6-1-2018

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Analytics: Potential in Higher Education

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Abstract

Analytics is altering the world of business and leadership as companies take advantage of its descriptive and predictive capabilities. Industries incorporating analytics into their daily operations are outperforming their competitors, generating greater profits and reducing expenditures. Following industry's lead, higher education is beginning to make sure of big data to induce academic success by means of increased enrollment, retention, and graduation rates. Incorporating analytics into the decision-making process and overarching operations of an organization may yield considerable outcomes in corporate and academic environments. Integrating analytics into corporate culture requires collaborative partnerships focused on mutual interest and leadership expertise. This article discusses how analytics has influenced business and its potential impact on the future success of higher education.

Keywords

analytics, higher education, business, leadership, auto-analytics

Your personal information, habits, browsing history, purchases, travel, and more are constantly being tracked, downloaded, and stored. It's not just your smart phone that lets major data corporations know your daily habits, but the cash register at the grocery store, your gym membership card, online shopping, social media posts, online photos, calling history, videos, and email that provide a massive amount of information about you, the individual, and society as a whole. And don't forget about your most recent visit to Disney World where you were given a wristband to gain access to all the park's amenities. That wristband was tracking your every move and action, down to the last refill of your soft drink.

Over the past decade, this collection of information has become an ever-increasing utility in predicting future trends in business and marketing. This massive collection of information is referred to as *big data*. All of this seemingly mundane information remains useless until it is filtered down and extruded for specific practical examination: *analytics*. *Analytics is the deciphering of meaningful patterns from large sets of data* (Gandomi & Haider, 2015). On the macro-scale of economics, analytics is steering major organizations toward increased productivity and profits. On the micro-scale, it is providing the individual with personal insights into self-awareness. The impact of big data and its interpretation through analytics is and will continue to have a major impact on business, the individual, leadership, and eventually higher education.

A New Focus for Analytics

Analytics has become a necessary tool for many companies striving to maintain a competitive edge. Industries integrating big data into their overall prospectus of services and products yield a more efficient and sustainable organization. Individuals using personal analytic tools are generating assessments designed for increasing physical, mental, and spiritual well-being. As analytics continues to influence various segments of society, it seems rational to assume big data will have a dynamic influence on higher education. Industry's experience with analytics may provide colleges and universities with a powerful roadmap to generate greater outcomes and efficiencies for students, faculty, and staff if strategically integrated into their overall mission and design.

Higher education has struggled over the past three decades as the cost of a four-year degree continues to rise and state funding continues to decrease. Universities and governing bodies are searching to find ways to reduce costs while maintaining productivity among students, faculty, and staff. The objective of this article is to provide a brief overview of analytics' implantation into business and personal growth and to spark ideas for how higher education can, and is, capturing the rising tide of big data.

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Analytics in Higher Education

As big data continues to pour in and data mining organizations compile massive amounts of information, the use of analytics is crossing into various segments of society. From consumerism to healthcare, data analytics is having an impact on daily life. As previously mentioned, higher education has struggled to remain financially sustainable as the cost of college continues to rise and state funding continues to decrease or remain stagnant. Universities and governing bodies are looking to find ways to reduce costs while maintaining productivity and efficiency within the higher education community. Analytics may be the next significant venture on university campuses as higher education is held accountable to increase retention and graduation rates while decreasing overall operating costs. Analytics has the potential to contribute to collegiate success on both personal and organizational levels.

On the micro-scale, many college students have already begun to use auto-analytics to assess their own physical and emotional well-being. Fitbits, Apple watches, and the like provide students with continuous data about their daily habits, meant to increase overall mental and physical well-being. Fitness trackers and organizational apps provide students with continuous feedback designed to promote personal success. New applications have the potential to heighten individual success even further if applied to student academic needs and interests. For example, many students struggle to declare a major or settle on a particular career path. This indecision often becomes a barrier to degree attainment as students take unnecessary classes as they explore a multitude of majors and careers, extending their time in academics. Suppose a student utilized auto-analytics to assess levels of interest in classroom activities to help determine what career/major engages her/him the most. Auto-analytic trackers could provide a student with critical personal insights that previously may have gone unnoticed. This information, coupled with guidance from an institution's career services department, may help the student determine a course of action in choosing a major and procuring a future career path.

