BUILDING A SEM ANALYTICS REPORTING PORTFOLIO

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Effective strategic enrollment management (SEM) efforts require vast amounts of internal and external data to ensure that meaningful reporting and analysis systems can assist managers in decision making. A wide range of information is integral for leading effective and efficient student recruitment and retention programs. This article is designed to help college and university enrollment professionals initiate a SEM analytics reporting portfolio that focuses on shifting the attention of reporting systems from transactional data gathering to shared performance understandings that can be leveraged throughout the enterprise on a timely basis. By employing a K–20 student pipeline planning approach, the authors discuss reporting fundamentals for enrollment management data analytics, the components of a comprehensive reporting portfolio, strategies for building SEM-focused research organizations, and data interpretation methods.

Introduction

Using data to make decisions has been a part of the enrollment management agenda since the field's onset in the early 1970s. Yet in recent years expanded accessibility to diagnostic tools and the unprecedented availability of data, from within and outside our higher education systems, is increasing the possibilities and promise of data analytics to improve a wide variety of outcomes throughout higher education. Fundamentally, data allows leaders to better understand the past (data mining) and plan for student success in the future (predictive analytics). As the volume of kindergarten throughout graduate school student pipeline data amasses, the skills needed in the profession are quickly changing. It is a new call for enrollment managers to balance quantitative skills with qualitative experiences.

This article explores an emerging agenda for enrollment professionals by linking current strategic enrollment management (SEM) trends and best practices with the findings in a recent EDUCAUSE Center for Applied Research (ECAR) report and the traditional enrollment funnel model. The authors use one university's enrollment report planning structure to demonstrate how institutions can effectively move toward developing a SEM-focused analytic model.

The Role of Data in Higher Education Administration

In theory, administrative decision making in higher education becomes more effective when relevant data is readily available. Recent improvements in information access are, in part, a result of institutions evolving from separate databases to relational databases and enterprise application suites (Yanosky, 2009). Today's broad data ecosystems consist of data sources (structured and unstructured), data warehouses, and business analytic

tools. Access to broader resources of data has allowed motivated administrators to more easily answer "what if" questions (Picciano, 2012). Quite simply, "Data tells us what has happened and improves strategic planning" (Wagner, 2013). The ways in which data is presented to end users has also changed, moving from simple spreadsheets to advanced dynamic visualizations and comprehensive reporting systems.

Most colleges and universities are awash in data but still struggle to readily access timely and germane information to best direct student recruitment and retention efforts. A 2012 EDUCAUSE Education Center for Applied Research (ECAR) report noted that "many IT (Information Technology) and IR (Institutional Research) professionals believe that their institutions are behind in their endeavors to employ analytics" and "much of the data collected are not used at all" (Bichsel, 2012, p. 3). The ever-changing nature of data can lead to doubt and second-guessing a decision among managers. In today's competitive environment, leaders need to share information in order to facilitate a more comprehensive analytic culture (Popovič, Hackney, Coelho, & Jaklič, 2014).

In order to use these vast data resources for an effective SEM analytics reporting portfolio that guides improvements in new student recruitment and graduation rates, an institution needs to have personnel with strong analytical skills, a systemic understanding of enrollment management, and access to reliable and well-defined data sources. Bichsel (2012) noted that analytics is not a singular action. It is a process that begins with a strategic question; moves on to finding/ collecting and analyzing the appropriate data "with an eye toward prediction and insight," displaying the findings in ways that the audience will find compelling and actionable; and finally creating a feedback loop to address the original question and possibly create new ones. Figure 1 is a visualization of the analytics process (Shedroff, 1999).

Strategies for Building SEM-Focused Research Organizations and Data Interpretation Methods

Enrollment leaders can best make data-informed decisions when information is organized into a comprehensive reporting portfolio consisting of both strategic

and tactical reports that follow the student progression pipeline. Strategic reports are those that provide data for large institutional decisions and planning such as year-to-year student application-to-enrolled yields by student market, year-to-year student demand levels by academic program, persistence reports by student type and academic program cost, and capacity levels, whereas tactical reports monitor the operational needs across a function or transaction, scanning for errors, anomalies, and outliers. Each report may point to emerging trends, seeing possible student intervention points, or are needed to meet external reporting and compliance requirements. For example, the academic advising unit might have a report designed to flag when a student has been reported as missing three or more classes in a term, or the registrar has an exception report identifying any missing grades after the grades are due. A recent AACRAO survey noted that 77% of the respondents indicated that their institution uses operational exception reports to manage data quality (Kilgore, 2015), which is essential for accurate strategic reporting. Operational reports in combination with tactical reports are necessary for the systemic application of data-driven decisions to support SEM initiatives and are part of a comprehensive reporting portfolio.

