruiter

BI content represents different things to different people; however, in the end, BI coursework needs to cover a diverse and wide range of topics, such as are shown in Table 1.

**Table 1: Topics for BI Coursework**

| |
|---|
| Business subjects (e.g., finance and marketing) |
| Research methods |
| Statistics |
| Data management (e.g., data modeling, SQL, query tools) |
| Data integration |
| Data warehousing |
| Data mining |
| Reporting and online analytic processing (i.e., descriptive analytics) |
| Quantitative analysis and operations research (i.e., predictive analytics) |
| Management communications (written and oral) |
| Systems analysis and design |
| Software development |

The two most common approaches for delivering BI content come from business schools and from computer science/engineering schools.[10] In business school IS curricula, students develop strong data management, business, and communication skills. Few students, however, graduate from business programs with the deep statistics and quantitative skills required for descriptive and predictive analytics. Specialized BI skills, such as developing algorithms for new OLAP and reporting features for BI vendors' tool suites, are also rarely taught.

The approach by computer science and engineering schools produces technologists who possess the required quantitative competencies, but do not have strong business functional knowledge or communication skills. These students find it more difficult to apply their technical knowledge in practical ways that meet business needs.

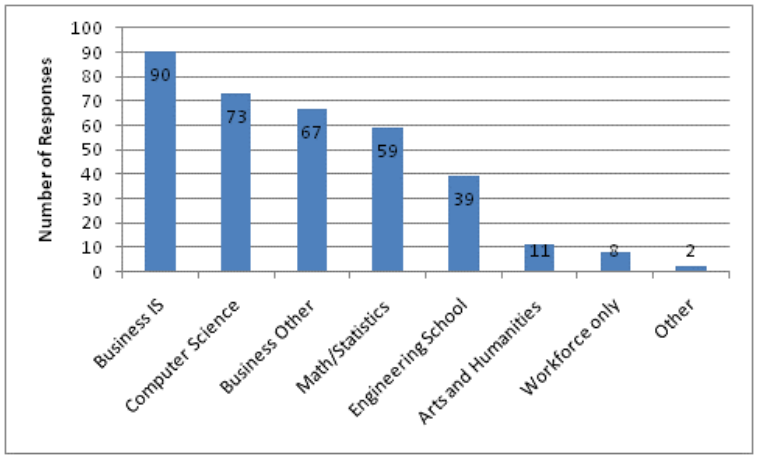
We conclude that to address the widest scale of industry needs, the BI program of the (near) future should cover a broad range of content, ensuring that, at a minimum, students understand data management, business functional knowledge, statistics and quantitative analysis, and communication. These skills are associated with the "hybrid" type of employee who is important for successful company BI initiatives [e.g., Anderson-Lehman et al., 2004; Wixom et al., 2011].

## Universities Can Produce Students with a Broader Range of BI Skills Using an Interdisciplinary Approach

The variety of content described in Table 1 rarely can be offered by a single unit within a department or school. While statistics departments, for example, can teach content that builds strong quantitative skills, they usually are not organized to teach students the rich business functional content required for BI. These silos frustrate recruiters as well as students who need to take classes across university units. Figure 1 illustrates the many university units with which BI recruiters currently interact.

If BI offerings were organized better internally, the hiring process would be much easier for recruiters and would create stronger, more satisfied candidates. This approach requires, however, that professors and program directors need to work across the university and overcome barriers that traditionally create school and department silos.

[10] The two approaches we present represent extremes. There also are hybrid approaches, which are rooted in less traditional academic models, such as Information Technology schools.




