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# Executive Summary

*Science and technology revolutionize our lives,  
but memory, tradition, and myth frame our response.*

—Arthur M. Schlessinger

The typical college's information systems produce hundreds of management reports and capture sufficient data to create many more. Individual administrators possess additional information in personal or departmental shadow systems. How is this information used? Clearly, the institution requires much reporting just to monitor its routine transactions. The external environment is also a major consumer of institutional information. Regulatory bodies, the Integrated Postsecondary Education Data System (IPEDS), state agencies, and others all require descriptive or operational data from the institution.

Do institutions do more with the data they collect? Are institutions investing more resources in tools that enable them to collect and manipulate management information? Do they use information and analysis to support institutional decision making? These are the core questions this study sets out to answer.

Since the 1980s, higher education has spent hundreds of millions of dollars on administrative technologies. A major intent of many of these expenditures was to improve access to information. Some institutions implemented new enterprise resource planning (ERP) systems. Others invested in data marts, data warehouses, and other technology tools to improve their ability to access and analyze

information. Many institutions implemented both ERP and supplemental technologies to improve reporting. What have these strategies accomplished?

For many institutions, the challenge is no longer the lack of access to timely information. Institutions have significantly improved their ability to capture, distribute, and manipulate management information. But having information and using information are two different things. Has higher education changed how it uses information? Are its primary information consumers still external agencies requesting descriptive data, or staff involved in transaction processing?

Technology has enabled more advanced analysis. Like their corporate counterparts, higher education institutions can now model the impact of decisions before they make them. They can build analytical models to predict student achievement or which students are most likely to enroll. They can leverage information technology to produce up-to-the-minute management information that is displayed in easy-to-use, graphical formats. Or, they can integrate data and analysis into their business processes and generate automated responses and alerts if a key metric falls outside a desired range. How widespread has the adoption of these advanced analytical

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applications been? Who are the adopters, and what have they accomplished?

## Academic Analytics

We have adopted the term *academic analytics* to describe this study. It is an imperfect label because it suggests we're not interested in administrative uses of analysis. This is clearly not our intent. At the outset of this study, we anticipated that most users of analytical tools are the administrators who manage the "business" of the institution. However, we found the term academic analytics to be far better than traditional corporate terminology such as business intelligence or data mining. These labels tend to be poor fits for higher education's mission, and they are too jargon-like. Likewise, we wanted a term that conveys our intent to study more than just technology. We did not set out to study data-warehousing or decision-support tools. Rather, we were interested in the applications of these technologies and how they impact institutions. This is a study about how institutional characteristics and management climate and culture impact the use of information.

## Technology Platforms

At the study's outset, we hypothesized that most institutions rely primarily on their transaction systems (such as finance or student information systems) for reporting and analysis. This proves to be the case. Among survey respondents, 47 percent report primarily from their transaction systems. The remaining institutions employ a combination of technologies.

Initially, we thought respondents would have one of three technology platforms:

- ◆ Level 1: Reporting from transaction processing system only.
- ◆ Level 2: An operational data store or single data mart used in conjunction with extract, transfer, and load (ETL) processes and reporting tools.

- ◆ Level 3: An enterprise data warehouse or multiple data marts used in conjunction with ETL tools, reporting tools, executive dashboards, or alerts.

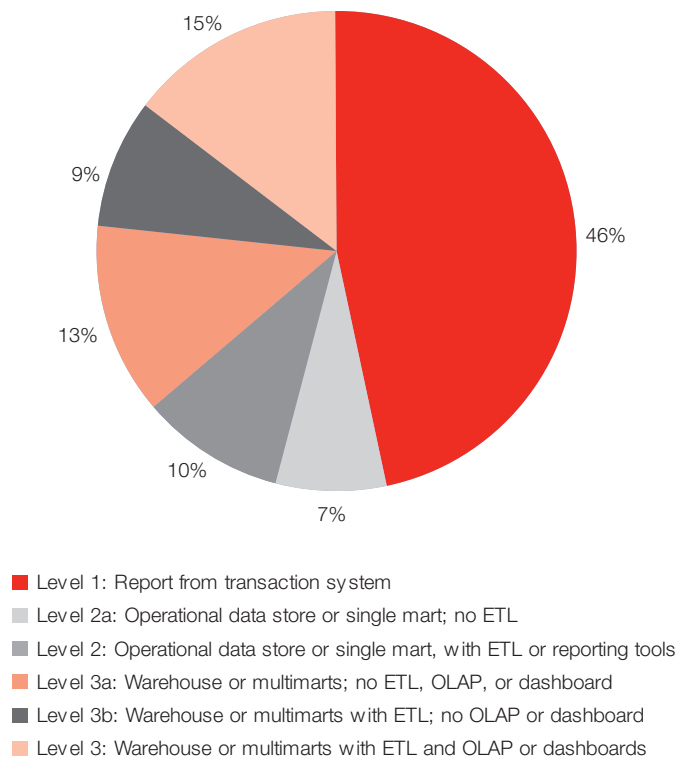
By labeling the levels 1 through 3, we offer no prejudgment that level 3 capability is more desirable or effective than that of levels 1 or 2.