With such a wide range of available data sources and technology available, an overriding question is: *why aren't most institutions using the available data to gain both operational and strategic advantages?* A recent ECAR report

Figure 1. Analytic Process
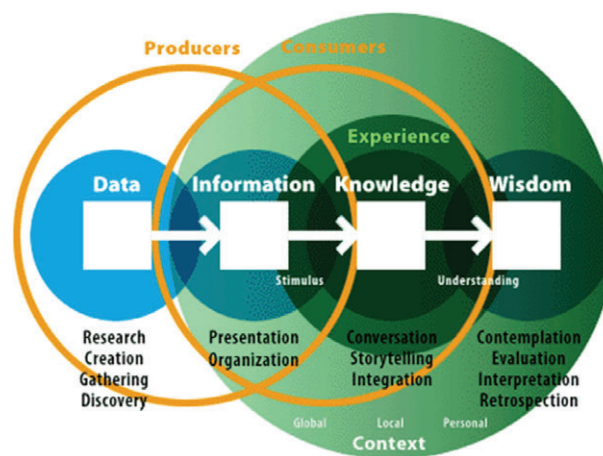
Source: Shedroff (1999)

suggests that "many institutions view analytics as an expensive endeavor rather than an investment" believing the first order of consideration is buying an expensive technology solution to wrangle their data ecosystem and produce meaningful and action oriented reports (Bichsel, 2012, p. 3). On the other hand, Bichsel advocates what is most needed is an "analytics professional who can assist in the entire process." For the majority of institutions, it is likely to be more than one individual that meets this role but what they have in common is the interest and skill to "combine, transform, summarize, analyze and synthesize the data to inform SEM decisions across the institution" (Wohlgemuth, 2015, p. 449).

Often, this means a team of individuals charged with serving as a SEM research council and accepting responsibility for ongoing and annual reporting and research initiatives. For example, included below is the charge for the 12-member Saint Louis University (SLU) Research Reporting Council. The council consists of faculty and staff representing all aspects of administrative, academic, and student services at SLU. The cross-divisional team is responsible for planning ongoing and annual enrollment-related research activities (Figure 2). SLU developed a vision statement to guide the Council's focus. In addition, an annual meeting schedule ensures that appropriate SEM data is reviewed at times that will support the university's annual decision-making and budget processes.

> **CHARGE:** The Research and Reporting Council (RRC) is to provide data analysis, reliable reports, and policy recommendations to the SEM Executive Steering Committee on matters pertaining to student recruitment, admissions, financial aid, student persistence and other issues related to enrolling and graduating the desired student body at SLU. The efforts of this council will focus on developing strategies that will enhance data collection, reporting and analysis efforts focused on meeting the University's goals for the undergraduate and graduate students. (Goff, 2012)

In addition to the considerations above, the "new normal" in postsecondary education which includes (a) new demands for accountability, efficiency, and effectiveness, (b) greater transparency, (c) shared services, and (d) more competition, has contributed to the surfacing of "big data" in higher education analytics

(Wagner, 2013). Big data expands the data ecosystem to include mass quantities of unstructured data (e.g., web traffic, call center data, Twitter) in addition to the existing structured data sources. John Ittelson of California State University Monterey Bay uses an analogy of a snowflake to describe big data, "there are lots of snowflakes—data points out there right now. But this doesn't become big data—a blizzard—until it's piled heavy and deep …" (Grush, 2014). Big data provides higher education institutions with the ability to address more meaningful questions both in the aggregate and disaggregate (i.e., student level).

