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Uses of Academic Analytics on Campus

Unobstructed access to facts can produce unlimited good only if it is matched by the desire and ability to find out what they mean and where they lead.
—Norman Cousins, U.S. author

Institutions vary in both who uses academic analytics and how they use it. Some have deployed their capacity broadly and have many active users. Others have focused on smaller user groups. Institutions also vary in how extensively they use their capabilities. Many use their analytical infrastructure as a means to deliver information to monitor operations such as comparing budget to actual performance. Others have begun to harvest information from their analytical systems for more advanced uses such as predictive modeling (for example, of student retention). Use of academic analytics varies not only by institution but also within functional areas as well. Some areas, such as institutional research, have a long history of data-driven analysis. Other areas have used data to a far lesser extent and may in fact use their analytical tools very differently.

This chapter explores the different ways institutions have elected to deploy and use their analytical capacity. It examines:

- How have institutions deployed their academic analytical capability?
- How do institutions use their capacity, and how does it impact individual functional areas?
- What kinds of information are institutions maintaining in their data stores, data marts, and data warehouses?
- What is the nature of plans to upgrade and expand institutional capacity?

In the next chapter, we look closely at those respondents who indicated they have the most advanced uses of their analytical tools.

Key Findings

- Institutions deploy their academic analytics solutions differently. Some have broad deployment but relatively basic use, while others have narrow deployment and sophisticated use. Relatively few have achieved both broad deployment and sophisticated use.
- Nearly 70 percent of respondents use their academic analytics primarily for transaction reporting.
- Fewer than 10 percent of respondents report that their primary use of academic analytics is for what-if analysis, predictive modeling, or automated alerts.
- The most sophisticated use of academic analytics occurs within respondents' institutional research and central planning and budget functions.
- Respondents with effective training programs achieve significantly greater utilization of their academic analytic applications.

Breadth of Use

This section examines two aspects of how institutions deploy academic analytics. It first looks at how actively different institution types use it. Second, it looks at adoption of academic analytics within specific functional areas.

Institutional Deployment

Respondents differ in both how they deploy their academic analytical capability and how they use it. For example, we asked all respondents with capability beyond transaction system reporting whether they deployed their academic analytical capability institution-wide. Using a scale of 1 to 5 (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree), respondents indicated their level of agreement that their deployment was institution-wide. The mean response was 3.39, indicating slight agreement with the statement. The standard deviation exceeded 1.10, however, indicating that many respondents agree and many either disagree with or are neutral to the statement. The responses are not uniform, and they suggest that not all institutions have pursued or succeeded at institution-wide deployment.

We also asked respondents a series of questions about who their most active users are. Among institutions with technology platforms beyond level 1, we found, on average, slight agreement that the active use of academic analytics occurs primarily within a few departments. In fact, on a 1-to-5 scale, the mean response was close to neutral (3.24), and the standard deviation exceeded 1.21. This indicates that many respondents agreed and disagreed with the statement. So, respondents vary in how broadly their solutions have been deployed and how widespread their use has become. Here again, there does not appear to be a strong pattern of how institutions are deploying and using their analytical capacity. Nor does there appear to be a relationship between the breadth of deployment or use and the type of technology platform the institution has adopted.

We do see some relationship between institutional enrollment size, deployment, and use. In general, moderate-sized institutions agree more strongly that their deployment is institution-wide than do either larger or smaller institutions. The largest institutions (enrollments greater than 25,000) appear to be in the middle: They had relatively less agreement that they have deployed their capacity institution-wide, but they disagree the most that use was limited to a few individual departments. For large institutions, the breadth of their operation may make institution-wide use a substantial challenge. However, these same institutions may have many departments actively using academic analytics. Table 6-1 lists the mean responses to each question (deployment and use) by student enrollment.

The deployment approach may depend somewhat on how the institution manages itself. We did not find a statistical relationship between breadth of use and the degree of centralization of an institution's management control. However, we did learn through qualitative interviews that some institutions' management philosophies did influence their deployment strategy. David Weiser, director of information systems and services at Lorain County Community College, explains that broad deployment was the only option for his institution. "Why did we deploy broadly? The best way to explain it is to look at our organization chart. We are a very flat organization. We have a president who is dynamic and delegates authority. There is a lot of distributed authority, and real power exists at the director level."

