

# Institutional Analytics in Higher Education

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## Executive Summary

The potential application of analytics in higher education has been a subject of intense interest for nearly a decade. In the wake of the initial hype surrounding the prospect of marshaling institutional data to improve student learning outcomes and render college and university business practices more efficient, we are beginning to see the thoughtful use of data in a number of domains. As conversations about analytics in higher education have matured, a basic taxonomy of analytics appears to be solidifying that comprises two main categories: learning analytics and institutional analytics. The former is more concerned with various aspects of the student experience; the latter focuses on the business side of higher education. This report addresses the current state of *institutional* analytics at colleges and universities.

Institutional analytics is a major priority for almost half of higher education institutions and is a departmental priority for about a quarter of them. Among institutions for which institutional analytics is *not* currently a priority, an overwhelming majority expressed an interest in pursuing analytics. Within institutions, units that routinely rely on data extensively, such as financial aid, accounting, and human resources, do not see institutional analytics as a pressing concern. In contrast, units such as institutional research, institutional effectiveness, finance, and advancement, which have troves of data related to institutional performance and are hoping to discover new efficiencies, cost savings, or revenue streams, are considerably more enthusiastic about the potential of analytics.

Presently, analytics—specifically learning analytics—is used most extensively for student management and tracking degree completion, perhaps spurred by the advent of Integrated Planning & Advising for Student Success (iPASS)<sup>1</sup> technologies. Institutional analytics is used less extensively but is poised to become widespread, with a large number of institutions using it at least sparsely or planning, experimenting with, and considering its use.

However, our 2014 Analytics Maturity Index suggests that considerable work remains to be done before we observe an institutional analytics revolution. On average, colleges and universities demonstrate only a moderate level of general analytics maturity, one characterized by standardized capabilities, documented procedures, and/or delineated responsibilities. To achieve the next level of maturity, institutions will need to manage these capabilities to achieve predictable results on the basis of reliably measured performance indicators.

The primary barrier to a mature institutional analytics program is investment and resource allocation. Specifically, few institutions reported that their analytics initiatives are viewed as an investment and are funded sufficiently. At the same time, not many institutions reported having the appropriate number and type of professional staff to carry out such an endeavor. On the other hand, a majority of institutions appear to have elements of a culture that would support institutional analytics initiatives. In a culture supportive of using analytics for improving institutional business practices and outcomes, obtaining the funding necessary to invest properly in analytics resources should be relatively easier.

In addition to acquiring appropriate levels of investment in analytics resources, institutions should take the next steps in their institutional analytics planning. First, identify the specific institutional problems that analytics can be expected to solve. Second, identify the types of data required to solve those problems. Third, identify the technologies that can best deliver the needed analytics; many of these technologies are in place as part of existing vended or homegrown applications. Fourth, cultivate partnerships beyond the boundaries of central IT units to facilitate data sharing and standardize institutional measures.

## Key Findings

- **Campuses reported significant interest in institutional analytics**, with most institutions indicating that it had been made a “major priority” for at least some departments, if not the entire institution.
- **Despite the high priority cited for institutional analytics, institutions’ average level of analytics maturity falls somewhere between “defined” and “managed.”** A defined analytics capacity is characterized by having standardized capabilities with documented procedures and/or responsibilities related to it; a managed analytics capacity has the capability to achieve predictable results on the basis of reliably measured performance indicators.
- **Institutional research, finance, IT, and advancement** were most frequently cited as the departments leveraging analytics today. Of these, institutional research is the most involved in analytics according to the maturity index. The IR director is second only to the CIO in assuming a leadership or sponsorship role for analytics.
- **The current and planned use of analytics in general converged on five factors:** business analytics, student management analytics, learning analytics, faculty performance analytics, and degree completion analytics. On average, student management analytics activities are the most widely deployed category; business analytics activities are the second most widely used.
- **A lack of investment in and funding for analytics resources** was cited as a key challenge holding back analytics initiatives and maturity.
- **Most institutions reported having a culture conducive to developing an analytics strategy**, but only about one-third reported having an analytics strategy. One concern consistently cited across institutions was faculty resistance to using analytics to move toward a data-driven approach to decision making on their campus.

## Introduction

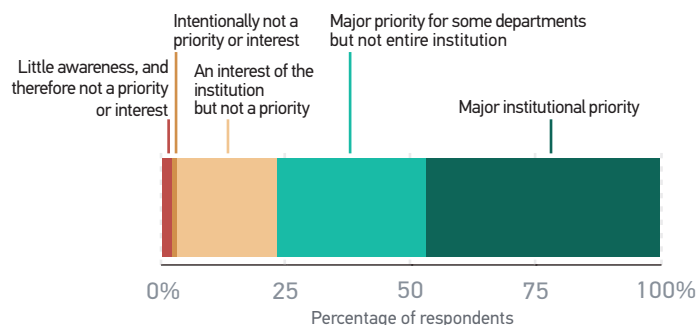
As noted in *The Analytics Landscape in Higher Education, 2015*,<sup>2</sup> we define analytics as the use of data, statistical analysis, and explanatory and predictive models to gain insight and act on complex issues. It is important to note that our definition goes beyond traditional reporting to include predictions and action. In this series of reports, we make a distinction between institutional analytics and learning analytics. The former focuses on the way in which analytics is leveraged to improve the business practices of institutions of higher education; the latter is more concerned with improving students' success, student learning outcomes, and student services. This distinction is not stark, however, and necessarily involves some overlap. Certainly some business practices are designed to directly or indirectly impact student success without explicitly addressing student learning outcomes. In this report, we focus our analysis on institutional analytics in higher education "intended to improve services and business practices across the institution."<sup>3</sup> Drawing on 2015 survey data collected on the topic of analytics, interview and focus group data, and 2014 EDUCAUSE Core Data Service (CDS) data, our report provides a comprehensive and up-to-date picture of institutional analytics in higher education.

## Institutional Analytics

Although analytics in higher education has been the subject of considerable interest for several years, the degree to which institutional analytics has been made a priority is somewhat mixed. Using analytics to support institutional outcomes debuted on the EDUCAUSE Top 10 IT Issues list in 2012 in the 6th position before falling to 10th in 2013 and rebounding to number 5 in 2014. Improving student outcomes through an institutional approach that strategically leverages technology was issue number 4 in 2015,<sup>4</sup> and *learning* analytics was included in Gartner's top 10 business trends for 2015 in the number 7 spot.<sup>5</sup> Analytics dominates the EDUCAUSE Top 10 IT Issues list for 2016,<sup>6</sup> and a broadened analytics trend of "analytics everywhere" is in the number 4 position in Gartner's Top 10 Business Trends Impacting Higher Education in 2016.<sup>7</sup> This growing interest is tempered by an ambivalence toward analytics that is reflected in the moderate levels of maturity in analytics reported between 2012 and 2014; the composite analytics maturity index shifted only slightly, moving from 3.2 to 3.4 on a 5-point scale for the two-year period.<sup>8</sup>

