

Appendix C Analytics Work Group Report

Analytics Workgroup – Focusing on the cross-cutting application of “big data” to the operation of the USM and its institutions, with particular attention to the areas of student performance and success.

Study Processes

The workgroup focused on an environmental scan of capacity for and use of analytics across the USM. In order to accomplish this, the workgroup conducted:

- Campus visits, including demonstrations to understand the leading edge potential of the current analytics systems,
- Conducted a roundtable session with USM academic leadership to understand how those leaders seek to use data and expand its use,
- Conducted informal discussions with campus staff to ascertain routine use of BI and Analytics systems on campuses,
- And utilized the ECAR maturity Index survey to ascertain a roughly objective measure of current use.

In addition, the workgroup is preparing an annotated bibliography of sources to aid in the expansion of use and development of campus analytics.

Identified drivers

The drivers, for and against, expansion of advanced analytics on campus present a considerable challenge to planners. The drivers encouraging wider use of analytics include:

- ***Improving student learning and outcomes*** – The capability of detailed data analysis of individual students and organization of learning and interventions around that students needs holds enormous potential for higher education. It has been suggested that the organization that effectively combines big data and analytics platforms to realize this potential will have developed the disruptive “killer app” in higher education.
- ***Predictive applications*** – The capabilities of advanced analytic systems to effectively predict outcomes are of critical interest. These are seen as keys to creating interventions to improve enrollment management, student outcomes, and other areas. The desire to get ahead of business, enrollment and demographic cycles, particularly when competitors are pursuing similar strategies, was a key driver.
- ***Expansion of Business intelligence*** – Leadership on campus, particularly at the best-run institutions, has developed a much greater desire to have access to large amounts of timely data for decision support. Systems that can deliver these data with minimal intervention at the point of use by campus IT or “power users” is driving current development.
- ***Ability to integrate operations across units*** – One of the key elements for increasing

effectiveness across campus is to more effectively integrate units across campus. The use of analytics can provide an effective method to achieve this end within horizontally-organized organizations such as universities.

- **Reduced cost** – Along with the potential for increased effectiveness of operations and outcomes, it is widely assumed that analytics systems, once mature on a campus, will allow considerable improvement in efficiency resulting in substantial cost savings and avoidance.

Despite the tremendous promise offered by these drivers for adoption, the countering challenges are formidable. They include:

- **Upfront and development cost** – “Staggering cost” (as it was described by one expert) of technology and development in a period with limited resources for new initiatives is a significant challenge. Additionally, the cost of earlier generations of Learning Management Systems (LMS) and Enterprise Resource Planning systems (ERPs) and their widely acknowledged underperformance have driven a level of aversion in policy makers to major new directions in information technology.
- **Risks to privacy and security** - The use of data analytics necessarily involves the use and collection of significant amounts of personal data. This presents considerable challenges in terms of both safeguarding data in the short and long term, but also in developing what kinds of data should be collected, how it should be used and how long it should be retained. The related legal, ethical and political issues have created considerable reticence in the university community for rapid expansion of analytics.
- **Resistance to process reform** – Significant process reform (including teaching and faculty organization, integration of student services units, and Information technology integration with non-technical units) is necessary to effectively integrate analytics into daily operations of universities. Considerable resistance, particularly among faculty, is expected as the level of change accelerates. The alternative is expensive systems development without commensurate improvements in effectiveness, outcomes or efficiency.
- **Personnel** – Personnel training, recruitment and retention for necessary technical and “technical process-literate” staff across all units is a significant force slowing uptake. Attracting and hiring is expensive and these staff then are often asked to integrate into systems whose processes do not currently require (or value) the highest levels of technical competence.

Findings

Beyond defining the drivers for and against the wide adoption of large scale analytics on campus, the workgroup’s environmental scan gathered information from campuses to determine the current state of development of analytics. Through the course of the work, the focus of the analytics group became student-related analytics and these findings focus on those areas. In terms of these areas which directly relate to the issue of student success, most USM institutions are not at a point where they can realistically claim to have a developed analytics capability. Although, this is not true in every instance or in every area of the activity, but even

on the campuses which are best utilizing the potential of these systems much work remains to be done.

EDUCAUSE, through their ECAR research on process maturity, have provided a useful framework for considering our position both in absolute terms (i.e. how close the USM is to fully utilizing the technology) and in relative terms (i.e. where we are in comparison to other higher education organizations and institutions). Among the ten most common current areas of analytics development activity in higher education, they identified six areas either directly related to student success or in closely related areas. These areas are: Enrollment Management, Student Progress, Instructional Management, Student learning, Progress of Strategic plan, and Cost to Complete Degree.

To provide a relative measure of the use of data in these and other areas they noted five levels of data use on campus. Only the top two levels describe systems that are commonly known as “Analytics” systems today (See table 1).