We also asked respondents to tell us how intensely their analytical systems were used, regardless of deployment strategy. We asked them to agree or disagree with the statement that their analytical tools are used actively by

Table 6-1. Breadth of Deployment and Use, by Enrollment

FTE Enrollment	Academic analytics is used primarily in a few individual departments.			Academic analytics is deployed institution-wide.		
	Mean	N	Std. Deviation	Mean	N	Std. Deviation
1–2,000	3.62	29	0.979	3.17	29	1.136
2,001–4,000	3.50	38	1.225	3.47	38	1.084
4,001–8,000	3.24	37	1.188	3.76	37	1.116
8,001–15,000	3.19	37	1.244	3.41	37	1.117
15,001–25,000	3.25	36	1.228	2.94	36	1.094
More than 25,000	2.50	22	1.225	3.32	22	1.211
Average/Total	**3.26**	**199**	**1.214**	**3.36**	**199**	**1.136**

(1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)

the majority of eligible user departments. On a 1-to-5 scale, the mean response was 2.53 and the standard deviation was 1.045. So it appears that most respondents on average believe that the majority of their eligible departments are not active users of their academic analytical capacity. Interestingly, we found no significant relationship between the technology level the institution had deployed and their assessment of the intensity of use. So despite the belief that level 3 technology is easier to use, respondents with level 3 technology platforms did not report significantly more or less intensive use of their analytical capability.

The reality may be that it just takes time for the use of academic analytics to take hold in an institution, no matter how intuitive the tools. For example, in 2003, the University of California at San Diego introduced a tool called MyDashboard to enable users to create reports from local departmental information and the institutional data warehouse (a full case study of UCSD has been prepared as a companion to this study). On the basis of feedback provided to ECAR, UCSD users view MyDashboard as intuitive and easy to use. However, it has not been adopted at a uniform pace across user areas. Some have been slow to adopt MyDashboard. One participant in an ECAR interview observed, "People are resistant to change and slow to adopt innovations, however promising. Perhaps innovation doesn't occur because people have no time to convert to a new system and insufficient motive to make time to do so."

Use by Functional Area

To deepen our understanding of how institutions use their analytical capability, we asked respondents to tell us their three most active and three least active user departments. As Table 6-2 illustrates, the users that respondents most frequently selected as most active were central finance, central admissions, and institutional research. This is not surprising, as these areas tend to be more facile with data and analysis. The least active areas were department chairs and their staffs, deans and their staffs, and central human resources.

Respondents report that central research administration and central fundraising are also relatively inactive users of academic analytics. Admittedly, these two areas are particularly sensitive to institution type and mission. So, we looked at the question of active use by research administration in relation to Carnegie class. Likewise, we looked at the relative activity of central fundraising by insti-

Table 6-2. Top Three Most Active and Least Active User Areas

Area	Most Active	Least Active
Central business/finance	66.5%	4.8%
Admissions/enrollment management	63.3%	2.7%
Institutional research	57.2%	6.1%
Central academic/student services	45.7%	5.1%
Dean/dean's staff	15.4%	39.1%
Central fundraising	12.5%	21.8%
Central HR	10.1%	31.1%
Department chair/chair's staff	8.0%	57.2%
Central research admin./grants management	3.2%	29.8%
School-based admissions	0.8%	15.7%
School-based fundraising	0.5%	23.4%
School-based grants management	0.5%	26.1%

tutional control. We found that even among doctoral institutions, 16.5 percent reported that central research administration staff were among their least active users. Nearly a third of master's institutions (33.3 percent) reported similar findings. So even among more research-intensive institutions, use by research administration staff is relatively low.

We expected use by advancement staff at private institutions to be higher. Since private giving is a more significant revenue stream for most private institutions, they would tend to place a greater emphasis on fundraising and invest greater resources in their advancement function. As anticipated, we did see a difference between respondents from private and public institutions. Just 10.7 percent of private institutions reported that their central advancement staff members were among the least active users of academic analytics. Conversely, 29.8 percent of public institutions reported that their central advancement users were among the three least active.