When we asked about the priority institutions place on institutional analytics, we obtained results that also reflect higher education's irresolution on this subject. Fewer than half of respondents (47%) indicated that institutional analytics is a

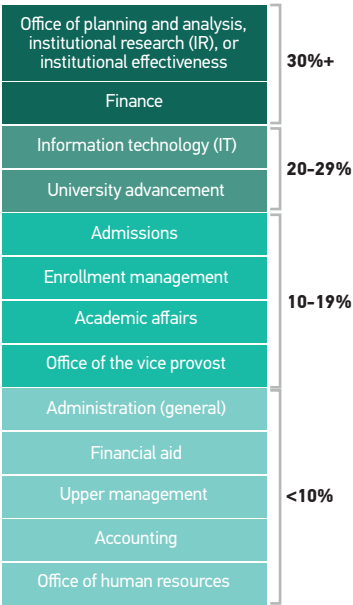
major institutional priority (see figure 1). About one-third (30%) of respondents indicated that although it is not a major priority for the institution as a whole, some departments, units, or programs see institutional analytics as a major priority. Another one-fifth of respondents indicated that their institution is interested generally in analytics but has yet to make it a priority. This pattern is fairly consistent across institutions regardless of type (public, private, for-profit), Carnegie class, or size (student FTE).



**Figure 1. Institutional priority on institutional analytics**

We asked the 72 respondents who said that institutional analytics is a major priority for departments, units, and programs to identify which entities are making it such. The organizations listed fall into roughly three major categories: 1) units that already generate and use large amounts of data to manage institutional business and affairs; 2) units that collect and use data on students and potential students; and 3) units that aspire to collect and use data to improve business processes and impact institutional decision making.

Departments and organizations that constitute the first category—institutional research, finance, IT, and advancement—were the most frequently cited (see figure 2). This is not surprising, given that these functional units began performing statistical analysis on large institutional data sets long before “analytics” was a buzzword and seem to be a natural fit for new tools for collecting, processing, and analyzing data. Student-focused units such as admissions, enrollment management, and academic affairs were cited by 15–18% of respondents, a smaller number that reflects the emergent application of complex algorithms to determine which students to admit, to facilitate degree planning and progress tracking, and to monitor student success.<sup>9</sup>



**Figure 2. Departments, programs, and units that consider institutional analytics a major priority**

The infrequently cited departments in the last category appear to be aspirational in terms of their usage of institutional analytics. In some instances, analytics may serve as a new tool or approach to thinking about leveraging existing data to improve outcomes, such as allocating financial aid, identifying cost savings, or managing talent. For more administrative units, whose benefit from using analytics may be less clear, the promise of analytics may outpace specific needs (perhaps addressed by other units) but is seen as valuable and worthy of pursuit on its own.



## Current and Planned Use of Analytics

In order to glean what may or may not motivate colleges and universities to invest in institutional analytics, it is worth considering how funds for information systems and applications—the area most closely related to analytics for which we have data—are actually allocated. According to 2014 CDS data, out of the total central IT operating and capital expenditures for information systems and applications, administrative functions received the lion's share of funds (67%). Teaching and learning functions received most of the remaining funds (29%), with research and other functions splitting the remaining amount nearly equally.

To better understand how IT spending priorities might be related to the way colleges and universities are approaching institutional analytics, we asked survey respondents to describe the use of analytics in a number of functional areas at their institution. Principal component analysis (see table A1 in the Appendix) reveals that the 19 areas we asked about break out into 5 factors that we have chosen to label as business analytics, student management analytics, learning analytics, faculty performance analytics, and degree completion analytics (see figure 3). Business analytics and faculty performance analytics fall squarely into the broader analytics category of institutional analytics; learning analytics and degree completion analytics belong to the broader category of learning analytics. Student management, however, is a factor that could fall into either the business or learning analytics categories given that the items that it comprises have more to do with management than learning, but it still focuses on students.

