# The Financial and Non-financial Aspects of Developing a Data-Driven Decision-Making Mindset in an Undergraduate Business Curriculum

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## Abstract

*Making data-driven decisions is becoming more important for organizations faced with confusing and often contradictory information available to them from their operating environment. This article examines one college of business' journey of developing a data-driven decision-making mindset within its undergraduate curriculum. Lessons learned may be of use to other institutions of higher education that are implementing courses with business intelligence (BI) and business analytics (BA) content to provide students with the knowledge and skills they need to excel in a challenging career environment.*

**Keywords:** Business education; instructional project guidelines; undergraduate curriculum

## Introduction

Increasingly, critical business decisions have become more data oriented. Many aspects of life in the age of information rely on individuals who have an education in data analytics to help make data-driven decisions. Data analytics skills are used in all business related fields, and many non-business related fields like politics, health, and strategic planning. Data analytics are applicable to all levels of the enterprise, from top level executives to the loading dock crew. Hence, it is imperative that university graduates have a data-driven decision-making mindset. A university that does not instill a data-driven mindset in its graduates will not compete effectively for a market share of new students in the end.

### *Overview of the Problem*

To better support data-driven decision making once they graduate, students need a better foundation in business intelligence (BI) and business analytics (BA) skills to help organizations understand the copious amount of information collected (Mitri & Palocsay, 2015). However, students also need to understand how to communicate effectively and have the general business knowledge to understand the problem, enabling decision makers to deal with problems and take advantage of opportunities (Wixom et al., 2014).

An academic institution is no different from any other business competing for market share. The institution must stay current to remain competitive and meet the needs of its constituents; for academic institutions, prospective employers who employ university graduates largely comprise that group. Many prospective employers expect university graduates to have a data-driven decision-making mindset supported by appropriate critical thinking and data analysis skills, so the university needs to rise to the occasion.

Responding to the demand of the marketplace is not without its difficulties in academics as several issues were identified in implementing a business intelligence curriculum.  An Association for Information Systems Special Interest Group reported on an examination of the challenges faced by institutions on Decision Support, Knowledge and Data Management Systems (SIGDSS). The report identified four key areas that needed addressing: access to software and technical support, finding room in the curriculum, finding faculty capable of teaching analytics, and access to practical experiences and data sets (Wixom et al., 2011).

## Literature Review

Chiang, Goes, and Stohr (2012) stated that enormous amount of both structured and unstructured data generated by the Internet, social media, and electronic transactions, is stretching our capacity to manage it. According to their study, the new challenge is to develop the capability to understand and interpret the growing volume of data to take advantage of the opportunities it provides in many human endeavors. New disciplines like Data Sciences (DS), and Business Intelligence and Analytics (BI&A) endeavor to address emerging business needs, presenting both unique challenges and opportunities for the research community, and for higher education Information Systems (IS) programs.

### Business Intelligence and Analytics

Business intelligence and analytics are the "techniques, technologies, systems, practices, methodologies, and applications that analyze critical business data to help an enterprise better understand its business and market and make timely business decisions" (Hsinchun, Chiang, & Storey, 2012, page 1165). Davenport (2006) discussed the importance of data analytics in an increasingly complex business environment. He stated that data analytics could and often does give corporations a competitive advantage even if their products and services are identical. Davenport observed, "Employees hired for their expertise with numbers or trained to recognize their importance are armed with the best evidence and the best quantitative tools. As a result, they make the best decisions" (Davenport, 2006). Additionally, Mitri and Palocsay (2015) claim that "business intelligence (BI) combined with business analytics (BA) is an increasingly prominent strategic objective for many organizations."

Educationally, BI/BA is still evolving, requiring universities to develop a model BI/BA curricula. Further, the academic domain of BI/BA appears to be a hybrid of disciplines, calling for knowledge of information systems, statistics, management science, artificial intelligence, computer science, and business practice/theory. Based on IS 2010's model curriculum constructs, the authors examine two options for the proposed curriculum: a typical IS major with a BI/BA concentration, or a comprehensive, integrated BI/BA undergraduate major. They exhibit evidence of increasing need for BI/BA capabilities in the global economy, analyze the current state of BI/BA education, and connect anticipated requirements for BI/BA curricula with the IS 2010 model curriculum.

### Business Intelligence and Analytics Teaching in Higher Education

The current interest in business analytics (BA) is discussed extensively by Gorman and Klimberg. They state that professional consultancies and software houses are "touting it as the next wave in business, claiming that the need for BA skills is large and growing" (Gorman & Klimberg, 2014). Thus, schools are responding by providing relevant undergraduate majors and minors, Master of Science degrees, certificates, and concentrations within their Master of Business Administration programs. The authors surveyed some of the largest, most established, and best-known programs and interviewed representatives of these programs to understand better the requirements for students entering, the required and elective course topics covered, and job opportunities for graduates.