Table 1 – Levels of Data Usage

Level	Type of use	Description	Typical of:
1	Proactive use	The highest level of use, in which data is available, is used to predict future action and action is taken in advance of the process being measured. This reflects a very high level of confidence in the technology, data quality and the modeling which lies behind them.	Analytics
2	Prediction	Data analytics are routinely used to make forecasts and these forecasts are widely distributed. These forecasts are used to inform the campus community and may lead to some preparation or planning.	Analytics/Business Intelligence
3	Monitoring	Analytics are used for real-time (or highly timely) monitoring of activities to inform action. All views are current or retrospective.	Business Intelligence
4	Dormant data	Data exists within institutional (or System) information systems but is not used to monitor or inform activity routinely. Data may be by-product data of activities or data in “silos” which does not interact with main campus systems.	Operational systems
5	No data	Data is either not collected, or collected in such an inconsistent or poorly constructed format that it cannot be used effectively.	Operational systems / Ad Hoc Systems

Within this framework, it is possible to characterize the relative progress of USM institutions in the development of their Analytics systems. Table 2 characterizes the position of the USM in the most common areas related to student success. Note that the ECAR survey data

(represented in the National average) includes public, private and for-profit institutions and those which exclusively offer instruction online, those in the latter two categories have reported very high levels of use.

Table 2 – Current Usage in Key Areas of Analytics Development

	Best USM	Average USM	Average National*	Major Challenges	Exemplar Institutions**
1. Enrollment Management	Proactive	Predictive	Predictive	Linking of Campus Data and Poor Process Integration	UMUC, UMBC
2. Student Progress	Predictive	Predictive / Monitor	Predictive	Lack of Effective Modeling, Poor Process Integration	UMUC, UMBC
3. (Finance & Budgeting)					
4. Instructional Management	Proactive	Dormant	Monitor	Poor Process Integration, Personnel Training, Cultural Issues	UMUC, UMBC
5. Student learning	Predictive	Dormant	Monitor	Lack of Effective Modeling, Process Integration, Personnel training, Cultural Issues	UMUC, Bowie
6. Progress of Strategic plan	Predictive	Monitor	Monitor	Poor Process Integration and Personnel Training	UMCP
7. (Central IT)					
8. (Alumni & Advancement)					
9. Cost to Complete Degree	Monitor	Dormant	Dormant	Not an area of focus	UMUC, UMCP
10. (Human Resources)					

* Source: ECAR Survey, Educause

** Exemplar institutions are not exhaustive listings

Notes regarding each area of usage appear below.

- Enrollment Management** – Use of analytics to manage enrollment processes are among the most developed in the USM. However even when they are well-developed and being used “predictively”, they are not generally integrating all relevant data sources in a widely available manner (for example financial aid and admissions data) and processes for use of these data lag behind technology to a considerable degree on almost all campuses. Additionally, few systems incorporate non-typical data (for example, housing data) in enrollment management.

- ***Student Progress*** – At the institutional level retention/re-enrollment analysis remain the most typical areas of analysis, advanced advising systems are also in place to provide granular data to advisers and faculty but conclusions and predictions are often not based on advanced modeling and frequently are the subject to no modeling at all.
- ***Instructional Management*** – Learning management systems exist and are in use on all campuses but their more advanced features are woefully underused. Additionally, the systems themselves are hardly used beyond the mandatory minimum level by significant portions of the System faculty.
- ***Student learning*** – In-class data feeds to instructors and advisers are limited on most campuses and are often less timely than would be most effective. Modeling is also very limited and development of outcomes and measures of mastery limited to a relatively few areas on campus.
- ***Progress of Strategic plan*** – Accountability and assessment against goals and benchmarks has advanced significantly on most campuses as they have sought to monitor and plan for their own strategic goals and those of the USM. Despite this, many campuses planning to meet these goals remain subject to processes which exclude data, or which design interventions that are unsupported by available data.
- ***Cost to Complete Degree*** – Predictive analytics focused on fiscal elements of student success and deployment of institutional resources have not been an area which has received a high level of focused attention on most campuses. Most analysis and systems are either focused on monitoring of System and institutional indebtedness targets.

Finally, although most institutions can note success in implementing some level of solutions in the various areas listed, in most cases these solutions fall well short of the potential on campus. During the course of the Workgroup’s study, the group consulted Donald Norris (of Strategic Initiatives Consulting) regarding potential future directions which impact all of these areas and are potentially transformative. The work of he and his colleagues outlined several areas of interest, these include:

1. ***Enhanced Management of the Student Pipeline and Success*** – As noted enrollment management and use of data to monitor and predict student success are the most advanced areas at USM institutions. However, the addition of analytics providing real-time and individual level data on demand and the use of data mining to identify potential barriers to success could further enhance this area on campus. As many as three quarters of USM institutions are positioned in terms of processes and