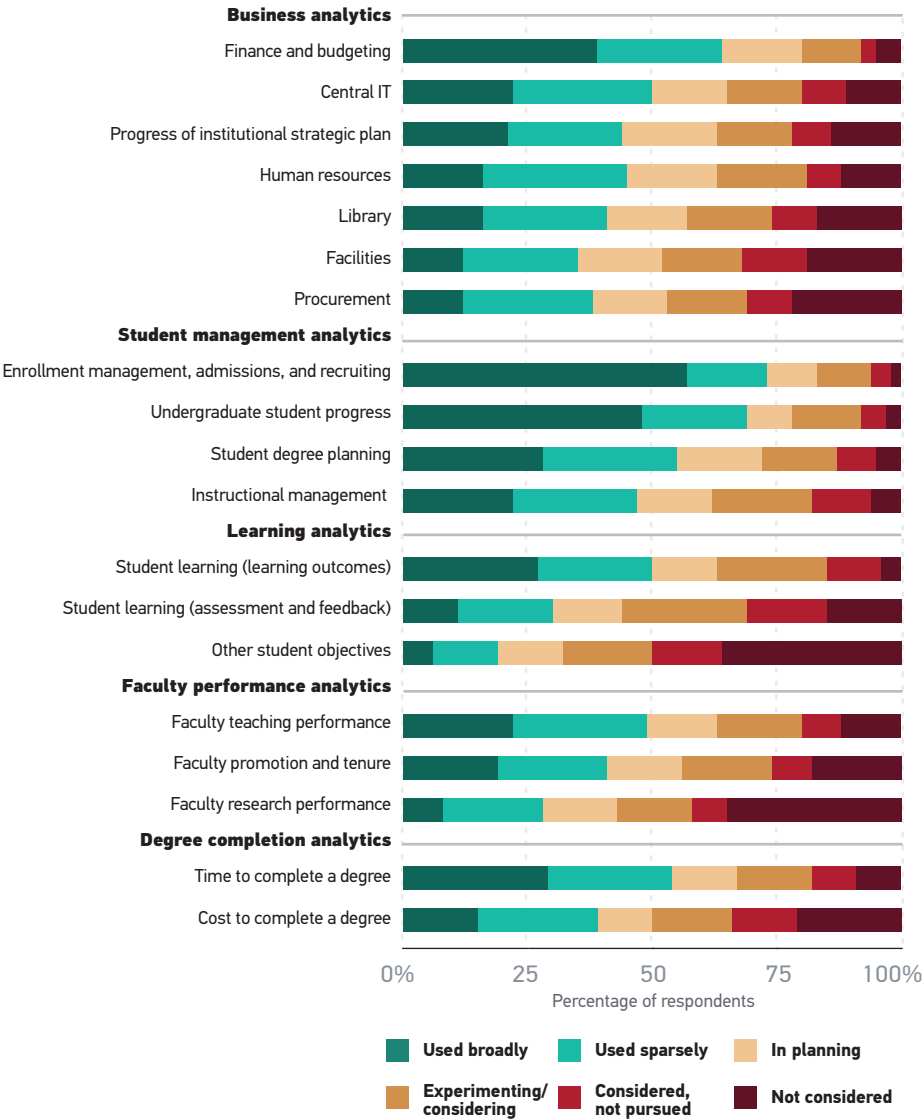


Figure 3. Current and planned use of analytics

## Business Analytics

The functional areas in which colleges and universities are using or considering using institutional analytics are those for which considerable amounts of data already exist and/or for which data can inform short- and long-term decision making about running the institutions. In every functional area in the category of business analytics, more than half of responding institutions are already using or are planning to use analytics to inform decisions in every functional area in the category of business analytics. In the areas of finance and budgeting and of central IT, a majority of respondents indicated that analytics is already being used. Within this category, institutional analytics is being used the least in the areas of procurement and facilities. The motivation behind the widespread and early adoption of institutional analytics in all of these issue areas may stem from the fact that each represents a function that can immediately benefit in practical and meaningful ways from the thoughtful application of analytics techniques to existing data sets. That is, the promise of what institutional analytics can do finds a natural home in units and activities that are aligned with business functions. Analytics initiatives in business areas often also benefit from the easy identification of a single or a small number of highly placed institutional decision makers with responsibility for the data and the institutional authority to act.

## Student Management Analytics

Student management, a category that comprises such areas as enrollment management, student progress tracking, degree planning, and instructional management, is the second factor to emerge from our analysis. Again we find that considerable effort has already been put into exploring and implementing analytics in service to student management. Three out of the four issue areas of student management analytics are in use to some degree at a majority of institutions, with nearly all respondents indicating that their institution is at least considering the use of analytics in this factor.

Recruiting and managing enrollment (73%) and tracking undergraduate student progress (69%) are the areas in which we observe student management analytics use to the greatest degree, an unsurprising finding given that they have long been the institutional objects of interest for the purposes of accreditation, fulfilling requirements for public funding, or comparing results against internal strategic benchmarks. The use of analytics for recruiting is an area of growing interest for institutions as they seek to sustain and grow enrollments and to attract best-fit students for the institution. The ability to mine, analyze, and act on data about prospective students and applicants is a key element of making institutional improvements in this space. Student degree planning, one of the key domains of

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Integrated Planning & Advising for Student Success (iPASS), is an emerging area of student management analytics in which institutions are taking part.<sup>10</sup> And instructional management, the least broadly used (22%) but most experimental (20%) area of analytics related to student management, is tied to both current and future uses of student data from learning management systems (LMSs).

## **Learning Analytics**

The third factor, learning analytics, is the area of analytics investment and interest that is most directly related to the student experience and learning outcomes. Despite the relative newness of learning outcomes analytics, about half of respondents indicated that their institution is using it either broadly or sparsely. Another third of responding institutions are in the planning stages, are experimenting, or are considering learning outcomes analytics. Considerably fewer institutions are employing on-demand assessments (11% broadly and 20% sparsely) or other student objectives (6% broadly and 13% sparsely), and substantial numbers have considered but not pursued analytics for those areas or have flatly not considered them at all. This may be due in part to the fact that there are few, if any, agreed-on metrics or consistent sources of data available in these areas; the costs and efforts associated with applying analytics to these areas simply may be prohibitive at this time. Another explanation, offered by John P. Campbell, associate provost and CIO of the University of West Virginia, is that other challenges to learning analytics are scale and consistency. On the front end, faculty use a variety of tools other than the LMS to teach and manage students. On the back end, institutions continue to struggle with the disaggregation of the LMS and the resulting data being stored in so many different locations. “Until this is addressed, scaling learning analytics will continue to be a struggle,” observed Campbell.

## **Faculty Performance Analytics**

The current and planned use of analytics in areas making up our fourth factor, faculty performance analytics, is similarly thin. Analytics in the area of faculty teaching performance leads the three areas included in this factor, with nearly half of respondents reporting that their institution is using analytics to some degree to measure, compare, and assess faculty teaching. Not only is the broad use of analytics for faculty research performance (8%) lagging other areas, but a plurality of respondents (42%) also indicated that they have either considered and not pursued the use of analytics in this area or are not considering its use at all. Although journal impact factors, typically measured as an average of the number

of citations received by recent articles, have been used for decades as a proxy measure of research performance and individual-level measures (e.g., H-Index) and are growing in popularity, some research programs may be so narrow that they do not lend themselves to being measured reliably and validly by such methods. Moreover, institutional and departmental expectations for research may vary considerably. Some institutions and departments are beginning to use analytics to track the acquisition, distribution, and use of research grant dollars. The combined objections and concerns about using analytics to measure teaching and research performance may explain why the use of and interest in faculty promotion and tenure analytics is tepid. In fact, this appears to have played a key role in faculty pushback against the use of analytics to evaluate faculty performance at Rutgers University at New Brunswick.<sup>11</sup>

### **Degree Completion Analytics**

Degree completion is the subject of the fifth factor and considers both the time to degree completion and the cost of degree completion. The use of analytics in these areas appears to be more mature than for student learning and faculty assessment, perhaps because these data have been collected and tracked by institutions extensively. A majority of respondents (54%) indicated that degree completion analytics are in use to some extent, and two out of five respondents (39%) said that cost-of-degree-completion data are being used. Newer iPASS innovations such as degree planning systems and progress tracking software may serve well to better understand the factors that inflate these numbers and thereby lead to reductions in both time to and cost of student degree completion.<sup>12</sup>

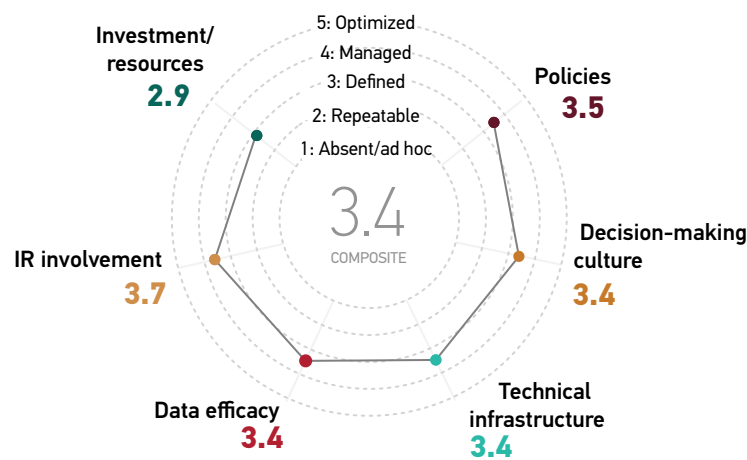
The areas in which colleges and universities are using institutional analytics approaches to a comparatively greater extent appear to be those for which 1) data are already being collected and analyzed on a regular basis, 2) established and relatively objective metrics are in place, 3) the relationships between metrics are fairly well established and understood, and 4) there is often an identifiable key stakeholder with governance over the data and the authority to act on insights. For those areas more aligned with or dependent on social sciences and/or qualitative data (for which reliable and valid metrics have yet to be established, and meaningfully practical applications of analytics are being explored), we see considerably less usage and greater skepticism or hesitancy with regard to implementing analytics.

