



Academic Analytics: Business Intelligence For Higher Education

September 2013

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Academic Analytics: Business Intelligence For Higher Education

Introduction

For more than a quarter of a century, corporate America has benefited from business intelligence, the practice of using analytics to make informed business decisions. Today, colleges and universities are exploring ways they can leverage those same analytic tools in both administrative and instructional functions.

In this special report, sponsored by Dell, *Campus Technology* looks at how institutions of higher education are using analytics to recruit and retain students as well as improve teaching and learning. In addition, the paper takes a brief look at the barriers of wider implementation of advanced analytics across all functional areas of a college or university.

Business Intelligence in Education

While the principles of business intelligence and the methodologies of business analytics certainly apply to higher education, many educators and researchers felt the term business analytics was inappropriate and insufficient to describe the needs and objectives of a higher education environment.

As a result, beginning in 2005, Goldstein and Katz and other educators and researchers settled on the term *academic analytics* to describe “the intersection of technology, information, management culture, and the application of information to manage the academic enterprise.”⁽¹⁾ The term applies to all aspects of managing the business of an academic institution, from enrollment management to finance and budgeting to student progress.

In recent years, a new term emerged: *learning analytics*. Learning analytics refers to a subset of academic analytics that pertains specifically to teaching and learning.

In 2011, the 1st International Conference on Learning Analytics and Knowledge defined learning analytics as “the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs.”⁽²⁾

Learning analytics, then, is focused on the learner and is designed to assess academic progress and predict future performance based on “the interpretation of a wide range of data produced by and gathered on behalf of students.”⁽³⁾ Learning analytics make it possible for the instructor to customize learning paths and provide appropriate feedback based on specific needs of individual students.

Predictive analytics at Baylor University

Baylor University, a private institution in Waco, TX, is an example of one institution that has developed a sophisticated admissions strategy based on the gathering and analysis of massive amounts of data on prospective students. In developing their program, Baylor identified eight variables that taken together result in the best predictive model for students who are likely to matriculate. They are:

- Attending a premier event;
- Visiting the campus;
- Interest in extracurricular activities;
- High school attended;
- Mail qualifying score (Baylor level of interest);
- SAT score (for non-Texas residents, this variable was replaced by the number of solicited contacts);
- Number of self-initiated contacts; and,
- Telecounselor score (Baylor level of interest).

By analyzing these variables Baylor has been able to segment its prospect pool, target the most likely candidates, and deliver the appropriate promotional materials to each group.⁽⁹⁾

Advanced Analytics in Today's Higher Ed Environment

The use of advanced analytics in higher education is still in its infancy. According to one recent survey among chief information officers at 380 public and private colleges and universities, only 8 percent of respondents reported advanced applications of analytics in their institutions.⁽⁴⁾ The majority of the respondents said that the primary use of analytics at their institutions was for reporting transaction data, such as SAT/ACT scores, GPA, or facilities data. At the same time, a majority of respondents also reported plans to expand their analytical capability.

In fact, in a 2012 study by Educause Center for Applied Research, 69 percent of the study's responding institutions reported that analytics is "a major priority for at least some departments, units, or programs."⁽⁵⁾

Most institutions that are exploring the power of advanced analytics are doing so in two main areas: enrollment management (determining which students in an applicant pool are most likely to enroll in a given institution and tailoring promotional materials accordingly) and student retention (identifying at-risk students early on and intervening with appropriate support materials or resources). A third area of promise is the use of analytics to help improve teaching and learning.

Enrollment Management

Enrollment prediction models are designed to identify, recruit, and retain a specific cohort of students based on certain pre-determined variables and criteria. These models help enrollment managers identify "ideal" students and decide which students to accept, deny, or put on hold, based on historical data of previously enrolled students.

Enrollment prediction models can also help enrollment managers tailor recruitment packages and follow-up efforts. "Just as Amazon.com knows when to send someone an e-mail notice of a new book that he/she might be interested in buying, so does an admissions office know whether to invest in printing and postage necessary to send a high school junior a glossy campus viewbook," wrote John Campbell, associate vice president of the Rosen Center for Advanced Computing at Purdue University (IN), Peter DeBlois, former director of programs and media relations for Educause, and Educause President and CEO Diana Oblinger, in the *Educause Review*.⁽⁶⁾

Predictive modeling can help target which prospective students are most likely to matriculate, based on past behaviors and characteristics of successful applicants.

"The history behind who enrolled at your school," says Charles Ramos of Noel-Levitz, a higher education consulting firm, "tells a powerful story about who you can expect to enroll in future terms."⁽⁷⁾

Clearly, any tool that will help colleges and universities make better decisions about which students are likely to matriculate can have direct cost benefits. In 2011, the cost of recruiting a single new student ranged from \$457 for a four-year public institution to

Improving retention at Sinclair Community College

At Sinclair Community College in Dayton, OH, for example, an Early Alert System is helping to improve retention and success of at-risk students. Early Alert is an intervention program that allows faculty to notify advisors of any issues that may affect the success of a student. The intervention program is part of the school's Student Success Plan, open source analytics software designed to increase success and graduation rates of at-risk students. According to Sinclair, Early Alert "contributes to higher retention rates for SSP students than the general 'not at-risk' population."⁽¹²⁾

\$2,185 for each new student at a private and university.⁽⁶⁾ Knowing where to target that money and how to spend it can help enrollment managers optimize both effectiveness and efficiency.