- technology to move forward on projects in this area. Non-technical personnel have in many instances already adapted to use of tools in this area.
2. ***Dynamic analytics and data visualization for non-power users*** – The move away from so-called “power users” as mediators between data products, and operational personnel (e.g. faculty, student services staff) and leaders (e.g. provosts). This would require the creation of timely, granular, and very easy to use data interfaces backed by high quality data. Perhaps half of USM ‘s institutions have technology in place to achieve this in the short term and less than half are in the position in terms of processes and training of non-technical personnel. Virtually all would have difficulty maintaining technical personnel to meet the demand.
 3. ***Individual Planning/Advising and Personalized Learning*** – Perhaps the single most ambitious analytics project today is the movement to highly individualized planning and learning platforms which would directly impact the ability of students to master material and guide their course through a degree program. Only one institution in the system, UMUC, appears to be positioned to move rapidly into this area because of its very high level of data capture and current modeling work. Other institutions, including the most technically advanced, have a considerable task in terms of data capture and data normalization before either processes or personnel can move in this direction.
 4. ***Advanced Data Mining and Linked “Success Makers”*** – Data mining of so-called “Big data” and linking to other K-20 and workforce appear to be beyond the capabilities, both current and potential in the immediate future, of any individual institution. These directions would require multi-institutional and larger collaborations. Salisbury University and UMUC each provided examples of potential collaborations that could provide models for other USM institutions to move forward in these areas.

Recommendations with Suggested Aligned Measures of Effectiveness

The following recommendations are designed to facilitate the movement of institutions to the advanced uses of Analytics described above while building on existing success. They would help to reinforce the positive drivers while beginning to weaken the countervailing issues. Many are already partially in place on campuses but, on the whole, few USM campuses have achieved a position which will allow the effective potential of the next generation of analytics systems to be realized.

Institutional Organizational Recommendations

- ***Form Leadership groups***- Beginning with the Presidential direct report group, leadership teams should be established. These leadership groups should be charged with championing the use and training to use data, and the re-thinking of processes

on campus to integrate data. Without leadership and public valuing of these processes at the highest levels the creation and integration of these systems is unlikely to occur.

- ***Establish Cross-functional teams*** – With the intention of bringing data into use in all institutional decision-making, but particularly in student learning and success, establish cross-functional teams to coordinate use, training, and procedural reform on campuses. Establish a standing re-engineering team to coordinate activities across campus.

Data and Data Systems Recommendations

- ***Improve immediate proximate measures*** – Measure what matters in the immediate term and in the most rigorous fashion available. After leadership at the highest levels, no single item will more effectively drive improved data quality, systems and use as establishing short-term data-driven metrics and holding units and leaders responsible for them.
- ***Integrate data systems (regularize and reorganize data)*** – Even in the absence of fully-unified systems on campus, data should move from peripheral systems into higher level systems. This data should be subject to rigorous review and the establishment of uniform data dictionaries and definitions. The cross-functional teams on campus should move forward with an ultimate goal of systems that can contribute to an efficient and integrated analytical system in the long-term.

Procurement and System Development Recommendations

- ***Establish a partner plan for development*** – In order to address cost issues, each institution should establish a plan for partnering with USM institutions and outside organizations to bring effective analytics systems to their campus. Institutions should be strongly discouraged from “going it alone.” USM should act to help broker these partnerships and attempt to achieve shared procurement and other shared services efficiencies.

Data Usage, Privacy, Security Recommendations

- ***Address Overall Changed Nature of Privacy and Data*** – The USM should take a leadership role in establishing the appropriate “data ethics” for use and non-use of student data through a dialogue with data ethicists, data policy professionals, academic and legislative leadership. These discussions could focus on the changed nature of privacy, appropriate disclosure of practices and data, and the role of the university in capturing data on a broad scale.
- ***Create comprehensive data policy plans*** – To ensure the highest level of fidelity to mission-driven use of data and robust protections of privacy, institutions should develop plans that detailed planned collection, use, and retention of data (including but not limited to student data). These data policy plans should recognize the central role of data in decision-making. The plans need to establish not simply technical specifications, but also include acceptable use, appropriate purposes for data collection, and enforceable controls for this use of data.

Implementation of Recommendations

The USM is a federated system of institutions and use of these systems must be developed on campus, and left in the full operational control of the individual institution. The following implementation recommendations seek to promote the recommendations made above through enabling the institutions to enhance positive drivers of change while weakening countervailing drags on development.

Overall

- Establish a BOR policy that analytics systems to improve student performance and success should be institutional priorities,

Institutional Organizational Implementation

- Campuses should provide the Board of Regents with a plan to develop leadership and cross-functional teams as outlined in the Recommendations in order to accelerate institutional adoption of analytics in areas related to students success,
- USM should promote the effectiveness of campus and leadership teams and develop best practices for use of analytics in student success through workshops, training and other shared events,

Data and Data Systems Implementation

- USM should promote development of appropriate measures, sharing of measurement research carried out on campuses, and establishment of data regularization plans through routine meetings between campus teams and I.T. and I.R. staff at System,

Procurement and System Development Recommendations

- The USM should work to coordinate partnerships beyond USM with institutions, organizations, and vendors to achieve efficiencies and include all USM institutions in an effective development framework,
- The USM should work to establish efficiencies through shared procurement to create infrastructure and negotiate contractual and partnership relationships,

Data Usage, Privacy, Security Recommendations

- The USM should convene, in coordination with Campus data experts and faculty, a conference to establish a USM-wide vision for the appropriate use of data and establish “data ethics” as a ongoing discourse with a wide campus and public constituency,
- The Board of Regents should issue guidelines for data use and retention best practice recommendations and campuses should report on their own plans for use and retention.