## Important Maturity Issues for Institutional Analytics

In 2012, EDUCAUSE began working to develop maturity indices to help colleges and universities measure their capacity for analytics. The maturity index can help individual institutions engage in strategic planning and management by providing evidence regarding their current levels of analytics development, identify areas of strength and weakness, and formulate responses that proactively move the proverbial needle in the desired direction.

### 2014 Analytics Maturity Index

Using data from the 2014 CDS survey, we have refined our measures so that the 32 items used to benchmark analytics maturity are placed on a scale with attributes ranging from 1 (the characteristic is absent or ad hoc) to 5 (optimized). Statistical analysis reveals that these items contribute to six factors or dimensions: policies, decision-making culture, technical infrastructure, data efficacy, institutional research (IR) involvement, and investment/resources. The current analytics maturity-index scores for all institutions participating in the relevant module of the 2014 CDS survey are displayed in figure 4.



5: Optimized	Besides measuring performance, we regularly reassess the way we deliver this capability, in order to improve practices and manage risks.
4: Managed	We manage this capability to achieve predictable results on the basis of reliably measured performance indicators.
3: Defined	We have a standardized capability and have documented procedures and/or responsibilities related to it.
2: Repeatable	We have an established capability, but our practices are mostly informal.
1: Absent/ad hoc	We don't currently have this capability, or we address it in an improvised, irregular way.

Figure 4. Analytics maturity index, 2014

Comparatively, the level of IR involvement in institutional analytics projects is the most developed dimension of this maturity index; its average score reflects the purview of IR units to leverage institutional data for predictive modeling using reliably measured performance indicators. Policies, decision-making cultures, technical infrastructure, and data efficacy have average scores halfway between being defined and managed. A defined analytics capacity is characterized by having standardized capabilities with documented procedures and/or responsibilities related to it; a managed analytics capacity has the capability to achieve predictable results on the basis of reliably measured performance indicators.

### **Areas for Improving Levels of Analytics Maturity**

One of the more useful aspects of applying a maturity index to evaluate an institution's analytics program is that it helps identify the general and specific areas that can be targeted for improvement. In this section, we consider three of those areas: investment/resources, decision-making culture, and data efficacy.

#### *Investment/Resources*

An examination of the individual items that make up the analytics maturity index reveals that about one-third of them are at or below the midpoint of the maturity scale. Of the 11 items in this group, the 7 that are below that threshold are all part of the investment/resources dimension. In terms of investment, institutions are relatively immature with regard to funding analytics as an investment, investing in analytics training, and funding at levels sufficient to meet institutional needs. For resources, institutions are underdeveloped in terms of having sufficient professionals who have specialized analytics training, know how to apply analytics, and know how to support analytics, as well as having an appropriate number of data analysts (see figure 5).



Figure 5. Maturity-index items with growth potential, 2014

Clearly, insufficient investment in and funding for analytics resources is a key factor that keeps institutions from reaching managed or optimized levels of maturity. Despite the hype associated with analytics in higher education and the representation of analytics in the EDUCAUSE 2016 Top 10 IT Issues list, many institutions continue to balk at allocating resources for institutional analytics. Although there may be some institutionally specific reasons for this, a lack of evidence of the impact may be one reason that is common across institutions.

Uncertainty around how to organize for analytics may be another key issue that slows initiatives. Institutions may waffle between a centralized versus a decentralized organizational structure to support analytics. This uncertainty around the organizational model can exacerbate the funding gap if an institution determines that a new set of centralized resources is required to make analytics progress. Gartner recommends a two-tiered organizational model that includes both a central team and a limited number of distributed units.<sup>13</sup> This structure strikes a balance of power by creating a central team to ensure consistency and governance across business areas while leveraging the domain expertise, agility, and responsiveness often associated with distributed units.

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Related to investment and organization, leadership on the subject of institutional analytics is required for initiatives to mature beyond the managed level and rise toward the optimized level. Presently, institutional analytics leadership resides with CIOs, presidents and/or chancellors, directors of institutional research units, chief academic officers (CAOs) and/or provosts, and chief financial officers (CFOs) (see figure 8 on page 27). Certainly, analytics projects will not succeed without the backing of one or more of these officers, but a handful of champions, stakeholders, and potential end users who understand the potential practical impact of institutional analytics may be better suited for spearheading analytics projects. These individuals can encourage the necessary buy-in and cultivate a culture conducive to supporting the processes required for a successful analytics initiative.

Focus group participants identified a variety of challenges for institutional analytics. One rather fundamental issue raised was that not everything in the academy can be reduced to a return on investment (ROI) or a cost-benefit analysis, raising a general concern that the institutional mission is not always cost-effective and that institutional analytics projects are often motivated by achieving such efficiencies. Other obstacles mentioned include institutional inertia, management changes, and data-privacy concerns. However, a recurring theme was the issues of data quality and data usage as key challenges for institutional analytics on campus. The sentiment was that the well-known axiom “garbage in, garbage out,” or GIGO, is a reality requiring reframing to achieve analytics success.

Four of the individual items that make up the analytics maturity index are only slightly above the midpoint (not pictured). These items belong to three of the issue areas and are also worthy of attention if colleges and universities are expected to mature their institutional analytics programs. One of these items also belongs to the less developed investment/resources area: analysts knowing how to present processes and findings in a visually intuitive manner.

### *Decision-Making Culture*

We have identified two items that can improve the decision-making culture as it relates to institutional analytics: 1) managing and optimizing processes of rendering data actionable, and 2) faculty acceptance of the use of analytics for decision making. Although the former is a matter of policy and process development, the latter is perhaps more difficult because it requires a shift in values, attitudes, and beliefs. We know that faculty already support leveraging analytics for student success initiatives and desire evidence of impact on technologically related initiatives.<sup>14</sup> This suggests that the perception of faculty

reluctance may stem from either a misunderstanding of their positions on such things or a lack of evidence thus far that analytics can and does improve institutional outcomes.

Focus group participants identified the need for cultural change on campuses to truly achieve the analytics vision of the future. They specifically pointed to the need for “buy-in,” development of a “shared vision,” “shared data ownership,” and “student input” as important factors in advancing analytics. They described a shift from managing and operating on the basis of “gut” and instinct to building a data-driven and decisions-based culture as significant. The latter is dependent on a commitment to “measurement,” and that will require a high degree of change to standard operating procedures, especially for faculty, at many institutions. This observation is supported by the survey results (represented in figure 5).

### *Data Efficacy*

The final item that we think demands attention is a component of the data-efficacy dimension. On average, it appears that institutions are barely above the level of having defined the parameters associated with data standardization that supports cross-institutional comparisons. Although some work could be completed by institutions in isolation to increase levels of maturity for this item, cross-institutional standardization may require considerable collaboration and cooperation across institutions (perhaps within consortia) or through professional organizations associated with functional units (such as NACUBO, AIR, and CUPA-HR), or through vendors that offer a data-benchmarking component to their products or services.