The introduction of big data has also resulted in a recent shift in data analytics: from the ability to manage and use large amounts of data (volume) to also being able to work with and respond to data quickly (velocity) (Finch et al., 2014). Effectively addressing data velocity is difficult. Higher education institutions need to embrace an organizational culture where there

Figure 2. Annual Activities of the SLU Research and Reporting Council

ANNUAL ACTIVITIES:
The SEM Research and Reporting Council serves in an advisory role to the SEM Executive Steering Committee in the following ways:

Ongoing:	**Review** best practices, enrollment assessment reporting and research on the impact of recruitment and retention initiatives
Ongoing:	**Analyze** market, recruitment and retention research and update the SEM reporting and assessment portfolio
Ongoing:	**Identify** research and reports needed to support the SEM plan and goals
Ongoing:	**Recommend** recruitment and retention policies or practices to the Recruitment Council, Retention and Student Success Council and/or the SEM Executive Steering Committee
September	Review and update the SEM reporting and assessment portfolio
October	Develop and update enrollment projection and capacity models
November	Retention council and committee updates and research requests – set initiative evaluation plan (3–5 per academic year)
December	Update and review environmental scan and market data for recruitment
February	Update and review re-enrollment and registration reports
March	Recruitment council and committee updates and research requests – set initiative evaluation plan (3–5 per academic year)
April	New research updates and committee reports/requests
May	Annual report development
June	Provide an annual report of the council's activities and the University's progress in meeting recruitment, retention, student success and graduation goals

Source: Goff (2012)

is both a "pervasive adoption of analytics throughout the organization and the technical capabilities to quickly act on insights" (Finch et al., 2014). Leaders in real-time data environments face constantly moving decision points where they must take on a satisfying role (Brown, 2004; Simon, 1979). Regularly, they must determine when enough exploring has been done, and when information is at an ample level to drive specific actions. It is not always about making "speedy" decisions but also about the need to understand and appreciate the constant changing nature of data and it can lead to doubt and seconding-guessing of a decision. If a decision maker has a desire to be seen as "decisive" in the face of constantly changing information, it may impact the performance and confidence of decision-making quality overall for an organization.

Big data and analytics are "not panaceas" to tackle all of the issues and decisions in higher education (Picciano, 2012), they can be part of an integrated set of solutions. Notwithstanding, all of these factors contribute to a complex system in which leaders can greatly benefit from building, using, and maintaining a SEM analytics agenda. The remainder of this article will address the "what and how" fundamentals of building a reporting portfolio.

Getting Started With Data Analytics Fundamentals: Data Governance and Collection Principles

A recent report from IBM highlighted that institutional and market data needs to be viewed as an enterprise-level asset and remarked on the importance of information governance (Finch et al., 2014). The analytics giant noted that:

> Business-driven information governance often appears to make data efforts slower, but without it, data integration becomes an even more arduous task. The upside of information governance is so powerful—the ability to contribute reliable, consistent and quality data to the analysis process—that organizations simply can't ignore it if they want to stay competitive."

This is true of most higher education institutions, especially given the large and diverse populations of students that institutions are intended to serve and help succeed.

The variety, volume, and velocity of data available for SEM analyses is immense. Gaining an understanding of the variety and volume of data available to enrollment management professionals is a good first step to building a reporting portfolio. In the world of data analysis, one of the fundamental ways to label and aggregate data is into two simple categories: "structured" and "unstructured." Structured data in higher education often consists of transactional data captured by various systems used to support institutional, academic, and student operations and stored in a relational database and/or a data warehouse.

Unstructured or semistructured data, on the other hand, has not been typically stored in a standard relational database (Dull, 2015). In higher education, this data can be generated from a wide variety of deliberative sources including email, sensor data (e.g., ID card readers), radio frequency identification (RFID) tags, Twitter, and Facebook. Data external to the institution (i.e., third-party data) can be structured or unstructured and is also a vital source for dynamic SEM reporting.

Data source identification and the establishment of a data management infrastructure is the first step in developing the SEM reporting inventory infrastructure. The second step is the creation of a universal data dictionary and definitions of the common terms used in the institution's retention and recruitment process. A universal data dictionary should be created before developing the reports. The establishment of a data dictionary proliferates the standardization of data and enables "various facets within an organization to speak the same language" (Finch et al., 2014). Without an agreed-upon data dictionary there is often confusion about the meaning of even seemingly common terms. For example, in higher education if one were to ask a staff member from admissions, the registrar's office, and academic advising the definition of a "new student" without a universally adopted data dictionary, one is likely to get multiple answers to that seemingly common question.

