2017 Trends and Technologies: Analytics
Introduction

Since 2014, EDUCAUSE has examined higher education's top strategic technology priorities. This year, in addition to reviewing the overall list of strategic technologies, EDUCAUSE will publish nine separate reports examining in detail the technology domains we asked about and reviewing each domain's component technologies and the trends associated with those technologies. This report covers the 13 technologies and 5 trends included in the analytics domain.

EDUCAUSE defines analytics as “the use of data, statistical analysis, and explanatory and predictive models to gain insights and act on complex issues.” As a practice, analytics is becoming ever more important to colleges and universities seeking to gain insights and act on issues across all aspects of institutional goals, especially as pressures continue to mount to contain costs while increasing student success. A 2015 EDUCAUSE study found that institutional analytics is a major priority for almost half of higher education institutions. Two years later, that number is likely higher, as colleges and universities consider the possible benefits of so much available data. The increasing access to data both within institutional systems and from external sources creates a potential gold mine of information to be harnessed, managed, and analyzed. The resulting trends described here reflect this increasing availability of data and the need to integrate and interpret data in the service of institutional goals.

Understanding the impact of analytics technologies is an important piece of managing and adapting to these trends. Taking advantage of these technologies can position the institution to better understand the impacts of their decisions on student success, on the financial health of the institution, and on progress toward goals and initiatives.

The focus of this report is the trends and strategic technologies associated with analytics. Mature, commonly deployed technologies (such as financial information systems or networks) may be among the most mission-critical technologies, but they are generally more likely to receive operational rather than strategic attention. Strategic technologies, by contrast, are the relatively new technologies that institutions will be spending the most time implementing, planning for, and tracking in 2017. None of the 13 analytics technologies analyzed in this research is currently in place in more than 30% of institutions.

Technologies are what IT organizations do. Trends, on the other hand, are widespread external factors that influence institutional and IT strategy and often spur the adoption of technologies. This report examines the trends that institutions are paying the most attention to and that are influencing emerging institutional IT strategy the most. This year’s trend list included five items closely associated with analytics.
## Covered in This Report

### Trends

- Changing vendor-institution relationships (moving from a transactional to a strategic relationship)
- Data-driven decision making
- Institution-wide data management and integrations
- Internet of Things
- Ubiquitous digital sources and streams (social media, IoT, systems and applications, OERs, etc.)

### Technologies

- Flexible interactive platforms for descriptive and predictive analytics of institutional data
- Massively scalable database architectures and software
- Mobile apps for institutional BI/analytics
- Predictive analytics for institutional performance
- Predictive analytics for learning
- Predictive learning analytics (course level)
- Talent/workforce analytics
- Technologies for degree auditing (documenting and tracking students’ educational plans)
- Technologies for improving analysis of student data*
- Technologies for integrating student records data across case management systems
- Technologies for offering self-service resources that reduce advisor workloads*
- Technologies for planning and mapping students’ educational plans*
- Technologies for triggering interventions based on student behavior or faculty input*

*Part of the overall 2017 Top 10 Strategic Technologies
Findings and Recommendations

What do we know about the kind of progress higher education might make with analytics technologies? What trends might influence this progress? While our data can never be a substitute for an institution’s own analytics strategic plan or roadmap, this report can inform an institution’s overall IT strategy and analytics technology deployment strategy.

The Trends

We characterized a trend as “influential” if it was already incorporated into IT strategy or exerting a major influence over emerging IT strategy. We used that characterization to classify the trends into four levels of influence, based on the prevalence of influence across institutions:

- **Most influential**: Trends that are influential in 61% or more of institutions
- **Taking hold**: Influential in 41–60% of institutions
- **Worth understanding**: Influential in 21–40% of institutions
- **Limited impact**: Influential in 20% or less of institutions

**Understand how the most influential trends are affecting your institution.**

One trend is influential at 61% or more of colleges and universities:

- **Data-driven decision making**. Data-driven decision making is often used as a synonym for analytics. The term emphasizes the purpose, rather than the process and technologies, of analytics. Many analytics initiatives focus on data, tools, and reports. All are necessary inputs into the activity that makes analytics worthwhile: deriving meaning from the data and determining the best actions to take. Data-driven decision making can take many forms. It can be incorporated into existing planning and management activities and processes. It can also be programmed into applications to generate real-time, personalized triggers, alerts, and advice for students, faculty, advisors, and other constituents.

**Review the trends that are taking hold and address them at your institution.**

One trend is influential at 41–60% of institutions:

- **Institution-wide data management and integrations**. Next-generation enterprise IT provides agility, scalability, and cost-effectiveness through a growing combination of applications, architectures, and sourcing strategies. However, it also complicates the challenge of making all those disparate
systems communicate with each other. To provide useful information from so many different systems and applications, IT needs an institution-wide strategy for data management that takes multiple stakeholder needs into account as well as an intentional focus on data integration across many different types of systems.