## A Culture to Develop an Analytics Strategy

Which comes first, culture or the institutions? From a social scientific standpoint, we know that it works both ways: culture shapes institutions and institutions shape culture. Although it may be impossible to ferret out the direction of causality, what is typically true is that a critical mass of either culture or institutions is required to bring about large-scale change. In the case of analytics, it appears that institutional commitment lags cultural maturity.

Only 35% of institutions participating in the 2014 EDUCAUSE CDS survey indicated that they currently have a strategy for analytics, with the remaining two-thirds indicating that they do not. Items that constitute the decision-making culture dimension of the maturity index had higher-than-midpoint scores on the index scale. Moreover, a clear majority of institutions agreed or strongly agreed that markers of a culture that conduces an analytics strategy are already in place:

- Use of data is part of our strategic plan (67%).
- Our senior leaders are publicly committed to the use of analytics and data-driven decision making (62% agreed or strongly agreed).
- Our administration largely accepts the use of analytics (59%).
- We have identified the key institutional outcomes we are trying to improve with better use of data (54%).
- We have a culture that accepts the use of data to make decisions (53%).

The lowest cultural item is the aforementioned acceptance of analytics by faculty.

With a culture in place that supports the development of an analytics strategy, the next steps necessarily involve identifying short- and long-term institutional goals and thinking about what needs to happen to achieve them. As a starting point, we recommend strongly that institutions use the [online EDUCAUSE tool](#) to assess their current level of analytics maturity and benchmark themselves against their peer institutions. The analytics maturity index can help institutions understand where they are in relation to where they want to be so they can determine the best course of action. In the next section, we offer some evidence-based advice for how to proceed.

## **The Importance of an Analytics Culture**

Culture is the fabric that ties together process, acceptance, shared definitions, and communication around data across an institution. Developing a community around analytics, beginning with faculty and including the broader institutional community, is a practical and effective method of inculcating a new institutional paradigm for analytics data.

At the University of Michigan, many analytics efforts began when faculty, students, and staff came together for a regular seminar series in which internal and external researchers shared findings related to student or institutional data (see [Student Learning and Analytics at Michigan](#)). Such talks allowed a shared understanding of available sources of information, actionable data, and relevant outcomes to grow and develop over time.

Building on such events, institutions can identify a set of faculty champions, across diverse disciplines, who can help set institutional priorities for analytics, suggest improvements for data sources and tools, and provide insight for analytics-related strategies. These champions can also identify relevant research projects and funding opportunities to spur innovation related to analytics. Developing a culture that accepts, trusts, and uses analytics across an institution can be difficult, yet doing so is vitally important to achieving analytics maturity and *maintaining* such status longitudinally.

*—Steven Lonn, Assistant Director for Assessment and Evaluation, Office of Digital Education and Innovation, University of Michigan*

## **Toward Using Institutional Analytics to Improve Business Practices**

Five main tasks can help institutions move toward the development and implementation of institutional analytics strategies. They include identifying the problems that analytics can solve, the data sources for institutional analytics, the university systems that are conducive to analytics, the sources of technology used to deploy analytics, and the interested campus partners outside central IT units.

### **Identify the Problems That Analytics Can Solve**

Establishing a successful analytics practice on campus starts with having a compelling reason for analytics. This distills to the clear identification of problems that can be better understood or perhaps even solved by taking a deeper look at data. The selection of a problem is particularly important for new analytics initiatives. Simply put, you want to select a problem that will likely result in an early first win, thus building momentum and support for growing the analytics practice on campus. This means identifying the business problems that could provide the biggest impact or quickest payback if solved. The types of problems that can be tackled with analytics are varied. They can include day-to-day operational decisions, tactical decisions related to planning, or even strategic decisions such as which academic programs to offer. Focus group respondents cited many examples of urgent problems facing their institutions where analytics has been or could be valuable. Recruiting and enrollment examples were common, as institutions struggle with finding and attracting the right students. Student retention is another focus for many analytics initiatives. Some respondents offered inspirational success stories such as “We drove down the [tuition] discount rate by 9 points through predictive analytics!” Stories like this clearly point to the great potential for analytics in higher education administration.

The selection of a problem is particularly important for new analytics initiatives. Simply put, you want to select a problem that will likely result in an early first win, thus building momentum and support for growing the analytics practice on campus.

## Identify Sources of Data

Institutional systems that are good sources of data for institutional analytics include the enterprise resource planning (ERP) components that manage the institution's human resources and financials, as well as the student information system (SIS). When available, institutional systems supporting advancement/alumni, research management, facilities, and customer relationship management (CRM) are also key sources of data. Although it is more aligned with learning analytics initiatives, the LMS is also a core element of institutional analytics.

The question of how to best integrate the systems and data to create a data flow and an enterprise architecture conducive to making sound data comparisons (across previously siloed and disparate data sources) is a multifaceted challenge. Solving this challenge requires strong data stewardship and standards, as well as data-integration technology. The data-integration approach must be designed with the necessary speed of integration in mind. Classic business intelligence initiatives were often architected to use batch-style methods to extract, transform, and load (ETL) data overnight from transactional systems to data warehouses, where the institution could report on the past. However, the use of analytics to support near-real-time decisions is increasingly necessary in the emerging digital business economy, and campus analytics initiatives will need to grapple with the complexities this presents for their analytics architecture and tools strategy. For institutions to move beyond descriptive (what happened) and diagnostic (why did it happen) analytics to the higher plateau of predictive (what will happen) and prescriptive (what should we do) analytics will require investment in new and different technology.

Focus group members pointed to data accessibility, portability, and quality as key elements of successful initiatives. These all rely on integration to ensure that everyone is “looking at the same numbers” and “talking the same language.” Good analytics requires data that are transparent and understood by more than just the report writers. “[Data need] to be reproducible and correct” per a focus group participant. Lastly, the ability to support data visualization is an essential element of producing digestible and insightful analytics.

The use of analytics to support near-real-time decisions is increasingly necessary in the emerging digital business economy, and campus analytics initiatives will need to grapple with the complexities this presents for their analytics architecture and tools strategy.