Use of personal analytics applications assess a student's optimal times for studying or determine which study habits work best for their individual needs/classes. *Nudgers*, a type of app that provides individuals with reminders/alerts to encourage positive behavioral changes, could direct students away from unproductive study habits toward constructive skill sets necessary for collegiate success. Using advanced Blackboard applications, professors could imbed nudgers within the course to direct students to active learning objectives and current news/research related to pertinent topics to keep the student engaged outside the classroom.

Additionally, time management is recognized as a key component to academic success or failure. Personal tracking information coupled with productivity assessments could aid students in developing action plans for increased productivity by guiding them away from non-academic distractions. Coupled with benchmark assessments from online university Blackboard systems, nudgers may help students develop stronger work ethics essential for academic and career success. Furthermore, auto-analytic financial apps could help students assess their financial well-being and help them gain greater control of their personal budgets, helping them create and stay within spending limits.

Similar to individuals within the corporate world, faculty members may want to track their daily routines to determine when they are most poised to teach, write, or conduct research. A faculty member is expected to wear a number of hats within the university system. Personal analytics may help individuals determine their level of productivity when meeting with students, teaching, attending curriculum meetings, and more. Similar to the students' experience, *trackers* may provide faculty and staff with important personal information concerning times of high and low productivity. Many faculty are given a considerable amount of autonomy concerning their work environment. Trackers and nudgers of auto-analytics have the potential to enhance efficacies and steer university employees toward projects where they will flourish.

In addition to semester course evaluations, analytics could aid the development of curriculum design and delivery. Defense Acquisitions University conducted an analysis focused on faculty and instructors to determine the needs of their non-traditional students. These students fared better in face-to-face classes as opposed to online courses. The university made an adjustment in how these courses were delivered in order to increase student learning and retention. Additional assessment, through the use of analytics, revealed guest speakers increased individual student learning and were a contributing factor to career productivity (Dutton, 2014). Using a similar model, individual university departments could use analytics to determine which teaching methods and mentoring relationships bring about optimal learning for students.

On a macro-scale, big data is being used for recruitment purposes as institutions analyze and refine their marketing strategies. With every recruitment class comes the challenge of communication and connectivity with a

new generation of students engaged in various forms of social media. Analytics is currently providing admissions offices with a conceptual view of target populations for a particular recruitment class and insight into preferred communication venues. Big data analysis also may help universities determine how many recruiters are needed for a given area, similar to how companies use big data to determine how many employees are needed for a particular store location. Additionally, analytics may guide recruiters to geographical locations where students may find their school more appealing, thus opening up new markets for college recruitment growth or branch campuses.

Universities that adopt the analytic process may be able to gather a multitude of information concerning student well-being to *increase retention and graduation rates*. Algorithms could flag students who show signs of academic duress. Additionally, in conjunction with the corporate world, universities may be able to adjust to market trends to promote particular majors and careers in order meet the needs of local industry. Through *analytic human resource*, colleges could assess and catch problems within departments and make adjustments as needed.

