



Building a Smarter Campus: How Analytics is Changing the Academic Landscape

As the amount of data in higher education is increasing exponentially, data analytics is fast becoming the process-of-choice for colleges and universities that want to improve student learning and campus operations. By turning masses of data into useful and actionable intelligence, higher education institutions are creating smarter campuses—for now and for the future.

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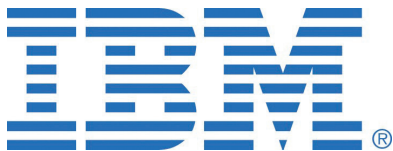


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Introduction

These days, organizations are drowning in data—customer relations management, web site usage, telemarketing research, email, and social networks, are just a fraction of the data inputs that organizations are trying to manage as they aim to better serve their constituencies and stay ahead of the competition.

But smart organizations are not letting the waves of data overwhelm them. Their leaders are turning to data analytics as a key business practice. Universities and colleges are a microcosm of this movement. Once primarily the purview of the business and research worlds, analytics are now making a strong showing in academic institutions as well. Indeed, in the current economic crunch, doing more with less has become the norm, and analytics provides the traction that helps make smarter decisions possible. These campuses are applying tools and proven practices for business intelligence, predictive analytics, financial performance, strategy management, and other analytic applications to improve their current and future performance.

Yet the challenge is formidable. James Lacey, Director of Finance for London-based Nottingham Trent University, notes that “the volume of data we have to process is mind boggling, including applications, enrollments, completion rates, and a whole number of other metrics for some 25,000 students. Turning this mass of data into meaningful management information is not a simple task.”

Lacey knows whereof he speaks: His school has been applying analytics technology to improve its reporting and analysis capabilities across a multitude of campus initiatives: finance, human resources, property management, and student records. “It’s more important than ever that our management team has the information they need from all departments to make the best decisions for the university and its students,” he notes.

Practically speaking, at almost any higher ed institution, everything every student does now is being recorded, including his or her activities, assignments, and performance. So at its heart, data-driven intelligence generated by analytics can help improve the student experience. By analyzing student data and getting down to ever finer detail, educators and administrators using these analytic systems gain a much deeper understanding of the student, enabling the decision-makers to anticipate the next stage, the next need, specific performance challenges, and even potential outcomes, and guide the affected individual to the right action for a given situation.

Analytic tools are useful from a business and marketing perspective as well. Notes Lacey: “The competitive edge will be gained from turning the data collected into useful information that we can analyze” toward improving business practices like recruitment, fundraising, and operations.

IBM has been an acknowledged leader in offering analytics tools, professional services, and proven practices specifically for education. Through its Academic Initiative, which provides generous licensing programs for its SPSS and Cognos product lines, comprehensive training and curricula, and access to subject experts for qualified colleges and universities, IBM is helping higher education institutions all over the world learn to create organizational cultures where the smart use of data is driving institution success.

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IBM SPSS Statistics

Wider constituencies of people within higher education are able to benefit from advanced analytics by virtue of the fact that they no longer need deep IT skills or an advanced degree in statistics to use the tools. Users don't have to go into the nuts and bolts of algorithms or queries to access multiple sources and forms of data. IBM SPSS Statistics version 20 is a base statistical analysis program that enables that to happen behind the scenes.

The features of IBM SPSS Statistics are available through pull-down menus or via a command syntax language. The user uses either approach to call up relevant data from the source and perform analysis to find relevant patterns. The program will highlight useful information and enable the user to shuttle it to reports and dashboards for user analysis.

The base product can be extended with IBM SPSS add-on modules to address specific types of data analysis.



Smarter Analytics: The Power of Predictive and Prescriptive Tools

There are many kinds of data analytic tools, but two of the most powerful in education are *predictive* and *prescriptive* analytics. Predictive tools answer an important question: Based on what's already happened, what's going to happen next? Prescriptive answers the ensuing question: In light of what we believe is going to happen, here are recommendations on how to best respond.

These two dimensions of smarter analytics allow educational decision-makers to detect patterns that exist within the masses of data, project potential outcomes, and make intelligent decisions based on those projections. Analytic tools, such as IBM SPSS Statistics, enable the quick creation of models that can be run against student data in order to identify and bring to the forefront those individuals, for example, whose performance is out of kilter with the norm. These tools can deliver a course of action, so that the educator understands what the right type of intervention would be based on data-driven findings.

