Enhancing Learning Analytics: The Rise of Institutional Research

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Abstract

The need for analytics and data-driven decision making in higher education has been on the rise as college and university leaders deal with student success, affordability, and competition in the management and growth of their institutions. Within higher education, Institutional Research (IR) offices on campus have traditionally acted as the data keepers and official reporters for institutional information. In response to the need for analytics and data-driven decision making, IR offices have started to shift from being reporters to analysts. This paper will provide an overview and history of business intelligence (BI) in higher education and the shift towards BI in IR offices. In addition, the paper will also analyze The Association for Institutional Research (AIR), the national professional organization for IR, annual forums to provide trends and insights on analytics and BI in higher education.

Keywords: Analytics, Higher education, Learning Analytics, Institutional Resources, BI infrastructure, Student learning outcomes.

1. INTRODUCTION

Postsecondary institutions are large organizations that have various community and governmental ties as they enroll, house, and credential students. Some institutions are long standing and have vast amounts of data that can be tapped for knowledge. As schools compete for students, face declines in state and federal funding, and are asked to address affordability and accountability in their operations, the need for analytics and business intelligence (BI) is only growing (Miyares & Catalano, 2016). Grajek (2016) notes that one of the top 10 IT issues facing higher education is BI and analytics, stating fewer than 15% of analytics programs are described as strong or excellent in the industry. This paper will discuss the history and current landscape of BI and analytics in higher education and the role of institutional research (IR) offices in the implementation of BI on campuses.

2. INSTITUTIONAL RESEARCH OFFICES

History, Staffing and Functions

More than fifty years ago, institutional research became an established entity of importance within postsecondary institutions. They were established as vehicles to more systematically inform and provide data reports to key decision makers across the postsecondary institutions. While the demand for data has continued to grow across various industries and transformed them, higher education has lagged behind and continues to be in early stages of analytics maturity in its offerings to users in higher education. At present, IR provides services to a highly ranked set of users from the president, provost (chief academic

officer) to other major administrative positions on campus (e.g., Chief Business Officer) including those that report to government agencies and accreditation bodies. In addition, while IR caters to lower level data needs of departments and colleges, they are often understaffed and hard pressed to meet data and reporting needs related to success of educational programs and student cohort success. Still, it is considered the largest center for analytics within the majority of higher education institutions though its functionality is limited to responding to basic reporting needs (Volkwein 2008).

Aspirational Statement for IR

As IR has evolved over the past 50 years, the Association for Institutional Research (AIR) published an aspirational statement for IR in the future. The aspirational statement was developed and vetted by IR offices in the United States in conjunction with the AIR staff. In the statement, four overarching roles are stated for IR offices. The first is for IR to become a change agent on campus broadening the decision makers on campus (Swing & Ewing-Ross, 2016). Instead of the executive leadership being the main decision maker, IR offices are aspiring to include staff, faculty, and students as decision makers and provide data to the various groups. Secondly, IR is aspiring not to be the only source of truth with the data but work to be data coaches for decision makers (Swing & Ewing-Ross, 2016). Instead of focusing on traditional enrollment counts and graduation metrics, IR offices are now aspiring to focus more on the student experience (Swing et al, 2016). Lastly, the future role of IR offices should focus on the oversight of analytical tools as resources for all, not just top-level leaders (Swing & Ewing-Ross, 2016). With this new vision in place, IR offices are setting themselves up to expand their analytical capabilities and foster a culture that is conducive for BI.

3. BUSINESS INTELLIGENCE IN HIGHER EDUCATION

Applying Analytics and BI on Campus

Yanosky and Arroway (2015) define analytics as, "the use of data, statistical analysis, and explanatory and predictive models to gain insight and act on complex issues". Higher education institutions are seen as the perfect fit for analytics and BI as a lot of schools have been in operation for over a hundred years and have big data. Laney (2001) defines big data collection in 3 v's: the increase in volume, the increase in the velocity, and the differing varieties of data. When looking at the application of analytics in higher education, there has been a greater emphasis on institutional vs. learning analytics (Yanosky & Arroway, 2015). Institutional analytics look at business practices and services provided by the institution while learning analytics focus on factors impacting student success (Yanosky & Arroway, 2015). Areas where analytics were most adopted on campuses were in enrollment management, undergraduate student progress, finance, and budgeting (Yanosky & Arroway, 2015). In Yanosky and Arroway's research of the landscape of analytics in higher education (2015), most institutions did not have a chief data officer or executive level leader who led the analytics work for the institution and only 9% had dedicated analytics centers.