Student Retention

Today, most colleges and universities are grappling with the problem of student retention – and with good cause. Among those students who begin their college career as full-time freshmen in four-year colleges and universities, only about 56 percent of male students and 61 percent of female students complete their degree within six years.⁽¹⁰⁾ This means that each year more than 500,000 students fail to achieve a college degree.

While there may be numerous reasons why a student doesn't continue to pursue his or her college degree after freshman year, research shows if a college or university can identify at-risk students in their critical first year, and intervene with appropriate resources or university support programs, they can potentially increase retention and help students persist to graduation.⁽¹¹⁾ This is important not only for the student, but for university when education stakeholders are now measuring the success of an institution in terms of its graduation rates.

A number of schools are turning to analytics as a way to identify at-risk first-year students and to recommend the appropriate intervention, for outreach efforts, counseling, or other action.

Teaching and Learning

Each year since 2002, the New Media Consortium Horizon Project, a comprehensive research venture, has identified and described emerging technologies likely to have a significant impact in teaching and learning within three specified adoption horizons: near-term horizon (within the next 12 months); mid-term horizon (two to three years out); and far-term horizon (three to five years away).

In 2012, the Higher Education Edition of the Report identified *learning analytics* as one of two technologies placed in the mid-term horizon, predicting widespread adoption of learning analytics within the next two to three years. (It is worth noting that learning analytics was featured in the 2011 NMC Horizon Report on the far-term or three-to-five year horizon.)

While there exists exemplary analytics programs for identifying at-risk students and then recommending appropriate intervention resources or strategies, the larger promise of learning analytics, according the Horizon Report, is that it will "enable faculty to more precisely understand students' learning needs and to tailor instruction appropriately far more accurately and far sooner than is possible today."⁽¹³⁾

The availability of real-time insight into the performance of students has positive implications for both teachers and students. For teachers, real-time data means they

Analytics Improve Teaching and Learning at Purdue U.

In 2007, Purdue University in West Lafayette, IN, launched a software application designed to track student academic progress, detect early warning signs, and provide intervention strategies, starting as early as the second week of class. Called Course Signals, the Purdue app communicates to students, faculty, and advisors a student's status in a course in real time, using a clever stoplight system -- red for high likelihood of failing, yellow for potential problem of succeeding, and green for high likelihood of succeeding.

"In brief," says Kimberly Arnold, educational assessment specialist for the Teaching and Learning Technologies Group at Purdue, "Signals works by mining data from the SIS, the CMS, and the gradebook. This data is then manipulated, transformed into compatible forms, and fed into an algorithm that generates a risk level with supporting information for each student, represented by a green, yellow, or red indicator."⁽¹⁵⁾

By the spring of 2010, the results of the program were impressive. Signals users not only scored up to 26 percent more As or Bs, they also earned up to 12 percent fewer Cs and up to 17 percent fewer Ds and Fs. In addition, students asked for help earlier than the control group.⁽¹⁶⁾

can take immediate steps to adjust and customize their teaching styles to better meet the needs of students. "For students, receiving information about their performance in relations to their peers or about their progress in relation to their personal goals can be motivating and encouraging," wrote Phillip Long, director of the Centre for Educational Innovation & Technology at the University of Queensland, and George Siemens, associate director for the Technology Enhanced Knowledge Research Institute at Athabasca University, in the *Educause Review*.⁽¹⁴⁾

Barriers to Success

The amount of data created and stored throughout the world continues to grow at a staggering rate. A 2003 study at the UC Berkeley School of Information, for example, found that the amount of new information being created every year and stored on media was 5 exabytes, an amount equal to the information stored in 37,000 libraries the size of the Library of Congress in the US. Four years later, by 2007, the amount of information stored each year had increased to 161 exabytes. Google CEO Eric Schmidt once noted, in a 2011 report from the Berkeley Center for Law and Technology, "Mankind now creates as much information every two days as it had from the dawn of civilization to 2003."⁽¹⁷⁾

Despite the enormous amount of data that a university collects and stores — often in a variety of systems in a variety of locations — much of that data is not being used proactively, either for prediction or decision making. Rather it is being used, as Bichsel notes, primarily "to satisfy credentialing or reporting requirements," if it is used at all. "Identifying the barriers to using data proactively to make decisions is key to making progress in analytics."⁽¹⁸⁾

In broadest terms, those barriers include concerns about affordability, concerns about the data, concerns about legal and ethical issues, and concerns about the technical challenges.