Specialized statistical software chews through data to create models that generate correlations or connections among seemingly unrelated pieces of data. Those related pieces of data become the leading indicators, relevant variables that have an impact on an outcome. Analytics refine the analysis to uncover which indicators are the most influential among all of the possible scenarios in order to give those top billing in decision-making. Once the model is "trained" on past data, it can be used for predicting more accurately what's going to happen next and which course of action will be most effective given specific factors.

How these powerful tools are being applied in higher ed shows the breadth and depth of their potential.

Targeting Student Scholarships. Two years ago, David Wright, a faculty member in the department of Sociology at Wichita State University (KS) proposed a project in which the university would use analytics to find out whether or not it was spending its limited scholarship funds on the best student candidates in terms of their ability to attend the school and remain until degree completion.

Wright describes the department's prior approach to scholarship awards as: "We have this amount of money, so let's go out and push those scholarships to a number of students who might be prospects and hope they come and hope they succeed."

That approach, he knew, was not sustainable. "We wanted to flip it. We wanted to target the students who would be the greatest return on investment, then package the scholarships to work better for them."

Using IBM SPSS Statistics software, Wright and his team brought about a reduction in the amount of cost connected to the scholarship program and an increase in the value of those scholarships, "because the money we spent was actually attracting higher quality students who were staying with us longer," Wright notes.

Based on the success of that initiative and others like it, Wright now heads up Wichita State's office of strategic planning and business intelligence. Part of his mission in his new role is to evangelize the use of data analytics within functional units and departments in order to increase their efficiency, reduce expense, and promote operational decisions based on the use of live data. All of these efforts are using a suite of software -- particularly, IBM SPSS Statistics -- to drive data collection, analysis, and distribution throughout the university.

Improving Admissions ROI. In a recent endeavor Wright worked with leaders in undergraduate admissions to help them better understand the drivers in new student recruitment. The solution extracts data from source production systems and creates a

IBM Cognos Business Intelligence

Version 10 of IBM's Cognos Business Intelligence suite provides an integrated set of programs for query and reporting, analysis, creating scorecards and dashboards, doing real-time monitoring, and extending the results generated with IBM SPSS Statistics throughout an organization.



centralized and integrated student and course database, which is refreshed nightly and contains data all the way back to 1982.

A set of equations weighing demographics, academic history, and other factors for different student populations (freshmen, transfers, and so forth) are run against potential prospects to target those students who have the highest probabilities of coming to Wichita State and therefore result in the highest recruitment "yields" within each category of student type.

The results have been remarkable. Now, when admissions interacts with prospects or evaluates applicants, "we can target those who have greater ROI, generating higher yield at lower cost," Wright says.

"Just in the last year, admissions has eliminated all of their out-of-state travel," Wright says. "They've discovered they didn't need to do it; most of their students come from in state. They eliminated 14 college fairs. They began to restrict the number of high schools they'd go only to those that had the highest probability of being able to pull students in. All of that meant they could decrease the number of funds they needed for their operations while increasing the number of students they had coming into the institution."

One example: Where a direct mailing of 9,000 letters would go out before, now they're getting the same results with 5,000 to 6,000 letters, "and we're going to get more students than when we did with 9,000," adds Wright. Successful recruitments were up a remarkable 18 percent last year and are up 26 percent this year.

Identifying At-Risk Students. Wright has begun applying analytics to enrollment too, encompassing students who have been admitted to the university and have registered for a class. "Our first target has been identifying at-risk students," he noted. But contrary to the typical institutional approaches, Wichita state is working to identify at-risk students before class begins. "For us, once the class begins, it's almost too late to make a change other than having the student drop out," he explains.

For the last year, advisors in the enrollment unit have been receiving reports notifying them of potential conflicts -- students who have enrolled and registered for a class that could put them at further academic jeopardy. Before the class begins, Wright explains, the advisor can take steps to redo that student's schedule, "to put them in classes where they'll get preparation for the day when they may be ready to take the other classes."

Tracking Attendance. Edinburgh's Telford College is one of Scotland's larger colleges, with about 15,000 students and 600 staff. Not so long ago, the administration relied on reporting that tended to do decision-making based on "flat reports." As IT Manager Lisa Dawson explains, "You get the information, but there's nothing smart about them. You have to look for any exceptions."

That was a problem when it came to tracking attendance. Many of Telford's students rely on government funding to pay for their education, and those funds are parceled out monthly based on solid class attendance as reported by each lecturer.