Source: BI Congress II survey, based on 219 recruiter responses

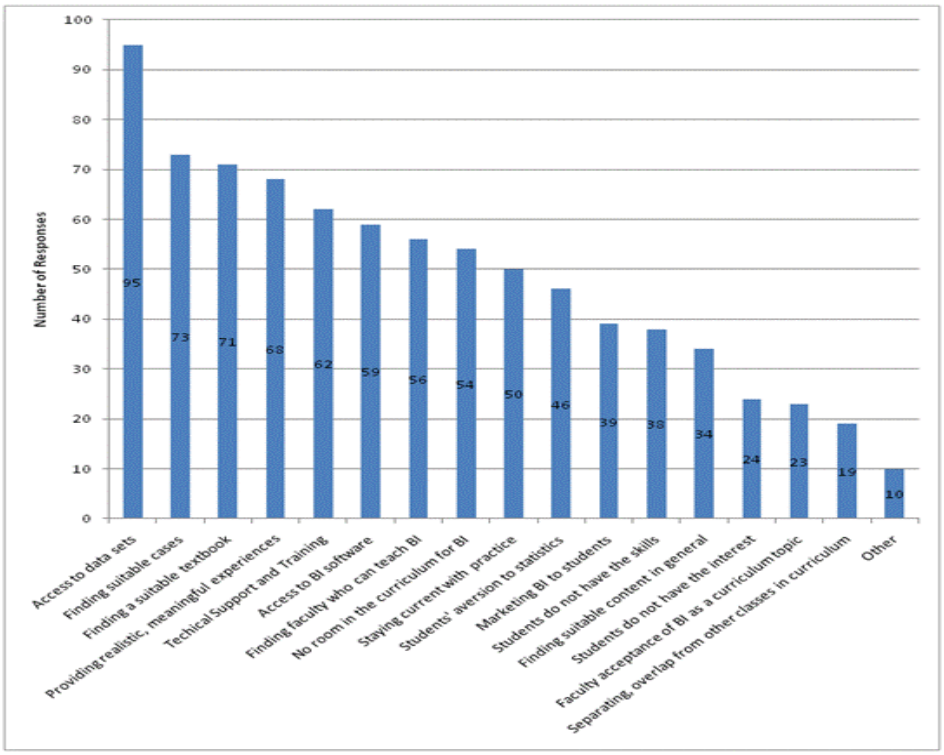
**Figure 1. From Where Do You Hire BI Skills?**

## Instructors Need Better Access to Teaching Resources

*There is very little hands-on material [to teach BI]. Most of my material and labs I created myself.*

BI Instructor

The primary challenges that professors believe they face when teaching BI stem from a shortage of teaching resources and support. Figure 2 indicates that professors who teach BI lack: data sets, suitable cases, suitable textbooks, BI software, and technical support/training. We believe that the pedagogy issues result from existing content not being shared adequately rather than from the resources not existing. That is, instructors are recreating content when teaching BI.




Source: BI Congress II survey, based on 219 recruiter responses

**Figure 2. What Are the Challenges in Teaching BI?**

Currently, the best platforms for accessing and sharing BI teaching content are the vendor academic alliance programs (Section V). Many vendors work with faculty to develop content that can be used with their software tools and data sets. The Teradata University Network (TUN) has a particularly wide selection of teaching materials, much



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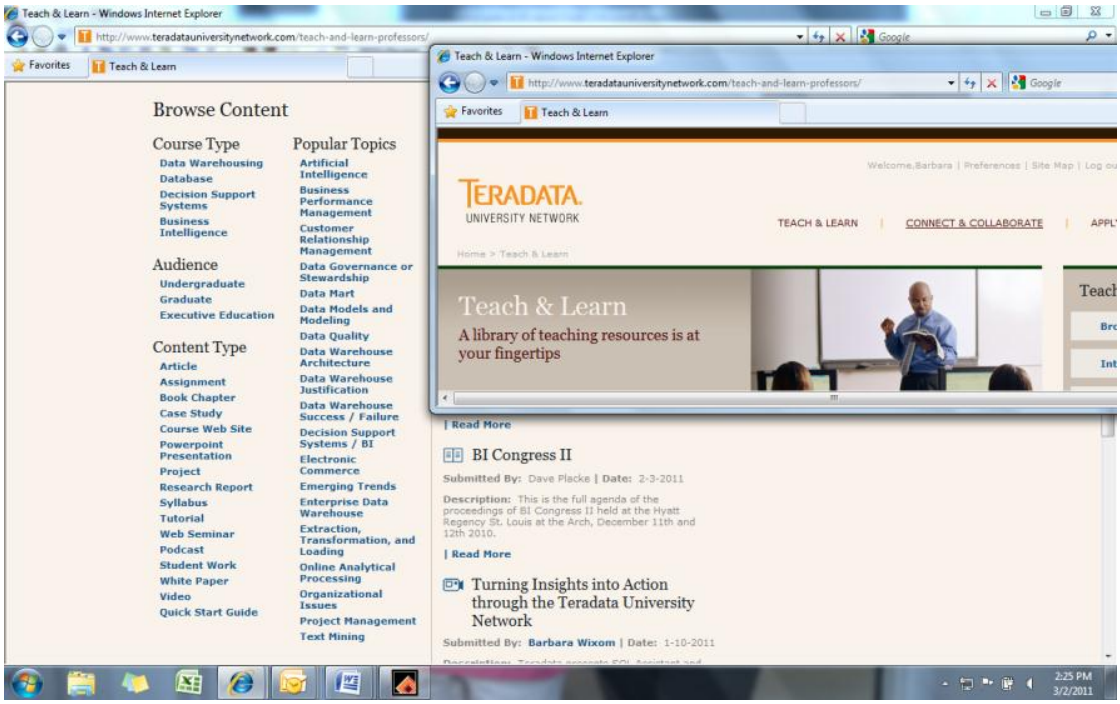
of which is vendor agnostic; the TUN website offers content that ranges from BI syllabi to videos to articles (Figure 3). The BI Congress II incorporated teaching content into its program and attracted strong teaching content submissions for its Teaching Track; these resources are available for the entire BI community through TUN.[11]