After analyzing the survey responses, we realized that many institutions have technology platforms that are between levels 1 and 2 or levels 2 and 3. These institutions are either in a state of transition (as evidenced by their planned investments) or have chosen to stop at an intermediate point between the levels. So, respondents can actually be clustered into one of six technology levels: three primaries and three intermediaries. They are

- ◆ Level 1: Reporting from a transaction processing system only.
- ◆ Level 2a: An operation data store or single data mart.
- ◆ Level 2: An operational data store or single data mart used in conjunction with ETL and reporting tools.
- ◆ Level 3a: An enterprise data warehouse or multiple data marts used without ETL tools or advanced reporting tools.
- ◆ Level 3b: An enterprise data warehouse or multiple data marts with ETL tools but without online analytical processing (OLAP) or dashboards.
- ◆ Level 3: An enterprise data warehouse or multiple data marts used in conjunction with ETL tools, reporting tools, executive dashboards, or alerts.

Figure 1-1 illustrates the distribution of respondents by technology platform type.

As we would expect, institutions with more extensive technology platforms report higher levels of expenditures. We asked respondents to report their aggregate spending for the last five years on academic analytics. Institutions with level 3 capability reported average aggregate costs of \$1.3 to \$1.4



**Figure 1-1.**  
Distribution of  
Respondents,  
by Technology  
Platform (N = 350)

million. Comparatively, institutions with level 2 capability reported average five-year costs of \$800,000 to \$900,000. Institutions approaching level 2 or level 3 reported somewhat lower aggregate costs than those already at the next highest level. We caution that the relatively small numbers of respondents in any one group make it difficult to draw strong conclusions from this data.

Institutions with more extensive technology platforms also report higher satisfaction levels with their academic analytic capability. We asked respondents to assess three different aspects of academic analytics:

- ◆ the ability to give decision makers timely access to data,
- ◆ the ability to make information widely accessible, and
- ◆ their technology tools' ease of use.

Overall, satisfaction increases with the complexity of the technology platform. The most significant jump in satisfaction appears to occur when an institution moves beyond

transaction system reporting (level 1). Respondents with near level 2, level 2, or near level 3 capabilities all have fairly comparable levels of satisfaction. Satisfaction increases again significantly for those institutions with level 3 capability. These respondents had the highest average level of satisfaction with timeliness of information access, breadth of information access, and their tools' ease of use. Respondents with near level 3 capability (lacking ETL, OLAP, or dashboards) had lower levels of satisfaction. This suggests that adding sophisticated tools like OLAP or dashboards that make it easier for users to obtain and manipulate data does make a difference.

Note that these criteria measure an institution's satisfaction with the performance of their academic analytical tools, not the outcomes they achieve with them. We draw this distinction because satisfaction with analytical tools' performance depends more on technology level than do the outcomes the institution achieves.

## Applications of Academic Analytics

Respondents report the most active and sophisticated use of academic analytics in the central finance, budget and planning, and institutional research functions. We found the least active use in advancement and grants management. Usage in these areas is somewhat higher at institutions with missions that place more emphasis on fundraising and research. Most institutions use their academic analytics to report transaction data and monitor operational performance (such as budget-to-actual results). Only 30 respondents indicated that their primary use of academic analytics was for an advanced application such as predictive modeling or scenario building.

Institutions appear to have chosen different paths for deploying academic analytics. Some report broad deployment but limited use. Others seem to have focused on advanced use in a few key areas. Relatively few have done both. Qualitative interviews suggest that the institution's degree of decentralized authority affects their strategy for how broadly to distribute their analytical systems. The quantitative data suggest that larger, more organizationally complex institutions (for example, those with multiple colleges and multiple revenue streams) are more likely to deploy broadly.

