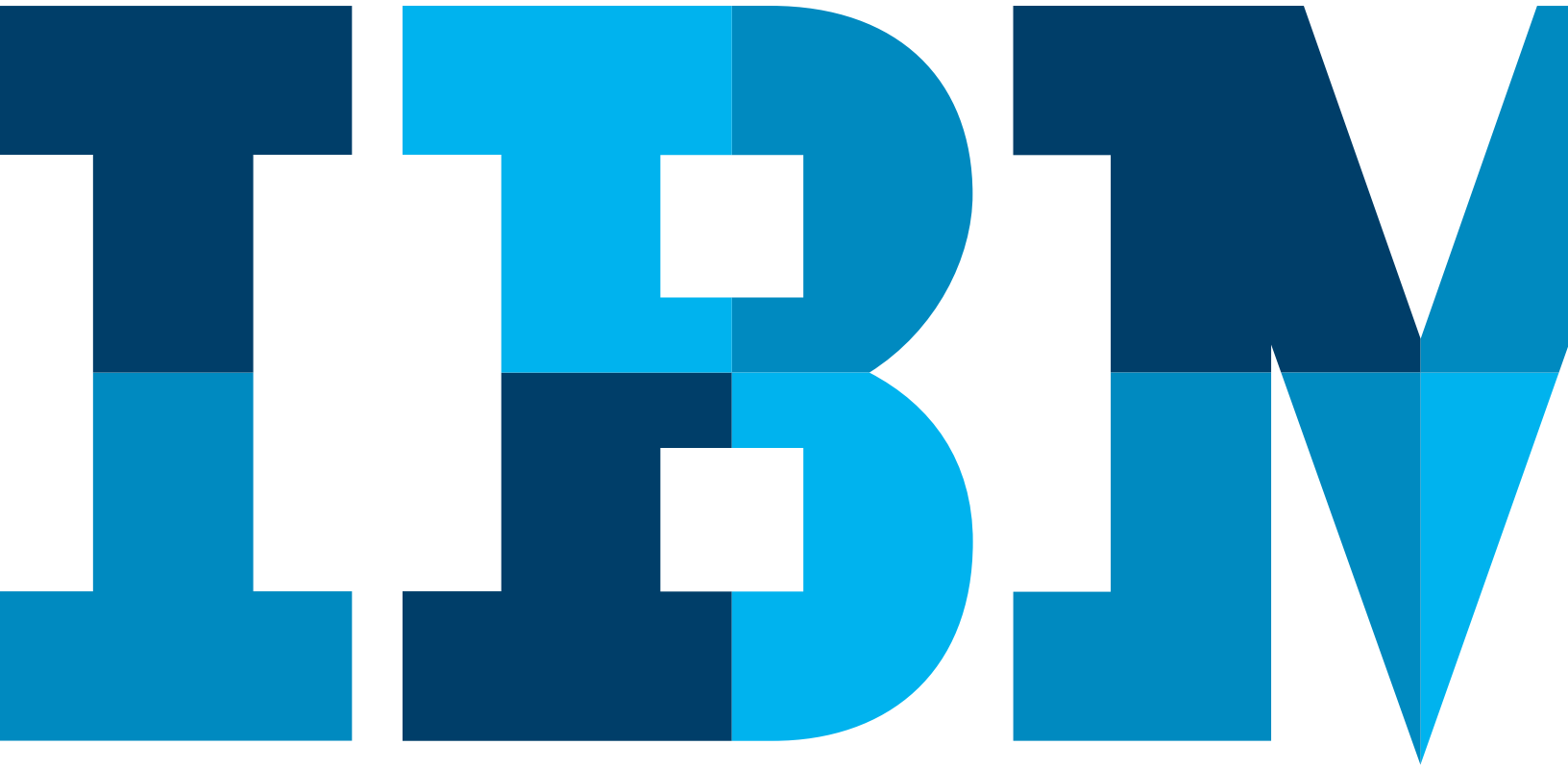
Global Business Services
White Paper

Recruiting and maintaining quality students within higher education using IBM's Analytics

A point of view paper from IBM Smarter Education



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Executive summary

In collaboration with the Economist Intelligence Unit, the IBM Institute for Business Value recently published a report entitled *Pursuit of relevance: How higher education remains viable in today's dynamic world* that outlines strategies for higher education institutions to "keep pace" with rapid economic and technological changes.[1] One of the report's key recommendations is to "Embrace new technologies to improve educational access, experiences, variety and outcomes". *Pursuit* suggests analytics is a fundamental approach to improving student outcomes. Analytics improves "decision making by focusing on patterns that indicate student success" and provides "greater context and insights" for higher education institutions. Predictive analytics provide an even greater opportunity. It indicates that "Through predictive models and collaborative frameworks that identify critical risk points, institutions can help improve student success."