Because the exception tracking relied on a pattern-matching process that was manual, if somebody stopped attending, the registrar might not notice until five or six weeks later. "By which time, the student is gone," Dawson acknowledges. "The government funding provided for that person to be in that course has been used, and it can't be used for somebody else. That's just a waste."

At the beginning of 2010, the college was directed by Miles Dibsdall, the university's new principal and chief executive, to lower absenteeism to improve student attendance. Because the college already had IBM Cognos software in house, Dawson sought advice from IBM to find out if there was anything Telford could do with the software to address

Preparing Students for Jobs in Analytics

Not only are data analytics playing a role in making institutional operations more effective, but a number of schools are preparing their students for careers in analytics as well. Just in the last year both Northwestern University and Fordham have launched new masters degrees in analytics to provide education on advanced data analysis, advanced statistics, database management, web analytics, predictive modeling, and marketing analytics, among other related topics. Both use IBM software at their core.

In each of these announcements, the schools are collaborating with IBM through its Academic Initiative, a program that gives colleges and universities access to technology and business industry expertise. That includes curriculum, project-focused case studies, access to software, and guest lecturers.

"Business leaders are faced with an enormous, and ever-increasing, amount of complexity," says Northwestern's Julio Ottino, dean of the school of engineering. "It is critical that we prepare the next generation of leaders with the skills to find trends and patterns in this vast amount of data. The field of analytics provides powerful tools to find meaning and opportunity amid complexity. We are committed to preparing students to excel in this emerging field, and we value the support of IBM in our efforts."



the reporting gap that existed. She wanted tutors—who were put in charge of following up on absenteeism—to receive timely information. IBM put her in touch with a local business partner, Barrachd, which came in and showed her and her IT team how the latest version of IBM Cognos Business Intelligence could support the work of the campus administrators and the tutors.

The new IBM Cognos BI data analytics model created with the help of Barrachd gathers attendance data from the registers that lecturers take at the start of each class and integrates it with course-related information from the student information system. The application analyzes the attendance records against predefined limits personalized for each student and generates notifications whenever class attendance falls below a specified threshold. Those alerts show up in reports and on dashboards used by the tutors so that they can intervene and find out what's standing in the way of the student's success. "We can notify people in advance, to say, 'You're not going to get your bursary payment this month, because your attendance isn't high enough,'" Dawson notes.

The model has lately been integrated with the college's text message service and its new mobile app. Now, when those monthly government education stipends don't arrive when they're expected, there's no more waiting on the phone to speak with a college representative. Students can pull up their own schedules and attendance records on an iPhone or Android device and confirm the accuracy of the data. That access, says Dawson, "stops a lot of frustration. It's all about trying to use technology in a smarter way."

During what has been a challenging year for higher ed institutions in the United Kingdom, Telford reports that its achievement rate has increased from 78 percent in 2008-2009 to 82 percent in 2010-2011; likewise, the completion rate has improved from 89 percent to 92 percent during the same period. "That's not just due to technology," Dawson asserts. "That's due to people and processes, with technology wrapping around them."

Evaluating Curriculum. While the attendance system has been incredibly useful for addressing the attendance aspects of retention, now Telford College is also applying data analytics to another piece of the retention puzzle: curriculum evaluation. As Dawson explains, when a specific course is experiencing larger-than-normal dropouts, the model will highlight that to bring it to the attention of administrators.

"Is it a problem with the standard of teaching? Is it a problem with the lecturer?" she says. "It helps you plan your curriculum in a more satisfactory way, so you get the best results for the student. Ultimately, you want every person to achieve as much as they can."

Telford has entered into merger talks with two other Edinburgh colleges. Should that happen in 2012, as expected, Dawson believes that the type of supportive model developed at her college can be used at other institutions. "People are very excited about what we're doing and they're interested in learning more. This could become a standard model across all of the colleges to support best practice and support attendance and retention. Our developments show how smart technology can support the learner journey."

Dawson is also working with MIS, the department in charge of managing institutional data, in order to bring other key business systems into Cognos. While the current work focuses on student records, there's a small deployment for human resources to track staff absenteeism. The next stage will bring finance data into Cognos to produce reports for budgeting and monitoring spending.

Identifying Key Donors and Investors. Indeed, the use of business analytics in higher education shows rich promise in many areas outside of teaching and learning. In the area of fundraising, for example, some alumni organizations are finding that they can use analytics to go through their databases of alumni and identify those with the greatest propensity for

giving donations -- and with the greatest potential to grow their donations as their careers evolve. Likewise, predictive analytics can be applied to uncover those donors who may be disengaging from the institution and becoming less likely to contribute. Prescriptive analytics can offer ways to keep them actively engaged. The result: more donors giving more money over longer periods of time.