We also tested whether the technology platform type an institution deployed had any relationship to which user areas became the most active. We did not find any significant relationship between the two. It appears that institution type and a functional area's historical use of data have more impact on the area's intensity of academic analytics usage.

Lastly, we examined the role of effective training in promoting the use of academic analytics. As one would expect, we found that respondents who reported that their training was more effective also reported more active use of their analytical capability. As Figure 6-1 illustrates, respondents who agreed that their institution provides effective training also agreed to a greater extent that the majority of eligible users actively used their analytical capability.

Qualitative interviewees also cited training as a major factor in promoting effective usage. According to Joseph Sawasky, associate vice president at the University of Toldeo, training and success were linked at his institution. Sawasky explains that "the data warehouse did not experience critical mass of use, nor did the institution derive real value from the data

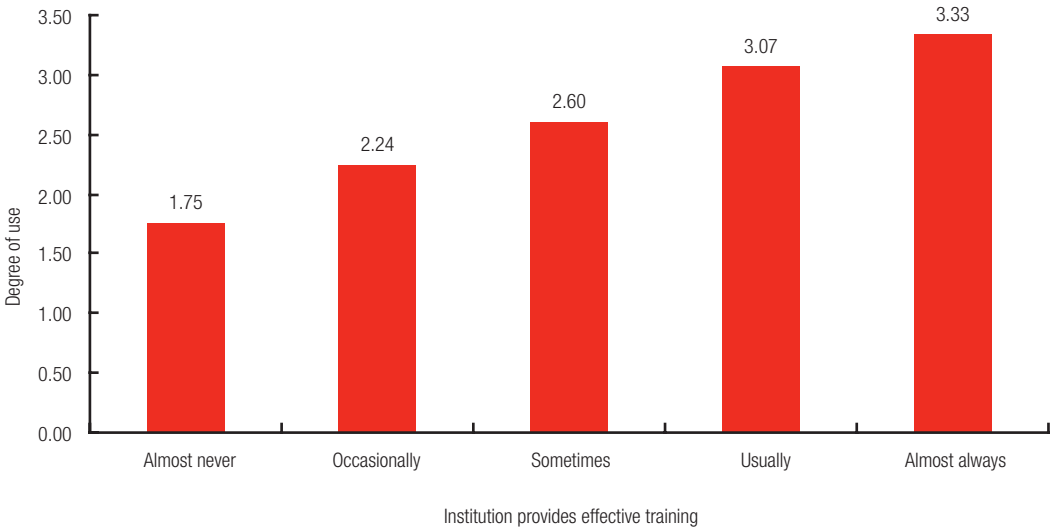

Figure 6-1. Degree of Use of Academic Analytics, by Effectiveness of Training (N = 368)

Q: *Reporting, modeling, analysis, and decision support tools are used actively by the majority of eligible user departments. (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)*

warehouse, until we put together our training program for end users."

Institutions face a two-part challenge. They must train users in a new tool and train them to use the data. Susan Foster, vice president of information technologies at the University of Delaware, notes that the latter type of training can be a formidable challenge. "We chose a tool that is fairly easy to use; that has not been the problem. The problem has been getting end users to not only learn a new tool, but to understand the data they are working with." Delaware has had to adapt its training program to meet this reality. Foster goes on to explain that her university has "recognized that different people learn in different ways and have different cognitive strengths. A three-hour training session is often not the most effective way to train employees."

Data Sources

Our analysis also looked at the kinds of information institutions include in their academic analytics systems. ERP systems (or legacy administrative transaction systems) are the predominant data sources for respondents' data stores or warehouses. Most respondents with analytical capability beyond level 1 (transaction system reporting) include data from their student and financial systems in their data marts or warehouses. Table 6-3 lists the major sources of data that institutions with analytical capability beyond level 1 draw from when importing to their data stores or warehouses.