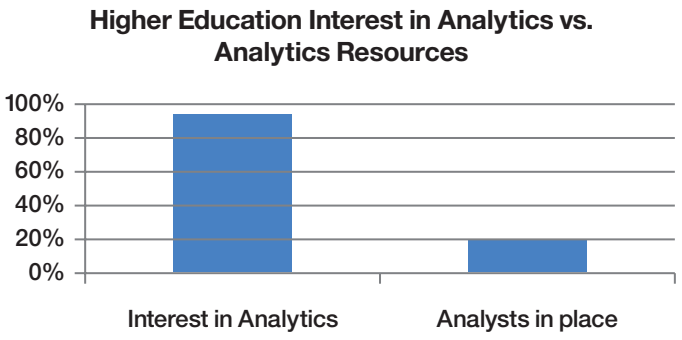
Building on *Pursuit*, this point of view focuses on how public and private higher education institutions can use analytics to improve student recruitment and retention. It includes IBM's point of view on how institutions can build their analytics capabilities and IBM's approach to implementing analytics solutions. Finally, the report describes IBM software that higher education intuitions might consider when implementing an analytics solution to improve student recruitment and retention.

Recruitment and retention challenges and opportunities

Higher education institutions are under immense pressure to enroll, educate, and graduate millions of students in the U.S. each year. A recent trend depicts the challenges many institutions are facing in meeting enrollment goals. Only 29 percent of private baccalaureate colleges reported meeting their new student goals this past year.[2] Moreover, colleges currently spend about $2,230 throughout the recruitment process per enrolled student (private colleges spend about 3X as much on recruitment per enrolled student).[3] Meeting enrollment goals is critical in order to sustain a steady source of funding and fill classrooms and dormitories. To effectively do so, colleges and universities have ramped up their recruitment and admissions efforts, worked to improve retention and graduation rates, and offered curricula that meets students' interests. These actions are not addressing the recruitment challenges. About half (47 percent) of admissions directors say they are very concerned about meeting their new student enrollment goals this year. Only 5 percent say they are not at all concerned. The level of concern seems warranted since only 39 percent say their

institutions met their new student enrollment goal by May 1 of the past year.[4] Institutions have dedicated significant resources to these areas of enrollment management. Now with new technologies and services, institutions can leverage the wealth of data collected to understand historical trends, predict future results, and align resources to advance institutional enrollment goals.

Analytics capacity challenges



A recent national survey of higher education institutions explains that employing data-driven strategies to improve results is not the norm in higher education.[5] Specifically, the survey measured the current and future use of analytics. 84 percent of respondents believed that analytics is more important than two years ago while 86 percent of respondents thought that analytics will be more important two years from now. The survey found that the primary perceived benefit of analytics was to understand student demographics and behaviors, followed by resource optimization, recruiting students, helping students learn more effectively, and graduate on time.

Despite a strong interest in analytics, intuitions are not investing in analytics resources. Senior leaders' interest in analytics was reported in place at 95 percent of institutions (the number one factor to the question "What Is in Place for Analytics"). However, institutions also reported that Analysts were in place in fewer than 20 percent of institutions (the smallest factor of "What Is in Place for Analytics"). These survey results clearly depict the misalignment between the growing importance of analytics alongside the lack of funding for analytics resources at colleges and universities.