Identify Best Systems to Deploy Analytics

The promise of institutional analytics is the opportunity to improve business practices and make better decisions grounded in the thoughtful analysis of data. There are a host of information systems and applications that most institutions are beginning to deploy, have deployed in a targeted fashion, or have implemented institution-wide. Many of these systems and applications both manage and generate large amounts of data that might be marshaled in service to an institutional analytics initiative. The five college/university systems and applications with potential institutional analytics applications are shown in figure 6:

- Business, finance, and human resources
- Event management and calendaring
- User system configuration and asset management
- Housing, parking, and alumni management
- Portal

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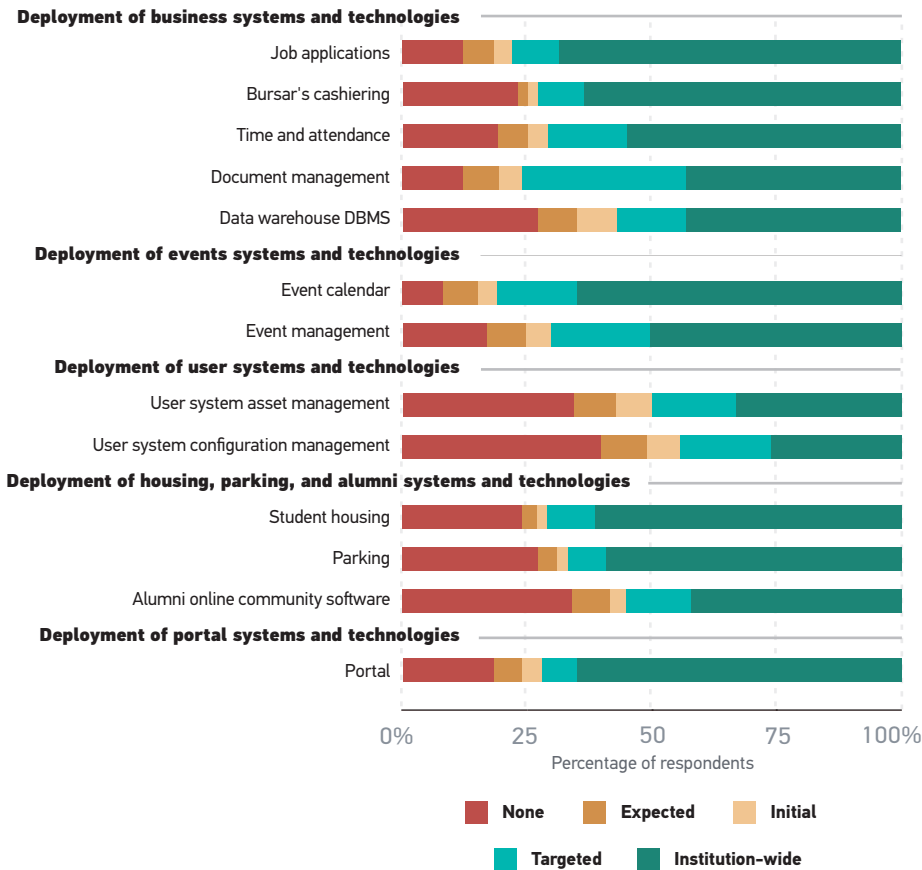


Figure 6. Deployment levels of college/university systems and applications

Although the specific domains, systems, and technologies on which an institution may choose to focus will vary based on factors specific to that institution, some broad contours are evident in the data that suggest some initial points of consideration, depending on the maturity of institutional analytics. First, if virtually no institutional analytics systems are in place, target domains or systems that are fully deployed and that have the potential to make an immediate and significant impact on the institution. Evaluate the untapped potential of embedded analytics that are available today within systems, and look for embedded analytics as a critical capability when buying and replacing systems. College/university systems and applications that enjoy institution-wide deployment are likely to be veritable treasure troves of institutional data that can be analyzed. Moreover, larger systems, like ERPs, are frequently associated with fundamental business processes; applying analytics to these systems may result in the identification of institutional inefficiencies that can be improved to produce cost savings and streamlined processes.

Second, if some institutional analytics systems are only initially in place, targeted, or expected, the opportunity exists to systematically develop a widespread application of analytics. A first step is to identify a business problem and then identify the data available and the potential variables that might provide insight and contribute to improvements in the key business practices relevant to the problem. The selection of the problem is closely aligned with the identification of key stakeholders (see Identify Partnerships Outside IT below). Next, consider how the data and variables identified can be leveraged to emulate or replicate generally accepted good practices and how they will measure the quantities of interest in a reliable and valid manner. Finally, using the initial results of analytics efforts as a baseline, assess the degree to which those measures are performing in expected and useful ways, adjusting the measures as necessary to improve both the models deployed and the outcomes measured. Such an approach is methodologically sound and can set the stage for future expansion of analytics into other areas.

Third, if technologies and systems enjoy institution-wide deployment, use of data and analytics *within* units for specific business functions might already be widespread. If this is the case, there may be additional opportunities to collaborate and share data with other units tasked with similar or related functions in the same domain (such as job applications, bursar's cashiering, time and attendance, document management, and data warehouse). Of course, this requires identifying potential benefits of data sharing, cultivating a culture of trust, and integrating data systems with common data definitions. Regardless, significant business value may lie in breaking down existing data silos and leveraging shared data for the benefit of the institution as a whole.



Identify Technologies to Deliver Analytics

One potential obstacle that leads institutions to balk at pursuing analytics initiatives is the concern that new and expensive systems are required to collect and analyze data. While it is true that investment in data and statistical experts may be required, many institutions already have systems and applications in place that are managing, collecting, and analyzing data. And many of them, an overwhelming majority in fact, are widely known and widely deployed vendor products (see figure 7). For respondents who were able to identify the systems and technologies used, the most common ones are alumni online community software (97%), bursar’s cashiering (96%), and document management (95%); among the least frequently identified vendor/open source systems and technologies are those that support portals (80%), data warehouses (73%), and parking (70%). Simply stated, most institutions have units that already have systems and technologies in place that can support institutional analytics initiatives.

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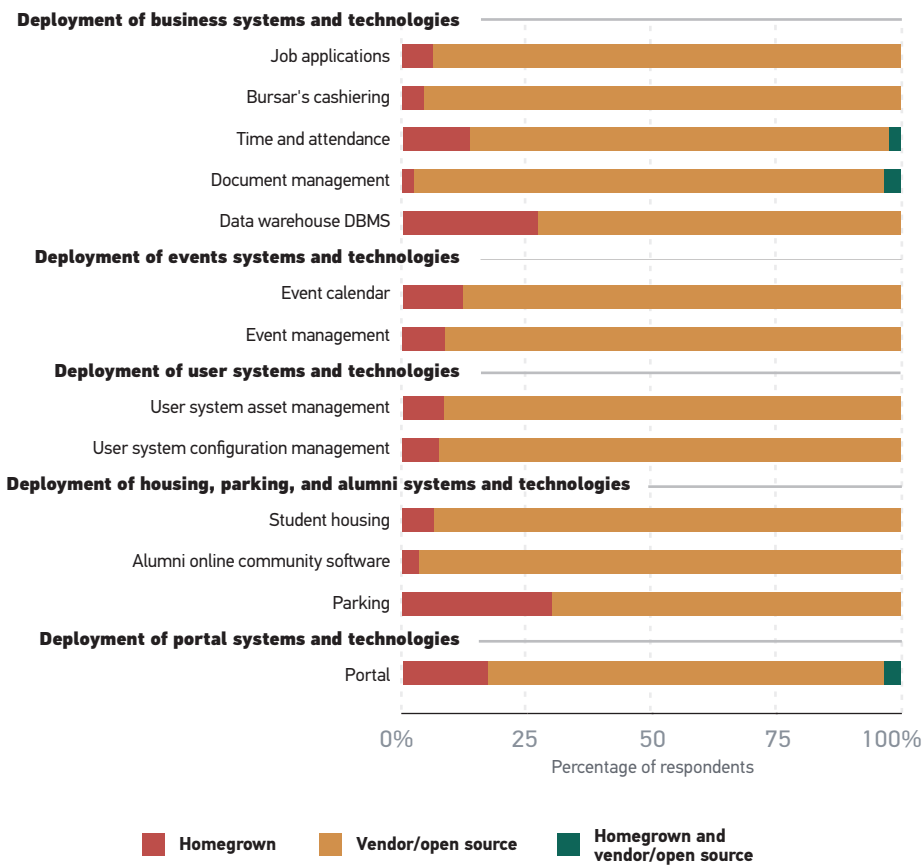