Source: BI Congress II survey, based on 219 recruiter responses

**Figure 3. Screenshot of the Teradata University Network**

## Academic BI offerings Should Better Align with the Needs of Practice

> *Academia does not provide the experience required by business. Having finished a BI track, there is no way a recent graduate can accomplish anything close to real life. Real life has many complexities, which a student is not exposed to. I had absolutely no training on data quality and [data warehouse] loading, which is one of the critical processes in BI.*
>
> BI Student

BI content needs to be communicated and taught using realistic contexts, tools, and problems so that students can apply their skills when they accept employment in BI. The BI Congress surveys suggest that many teachers, students, and recruiters find that current academic experiences lack realism. The student survey responses communicate that the most important ways in which their BI education can be improved are tied to realism. Students requested that the following be better incorporated into their classes: real-world software (189), data sets (163), in-class BI projects (154), clearer links to jobs (145), industry speakers (105), and case studies (77) [Wixom and Ariyachandra, 2010].

## IV. ACADEMIC BI BEST PRACTICES

In Section III we introduced four key ideas that we learned through the BI Congress events and surveys. In brief, they are:

1. Provide a broader range of BI skills.
2. Take an integrated approach for BI programs.
3. Develop reusable, high-quality teaching resources.
4. Align with practice.

[11] BI Congress resources are available to instructors at no charge at www.TeradataUniversityNetwork.com. The resources include cases, assignments, slides, and videos.

The BI Congress events and surveys identified a number of universities and professors that are excelling in BI education. In this section, we propose the following best practices for those colleges and universities that currently offer or wish to offer BI content, classes, and/or programs.

## Leverage Corporate and Vendor Relationships and Support

Although many universities incorporate BI content into existing classes and programs, very few have created BI degree programs and offerings. Of the schools with BI degrees and concentrations that responded to the BI Congress surveys, almost all leveraged corporate and vendor relationships and support to make that happen. They employ a variety of models, however, ranging from customized program development to certificate offerings to advisory boards. Appendix A highlights BI programs that both BI Congress events identified as exemplar programs through discussions and survey responses.

There are several reasons why pioneer programs tend to have heavy vendor and corporate influences. For one, vendors and organizations provide needed funding, technology resources, and curriculum guidance. At times, partnerships are leveraged to seed the programs with students—and mitigate market risks so that program directors feel comfortable that curriculum and program development investments will deliver returns. Concurrently, the vendors and companies influence marketplace skills, and they gain access to potential hires. For example, at North Carolina State, SAS has helped the faculty develop a leading edge, highly respected analytics program that develops deep SAS technology skills and expertise.

At the undergraduate level, some of the leading BI programs offer a BI certificate, often in coordination with a vendor partnership. For example, Loyola Maryland and St. Joseph's universities comply with SAS curriculum requirements and are then able to award their BI undergraduates with SAS certification when they complete the program. The undergraduates find software certification attractive because of the link with job opportunities and the credibility that accompanies certification.