IBM's approach

IBM's expertise providing analytics technology solutions within education as well as other industries can be leveraged to solve many of the critical challenges facing higher education today. Implementing such solutions will enable institutions to more effectively monitor admissions, enrollment, and academic performance trends. Further, IBM's analytical services can collect, analyze, and predict student outcomes. Together, these solutions and services can enhance colleges' and universities' ROI and their realization of institutional mission statements by increasing applications, selectivity, growing the student body, and enhancing student and alumni satisfaction. IBM is positioned to support the recruitment and retention efforts of higher education institutions for three key reasons: (1) IBM has the scale and experience to meet the growing need for institutions to effectively analyze, report, and predict student outcomes; (2) IBM's experience integrating vast amounts of institutional data to enable new areas of analysis; and (3) IBM consultants have experience transforming senior leaders' sincere interest in applying analytics at their institutions into solutions by providing them with access to data and knowledge to drive actionable insights.

Academic success	Cultural diversity	Alumni contribution
Students who enhance the overall community, realize educational goals, and obtain employment in intended field of study	Students who reflect cultural diversity and enhance the institution's mission	Students who are projected to be contributing alumni, serving the institution, their community and the world at-large

Table 1: Core Issues relating to recruiting and retaining best-fit students

Gathering clients' requirements, questions, and concerns & collecting institutional inputs

Analytics focused on student recruitment and retention is an area of interest for many higher education institutions. In order to provide actionable insights to colleges and universities, IBM will work with institutions to first gather requirements and inputs. During this discovery, the IBM team asks probing questions and listens intently to fully understand client's needs, historical challenges, and expected outcomes.

IBM expects higher education institutions to share certain core issues during the discovery process. One specific issue is how institutions define the types of students they perceive as "best fit". Best fit students are those students with certain characteristics that meet an institution's goals. For example, a particular institution may be interested in increasing diversity within the student body; therefore, "best fit" students would include those students with certain racial or ethnic attributes that would help meet these diversity goals. Other common student characteristics that define "best fit" students for a given institution are presented in Table 1.

From a recruiting and admissions perspective, these are some of the common steps to gather requirements, goals, and objectives:

1. Determine the attributes of an institution's model of "best fit" students, whether by geographic location, students' demographics, types and sizes of high schools students attend, students' high school and community engagement, and received awards
2. Evaluate the effectiveness of the recruiting model to assess each student candidate and to determine what factors are associated with influencing each student to apply
3. Determine how to modify the recruitment process to recruit "best fit" students, such as:
   - Assessing how and when the student became an initial recruiting candidate and how active or passive the student was within this inquiry period until the student applies
   - Evaluating all recruiting and admissions contacts with students including letters sent and events invited to and attended (e.g. HS Visit, Counselor Interview, Open House, Skype event, College Overnight)

IBM's team can assess these recruitment activities to determine triggers that motivate students to apply and identify the most impactful points in the inquiry phase. Following this assessment, the team can develop predictive models based on those factors that are highly correlated with application and enrollment to support more strategic recruitment decisions.

For currently and future enrolled students, the following lists represents a sample of the requirements and issues that may be evaluated.

- Expected vs. actual time to graduate per academic year
- Each student's academic performance, by semester to determine adequate progress
- Prior academic probation or early probation alert
- Patterns of students declaring a major and frequency of changes from original declaration
- Students' involvement in campus activities and leadership roles (e.g. SGA, Sorority, Spirit Band) and correlation with similar High School involvement
- Interaction with institution career planning and placement services (i.e. meetings, applying for and participating in internships)
- Insight from institutions Learning Management Systems to determine student engagement and performance

Based on research from the IBM Institute for Business Value's *Pursuit of relevance*, one key step that IBM recommends for higher education institutions is to assess current capabilities. As part of this assessment, institutions should "evaluate analytics capabilities and decision support tools within the ecosystem to identify opportunities to enhance decision making and improve student outcomes." In the areas of student recruitment and retention, the **inputs to this discovery include:**

- **Review of data collection processes, source systems, and access:**
  - Review the enterprise data landscape to determine the level of data centralization vs. de-centralization
  - Review challenges accessing data from current systems (e.g. antiquated systems or those with proprietary data retrieval tools)
  - Determine source systems and means of accessing data from these systems (including 3rd party vendors such as hosted applications)
  - Analyze available historical data
  - Identify gaps in data, especially among identified module areas
  - Identify source systems including those that represent the "version of the truth"

This task provides insight into data mapping, data quality and cleansing

- **Review of the institution's current and historical reporting and analytics:**
  - Evaluate school's standard reports (daily, weekly, monthly, external and data feeds) by stakeholder
  - Assess ad-hoc reporting process and categorize ad-hoc requests to examine commonality
  - Note and review any present or potential predictive or prescriptive analytics
  - Highlight how analytics (descriptive, predictive, and prescriptive) has changed over the last 18 months, as well as its impact on institutional decisions

This task provides insights into the client's vision into analytics and provides information that can be embedded into data modeling, analytics approach, and presentation.