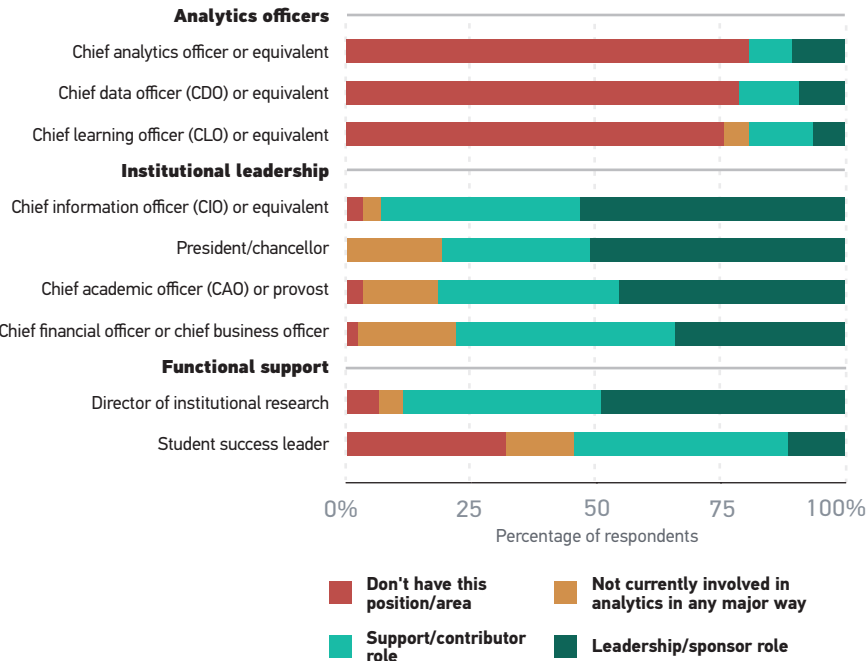
Figure 7. Systems and technologies deployed, homegrown and vendor/open source

One surprising finding from the CDS data that were used to identify technologies that have the potential to deliver analytics is the number of homegrown systems that institutions reported using. Between 3% (for alumni online community software) and 30% (for parking) of institutions reported using homegrown systems to manage their business and data. The prevalence of homegrown systems affords colleges and universities the opportunity to experiment with analytics as a precursor to (or substitute for) investing in new and expensive systems that may not serve the interests of the institution well.

### **Identify Partnerships Outside IT**

Institutional analytics, not unlike many information technology projects, requires that IT organizations collaborate with offices and units that have little, if anything, to do with technology. To understand who the common institutional analytics partners are, we asked survey respondents to identify a number of non-IT entities and the roles they play in institutional analytics projects and initiatives. Principal component analysis reveals three main groups of partnerships that are important for such projects.

The first group—analytics officers—is seen by the institutions that have them as serving in either leadership/sponsorship roles or support/contributor roles (see figure 8). However, our analysis confirms the relative newness of such positions, with more than three-quarters of respondents indicating that their institutions do not even have analytics officer positions. Although we noted above that investment in analytics support personnel and tools has been underwhelming to date, we recommend investing in analytics officer positions in the forms of a chief analytics officer, a chief data officer (CDO), and/or a chief learning officer (CLO) to provide leadership and vision for analytics projects. The combined expertise of statistical, data-management, and learning experts, respectively, that such positions bring includes skills sets that are not necessarily within the purview of other critical offices and roles. One focus group attendee commented that what’s needed is a “Swiss-army-knife type of person.” Others described the need to hire a good storyteller and someone who is fearless. Analytics officers with the authority and mandate to design, implement, and manage institutional analytics projects appear to be a crucial, but often missing, piece of the puzzle.



**Figure 8. Institutional analytics partners and roles**

The second category of positions to emerge from our analysis comprises more traditional institutional roles. Here, the chief information officer (CIO) is the position most frequently cited as acting as a leader/sponsor or a supporter/contributor of institutional analytics projects. In this category, presidents and chancellors, chief academic officers (CAOs) and provosts, and chief financial officers and chief business officers are also viewed by respondents to be leaders and/or supporters of institutional analytics at similar levels. Focus group participants differed widely when asked about the optimal role that IT should play with institutional analytics. Some saw IT as the campus leader, while others felt that IT should be a supporting player and that it is essential for business vice presidents and deans to take the leadership role. Despite institutional differences in the role of the CIO as analytics leader, there was consensus that the CIO should at least be a facilitator with a strong ability and responsibility to identify the potential for leveraging data and to improve data access. The CIO often has a distinct insight into the meaningful stakeholder partnerships that can benefit from analytics. However, one challenge that institutions face is that not all executive leaders possess the knowledge and skill to be effective analytics champions. Therefore, it is important that CIOs look for that expertise and desire, wherever it may exist within their institution, and leverage it with exemplary projects—however fledgling—upon which to build the analytics practice and future analytics maturity.

The third category of positions crucial for engaging in analytics projects is functional leadership roles, namely institutional research and student success. Both of these units depend heavily on the analysis of institutional data to achieve their objectives. In fact, without analytics they will be hard pressed to succeed. This is reflected in the large number of respondents reporting that the IR director has the leadership/sponsor role for analytics.

Regardless of what corners of the campus the stakeholders come from, success with analytics, especially advanced analytics, requires bringing together three key types of skills: IT skills, data science skills, and business skills. The IT skills will be foundational for the application of technology tools and the aggregations of data. The data science skills will be directional in terms of exploring the data available and determining which analytics to choose. Lastly, the business skills will be key to understanding what questions to ask and eventually how to use the analytics to make data-driven decisions—the ultimate goal of “actionable insight.”

## Conclusion

Institutional analytics regimes at colleges and universities are presently developing and require considerable investment to hasten their maturity in the immediate future. Fortunately, conditions appear to be conducive to expanding and improving on the capacity of analytics to deliver information to better inform business decisions and processes in higher education. From an organizational perspective, empowered stakeholders, greater data governance clarity, reduced data-security and privacy concerns, and large amounts of data generated and captured all contribute to an environment in which analytics initiatives can find purchase. From a cultural perspective, institutions appear to be ready in many respects to embrace data-driven decision making as a standard operating procedure. From a technological perspective, administrative software solutions will increasingly be equipped to provide institutional analytics, embedding analytics in transactional systems that lend themselves to standardized reports, reliably measured performance indicators, and predictive results. The key issue that appears to be stunting the growth of institutional analytics efforts is a lack of investment in terms of both funds and staff. As institutional pressures for greater efficiency continue to mount, the question of analytics investment will move from whether institutions should invest to how and how much they will invest.