Currently, a number of institutions are expanding the reach of their departments of Institutional Research, Admissions, and Advising by means of incorporating big data into their decision-making process. Like many universities, Georgia State struggled to retain and graduate individuals from low-income, minority, and first-generation backgrounds. Analysis of their student body highlighted key barriers to college completion. Many of the above mentioned students were taking classes that did not count toward their major or were taking advanced courses before they were ready. The consequences of these poor decisions resulted in additional and repeat coursework that could have been avoided. In response, the university addressed these specific problems and committed to the development of a university-wide advising corps. Following this experience, Mark Becker, the university's president, hired Educational Advisory Board to expand the institution's awareness of the students attending Georgia State. The company spent weeks reaching into past and current data to develop an active software system designed to tack a multitude of data points. Each night hundreds of variables are processed and analyzed through an algorithm which flags students who may be heading for trouble. Once identified, pertinent information is automatically emailed to the students' advisors to address the particular problem or concern. Within the first year, retention and graduation rates began to increase. Average time to graduation had decreased by half a semester for the entire student population, resulting

in $15 million savings for the students. In turn, increased retention rates resulted in increased funding. For every percentage point increase in retention, the university gained an additional $3 million in revenue. Utilizing data analytics provides large universities with the opportunity to personalize the academic experience for the student. Becker stated, "Our system right now is doing what professors at a very small college would do, which is keep an eye on the students. When they see something happening, they find a way to intervene" (Else, 2017, p. 4).

Other institutions like Arizona State University recognized many of their incoming freshmen were ill-prepared for the rigors of collegiate-level math. Instead of placing students in general lecture style developmental courses, the university chose a more personalized need-based approach through the use of a software system. At the start of the courses a computer program assesses the students' abilities as outlined by the course objectives. Through ongoing analysis, the software program detects deficiencies and generates coursework to remediate those deficiencies. By using this automated system, students spend less time on previously acquired knowledge and instead focus on building skillsets necessary for academic success. After experiencing a 20% increase in classroom success, Arizona State University has offered similar software-based learning modules for other first-year courses such as psychology, history, chemistry, and algebra.

Arizona State also has integrated the use of big data within their peer mentoring programs. Using data analytics, undergraduate students are matched to older peer mentors who may have experienced similar difficulties as they progressed through school. Making the right connection between student and mentor resulted in increased student retention as these individuals found a supportive mentor who could empathize with their particular situation. Additionally, the university expanded the use of data analytics to the Office of Financial Aid to predict when students may encounter financial difficulties preventing them from continuing in school. This predictive analytic system flags these students, and financial advisors respond to the student needs to address funding concerns. Due to these and similar measures, graduation rates have increased by 19% since 2006 (Else, 2017).

Big data has the potential to provide university administrators with predictive models for future growth, information for maximizing building and classroom use, cutting down on unnecessary expenses, positioning themselves to attract potential students, and monitoring student risk. The predictive data can provide administrators with actionable analytics necessary for making data-driven decisions.

The Rise of Analytics

The 2011 movie *Moneyball* shined a spotlight on modern-day analytics as Billy Beane used "sabermetrics," a statistical process to select and construct the 2002 Oakland Athletics baseball team. The transformation of the Oakland A's from a dysfunctional, underfunded losing team to playoff contenders in both 2002 and 2003 was an unfathomable accomplishment by all baseball aficionados. Soon after Beane's success, a multitude of professional sports teams began using predictive models and algorithms based on player statistics to assess the athletic potential and monetary value each competitor brought to the team (Peck, 2013).

Over the past decade and a half, numerous corporations such as Proctor & Gamble, General Motors, Google, General Electric, Bridgestone/Firestone, and AT&T have used analytics and complex algorithms to predict market trends in order to gain a competitive edge. LaValle, Lesser, Shockley, Hopkins, and Kruschwitz (2011) highlighted a study conducted by *MIT Sloan Management Review and IBM's Institute for Business*. They surveyed over 3,000 individuals employed as analysts, department managers, and executives from over 10 industries spanning 100 countries. "Among their key findings: Top-performing organizations used analytics *five times more* than lower performers" (LaValle et al., 2011, p. 22). Fifty percent of the respondents emphasized the importance of improved information and analytics as a driving force for industry success.