- **Review of the institution's strategic planning:**
  - Evaluate any recent accreditation event, especially the results from the institution's pre-accreditation self-study to identify gaps, findings, and issues related to recruitment and retention that were discovered and tagged for resolution
  - Review the institution's five or 10 year strategic plans and assess how these align with recruitment and retention analytics
  - Explore any internal or external research conducted that may influence recruitment and retention
  - Review institution's Common Data Set(s) to identify potential trends that may not be apparent from standard institutional data

This task provides additional requirements and insights from an enterprise perspective and promotes integration that institutional vision will be incorporated into business practices.

The process of eliciting and documenting the client's requirements and issues and conducting a review of the client's inputs, provides the background and infrastructure for this analytics journey.

Student and institutional data

Specific data from colleges and universities must be available in order to analyze historical trends and outcomes to improve future results. In particular, pertinent admissions and recruitment data should include detailed demographic, academic, and extracurricular activity information. Admissions and enrollment data will also be required to provide insight into recruitment. Institutional data on currently enrolled students is necessary to analyze retention, graduation rates, and time to degree. Data inputs for this analysis include:

- Course selection
- Majors/minors
- Grades
- Credit load
- Commuting status
- Scholarships/financial aid amounts
- Program enrollment (e.g. Honors)
- Campus activities (e.g., Greek life, clubs)
- Leadership positions
- Service and volunteering participation

This type of information is needed to conduct simple analyses on admissions and enrollment trends. Other potential data sources, such as US Census data, can also be considered to advance the quality of data and assessments.

Alumni information

Data on alumni and development efforts are important to fully understand the student experience. These include capturing alumni career progression, awards, and participation in institutional events (e.g. Homecoming, Alumni Weekend).

Social media analytics

A variety of social media data may be valuable within the higher education industry to understand and measure sentiments, identify potential threats, recognize events, and examine education topics discussed.

Social media data can be used in two ways: 1) Included as a data source within broader analyses on student perceptions that may include surveys and interviews or 2) analyzed independently to measure sentiments in real time or track events on campus.

IBM's social media analytics expertise and partnerships with Twitter and Hootsuite enable this analysis. Twitter or Facebook data can be analyzed to understand the sentiments of a variety of higher education stakeholders (e.g. the faculty, administration, student body, perspective students, policymakers, and industry experts). Analyzing Twitter data can provide meaningful information on campus events, views on new institutional policies, recruitment and admissions activities, and institutional reputation. This type of data and analyses may allow institutions to identify the key variables associated with different perceptions, understand the root causes of issues, influence communication plans, and respond to challenges.

In addition to gaining insights into their own institutions, higher education administrators may also be interested in understanding sentiments regarding peer institutions and broader industry trends. For example, May 1st is most often the date when high school seniors must commit to a college or university. Many applicants share feedback on their commitment decisions via social media. Administrators may want to glean insight into why perspective students choose different institutions to inform their recruitment strategies for the next cycle. They may also be interested in understanding how their students, alumni, and the general public view peer institutions to gain insights into potential best practices.

These partnerships, along with IBM's sophisticated capabilities analyzing unstructured data, provides an opportunity for higher education institutions to gather insights from social media data to better understand and examine sentiments from a wide variety of stakeholders and enable more responsive communication. Over time, social media data from Twitter, Facebook, and other sources can be incorporated within an institution's data models and integrated with historically structured data elements.

Predictive analytics

Analyzing historical trends is essential to accurately predict future outcomes. To do so, data from disparate sources must first be combined and cleansed, then analysts can begin summarizing and reporting on trends and outcomes. At this point, analysts can determine the key attributes influencing outcomes, which are employed to train current data to predict future results.