## Recommendations

- **Assess current levels of analytics maturity and benchmark against peer institutions.** Institutions can use the [EDUCAUSE Benchmarking Service](#) to conduct their assessments. The analytics maturity index can help institutions understand where they are in relation to where they want to be so that the best course of action can be determined.
- **Invest in analytics resources, especially officer positions.** A chief analytics officer, chief data officer (CDO), or chief learning officer (CLO) can provide leadership and vision to analytics projects, as well as statistical, data management, and learning expertise, respectively.
- **Cultivate a culture that supports the use of data for decision making for institutional business.** Building a culture that seeks and accepts data to inform decisions as a standard business practice reduces the likelihood of resistance to analytics initiatives and may lead to greater support and investment in analytics projects.
- **Identify existing repositories of data or live data sets that lend themselves to analytics.** Many of the data required to solve specific problems may have already been collected or are currently being collected. Understanding what is available allows an institution to avoid starting from scratch and helps identify gaps in needed data.
- **Leverage technologies and analytics tools that the institution already owns.** Colleges and universities already have enterprise systems that can capture, analyze, and report on data that are processed. Many subinstitutional units already use specialized or homegrown systems that could be used for analytics. Bringing the two together can be a powerful start.
- **Encourage the development of non-IT partnerships across the institution.** Developing relationships with potential stakeholders across campus increases the likelihood of buy-in for analytics initiatives. Moreover, it can improve the reliability and validity of data and the measures necessary to arrive at mature institutional analytics by facilitating cooperation and data sharing.

## Methodology

The 2015 analytics survey was administered to a sample of EDUCAUSE member institutions (N = 245, response rate 13%). Tables A and B summarize respondents' Carnegie class and institution size distributions. The survey contained both qualitative and quantitative items. Data collection occurred between May 12 and June 7, 2015.

In addition to the survey, data were collected from six focus groups conducted at the EDUCAUSE Administrative IT Summit in Seattle, Washington, in June 2015. Participants included leadership and professionals from IT, IR, dedicated analytics units, and business and finance. Additional data sources included the 2014 EDUCAUSE Core Data Service and Gartner's cross-industry analysis of the state of analytics.

**Table A. Respondent Carnegie class distribution**

Carnegie Class	Frequency	Percentage
AA	29	12%
BA	49	20%
MA Public	23	9%
MA Private	33	13%
DR Public	40	16%
DR Private	19	8%
Other	24	10%
Non-U.S.	28	11%

**Table B. Respondent FTE enrollment size distribution**

Size	Frequency	Percentage
Less than 2,000	40	16%
2,000–3,999	57	23%
4,000–7,999	40	16%
8,000–14,999	32	13%
15,000+	39	16%
Unknown (U.S. systems and non-U.S. institutions)	37	15%

## Acknowledgments

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## Notes

1. Integrated Planning & Advising for Student Success (iPASS) was formerly known as Integrated Planning and Advising Services (IPAS). This change was effective in 2015. Information on the former can be found at <http://www.educause.edu/grants/ipass-grant-challenge>; information and research on the latter can be found at <http://www.educause.edu/library/resources/integrated-planning-and-advising-services-research>.
2. Ronald Yanosky, with Pam Arroway, *The Analytics Landscape in Higher Education, 2015* (Louisville, CO: ECAR, October 2015), available from the [ECAR Analytics in Higher Education, 2015 Research Hub](#).
3. Ibid.
4. Top 10 IT Issues: 2000–2015, <http://www.educause.edu/visuals/it-issues/trends/index.html>.
5. Jan-Martin Lowendahl, Terri-Lynn B. Thayer, Marti Harris, and William Rust, *Top Ten Business Trends Impacting Education in 2015* (Stamford, CT: Gartner, November 26, 2014) (subscription required).
6. Susan Grajek and the 2015–2016 EDUCAUSE IT Issues Panel, “Top 10 IT Issues, 2016: Divest, Reinvest, and Differentiate,” *EDUCAUSE Review* 51, no. 1 (January/February 2016).
7. Jan-Martin Lowendahl, Terri-Lynn B. Thayer, and Glenda Morgan, *Top Ten Business Trends Impacting Higher Education in 2016* (Stamford, CT: Gartner, January 15, 2016) (subscription required).
8. Yanosky, *The Analytics Landscape*, 2015.
9. D. Christopher Brooks, *IPAS Implementation Handbook*, research report (Louisville, CO: ECAR, October 2014); and D. Christopher Brooks, *IPAS Evaluation and Assessment Guide*, research report (Louisville, CO: ECAR, 2015).
10. Brooks, *IPAS Implementation Handbook*, 2014.
11. Colleen Flaherty, “Refusing to Be Evaluated by a Formula,” *Inside Higher Ed*, December 11, 2015.
12. Brooks, *IPAS Implementation Handbook*, 2014; Brooks, *IPAS Evaluation and Assessment Guide*, 2015.
13. See Kurt Schlegel, Frank Buytendijk, and Dan Sommer, *Create a Centralized and Decentralized Organizational Model for Business Intelligence* (Stamford, CT: Gartner, November 4, 2014) for more information (subscription required).
14. D. Christopher Brooks, with a foreword by John O’Brien. *ECAR Study of Faculty and Information Technology, 2015* (Louisville, CO: ECAR, October 2015), available from the [2015 Student and Faculty Technology Research Studies Research Hub](#).

## Appendix

**Table A1. Principal component analysis of current and planned use of analytics**

Item	Business analytics	Student management analytics	Learning analytics	Faculty performance analytics	Degree completion analytics
Student learning (assessment and feedback)			0.7504		
Student learning (learning outcomes)			0.5956		
Student degree planning		0.6896			
Undergraduate student progress		0.6886			
Enrollment management, admissions, and recruiting		0.8046			
Cost to complete a degree					0.7320
Time to complete a degree					0.7460
Instructional management		0.5825			
Other student objectives			0.6905		
Progress of institutional strategic plan	0.5961				
Central IT	0.6588				
Facilities	0.6416				
Finance and budgeting	0.6977				
Procurement	0.6864				
Human resources	0.7011				
Library	0.6919				
Faculty research performance				0.7626	
Faculty teaching performance				0.5908	
Faculty promotion and tenure				0.6879	
Eigenvalue	9.11918	1.83346	1.21351	1.10522	1.04190
Variance	4.42227	3.23543	2.35760	2.30673	1.99125
Proportion of variance	0.2010	0.1471	0.1072	0.1049	0.0905
Cell entries are orthogonally varimax rotated factor loadings with Kaiser normalization. Factor loadings below 0.5000 not reported. $\chi^2 = 2103.72$ ; $p < .0001$ ; $N = 181$					