Understand these trends, and consider their possible role at your institution.
The influence of two trends is limited to 21–40% of institutions. Higher education is monitoring these trends (listed below from highest to lowest level of influence) with respect to emerging IT strategy and the deployment of analytics strategic technologies:

- **Changing vendor-institution relationships (moving from a transactional to a strategic relationship).** Next-generation enterprise IT is characterized by a shift in IT role from being a technology provider to being a service broker and partner. This shift allows for a different level of conversation between institution and vendor, as IT can broker a strategic conversation between the two, bringing technology investments into closer alignment with institutional mission in the process. In the broker role, IT can ensure that conversations about information security and privacy take place.

- **Ubiquitous digital sources and streams (social media, IoT, systems and applications, OERs, etc.).** Institutional data stores, systems, and applications provide a wealth of information that can be used in analytics initiatives. Increasingly, data from other sources such as social media, open educational resources, and the Internet of Things should also be considered as potential sources of important information, presenting institutions with the challenges of how to collect and harness so much data as well as how to deal with policy, privacy, and cultural issues related to externally sourced data.

The remaining trend was of limited impact in our research: Internet of Things.

**The Technologies**
The list of strategic technologies included in our survey was derived from the 2016 list and from several authoritative sources that annually identify emerging and maturing technologies in higher education. A total of 13 of the technologies
in the survey pertain to analytics. For each of those technologies, respondents selected one of six response options to indicate the level of activity for that technology at their institution in 2017:

- **Institution-wide deployment**: Full production-quality technical capability is in place, including ongoing maintenance, funding, etc., with deployment potentially supporting institution-wide access.

- **Expanding deployment**: In 2017, we will move from initial or partial to broader or even institution-wide deployment.

- **Planning, piloting, initial deployment**: This technology is not yet available to users; however, meaningful planning for deployment is either in development or in place. Staff are investing significant time (multiple person-weeks of effort) and resources in executing the plan to pilot or deploy this technology within a defined time frame.

- **Tracking**: Multiple person-days of effort will be assigned but restricted to monitoring and understanding this technology (much more than just reading articles).

- **No deployment**: None of this technology is in place, and no work will be under way or resources committed for this technology in 2017.

- **Don’t know**: I don’t know what this technology is.

We assigned attention scores to the responses, and the scores were weighted to highlight responses indicative of higher levels of activity (expanding deployment; planning, piloting, initial deployment; and tracking) over responses that suggest little or no activity of that kind (institution-wide deployment, no deployment, and don’t know).

Understanding what peer institutions (both current and aspirational) are doing can help you gauge whether your institution’s current approach is on track or might warrant reconsideration. Some technologies are more relevant for some types of institutions than others. We looked at broad demographic categories, including Carnegie class, institutional size, and approach to technology adoption, and found differences in attention score based on those factors. In figure 1, the U.S. mean is the average attention score for an item from all U.S. respondents. The minimums and maximums are the lowest and highest average attention scores among all groups within the categories of Carnegie class, institution size, and timing of technology adoption, with labels indicating which group or groups returned that score. In the event of a tie, all tied groups are represented.
Figure 1. Attention score averages and differences

Looking beyond attention scores, we sought to understand the kind of effort that the largest proportion of institutions is devoting to each technology. We created four attention categories by combining adjacent responses:

- Expanding deployment and institution-wide deployment, combined as **deploy and maintain**
- Planning, piloting, initial deployment and expanding deployment, combined as **pilot and deploy**
- Tracking and planning, piloting, initial deployment, combined as **decide and plan**
- No deployment and tracking, combined as **track and learn**

Although nearly every technology was represented to some degree in each attention category, we assigned each technology to the attention category with the greatest amount of institutional activity for that technology in 2017.
Complete initial deployment and maintain these technologies.

Our research shows that institutions are planning to deploy and maintain one analytics technology:

- **Technologies for integrating student records data across case management systems.** These technologies bring together data that may exist in multiple systems relating to each specific student. They make the data available to any staff or faculty member approved to access the information, allowing them to see all the data in the student record that is appropriate for their use. This access gives those responsible for student support up-to-the-minute information and enables them to collaborate to ensure student success.

Pilot and start deploying these technologies.

At this time, institutions are planning to pilot and deploy these three analytics strategic technologies (listed below from highest to lowest attention):

- **Technologies for planning and mapping students' educational plans.** Educational planning tools allow students and advisors to work together to build customized pathways through the curriculum that are appropriate for each individual’s interests and goals. In addition, these technologies offer a reliable way to chart and track progress toward a degree or credential completion. They also support institutions in the development of schedules that match demand.

- **Technologies for triggering interventions based on student behavior or faculty input.** These applications gather data points from a variety of institutional and academic systems, sending communications to students, faculty, advisors, and administrators in support of early intervention. They also provide a holistic view of a student’s progress, allowing the provision of targeted assistance in support of individual needs.