Successful Implementations and Advice

While the adoption of BI has not been widespread in the industry, there have been pockets of successful implementation. The University of Maryland undertook a 5 year implementation project to transform analytics on their campus. The university hired a private sector analytics expert to lead the charge and found four lessons learned: prioritize data collection, focus on building data models, communicate, and connect (Miyares & Catalano, 2016). In prioritizing data collection, the institution centralized its analytics and data collection into a central location; the institution also hired an executive at the institution for analytics leadership (Miyares & Catalano, 2016). To focus on building data models, the institution increased spending in analytics within the areas of high performance cloud computing, data integration, and a data visualization platform (Miyares & Catalano, 2016). Communicating and connecting with people across campus was pivotal to the success of the university's program. The university invested resources into hiring people who could build data science and storytelling for the office of analytics; in addition to people, the office of analytics also made demonstrations on the potential of cross-departmental data analysis (Miyares & Catalano, 2016). Miyares and Catalano (2016) noted that by combining data sets from different departments, the university was able to start answering complex questions like the effect of student financial aid on bad debt.

St Cloud University also had success in implementing an IT infrastructure on their campus to support BI efforts. The strategies the university used were using a data warehouse, changing the culture to view information as the most valuable asset for the institution, and having a data governance structure with clear ownership of data and processes (Guster & Brown, 2012).

To implement the IT infrastructure, Guster and Brown (2012) noted the importance of relying on business logic as well as a clear implementation methodology. The strengths of the implementation methodology for St Cloud including designing service level agreements (SLA), building data governance and data definitions, developing security and access protocols, and accessing data quality (Guster & Brown, 2012).

Advice for Implementing BI

For institutions considering analytics and BI, industry experts and leaders have advice on getting started. Grajek (2016) states that BI and analytics is one of the top 10 IT issues facing higher education. In order to respond, Grajek (2016) says institutions should divest, reinvest, and differentiate in their IT operations. Institutions should divest from processes and technologies that are inefficient and reinvest into resources like the IT workforce and IT funding to achieve competitive differentiation in BI and analytics (Grajek, 2016). Leaders are seen as the biggest advocates for adopting BI on campus and should work to build a data-driven culture that invests resources into analytics (Grajek, 2016). Durso (2009) also echoes the sentiment of having an advocate in the administration of the University for BI efforts. When choosing tools, Institutions should spend time researching tools and their current systems to ensure they choose the right tools for their school; legacy systems can prove to be challenging to adopt to BI tools (Durso, 2009). Similar to St Cloud's implementation, Durso (2009) notes the importance of establishing a data governance structure and to focus not only on the IT side of the BI implementation but also the business model and processes.

Challenges of BI in Higher Education

From a general business standpoint, 90% of corporate strategies will explicitly mention information as a critical asset and analytics as a critical competency by 2022 according to Petty (2019). While BI is a promising practice that is well suited to provide knowledge to decision makers, the implementation and adoption has been slow in higher education. EDUCAUSE, a non-profit that promotes the use of information technology in higher education developed an analytics maturity index to measure analytics adoption in higher education. The index has six dimensions: decision making culture, policies, data efficacy, investment/resources, technical infrastructure, and IR involvement (Dahlstrom, 2016). A score of 1-5 (5 being the highest) is given for each dimension and then the mean is computed to give the index. In 2012, the analytics maturity index for higher education was 3.2; the index increased to 3.4 in 2014 and remained flat at 3.4 in 2015 (Dahlstrom, 2016). When looking at the reasons for the slow to non-existent growth, the literature points to higher education's business model, infrastructure, and gap in talent as challenges.

Higher education's business model generally focuses on long term goals in 5-7 year strategic plans. Many leaders focus on long term goals such as employability, critical thinking skills, and developing civic leaders that are not easily collected or analyzed in the short term using BI (Dede, Ho, & Mitros, 2016). Traditionally, the adoption of BI and analytics has been used in admissions and enrollment management where there is more emphasis on institutional analytics (Yanosky & Arroway, 2015). Guster & Brown (2012) also note that politics, differing management styles, and expectations of BI hinder the use of BI; BI is often seen as cost-prohibitive by university executives that don't understand the advantages. Infrastructure issues also exist as higher education lacks IT infrastructure, data collection and cleaning processes (Dede, Ho, & Mitros, 2016). Guster and Brown (2012) noted that data integration at universities is non-existent and there is a garbage in garbage out trend that hinders the effectiveness of BI models. Higher education also deals with privacy (FERPA), security, and safety challenges with using data that adds to its existing list of challenges which makes the data accessibility by various analysts across the organization or/and the distribution analytics results more challenging (Dede, Ho, & Mitros, 2016).