## Leverage Academic Software

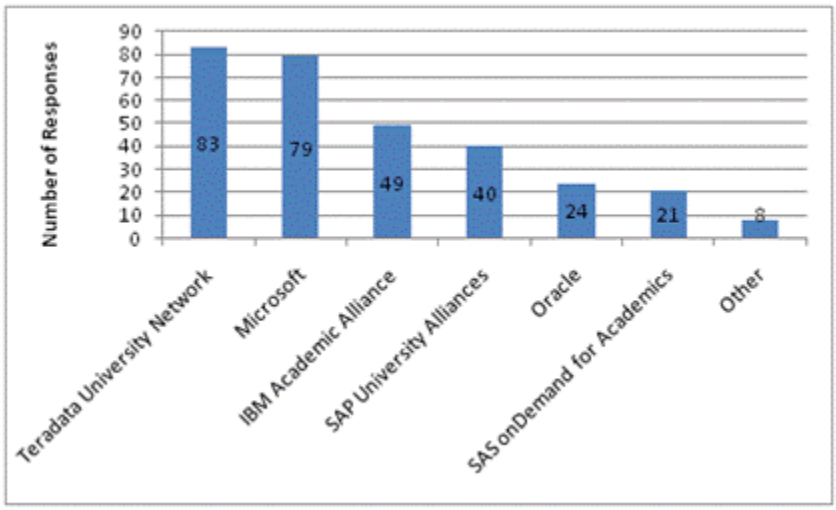
BI is a continually changing field with new developments emerging regularly; therefore, it is challenging for universities to ensure students learn about BI tools and technologies they will see in the workplace. Fortunately, vendors offer academic alliance programs that provide commercial software for academic use. Most of the programs also offer tutorials, webcasts, assignments, certifications and other resources that complement their software, making it relatively convenient for faculty to incorporate BI software into existing curricula. Appendix B lists well-known academic alliance programs.

Companies engage in alliances with the academic community to provide students the skills and exposure to BI software that would facilitate their transition from the university to the workplace [Conway and Vasseur 2009]. Universities across the world take part in these programs to give students experience with mainstream "real world" BI technologies and content.

As indicated in Appendix B, some academic alliance programs use a subscription model to make commercial software available to academic institutions. Companies such as SAP, Oracle, and Microsoft charge a subscription fee for access to their BI software, but the charge is considerably less than commercial pricing. Other companies (e.g., IBM, Teradata) provide their software free to qualifying institutions. The software offered through partnerships ranges from being the latest version to a near current version; however, the software may not include all the features and functionality provided to commercial users.

The majority of software is directed for installation on university computers. Managing this software and keeping it at current release levels is a challenging task involving investment of time and cost [Conway, 2007]. Companies such as Teradata offer BI solutions to academia through the Internet using an application service provider (ASP) model. In this way, Teradata hosts the technology and provides all maintenance and support services. This ASP model offers tremendous value to professors who are free to focus on learning, using and teaching the tools. The trade-off is that using an online solution occasionally encounters disruptions in service due to outages and vendor maintenance.

Some major BI vendors, such as IBM, now are exploring the use of cloud-based solutions for delivering their academic alliance software. IBM's Cognos-in-a-Cloud initiative is in pilot mode as of publication date and intends to offer professors a cloud-based approach to setting up and maintaining Cognos environments.




Source: BI Congress II survey, based on 219 recruiter responses

**Figure 4. What Academic Alliance Programs Are Being Leveraged?**

The University of Arkansas Enterprise Systems Program is a unique academic alliance program in which professors and students access a variety of vendor software and resources that are hosted by the University of Arkansas. The program offers software from Microsoft, SAP, IBM, and Teradata. Additionally, industry partners of the Arkansas Enterprise Systems Program donated computing systems and multiple, large-scale datasets for instructional use. The latter include datasets from Sam's Club (six tables and over 250 million rows of point of sale transactions for eighteen stores), Dillard's Department Stores (five tables with a transactions table of 120 million rows), Tyson Foods, and Wal-Mart (RFID data sets). The Enterprise Systems Program shares resources with the vendors' academic alliance programs.