- **Technologies for degree auditing (documenting and tracking students’ educational plans).** An application used for degree auditing facilitates analysis of the academic program, comparing the requirements that must be met with what the student has completed and thus guiding the student to the requirements remaining to be met in order to complete a credential.
Decide when these technologies fit your strategy, and start planning.
Institutions are carefully watching these three analytics strategic technologies (listed below from highest to lowest attention), **deciding and planning** for potential future deployment:

- **Technologies for improving analysis of student data.** These technologies enable immediate access to and rapid analysis of large, complex data sets, making it possible to discern trends in students’ engagement with college, in the types of difficulties students are encountering, and in their likely success in attaining credentials across the student body. They allow advisors, student services staff, and administrators to examine broader patterns across departments, divisions, schools, demographics, financial aid status, or other categorizations of interest and adjust strategies accordingly.

- **Technologies for offering self-service resources that reduce advisor workloads.** These platforms make tools such as online registration, scheduling, and academic planning available directly to students, enabling those with professional responsibilities for guiding them to reserve in-person appointments for higher-level interactions and counseling on individual issues.

- **Predictive analytics for institutional performance.** Predictive analytics for institutional performance is the application of analytics for improving institutional services and business practices. It uses modeling to determine what will happen based on historical and transactional data. Examples of predictive analytics for institutional performance include student retention efforts and changes in tuition discount rates.

Learn about and track these technologies.
Institutions are **tracking and learning** about the following analytics strategic technologies (listed below from highest to lowest attention):

- **Predictive analytics for learning.** Predictive learning analytics is the statistical analysis of historical and current data derived from learners and the learning process to create models that allow for predictions that improve the learning environment within which it occurs.\(^5\)

- **Flexible interactive platforms for descriptive and predictive analytics of institutional data.** Flexible interactive analytics platforms reflect a shift away from IT-centric analytics solutions to ones that do not require advanced technical or data science skills. These platforms allow a wider range of users to perform interactive analysis of institutional data. In implementing these solutions, it is important to consider data governance implications because end users will have more direct access to institutional data.
• **Predictive learning analytics (course level).** Predictive learning analytics is the educational application of analytics by gathering and analyzing details of student interactions in online learning activities. At the course level, the information gleaned can then be used to adjust class activities and coursework to address areas where students may need more or less help.

• **Mobile apps for institutional BI/analytics.** These mobile apps allow the user to access institutional BI and analytics resources and technologies via handheld devices.

• **Talent/workforce analytics.** Talent or workforce analytics uses data from HR or other employee information sources to optimize workforce efforts and promote staff engagement. A mature workforce analytics practice links planning and decisions about staffing to institutional goals.

• **Massively scalable database architectures and software.** Massively scalable database architectures, such as NoSQL and Hadoop, allow for the distributed processing of very large data sets by dividing the work across computer clusters. Large data sets can be broken into pieces for cheaper storage on readily available commodity hardware, allowing for faster parallel processing. This type of technology approaches data storage and retrieval in a nonrelational way, allowing for high performance and highly scalable data management that can handle massive data.
Preparing for the Future

Understanding the technologies that are most relevant for your institution and how fast a certain strategic technology may be growing is critical to institutional IT strategy. We estimated the pace of growth based on the percentage of institutions we predict will implement each technology over the next five years (by 2022). Figure 2 positions each technology in one of 12 cells based on institutional intentions (the “recommendation for today”) and the expected pace of growth of that technology. Reflecting what was noted above, the figure shows that most of the technologies we tracked are still being explored—rather than deployed—by most institutions.

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<th>Expected pace of growth</th>
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Figure 2. Plans for 2017 and pace of growth for analytics strategic technologies
**Conclusion**

These analytics trends and technologies reflect a higher education environment with an increasing demand for information to support strategic decision making. The most influential trends described here include a concern for the data management needed to support that demand—the need to integrate data across systems, incorporate data from outside the institution, and manage relationships with vendors who host institutional data. IT leaders should consider the strategic impact of these trends as they plan how to position the institution for a mature analytics practice. The EDUCAUSE Benchmarking Service includes institutional analytics deployment and maturity indices that can be helpful tools for measuring progress on analytics initiatives.

Many of the strategic technologies described here suggest ways colleges and universities can use analytics to support student success initiatives. Understanding and deploying those technologies can help an institution better understand the impact of its student success efforts, provide the kinds of insight that could enable course correction, and put more information in users' hands. The trends being driven by increased demand for analytics are likely to continue to exert a strong influence on institutional IT strategy, and institutions would do well to position themselves to be able to take advantage of new analytics technologies as a part of that overall strategy.

**Notes**


3. EDUCAUSE tracks these types of established technologies in the Core Data Service because they are widespread enough to enable institution-level benchmarking.

4. Primary sources were *The Horizon Report*, Gartner’s Top 10 Strategic Technology Trends for 2014, and multiple 2014 Gartner Hype Cycles (education, big data, cloud computing, cloud security, enterprise architecture, enterprise information management, GRC, identity and access management, IT operations management, privacy, business intelligence and analytics, and emerging technologies). We augmented those with several additional technologies, most notably in analytics.

5. To learn more about predictive analytics for learning, see Sakinah Alhadad et al., *The Predictive Learning Analytics Revolution: Leveraging Learning Data for Student Success*, working group paper (Louisville, CO: ECAR, October 2015).