Components of a SEM Analytics Reporting Portfolio: Start With the Enrollment Funnel

John Ittelson's "blizzard of data" metaphor describes the mental and organizational barriers that often impede institutions from starting a formal report planning

effort (Grush, 2014). The pondering of where and how to begin to organize a SEM analytics reporting portfolio can be an unnerving task. Most higher education administrators could very easily provide a wide range of potential reports and sources of data they wish were readily and easily available. However, identifying which data is valuable enough to warrant capturing and analyzing should be dependent on whether the data can provide greater insights than already exist (Dull, 2015). Focused data selection and report identification decisions must be made.

The wide variety of data needs and opportunities can make the prospect of starting a SEM-based reporting portfolio forbidding. This is where the framework of the student development pipeline approach becomes useful. It provides scaffolding on which to build and organize the reporting portfolio: starting with identifying college ready. Experience has taught enrollment managers that the essential components of a SEM analytics reporting portfolio include data from the following:

1. Government Reports on Education Participation and Population Trends

2. K–12 Precollege Programs

3. Recruitment and Admissions

4. Testing, Placement Assessment, and Competition Identification

5. Financial Aid

6. Matriculation and Orientation

7. Registration and Advising

8. Learning and Satisfaction Assessment

9. Retention and Graduation Persistence

10. Alumni/Postgraduation Activities, Employment, and Success

The content and order of components mirror the basic student and differentiated student pipeline (Figure 3). Essentially, each part of the traditional student "enrollment funnel" identifies a component set of strategic and operational reports. By regularly examining data in each stage of students' college preparation, selection, and completion processes, enrollment leaders are urged to identify both available and needed data to best ensure that their institution's student profile and total population goals are achieved. Processes and activities in each stage of the funnel create new data, which is often used in other components. For example, data collected from surveys completed from students who withdraw or failed to return as well as academic profile information can be used to help create persistence models and early alert reports for early intervention initiatives.

This portfolio development model provides universities with an inventory outline that emphasizes consideration of targeted student populations, market conditions, college selection factors, and data components supporting student persistence to degree. SLU's SEM Research and Reporting Council and enrollment leadership team developed its initial portfolio by identifying the data it needed to support the university's goals at each stage of the enrollment funnel (Figure 4). The planning resulted in a set of current or requested reports designed to inform managers responsible for the specific student populations targeted in SLU's student pipeline goals: precollege students (grades K–12), current and returning students (undergraduate, graduate, and professional), and graduates or alumni. To complete the portfolio, components such as formal report titles, report definitions, data sources, frequency of delivery, and individuals or units responsible for overseeing the data collection and analysis were added to the overall inventory. In an effort to increase awareness

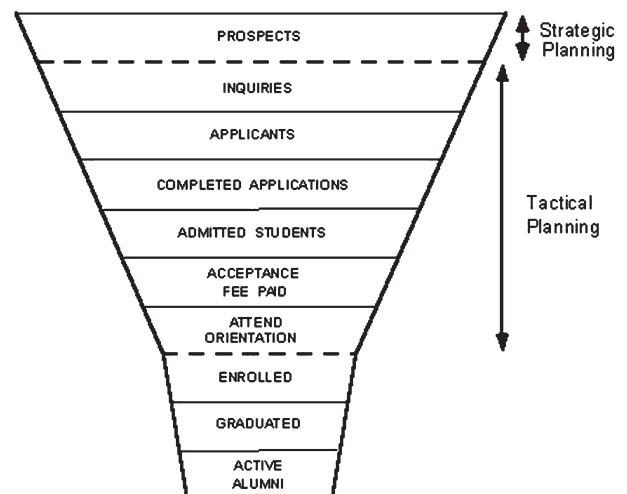**Figure 3.** Basic Enrollment Funnel

Figure 4. Common K–20 Student Pipeline Recruitment and Retention Reports

SEM REPORTING PORTFOLIO — STUDENT FUNNEL

INQUIRIES AND PROSPECTIVE STUDENTS
Pre-college and Summer Programs Inventory, Pre-college Prospect Counts, Program Service
Capacity Analysis, Program Inventory, Market Analysis, Competitor Analysis, Enrollment
Trends by Program, Inquiry by Program Demand Reports, Revenue Modeling and Goals