Almost all of the industry partnership programs provide faculty training for free or at a discounted price. These training programs help faculty begin the process of learning the BI software and incorporating it into their curricula. In addition, many alliances provide access to guest speakers for the classroom, discounted vendor certification opportunities for students, internship and recruitment opportunities, and student software competitions and challenges. Also, many organize academic conferences or workshops that encourage faculty interaction and sharing.

## Use a Multi-Disciplinary Approach to BI Offerings

When university departments or schools work together to provide integrated BI offerings, universities are better able to deliver programs that offer the breadth of skills that BI requires. Further, internal university coordination facilitates a more effective hiring process.

At the University of Virginia's McIntire School of Commerce, faculty from the IT, Marketing, and Quantitative Analysis (QA) areas work together to deliver a series of classes that provide BI skills for the MS Commerce program. The IT Area teaches data management, SQL, and organizational BI topics in an initial IT class; the QA Area next teaches a business statistics class; and then the Marketing Area teaches several marketing classes, including one about customer relationship management (CRM). Faculty members from each area meet at the beginning of the year to plan so that classes build on previous learning and avoid redundancy. The class series produces students who are well prepared for BI careers in Marketing.

At Indiana University, the Kelley School has a large fifty-five-person Operations and Decision Technologies Department that traditionally consisted of three distinct faculty groups: IT, Decision Sciences, and Operations Research. The department leveraged its diversity by crafting an analytics certificate program specifically for Deloitte Consulting. The faculty groups worked together to develop a nine-credit program whereby faculty from each group teach skills that, when combined, form a well-rounded BI curriculum that Deloitte feels is critical for members of its Analytics practice. (See Appendix A for more information on the Indiana University program.)

Ideally, BI programs need to be created using talent from technical and business schools and departments. IS departments have the opportunity to take leadership in working across the university to make this happen.

### Embed BI Content into Existing Requirements and Core Classes, Where Possible

An integrated BI curriculum, such as the ones described above, is one solution to increase BI skills. An equally important need is to produce "BI-aware" managers, that is, managers who will lead tomorrow's businesses to "compete on analytics" [Davenport and Harris, 2007]. These people are not necessarily statisticians, quantitative analysts, or even technologists, but they are functional managers and leaders making tactical decisions that affect their spheres of influence. They are the consumers of BI. Therefore, working knowledge about what BI has to offer should be imparted to all undergraduate and graduate students majoring in business, and not just those pursuing a BI degree or a major in IS.

At the undergraduate level, this strategy calls for embedding BI content and modules in existing required courses for IS and other business majors. Some schools already expose all business students to BI. For example, at Arizona State University, the W.P. Carey School offers a "BI-awareness" module in the core undergraduate IS course. In addition, in the honors version of this course, students read a book about the role of BI in the firm (i.e., *Super Crunchers* [Ayers, 2007]) and complete a mini-project and a presentation around one of the chapters in the book. ASU faculty finds the BI-awareness module increases demand for BI courses in general and IS majors in particular.

Beyond the core undergraduate IS class, deeper exposure to BI should be offered as part of undergraduate functional area core classes and electives. For example, in marketing, the core class should include a "BI in marketing" module and upper-division students should have access to electives with functional BI content, such as a CRM elective with emphasis in analytical CRM. Similar approaches apply to supply-chain and finance courses.

At the graduate level, planning for BI content needs to begin with the MBA student in mind, given that the MBA typically is the most visible and impactful program in leading business schools. MBA students need to understand that firms with BI capabilities have teams that are cross-functional, comprised of modelers/analysts, technologists, and business leaders. The latter role is most applicable to the standard MBA student who is most capable of understanding a business problem, articulating it within cross-functional teams, and supporting the modelers and technologists who deliver appropriate solutions.

The IS faculty at Arizona State University is experimenting with a "Business Intelligence Strategy" MBA elective course that emphasizes how major aspects of a firm's strategy will need to include BI. The "marketing" of such a course requires IS faculty to spell out what it means to excel at BI in multiple professions. For example, for marketing professionals, excelling at BI means understanding not only what the customers want to buy, but how much they are willing to pay; for supply-chain managers, it means not simply tracking inventories, but also anticipating and preventing future problems; for healthcare personnel, it equates to saving patient lives by intervening in real-time based on data from multiple sources.