Adoption of Analytics–Three Stages

Through their study, LaValle et al. (2011) determined organization integration of analytics can be identified at three levels. *First is the aspirational stage*. At this level organizations use data and analytics to *justify* their actions in key areas such as budgeting, financial management, sales and marketing, and operations and production. The use of this analysis is mainly for cost efficiency and revenue growth. Although executive leadership supports the use of analytics, often the organization's culture resists the sharing of departmental information with the analytics team.

Keith Moody (personal communication, November 21, 2015), a corporate leader of Bridgestone/Firestone's analytics department, highlighted the struggle to gain the trust of other department heads in order to integrate analytics into their decision-making process. A preconceived notion among many leaders is that their team is there to shine a spotlight on their department's inefficiencies. "Initially,

most people are afraid of losing their budgets" as his analytics team delves into a particular project or areas of concern. "Changing this mindset is all about building relationships. Barriers are always up. The process has to be collaborative, and it's essential for leaders to devote time and energy toward gaining the trust of the people with whom we work." Failure to cultivate relationships between the analytics team and department supervisors ultimately leads to a fruitless end. An analytics team may be able to provide a department with creative ways to improve their production and efficiency, but if it falls on deaf ears, their efforts will be in vain. "The question is; how will analytics make our department (company) better? When leaders take time to cultivate an atmosphere of trust and collaboration, they see the value of analysis and our analytics team is invited into the problem-solving process." Keith Moody stated, in order for analytics to be integrated into a corporation, "leaders must work toward building a collaborative community culture."

Experienced is the *second* stage of analytic adoption within a company as defined by LaValle et al. (2011). These organizations use analytics to *guide* their decisions and actions. Like companies in the aspirational stage, they use big data to leverage sales, marketing, production, and finances. However, those within the *experienced* stage also use analytics to *strategize business development, customer service, and is incorporated into research and development*. The primary function of analytics is to promote innovation that differentiates the company from its competitors, along with generating revenue growth, coupled with increased cost efficiency. These organizations possess a moderate ability to gather and analyze data. The corporate culture engages in increased use of analytics but remains limited in its ability to disseminate insights for industry improvement in regard to day-to-day operations. While this data helps to enhance a company's strategic action plan, leaders often lack an understanding of how to use the information to its fullest extent.

The third stage of analytics integrations is defined as *transformed*. At this level companies use analytics to *prescribe* actions. In addition to the functions and usage mentioned at the previous levels of *aspirational* and *experienced*, analytics is integrated into transformed companies to asses risk management, customer experience, guide marketing and brand management, and is incorporated into human resources/workforce planning and allocation. Similar to companies within the experienced stage, transformed organizations use analytics to *differentiate* themselves from other companies through innovation. They also focus on revenue growth, with an additional

aim to maintain profitability via customer acquisition and retention. These organizations have the ability to gather and assess massive amounts of internal and external data for analysis. Their culture facilitates an *open sharing* of insights and information generated from analytical endeavors. Because of this integrated culture, insights gained from analytics determine day-to-day operations and become a standard component of the decision-making process for future growth (LeValle et al., 2015).

Auto-Analytics: Building a Better Individual

Peter Drucker, the well-known educator, business consultant, and author, stated: "Companies today aren't managing their employees' careers; knowledge workers must, effectively, be their own executive officers" (Drucker, 2008, p. 151). Drucker highlighted the *necessity for employees to understand themselves* in order to be effective within the world of work. What are your strengths and weaknesses? What do you value? How do you learn? How would you describe your personality and how it influences those around you? In what ways can you contribute to solving problems or generating solutions? Failure to understand who you are will likely lead to diminished personal success. "Most people think they know what they are good at. They are usually wrong. More often, people know what they are not good at–and even then more people are wrong than right" (Drucker, 2008, p. 153).

Drucker's pivotal work, *Managing Oneself* (2008), provided the reader with salient advice on measuring one's own attributes. In order to determine one's strengths, he advised the reader to conduct a personal feedback analysis. When faced with making an important decision, he encourages the individual to write down the expected outcome. After an extended length of time (9 to 12 months), review the results of those decisions to assess one's success. Reviewing the outcome of those decisions over the course of time will provide the employee with a fairly accurate perception of his/her strengths and weaknesses. Drucker advocated similar analysis to determine personal productivity, communication, and values.