People are considered to be higher education's most valued and important resource. Grajek (2016) echoes this line of thinking with saying, "institutions won't progress without the right people", and in higher education, there's a lack of people with talent in analytics. In a 2015 survey conducted by EDUCAUSE, institutions noted they needed additional personnel to provide analytics services; this need ranged in size from a 59% increase from schools with more than 15,000 students to a 100% increase from schools with less than 2,000 students (Yanosky & Arroway, 2015). When asked for the type of skills needed, the top were predictive modeling (92%), analytics tool training (89%), data visualization (88%), user experience development (87%), and data analysis (87%) (Yanosky & Arroway, 2015).

4. IR's ROLE IN BI

As the data keepers and reporters, IR offices have been the natural choice to charge with the adoption of analytics and BI on campus. In looking at the responsibilities for analytics on campus, Yanosky and Arroway (2015) found that 43% of analytics were a shared responsibility between IR/IT departments, while 27% were a sole responsibility for IR departments, and 17% were a sole responsibility for IT departments. Clune-Kneuer (2016) noted the importance for IR/IT offices to collaborate on analytics as competing resources and time constraints can result in tensions between the two departments. By working together, IR and IT can help translate technical systems and processes to the campus that can be understood more easily (Clune-Kneuer, 2016).

BI Trends in IR Community: Examining IR's Professional Organization

The Association for Institutional Research (AIR) holds an annual conference for professionals working in institutional research offices in higher education. According to AIR, the annual conference, also known as the Forum, is the world's largest gathering for higher education professionals working in institutional research, assessment, and planning (Association for Institutional Research, 2019). To examine the rise in BI and analytics in IR, the Forums conference books from 2012 to 2016 were analyzed to look for trends in keywords used and sessions offered.

Keyword Search

A keyword search was conducted for BI and analytics keywords in each year's AIR conference book (Association for Institutional Research, 2012/2016). The keywords searched for included: data science, business intelligence, analytics, dashboard and visualization. Figure 1 located in the Appendix details the results of the search for the 2012 to 2016 timeframe. The results indicate the biggest increase in referencing visualization and analytics. In 2012, visualization was mentioned 14 times and jumped to 53 in 2016. Analytics jumped from being mentioned 42 times to 100 in 2016. Business intelligence remained flat and data science was not mentioned in the conference book until 2014 and was only mentioned 3 times in 2016. In 2019, an entire session on data science was offered: "Data Science Communicator: The Sexier Job of the 21st Century." This session presents the first time that an entire session was presented on this topic that provides further evidence of the growing importance of this topic.

Sessions Offered

The AIR Forum conference provides participants with the opportunity to learn more about the latest trends in higher education institutional research. Most of the sessions are geared towards education on the latest methodologies/approaches, best practice case studies and collaboration opportunities for participants to discuss common issues. Participants can submit session proposals for the Forum in one of six categories: (1) assessment, accountability, and accreditation, (2) data analysis and research, (3) operations, (4) campus decision support, (5) technologies, and (6) reporting and transparency. BI and analytics sessions would traditionally fall under one of three categories: data analysis and research, technologies, and campus decision support. To look at the trends in sessions offered, each session was tallied with the category submitted and a percentage of the total sessions were calculated for each category (Association for Institutional Research, 2013/2016). The results from 2013 to 2016 show an increase in technology sessions and a decrease in assessment sessions over the years (Note that 2012 could not be added to this analysis as in Figure 1 as the session categories were different in 2012). Technology presentations rose 7% to 17% of the total sessions while assessment decreased 8% to 19% of the total sessions in 2016 (Figure 2 in Appendix). Data Analysis and Decision Support sessions remained flat.

5. CONCLUSIONS

The need for more comprehensive Business Intelligence and advanced analytics in higher education is imminent as higher education becomes more complex. While some institutions have adopted BI in their business models, most institutions are still in the planning or consideration phase (Yanosky & Arroway, 2016). The University of Maryland and St Could University provide case studies of implementations and pockets of success within the industry. From the literature, institutions face challenges in leadership, culture, skills gap in human capital, and a lack of IT infrastructure in building a robust BI operations (Dahlstrom, 2016). When looking at the field of Institutional Research within higher education, similar trends exist. There is an uptick in technology presentations at the annual conferences and an increase in the use of keywords such as visualization and analytics, the terms and number

of sessions on BI are small but are on the top of the lists of areas that are trending according to figure 1 and 2. As institutions move forward, the need for BI is critical. Data and analytics provided through institutional research entities within higher education has the potential to help higher education students and institutions succeed. Institution leaders who have been on the forefront of these changes such as St Cloud have seen these benefits. University leaders should invest resources into their institution's IT infrastructure and view data as a strategic asset to transform their information into knowledge for decision making to ensure a positive future for their schools.