## V. BI AND CURRICULA

In examining historical cycles of technology innovation, a panel of IS academic leaders concluded that there is an increasing need for faculty to recognize innovations that matter:

> *In the past fifty years, we have lived through incredible changes in information and communications technologies…. Recognizing future technologies and the changes that will occur and making appropriate changes in strategy can make the difference between success and failure for an organization. They can also make a career difference for individuals who are in career-preparation educational programs or who have opportunities for job changes.*
>
> Baker et al., 2011

The time delay associated with new technology assimilation into organizations is exacerbated by the lag between business adoption of a new technology and the emergence of pervasive and effective curriculum models and pedagogy in universities. To reduce the lag, efforts like those of the BI Congress community and clear identification of the gaps that need to be closed are of utmost importance.

Within the IS community, model curricula provide the means to communicate starting points for curricular changes like those motivated by BI's rapid adoption. Two model curricula were established—IS 2010[12] and MSIS 2006[13]—to address undergraduate and graduate level Information Systems curricula, respectively. Both include a strong database component and other foundations for adding BI curriculum models. For example, IS 2010 includes a BI

[12] http://blogsandwikis.bentley.edu/iscurriculum/index.php/Main_Page
[13] http://en.wikipedia.org/wiki/Master_of_Science_in_Information_Systems

elective course. In their current form, however, the model curricula are not yet developed sufficiently to create a BI workforce armed with skills, knowledge, and experience that meet BI recruiters' needs.

There is ample opportunity to build on these model curricula to add BI material. We suggest that the model curricula be developed to articulate requirements for a BI elective and a BI concentration—as well as the content that every undergraduate and graduate business student who does not specialize in BI needs to know to be an effective BI consumer in the workplace.

We recognize that developing curricula for a BI elective and concentration as well as BI content within other courses is not trivial. It requires close coordination among the people who specialize in BI with the AIS graduate and undergraduate curriculum committees.

## VI. CONCLUSION

The BI Congresses and the surveys associated with them show that business intelligence is in high demand in industry and that aspects of BI are being taught in many business schools. The results also show a mismatch at both the undergraduate and graduate levels between what our students learn and what our students need to know. Rather than wringing our hands, we should view this mismatch as an opportunity for the IS field to expand its curriculum, attract more students, and become the academic leader in creating a high-skilled BI workforce. Specifically, we found that universities should consider:

1. Providing a broader range of BI skills
2. Taking an integrated approach for BI programs
3. Developing reusable, high-quality teaching resources
4. Aligning with practice

Based on our findings and on the best practices we observed, we recommend that universities:

1. Expand their ties with BI vendors to provide students capabilities for working hands-on with up-to-date software.
2. Extend ties with BI practitioners who can serve as advisors and provide BI content, such as real-world data sets.
3. Find ways to share teaching materials (including cases) to avoid reinvention.
4. Create multidisciplinary courses (some taught by faculty outside IS) to develop the broad-range of content required for BI.
5. Create practicums in which students solve meaningful problems set in realistic business contexts.

BI is pervasive within organizations, and employment opportunities in BI abound. Therefore, we recommend that the BI community work with the AIS curriculum committees to advance curricula models to develop the BI components, particular those involving a BI elective, concentration, and universal business BI content.

As a field, we need to recognize that IS is not alone in trying to fill the need for BI workers. For example, some actions are originating from operations research, a field whose professional organization (INFORMS) made Analytics the subject of its College on Practice in 2011. Other activity may come out of statistics or out of policy and strategy areas in business schools. At this time, none of these fields, including IS, can claim to offer all aspects of knowledge needed by students seeking to specialize in BI.

The IS field, however, is well positioned to be the leader in creating future business analysts and BI specialists. The IS field's intellectual and knowledge capabilities in decision support systems, business analysis, communication, operations research and statistics, and data management will serve us well. We cannot do it alone, but we can join with departments around our campuses to fill important gaps and to deliver the interdisciplinary offerings that recruiters and students value. Incorporating BI into IS curriculum efforts is an effective way to move the IS field forward.

BI is a major opportunity for our field, and the time to act is now, before the window of opportunity closes. If we embrace this opportunity, then recruiters, vendors, organizations, students, university colleagues—and the IS field as a whole—benefit.