Respondents did report greater instances of advanced academic analytics applications within individual functional areas. Central finance, budget and planning, and institutional research, along with admissions offices, are the most active users of advanced analytics. The primary applications of advanced analytics include modeling strategic decisions, studying enrollment trends, and measuring student retention.

Institutional factors play some role in determining where institutions implement advanced analytics. For example, private bachelor's institutions typically have a highly selective admissions process, often accompanied by

revenue-sensitive distributions of financial aid. These institutions are more likely to use advanced applications of academic analytics such as modeling in support of enrollment management. Across all functional areas, three factors significantly impact respondents' ability to implement advanced analytical applications. Respondents with effective user training, strong analytical skills among staff, and leadership committed to evidence-based decision making are more likely to have successfully deployed advanced academic analytics.

Interestingly, technology does not appear to be a factor in whether an institution can implement more advanced applications of academic analytics. We found no statistically significant relationship between a respondent's choice of technology platform and advanced applications in any of the functional areas studied. It appears that issues of management commitment and staff skills are paramount.

## Impact of Academic Analytics

Institutions do report that academic analytics has a positive impact on institutional metrics and measures of success in individual functional areas. Overall, respondents agreed that academic analytics improves institutional decision making, helps institutions meet strategic objectives, and provides a competitive advantage to the institution. On average, respondents disagreed, however, that academic analytics helps them reduce the number of shadow systems.

We also asked respondents to assess the impact of academic analytics on their success in five functional areas: finance, human resources, grants management, student services, and advancement. In each area, we asked respondents to indicate their level of agreement, using a five-point scale, that academic analytics improves the outcomes within the functional area. Respondents agreed

most strongly that they had improved results in the student area. The mean level of agreement for improved enrollment results was the highest (3.43), followed by improved retention (3.16). The only other outcome with a mean above neutral was improved financial results (3.09).

Respondents had the lowest mean level of agreement in grants management. Even among doctoral institutions, respondents on average did not agree that they had often used academic analytics in the grants management area. Respondents also did not feel strongly that they were improving their results in either the human resource management or advancement areas. Responses do differ by institution type. Private institutions had a significantly better assessment of the impact of academic analytics in the advancement area than did public institutions.

We used regression analysis to identify the factors most strongly associated with an institution's perceived success with academic analytics. We looked at such variables as enrollment, Carnegie class, and control (public versus private), as well as their aggregate spending on academic analytics. We reviewed management and cultural dimensions such as the effectiveness of training, leadership commitment to evidence-based decision making, the strength of staff analytical skills, and the institutional environment. We also assessed whether the institution's choice of technology platform affects overall success. Finally, we evaluated whether the level of sophistication of analysis an institution performs has an impact.

We found the most significant factors to be management factors such as training effectiveness, leadership commitment, and the presence of strong analytical skills among the staff. These variables had the strongest relationship with measures of success. Other important factors include

- ◆ whether the technology platform includes a data warehouse,

- ◆ the use of analytics to model strategic decisions,
- ◆ the use of analytics to forecast demand for courses, and
- ◆ the use of analytics to tailor student recruiting strategies.

In addition to the management climate characteristics described above, institutions that use their academic analytics to model strategic decisions, tailor recruiting strategies, or forecast demand for courses report higher success levels on several outcome metrics. Similarly, institutions that employ a data warehouse report greater success at using academic analytics to help the institution meet its strategic outcome. The only other significant relationship between technology and outcomes is that institutions with dashboards (for reporting) have greater success reducing the number of shadow systems.

## The Future

It appears we are still relatively early in higher education's adoption of academic analytics. While the technology has been available for many years, institutions are just now beginning to exploit it. Most respondents predict that they will significantly expand their capability in the next two years both in terms of the range of data they have in their data stores and their sophistication of use. Institutions predict that users' increasing appetites for information will drive them to expand their capability. External factors will also play a role as institutions are required to more closely measure student outcomes and provide more data to accrediting bodies.

Technological capabilities likely won't limit what institutions can accomplish with academic analytics. Rather, this will depend on the extent to which staff members develop the skills to understand and manipulate data and the commitment of leadership to embrace data-driven decision making.