Taking a step back from the larger world of analytics, as mentioned previously, a personalized form of analysis is gaining greater attention: *auto-analytics*. Auto-analytics, also known as personal analytics, self-tracking, or self-quantification, is the "process of voluntarily collecting and analyzing data about oneself in order to improve" (Wilson, 2012, p. 119). For years athletes have used statistics to measure their physical performance. Batting averages can assess a baseball player's ability to hit a slider versus a fastball. Through statistics, a tennis player can analyze her backswing accuracy at the start of a match as compared to the end, providing her with valuable information on specific aspects of her game that could lead to increased performance. Employees today are able to collect personal performance statistics about their workplace habits via a host of computer applications and devices. Auto-analytics is changing how employees receive feedback for personal and professional growth. Feedback in the business/corporate world traditionally has been a top-down process in which a leader assesses an associate's strengths and weaknesses. With auto-analytics, associates provide their own feedback via data collected through analytic applications, providing the user with *greater personal insight for self-improvement, such as how and when to make better choices, where to focus one's efforts, and at what time of the day one is most productive*. Auto-analytics is a quantitative tool, providing users with personal feedback for self-awareness and improvement.

Auto-analytics tools can be broken down into two categories as stated earlier: trackers and nudgers. *Trackers* collect data on physical routines and personal habits over an extended period of time. Trackers can assess food consumption, mobility, sleep patterns, heart rate, blood pressure, and more. Analysis of the data over time provides feedback allowing the individual to adjust daily habits in order to optimize performance and well-being. *Nudgers*, the second type of analytic tool, can be used to help make these adjustments to one's schedule and/or actions. These tools can be set up to remind (nudge) an individual to work toward performance goals, stress reduction, exercise, drink less coffee, or to slow down when giving presentations.

There are three categories of auto-analytics (Wilson, 2012) that can be useful for self-improvement: the *thinking self* (mind), the *physical self* (body), and the *emotional self* (spirit). To improve the thinking self, trackers and nudgers are used to understand the relationship between attention, efficiency, and productivity. For instance, auto-analytics applications can help individuals determine how email interruptions affect their productivity or assess when they are most creative, define the length of solitary time needed for optimal personal performance and rest, or gage if they are more energized by working with a team or on one's own.

The last category, the emotional self, is harder to analyze. The growing research on emotional intelligence has suggested the difference between average leaders and great leaders resides within their ability to assess the emotions of others and one's own emotional state. The

book by Bradberry and Greaves, *Emotional Intelligence 2.0* (2009), provides an in-depth understanding of how our emotions affect our daily interactions and productivity. "Emotional intelligence is so critical to success that it accounts for 58 percent of performance in all types of jobs" (Bradberry & Greaves, 2009, p. 20).

Using a GPS-enabled auto-analytic app, an employee can discover correlations between one's location and emotional state, requesting a response concerning one's emotional state via a quick survey throughout the day and track one's location when taken (Wilson, 2012). Is the individual happier alone in the office behind a desk or on the factory floor consulting with employees? Is the individual more energized by travel or does it cause one to feel drained and listless? Determining where the individual is the happiest may help guide that individual toward a career in which she/he is more likely to thrive.

Auto-analytics has the potential to provide individuals with quantitative information for personal and professional improvement based on quantifiable data. Drucker (2005) asserted *we must know ourselves* in order to become self-fulfilled, self-directed individuals capable of making significant contributions.