Modeling techniques can be employed to predict enrollment outcomes, such as, likelihood of an application, probability of a student enrolling (yield), and first year retention rate. To develop these models, historic information will be analyzed to understand the significant variables influencing enrollment results. Logistic regression, decision trees, neural networks, random forests, and gradient boosting are all popular predictive modeling techniques that may be tested and evaluated for this forecasting. The following is a more representative list of key outcomes:

- Applications (which prospective students will apply)
- Yield (which admitted students will enroll)
- Retention (which first year students will enroll as second year students)
- Engagement (how engaged student will be during enrollment)
- Graduation (which students will graduate or drop-out)
- Time to Degree (the length of time it takes a student to complete their degree)
- Scholarship amounts (the optimal amount of money to offer a student that entices them to enroll)
- Tuition payment (which students will be late or unable to pay tuition)
- Career readiness (which students are more prepared for the workforce)

These predictive models can be used by the admissions office to assist with the application review process. These will complement the current components of the admissions process, along with counselors' personal interactions so that "best fit" students are carefully reviewed for admission.

Following an agile process, these models will be refined each admissions cycle as additional pertinent data elements become available and the required insights from the models evolve. For example, the institution might develop new questions that require forecasting such as how to best promote and fill the seats of new academic majors, how to add more students from a particular geographic region, or how to educate more first generation college students. Once an analytics infrastructure is established, new inquiries are likely to surface as stakeholders seek new insights to answer the fundamental question "how do we recruit and enroll our best-fit students".

IBM's unique solutions

IBM has successfully provided higher education institutions with analytics software solutions for years. Tools such as IBM Cognos® BI and IBM SPSS® are used worldwide by student, staff, and administrators. These analytics solutions help staff and administrators collect and analyze data to understand historic retention and recruitment trends as well as predict future enrollment outcomes. Another suite of IBM products can also be employed within the higher education industry to address many of these analytics challenges. Specifically, the IBM Watson™ suite of products is a proven set of technology solutions that has aided a myriad of other industries (e.g., government, healthcare, transportation, etc.) as well as higher education.

The Watson suite

The Watson suite of solutions can provide benefits to different college and university constituents including: prospective students, current students, staff, faculty, and alumni. These solutions offer robust reporting capabilities, predictive analytics, cognitive computing power, and other benefits to assist administrators with their recruiting and retention goals. A specific Watson solution, Watson Engagement Advisor, in use today by Deakin University in Melbourne, Australia, allows students to ask Watson logistical questions about the University, including questions about available classes and courses, clubs, organizations, financial information, campus events, parking, etc. This unstructured data, typically stored across institutional handbooks and websites has been ingested by Watson's cognitive computing engine that allows students to ask questions in natural language to get answers instantly, instead of searching for information online or calling multiple phone numbers.

A different solution, Watson Explorer, is a flexible analytics tool that admissions officers can use to synthesize admissions and retention data. It has the ability to ingest structured and unstructured data that can help identify the key variables influencing student outcomes. This type of information may allow institutions to adapt recruitment efforts, marketing materials, and other admissions activities to better meet their objectives.

Future Watson solutions

Watson Teacher Advisor and Watson Cognitive Tutor are also being developed for use in the education industry to provide teachers and students with learning content and personalized support.

Overall, a number of Watson solutions can be leveraged by different populations within higher education to collect and analyze data, predict and report on student outcomes, assist prospective and current students find disparate information, advise students on their academic curricula, and more.

Apple + IBM partnership

The Apple + IBM partnership will provide enrollment management teams and senior leadership with a fluid and intuitive means of accessing information anytime on a mobile device. For example, admissions counselors could share key institutional metrics with perspective students or high school guidance counselors from an easy to interpret mobile application. Recruitment teams may also be able to use mobile analytics apps to answer key questions "in the moment" and quickly update perspective student information via digital forms and scanning through the iPhone camera.

Conclusion

Higher education institutions have been collecting data in admissions, student, and alumni development systems for more than 30 years. While each institution has developed its own level of descriptive, and some predictive reporting, the time is perfect for institutions to accelerate their analytics capabilities. IBM's history supporting higher education institutions, its understanding of core business processes and data, and new powerful cognitive computing and analytics tools, offer institutions unique solutions to address their recruitment and retention challenges.

For more information

For more information please contact your IBM representative or visit **ibm.com**/smarterplanet/us/en/education_technology/ideas/

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IBM Corporation
Global Business Services
Route 100
Somers, NY 10589

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