Data from human resource systems is also included in three-quarters of respondents' warehouses or data stores. Despite the relatively low intensity of use by human resource departments, institutions do incorporate personnel data in their marts or warehouses. This may indicate that other user areas (such as institutional research or academic affairs) perform analysis with this data.

Significantly fewer respondents reported having data from non-ERP systems in their warehouses or stores. Fewer than 40 percent of institutions included data from their advancement system (36.2 percent), and fewer than 30 percent included data from their grants management system (27.7 percent). Among doctoral institutions, fewer than half (47.3 percent) of respondents had grants management data included in their stores or warehouses.

Table 6-3. Information Contained in Data Stores or Warehouses (N = 213)

Source	Percentage
Student information system	93.0%
Financial system	84.5%
Admissions	77.5%
HR system	73.7%
Advancement	36.2%
Course management system	29.5%
Ancillary systems (e.g., housing)	28.2%
Grants management	27.7%
Department-/school-specific system	22.5%
Comparative peer data	20.2%
Feeder institutions (high schools)	9.4%

Data from course management systems is included in the stores or warehouses of 29.5 percent of respondents. A slightly higher proportion of public institutions (33.6 percent) than private institutions (24.3 percent) have course management data in their data store. Similarly, a greater proportion (40.5 percent) of moderately sized institutions (4,000 to 8,000 students FTE) reported having course management data in their data stores.

The percentage of both smaller and larger institutions with course management data ranged between 22.7 percent and 32.4 percent (see Table 6-4). If, as respondents anticipate, improving retention, demonstrating outcomes, and accreditation are the significant drivers of academic analytics, we would expect these percentages to significantly increase. Institutions will need the ability to look at data from their student information systems, course management systems, advising databases, and other sources to understand patterns in retention or student achievement.

Jack Suess, vice president of information technology at the University of Maryland, Baltimore County, describes how retention is driving his institution's expansion of academic analytics. "We just recently began some analysis about retention. This is an area where we have demonstrated results from using higher-level analytics. The university appointed a task force that is using a new data mart to attack the problem. There are a lot of databases around campus that provide clues; by bringing them together in a data mart we were able to look at both academic and nonacademic factors related to first-year retention and see a fuller picture and look at focused subpopulations."

Data Currency

We also asked respondents to tell us if they felt they refreshed the data in their data stores more frequently than users required. Many report that they have created a capacity to refresh data that outpaces users' needs. Nearly half of respondents (49.3 percent) reported that they usually or almost always refresh their data more frequently than required. Another 26.3 percent reported that they sometimes refresh their data more often than required. If institutions have overbuilt their capacity to keep data current, it does

not appear to have had a significant impact on costs. In fact, institutions that refreshed their data more frequently than users needed did not report a significantly higher level of five-year aggregate spending on their academic analytic solution.

Finally, we compared respondents' assessments of their data refreshing frequency with their assessment of their overall reporting capacity. As Table 6-5 illustrates, institutions that exceeded user needs for data freshness did not have a significantly higher opinion of their overall reporting and analysis capability.

One of the University of Alabama's lessons learned from their experience implementing academic analytics is that accurate data is more valuable than more frequently refreshed data. Vice Provost for Information Technology Priscilla Hancock reflects, "We refresh data every 20 minutes, but we don't need it. I prefer robustness over frequent refreshing."

Expansion Plans

We also asked respondents to indicate their plans to integrate additional data into their existing stores and warehouses. Respondents with advanced capabilities (beyond transaction reporting) show a strong commitment to expand the data in their various stores. This parallels a similar level of commitment to expand among those institutions with more basic capability. Respondents were asked to use a five-point scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree) to indicate their agreement with the statement "My institution plans to integrate

Table 6-4. Inclusion of Course Management Data in Data Stores or Warehouses, by Enrollment (N = 213)

FTE Enrollment	Percentage with CMS Data
1–2,000	27.6%
2,001–4,000	28.9%
4,001–8,000	40.5%
8,001–15,000	32.4%
15,001–25,000	27.8%
More than 25,000	22.7%

Table 6-5. Frequency of Data Refresh and Satisfaction with Academic Analytics (N = 213)

Information is refreshed more frequently than required.	Extensive reporting capability	Effective tools to analyze data
Almost never	3.63	3.50
Occasionally	3.03	3.33
Sometimes	3.11	3.25
Usually	2.97	3.13
Almost always	3.49	3.68
Average	**3.16**	**3.32**

(1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)

with our reporting, modeling, analysis, and decision support tools in the next two years." The mean response was 3.86, indicating that respondents agreed on average that they would integrate more data sources. In fact, 78.4 percent of respondents either agreed or strongly agreed with the statement.