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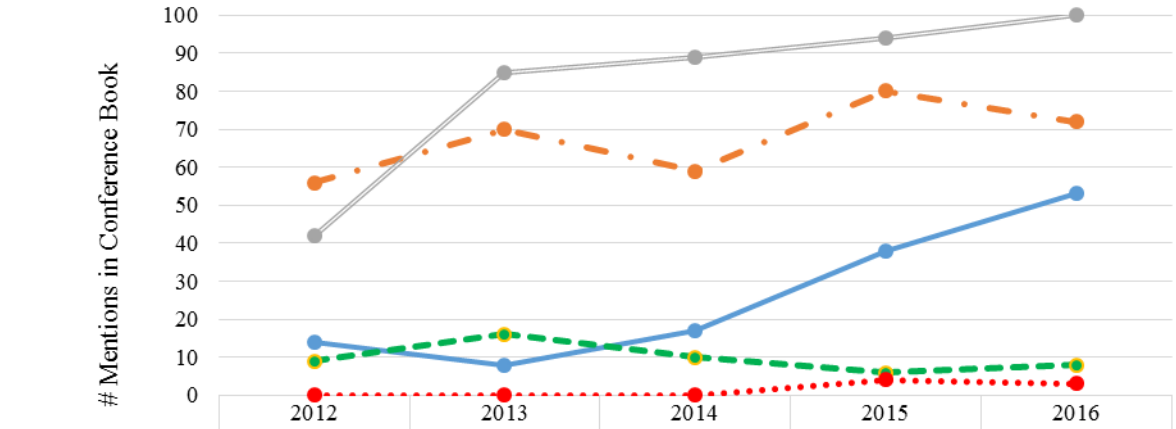
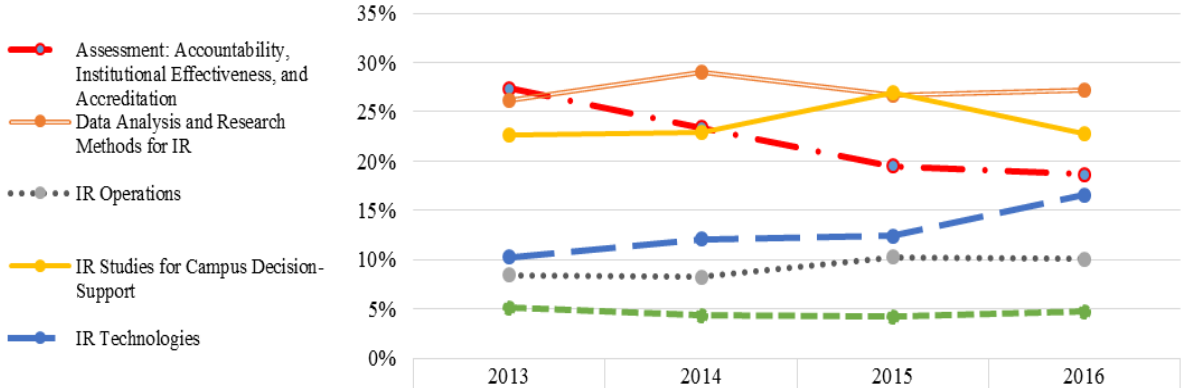
Appendices

Figure 1. AIR Conference Book Keyword Search



	2012	2013	2014	2015	2016
Visualization	14	8	17	38	53
Dashboard	56	70	59	80	72
Analytics	42	85	89	94	100
Business Intelligence	9	16	10	6	8
Data Science	0	0	0	4	3

Figure 2. AIR Conference Sessions Percentages by Category



	2013	2014	2015	2016
Assessment: Accountability, Institutional Effectiveness, and Accreditation	27%	23%	20%	19%
Data Analysis and Research Methods for IR	26%	29%	27%	27%
IR Operations	8%	8%	10%	10%
IR Studies for Campus Decision-Support	23%	23%	27%	23%
IR Technologies	10%	12%	12%	17%
Reporting and Transparency	5%	4%	4%	5%