Affordability. Given the economic climate, it should not be surprising that the biggest barrier to analytics in higher education is the presumed cost, not only for computing and storage, but for important human resources that are needed for data preparation, processing, and analysis. As many IT professionals and other school administrators ask, "Will the investment translate to improved graduation rates, retention, and other improved metrics across all functional areas? Bichsel believes that "the increased competition between institutions will help justify an analytics program to improve efficiency and effectiveness."

Managing the data. Many institutions are concerned both about the appropriate use of the collected data as well as the potential inaccuracy of the data. Who owns the data? Who should have access to it? Are the data standardized? How accurate are the data?

Toad Business Intelligence Suite 2.0 Helps Improve Decision-Making in Education

The Toad Business Intelligence Suite, an integrated data analysis platform, is designed to help K-12 and higher education institutions improve their decision-making processes. The comprehensive BI solution enables campuses of all sizes to easily access and extract information from heterogeneous data sources, then view and share the data for meaningful analysis.

Toad helps schools turn data into valuable intelligence with:

- Self-service reporting and advanced data provisioning;
- Data discovery tools that allow users to explore, analyze and understand data in simple, intuitive views; and,
- Data integration and collaboration, for easy sharing and viewing of information.

With Toad -- a system that is both simple to set-up and to maintain -- both technical and non-technical users can easily and securely access the data they need, when they need it.

Toad offers strong data governance without sacrificing agility and flexibility. "By being able to connect multiple sources of information into a single, integrated view," says Joanna Schloss, product evangelist at Dell Software, "and by being able to analyze those metrics quickly and agilely, users can respond more rapidly."

Editor's Note: Dell acquired Quest Software (the original developer of Toad Business Intelligence Suite) in 2012.

These are just some of the questions that create a roadblock to a successful analytics program.

Another problem for many universities is that data are often "siloed" — maintained in different locations with different and incompatible technology standards, making data integration difficult. Along with this lack of interoperability is the fact that different departments within a university are often "reluctant or unwilling to share data necessary for analytics."⁽¹⁹⁾

Legal and ethical considerations. For most schools, the legal and ethical concerns about collecting, storing, and using the data raise a variety of significant issues about data stewardship and privacy. For example, is the institution adhering to the Family Educational Rights and Privacy Act (FERPA), a federal law that protects the privacy of students/ education records? As Educause explains, "On one hand, institutions might be vulnerable to charges of 'profiling' students when they draw conclusions from student data; on the other, they could be seen as irresponsible if they *don't* take action when data suggest a student is having difficulty."⁽²⁰⁾

Technical challenges. Self-service analytics is potentially very powerful. But currently many faculty and staff feel that learning how to access and interpret the data is too difficult or time-consuming. For many, they would prefer to rely on their intuition, gut instinct, and experience when it comes to teaching and learning, all of which are important in any educational environment. Yet, understanding how to access and use data to help inform their intuition and experience can also play a critical role in the advancement of teaching and learning.

Creating an Effective Analytics Plan

An effective analytics plan for a business environment, according to analytics expert Tom Davenport, is comprised of five key attributes, including the right data, the right amount of enterprise/integration/communication, the right leadership, the right targets for analytics, and the right analysts.⁽²¹⁾

Bischel used these key attributes to inform an analytics maturity model for higher education, identifying five factors that are essential to a successful, advanced academic analytics initiative.

The five factors include:

Leadership: Senior leaders (including faculty and administration) need to be publicly committed to the use of analytics and data-driven decision making.

Expertise: Any initiative needs professionals who have specialized analytics training.

Data: Data need to be standardized (and accessible) to support comparisons across areas within an institution and across institutions.

Governance/Infrastructure: Information security policies and practices need to be in

Transforming Data Into Intelligence at Concordia U.

Concordia University had a problem. The 3,000-student private, liberal arts institution had a wealth of valuable data but it was all housed in disparate locations. The university needed a way to streamline this data so it could be accessed and transformed into actionable intelligence.

After evaluating a number of solutions and vendors, Concordia selected Dell's Toad BI platform. Dell's solution links to all the institution's databases, including Oracle Banner system, MySQL CRM, Blackboard, and Salesforce. University administrators, staff, and third-party vendors can now quickly access data as well as create and share reports using the system's easy-to-use interface

"Toad Business Intelligence Suite had everything I was looking for in a self-service BI tool," said Rebekah Anderson, director of business intelligence at Concordia University. "For the more technical data consumers, I enable them to provision data, make changes and run reports on demand. For the less-technical, consumers, it's super easy for them to browse and visualize data without having the ability to make changes."

place and clearly articulated.

Investment: Funding for analytics must be viewed as an investment rather than an expense.

With these attributes as a framework, institutions can develop an advanced analytics program that can help meet the numerous challenges that face higher education in the future and create positive change across all functional areas, including administration, research, teaching and learning, and support resources. As a result, the college or university will become, as Long and Siemens suggest, "a more intentional, intelligent organization with data, evidence, and analytics playing the central role in this transition."⁽²²⁾

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