We found no significant differences in expansion plans among respondents with different levels of technology platforms. All have a fairly similar degree of agreement that they would be integrating additional data sources. Expansion plans also do not vary significantly by either institutional enrollment or Carnegie class.

Depth of Use

We saw in the prior section that institutions have different experiences regarding the breadth of use of their academic analytics. Here we examine differences in the depth of use of academic analytics. In our survey, we defined a hierarchy of five stages of academic analytics use:

- Stage 1: Extraction and reporting of transaction-level data.
- Stage 2: Analysis and monitoring of operational performance.
- Stage 3: What-if decision support (such as scenario building).
- Stage 4: Predictive modeling and simulation.
- Stage 5: Automatic triggers of business processes (such as alerts).

We hypothesized that institutions move through these stages as the sophistication of their academic analytics increases. Our thought was that institutions with stage 4 or 5 academic analytics applications would be among the most advanced users. We expected to find few examples of institutions with these advanced applications.

We believed that most institutions start by using their academic analytics platforms to report transaction-level data or to analyze operational performance. This would include monitoring budget to actual financial performance or course enrollments. Institutions with more advanced academic analytics applications would begin to integrate their capabilities with planning, decision making, and business processes. These institutions would use information to forecast decisions using what-if analysis (stage 3). Stage 4 institutions harvest their information and analytical capacity to build predictive models and simulations. These could include enrollment forecasts or models that predict student learning outcomes. Finally, at stage 5, institutions have integrated information and business processes. These institutions use their academic analytics to automatically trigger a business process or event. For example, if a student drops a class, an appointment with an advisor is automatically scheduled.

Joel Hartman, vice provost for information technologies and resources at the University of Central Florida, describes how UCF is moving through a maturation process similar to the five stages we identified. "We envision a pyramid of use. At the first layer, we have operational reporting of daily data. Layer 2 is the data warehouse. It will integrate data from many sources. It will use OLAP cubes and be the official source of longitudinal data analysis. Layer 3 is the final piece, data mining. This last layer will be added when the data warehouse is well established."

We expected to find most institutions' use to be at stage 1 or 2. In fact, this proved to be the case. We asked respondents to tell us the primary use of their academic analytical capability. As Table 6-6 illustrates, nearly 70 percent reported that their primary use was for reporting transaction-level data (stage 1). Only 8 percent of respondents reported that their primary use was at stage 3 or higher.

We found no significant relationship between the type of technology platform a respondent employed and their application of

Table 6-6. Primary Use of Academic Analytics (N = 376)

Use	Number	Percentage
Stage 1: Extraction and reporting of transaction-level data	263	69.9%
Stage 2: Analysis and monitoring of operational performance	51	13.6%
Stage 3: What-if decision support (e.g., scenario building)	6	1.6%
Stage 4: Predictive modeling and simulation	7	1.9%
Stage 5: Automatic triggers of business processes (e.g., alerts)	17	4.5%
Not active users	32	8.5%
Total	**376**	**100.0%**

that technology. Respondents with level 2 or level 3 technology platforms were no more likely to have the primary use of their academic analytics include predictive modeling or automated alerts. In fact, 11 of the 17 respondents who reported that their primary application of their academic analytics capability is at stage 5 (automated alerts) used their transaction system as their primary reporting platform.

We do not conclude from this that technology platform does not in any way relate to the technology's potential applications. The small number of respondents makes it difficult to be conclusive about the technology platform's importance. Further, respondents may have interpreted each stage differently. We examine the group of institutions that did report stage 3, 4, or 5 applications of their technology in detail in Chapter 7.