North Carolina State University has been using IBM data analytics tools to identify potential investors for its technologies and scientific advancements. The university is applying the analytics technology to search through massive amounts of web data, such as blogs, forums, reports, industry-related news sites, and government web sites to produce a short list of potential investors. By streamlining the matching process, the institution is looking to speed up commercializing of inventions. "This project allows us to concentrate on those activities of highest value and payback for the university," notes Billy Houghteling, director of the Office of Technology Transfer.

Saving on Operations. Analytics is also being used on campus to save operating costs and cut energy usage. For example, McMaster University in Ontario, Canada, is working with IBM to improve the energy uses and supplies in its buildings campus-wide. Together, they're developing performance models and analytics using real-time data from sensors, actuators and meters, and dynamic-pricing data to assess, track, forecast, simulate, and optimize energy consumption for 60 campus buildings. The system will also identify under-performing buildings and the causes of energy inefficiencies. "The learnings from this project will have ramifications beyond our institution since we will be able to demonstrate, with IBM's expertise, that smart buildings can help save money and manage assets," notes Tony Cupido, assistant vice-president for facility services at McMaster.

Data Tools for Decision-Makers

One historical reason why data analysis is often not a part of institutional culture is that the tools are designed for statisticians, not for the people who are empowered to make programmatic decisions. And one reason for the success of cross-campus data analytics initiatives at places like Wichita State University is that the business analysts within each operational area are learning how to do data analysis with IBM SPSS Statistics.

The application is easy to learn, says David Wright. "You have the option to use it in a code format or a menu format. Some of [these business analysts] have very little skill in statistics; some have a lot. Some have very little skill in SQL; some are experts. You have to train those individuals within that unit relevant to their skills. But once you do, it's empowering to see them take control and move forward."

Each unit, he points out, is best positioned to know its data. That's important. Previously departments would rely on Information Technology (IT) or Institutional Research (IR) to obtain those reports, Wright explains. That reliance has meant that the units needing the reporting would sometimes have to wait weeks for their results.

Also, those two groups are oftentimes divorced from what actually takes place within the units they're serving. "Which means they do not know what the most up-to-date business practices are for admissions, for registrars, for financial aid, for degree completion. They have to rely upon those people within those departments to be able to tell them that."

Now Wright's pitch to functional areas is this: "You know your data better than anybody else. Let's give you the skills you need to be an analyst, to go grab your own data, to create your own reports, and do those instantaneously when you need them and for what you need."



Once he works with those departments and teaches them how to do the analysis, “they’re on their own. They’re no longer dependent on somebody else outside their unit to get their information for them.”

When data analysis permeates a university’s business units, change can happen. As the people at Wichita State and other institutions have learned, it’s decision-makers on the ground, feeling empowered by data to make intelligent decisions, that help build a smarter campus. All it takes is the right tools and the leadership to use them well.



About Us

About Campus Technology

Campus Technology is the only monthly publication focusing exclusively on the use of technology across all areas of higher education. Campus Technology provides in depth coverage of specific technologies and their implementations, including wireless networks and mobile devices; enterprise resource planning; eLearning and course management systems; "smart classroom" technologies; telecom; Web; and security solutions--all the important issues and trends for campus IT decision makers.

Launched in October, 2004, Campus Technology replaced the highly respected Syllabus magazine, a recognized leader in the coverage of technology on campus since 1988. Campus Technology continues to uphold Syllabus' mission of serving as a complete resource for academic and administrative IT leaders in higher education, and provides in depth coverage of specific technologies, their uses, and implementations on campus.

Campus Technology consists of the monthly Campus Technology print magazine; the daily CampusTechnology.com Web site; weekly, biweekly, and monthly electronic newsletters (Campus Cloud Computing, Mobile Technology in Higher Education, Campus Technology Insider, News Update, IT Trends, SmartClassroom, C-Level View, Campus Security); conferences; and targeted list rental opportunities.

About IBM Business Analytics

IBM Business Analytics software delivers complete, consistent, and accurate information that decision-makers trust to improve business performance. A comprehensive portfolio of business intelligence, advanced analytics, financial performance and strategy management and analytic applications gives you clear, immediate and actionable insights into current performance and the ability to predict future outcomes. Combined with rich industry solutions, proven practices, and professional services, organizations of every size can drive the highest IT productivity and deliver better results.

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