APPLICANT AND ADMITTED STUDENTS
Weekly Admission and Diversity Comparison Reports, Academic Unit
Enrollment Goals, Financial Aid Distribution Patterns and Goals,
International Visa Trends, Competitor Analysis

DEPOSITED AND NEWLY ENROLLED STUDENTS
Inquiry to Enrolled Funnel Yield Reports,
National and Global Footprint Maps, Net Revenue
and Discount Rates, Weekly Registration Reports,
New Student Survey and Profile

ENROLLED AND RETURNING STUDENTS
Five-year Enrollment and Persistence
Dashboard, Academic Space and Seat
Utilization, Non-returning Student Survey,
Student Demographic Profiles

GRADUATES AND ALUMNI
Graduating Senior Satisfaction Survey,
Retention and Graduation Audit,
Alumni Footprint Maps,
Annual SEM Report

Source: Goff (2012)

of the information provided within the portfolio and shared governance of the SEM process, SLU started providing SEM data-sharing open forums for the campus community each month. Although the direct impact of the new analysis and broader sharing efforts are difficult to directly measure, by the fall of 2015 Saint Louis University had met or exceeded most of its new undergraduate student profile and success goals just three years into the formal SEM planning process.

Implications and Need for Visual Analytics

SEM-based analytic strategies invite enrollment professionals more directly into the process of creating and structuring the institutional research arena. Recent research demonstrates how regular interaction with

data is blurring the lines across many traditional university information development and organizational structures. Who controls, interprets, and shares the data—information technology staff, the institutional research unit, or the enrollment management teams? It is not reasonable for any one person to do all of the analytic tasks from gathering data to decision making. Likewise, it is not feasible for enrollment leaders to be passive recipients of analysis performed by others. As decision makers shift away from a *problem-solving* posture and embrace an inquisitive and constantly vigilant *problem-finding* leadership style, they will need a method for easier interpretation and sharing of big data grounded conclusions.

The phrase "visual analytics" (VA) has been introduced as a key term in the new landscape for organizational

data management. VA is operationally defined as *the science of analytical reasoning facilitated by interactive visual interfaces* (Cook & Thomas, 2005). The approach is intended to create a powerful and interpretive reporting environment. VA utilizes strong statistical analysis combined with graphic presentations of data and interactive dashboards for users to easily find patterns and trends that would not otherwise be found in traditional reports organized in basic rows and tables. The VA method has become a key performance differentiator between organizations (Lavalle, Lesser, Shockley, Hopkins, & Kurschwitz, 2010) and has exciting operational improvement potential for the often broadly tasked leaders in higher education.

SEM leaders have found that VA approaches allow them to more broadly share new understandings about factors impacting current and future student enrollment levels, while also emphasizing the key performance indicators highlighted in the traditional enrollment funnel analysis. The resulting graphic presentations, or info-graphics, help to quickly inform the institutional community and can be used with a wider variety of institutional constituents: board members, government leaders, faculty, staff, alumni, students, parents, and so on. In addition, the VA applications offer the ability to provide a more responsive data platform to engage audiences using a variety of print and data access technologies: personal computers, tablets, and other smartphone or mobile technologies.

Conclusion

Embracing a SEM data agenda means striving to "sweep in" as much relevant data as possible into leaders' decision-making processes. It allows institutional leadership to better explore alternative paths and answer deeper questions about the strengths and barriers in the student enrollment pipelines. Inherently, the visualization of data will lead to an appetite for more and more data. This is why thoughtful and purposeful planning is the key in starting any report and analytics portfolio effort. Effective SEM organizations strive to eliminate knowledge differentials and increase decision quality at both the tactical and strategic levels throughout a university's community. A solid SEM reporting portfolio will support the stages of a comprehensive enrollment funnel. Each stage is supported with clusters of reports highlighting key data and findings about prospective students and the vital factors impacting students' registration and degree completion rates. The end game should be an effort that helps move our institutions from focusing on data collection and information sharing to applying knowledge that can continuously improve our service to students.

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