## ACKNOWLEDGMENTS

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## REFERENCES

*Editor's Note*: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

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## APPENDIX A: EXEMPLAR BI PROGRAMS

**Table A-1: Exemplar BI Programs**

| University | Partner | Offering |
|---|---|---|
| University of Denver | Colorado Business Intelligence Community Connection | 2-year MS in BI |
| Advisory board includes Bill Inmon and Claudia Imhoff. Program is taught using a cross-disciplinary team. URL: www.daniels.du.edu/schoolsdepartments/itec/degreesprograms/graduate/graduate.html | | |
| North Carolina State | SAS | 10-month MS in Analytics |
| Offered by the Institute for Advanced Analytics. URL: analytics.ncsu.edu | | |
| Fordham University | IBM | "Business Analytics for Managers" course |
| Began spring 2010 for Fordham students. www-03.ibm.com/press/us/en/pressrelease/28994.wss | | |
| St Joseph's University | SAS and other vendors | MS in BI; BI certificate; online offering |
| Leverages a variety of vendor software. www.sju.edu/academics/hsb/grad/msbi | | |
| Indiana University | Deloitte Consulting | Customized Graduate Certificate in Business Analytics |
| 3 three-credit courses that can be applied toward an Indiana University MBA. URL: www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/us_consulting_BA_AshokSoni_AnalyticsinAcademia_102210.pdf | | |
| Alabama, Arkansas, Loyola-Maryland, NYU, Oklahoma State, St. Joseph's, Texas at Dallas | SAS | BI Certificate |
| 4-5 undergraduate or graduate courses using SAS software. URL: gsb.uark.edu/certificates.asp | | |
| Loyola Chicago, SMU, Oakland, Washington, Missouri, George Mason | Various | BI Certificate |
| Noncredit, week-long customized, company-specific format for groups of managers from the same organization URL: www.luc.edu/exec-ed/cert_datawarehousing.shtml | | |

## APPENDIX B: VENDOR ACADEMIC ALLIANCE PROGRAMS

**Table B-1: Vendor Academic Alliance Programs**

| Vendor Academic Alliance Program | BI Software Access Offered | Method of Delivery and Cost to University | Teaching aids |
|---|---|---|---|
| Teradata University Network (www.TeradataUniversityNetwork.com) | Teradata SQL Assistant, MicroStrategy, Tableau, Planners Lab, XKEN, SAS | Online; Free | Faculty contributions, tutorials, assignments, cases, projects, articles, reports, videos |
| IBM Academic Initiative (https://www.ibm.com/developerworks/university/academicinitiative) | Cognos, DB2, SPSS, other | Download, Online, Cloud; Mostly free | Tutorials, white papers, computer-based training modules |
| Microsoft<br>MSDNAA (http://msdn.microsoft.com/en-us/academic)<br>MSDAA (http://www.microsoft.com/education/highered/faculty/curriculum/dynamicsaa/default.aspx)<br>MSFRC (www.facultyresourcecenter.com) | SQL Server, Microsoft BI stack, BI in ERP and CRM Products | Download, Online, CDs; Subscription to MSDNAA required or free | Aids are available through MSFRC; Lesson plans, videos, presentations for Microsoft software |
| MicroStrategy (www.teradatauniversitynetwork.com) | BI software | Online; Free | YouTube training videos—and presentations, assignments, articles, other resources available via Teradata University Network |
| SAP University Alliance Program (http://www.sdn.sap.com/irj/uac) | NetWeaver Business Warehouse, Crystal Reports, Business Objects | Online; SAP must be used at the university (but parts of portal open); $8,000/year for alliance membership | Course material, lectures, case studies, exercises, demos |
| Oracle Academy (https://academy.oracle.com) | Oracle e-Business suite, People Soft Enterprise, Hyperion BI | Download, Online; Subscription | Oracle-specific content and curriculum |
| SAS Global Academic Program (http://support.sas.com/learn/ap/prof/teach.html) | SAS software | Download, Online; Purchase or lease; Free Training | Course notes, presentations, data sets, exercises |
| Tableau for Teaching (http://www.tableausoftware.com/academic) | Tableau software | Download; Free | Online training, on-demand courses |

## ABOUT THE AUTHORS

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