Application by Functional Area

To further our understanding of how institutions use their capacity for academic analytics, we asked respondents to report the primary use by each major functional area. The functional units we focused on were all central administrative units and included

- advancement,
- business and finance,
- budget and planning,
- institutional research,
- human resources,
- research administration, and
- academic affairs.

As Table 6-7 illustrates, the majority of respondents report that their primary use is to report transaction-level data. Not surprisingly, institutional research used predictive modeling most frequently, and budget office users most frequently used decision support. These academic analytics applications align most favorably with the missions of these two units. These data also confirm our earlier findings that advancement, research administration, and human resources were among the least active users of academic analytics.

It is not clear from the survey why these areas are particularly inactive. In general, the research administration and human resource areas trail other administrative processes in their level of performance. A prior ECAR study, *Good Enough! IT Investment and Business Process Performance in Higher Education,* found that institutions were least satisfied with the performance of their HR and research administration processes. In the case of research administration, fragmented organizational structures and significant decentralized control make these processes difficult to change. It is possible that these same forces have slowed the adoption of analytical capabilities. The human resource area appears to lag other processes in garnering technology investment (Kvavik et al., 2005, pp. 46–50, 60–64).

Table 6-7. Primary Application of Academic Analytics by Functional Area

Use	Advancement/ Fundraising	Business and Finance	Budget and Planning	Institutional Research	Human Resource	Research Administration	Academic Affairs
Stage 1: Extraction and reporting of transaction-level data	56.9%	68.4%	49.6%	48.8%	62.2%	45.0%	52.8%
Stage 2: Analysis and monitoring of operational performance	11.0%	17.0%	19.6%	28.4%	7.8%	10.3%	18.2%
Stage 3: What-if decision support (e.g., scenario building)	2.3%	1.9%	13.5%	4.1%	0.6%	0.9%	4.7%
Stage 4: Predictive modeling and simulation	3.1%	3.0%	9.6%	11.6%	1.1%	1.7%	5.2%
Stage 5: Automatic triggers of business processes (e.g., alerts)	3.7%	2.5%	0.6%	7.1%	1.9%	1.1%	2.2%
Not active users	22.9%	7.1%	7.2%	0.0%	26.4%	41.0%	16.9%
Total	**100.0%**	**100.0%**	**100.0%**	**99.9%**	**100.0%**	**100.0%**	**100.0%**

Finally, the relatively high number of inactive users in the advancement area may reflect their greater outsourcing of the analysis function. In fact, 28.7 percent of respondents reported that their institution's advancement function routinely contracts with an outside firm to analyze data. This is a fairly typical practice in both the advancement and enrollment management areas and may in fact have depressed their demand for in-house academic analytics.

Summary

Academic analytics usage by functional area does not differ significantly by institutional size, control (public or private), or Carnegie class. In general, the relatively small number of respondents in the survey using their analytical capability for applications beyond transaction or operational reporting makes it difficult to conclude that no relationship exists among these institutional factors. One could certainly argue that a research university will become more interested in advanced academic analytics applications for research administration than would a private, bachelor's institution. Similarly, private institutions might become more interested in the predictive modeling capability for their advancement function than would a public institution. An institution's mission and competitive characteristics simply alter the potential benefits it can realize from expanding its use of academic analytics in different functional areas.

The usage patterns could also be attributable to how institutions have phased their academic analytics implementation. Institutions may have focused first on working with areas that have more data-driven cultures and needs, such as finance and institutional research. This would enable them to gain early successes by working first with more experienced users with strong knowledge of the institution's data. We did not find, however,

a strong relationship between the length of time respondents have had their academic analytical capability in place and the breadth and depth of use by area.

Finally, individual functional areas' local culture and leadership may play an important role in academic analytics adoption. Functional areas such as admissions and institutional research have both the need and the capacity to perform advanced analysis. We would expect these to be among the first to recognize the need for advanced analytical capability and to be its early adopters. There should be fewer cultural barriers to adoption in these offices, where there is a user base already skilled in analysis. As we will see in the next chapter, the skill of the user base is one of the most important factors in an institution's ability to achieve advanced uses of its analytical capacity.