People-Analytics: Building Better Associates and Leaders

Larry Page and Sergey Brin introduced their modest Internet search engine in 1996. Since then Google has become synonymous with innovation and creativity. According to *Forbes*, Google's parent company Alphabet is ranked as one of the most valuable companies in the world, estimated at $600 billion. Like many knowledge-based industries, the need for hiring the right people and retaining innovative employees is critical to the success of the organization. For years Google has been methodically collecting data on its associates, developing a comprehensive management-performance system (Derose, 2013). Google's *People Analytics* team asks specific questions that guide their analyses: "What if we could decrease ramp-up time for new employees by a month? What if all engineers were able to reach their potential for innovation?" (Derose, 2013, para. 4). The analytics team strives to *quantify* best practices for the company's productivity. In essence, they work to improve employee contributions through statistical analysis, finding out what works and what does not for the various departments and particular types of associates. "The goal of People Analytics is to complement human decision makers, not replace them. All people decisions at Google are to be based on data and analytics" (Derose, 2013, para. 9).

Google's People Analytics department discovered and implemented numerous changes over the years to bring about increased productivity and performance. For instance, more than four interviews for a potential employee did not yield higher quality hires. The number of required interviews for potential employees was reduced to save both time and money. Analyses contributed to the optimal size and shape of various departments, increasing productivity and reducing redundancies. *Google receives over two million job applications per year.* The analytics team created an algorithm to review rejected applications to catch talented individuals who otherwise might have gone unnoticed (Derose, 2013).

Like Google, many organizations are integrating analytics into their hiring and associate performance practices. This data analysis often is referred to as *talent analytics*. The largest investment for most companies is their investment in human capital. Companies harnessing the ability to predict these trends can maintain stronger economic health, outpace competition, and provide an environment where associates and leaders thrive.

Similarly, in 2009 Google statisticians embarked on a monumental endeavor called *Project Oxygen*. Their goal was to build a better boss. These data miners created algorithms based on employee reviews of supervisors and employee performance reviews, analyzed nominations and awards distributed to top managers, and even correlated words and phrases from various documents concerning leadership within Google's massive complex (Bryant, 2011).

For years Google kept a simple approach to management: "Leave people alone. Let the engineers do their stuff. If they become stuck, they'll ask their bosses, whose deep technical expertise propelled them to management in the first place" (Bryant, 2011, p. 2). Project Oxygen *revealed a strikingly different model* of management desired by their employees. Google employees were not interested in their supervisor's technical expertise, as previously thought. Employees wanted supervisors who were available to them for personal attention, who worked with them to solve problems in a collaborative manner, and who took an interest in their personal lives and careers. Project Oxygen created a new framework from which they created stronger leaders. As a result, various departments within the organization pivoted from a hands-off supervisory approach to leaders who encouraged their associates through professional relationships and generated group cohesion. The changes in leadership focus resulted in increased employee job satisfaction and performance.

Google's approach to building better bosses was specific to their own company culture. They wanted to know what worked for Google, not a generalized leadership model for any corporation to adopt. As the analytic movement continues to flourish, businesses are likely to follow Google's lead. Instead of the one-size-fits-all leadership design, industries may assess their own structure and culture to determine the particular leadership needs of their employees.

Conclusion

Analytics is changing the world of work and leadership as companies take advantage of their descriptive and predictive abilities. From the self-improvement of auto-analytics to the organizational restructuring of talent analytics, big data is dynamically influencing business decisions and corporate culture. Organizational leadership has encountered a new era, as many supervisors and executives are expected to quantify their leadership decisions. Companies that fail to use analytics are likely to be outperformed by their competitors who profit from its insights. Big data and its analysis has the potential to provide organizations with the crucial knowledge necessary for growth and profitability; however, leaders must cultivate an atmosphere of cooperation and trust between analytics teams and the various divisions of their companies. An inability to foster a culture of trust may result in diminished returns and lead to organizational failure as analytics becomes the dividing line between success and failure.

From its initial use in sports statistics to its far-reaching effects in company growth models, analytics is changing how we assess the world. The future of analytics is far-reaching and will continue to grow as the collection of data persists. How we incorporate that data into our work, education, and personal lives depends on our willingness to be open to changes brought about by the analytics movement.

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