Schwieger and Ladwig (2016) discussed the demand for college graduates with skills in big data analysis. They stated that "employers in all industry sectors have found significant value in analyzing both separate and combined data streams." Nevertheless, reports of data improprieties, privacy breaches, and identity theft continue to plague modern society. According to their article "while data privacy is addressed in existing information system (IS) programs, greater emphasis on the significance of these privacy issues is required as big data technology advances." To address this need, some institutions of higher learning are developing relevant degree programs that meet the challenges and opportunities presented by "big data." In their study, Schwieger and Ladwig demonstrate the critical role that data privacy represents in the realm of big data and suggest methods for implementing a layered approach to applying big data privacy concepts to the IS2010 Model Core Curriculum.

Dunaway and McCarthy (2015) discussed the newly developed graduate level business analytics program launched by Quinnipiac University. They stated that the program is entirely managed including curriculum development and delivery by the Computer Information Systems department. Their paper provides a knowledge base of lessons learned in the formulation and implementation of graduate Business Analytics programs.

Turel and Kapoor (2016) state that "business analytics is a fast-growing job market for business school graduates. Hence, researchers have made many calls to enhance business analytics training in business schools to meet the growing market demand for analytics-savvy employees." Some business analytics courses have begun to address this emerging need. In their paper, Turel and Kapoor consider the readiness of business analytics programs in US business schools by analyzing current business analytics-related course offerings of the top 104 business schools and 20 unranked business schools in the United States. They analyzed the programs by examining the types of courses offered and ranked the institutions based on business analytics course offering in terms of maturity levels. Their findings indicate that business schools still much to accomplish to achieve higher levels of business analytics maturity to serve the industry needs.

The Wall Street Journal had an article in their November 5, 2014 edition, which addressed the need for business schools to incorporate data analytics into their curriculum. The article stated that business school students and potential recruiters could not get enough of big data. Increased interest in specialized programs in business analytics has prompted business schools to create stand-alone programs.. The article stated that the growing interest in analytics comes amid a broader shift in students' ambitions. No longer content with jobs at big financial and consulting firms, the most plum jobs for business school graduates are now in technology or in roles that combine business skills with data acumen (Gellman, 2014).

Wilder and Ozgur (2015) state that analytics has become a new source of competitive advantage for many corporations. According to their study, the modern workforce must be cognizant of its power and value to perform their jobs effectively. In their study, they define the appropriate skill level and knowledge base required for business school graduates to be successful. They propose an undergraduate course of study in analytics for students with average to above-average analytical skills. Implementation guidelines are also addressed in their article.

### *Financial and Non-Financial Aspects of Curriculum Development*

Money magazine had an article in their May 16, 2016, edition, which stated that employers are willing to pay a premium for employees who possess certain skills. Being able to make sense of big data topped the list. The article also stated that being familiar with SAS (Statistical Analysis System) results in an average pay boost of 6.1%. Data mining, data warehousing, and data modeling yielded an average pay boost of approximately 5% (Renzulli, Weisser, & Leonhardt, 2016).

Wymbs (2016) stated that designing a new, potentially disruptive, data-driven, curricular program can be worthwhile. Students, faculty, and employers can benefit, while the program serves as a template for other initiatives. The new data analytics program should incorporate innovative theory and practices, but be driven by business input and academic leadership. Wymbs stressed an interdisciplinary approach that strengthened the analytic capabilities of existing faculty and encouraged faculty to pursue practitioner data sets and practical experiences. The approach developed in his paper may provide other universities with a path toward a data analytics curriculum congruent with the world of big data.

## Existing BSBA Curriculum

This study is focused primarily on the journey taken by the business school at a regional university in the SE United States as it endeavors to ensure that the graduates of its Bachelor's in Business Administration program have a data-driven decision-making

mindset. As such, it is a rather microscopic view of the research objective. Future studies should consider expanding the scope of this study by increasing the sample size.

## Method

The university in question currently offers a Bachelor of Science in Business Administration (BSBA) with three majors; they are accounting, economics and global business. Within each major, there are several concentrations thereby offering BSBA students an opportunity to specialize in an area that is of interest to them and that is aligned with their future career goals. The university in questions offers its BSBA program in a face to face setting at the main campus, at several onsite locations in the SE United States and select overseas locations, and online, using a learning management system (LMS).

The university's goal in developing its BSBA curriculum, which was largely designed by the Undergraduate Academic Council and approved by university administrators, was to ensure that graduates had a firm grounding in various topical areas that comprise the field of business. Hence, all BSBA students, regardless of their area of concentration, take courses in marketing, accounting, finance, economics, business strategy and statistics among other areas.

As mentioned in the preceding paragraph, a firm grounding in statistics and quantitative methods is already a key component of this university's BSBA program; in fact, the university even offers a data analytics concentration as part of its undergraduate business curriculum. However, a meta-analysis of the BSBA curriculum revealed some glaring discrepancies between the statistical component of the university's BSBA program and prospective employer expectations.

As mentioned earlier, prospective employers expect university graduates to have a data-driven decision-making mindset. In other words, simply indicating several courses in statistics and quantitative methods (QM) on one's academic transcript is not sufficient. The courses need to incorporate content that inculcates a data-driven decision-making mindset.

The university identified the need to strengthen the exposure of the students to additional practical analytic experiences. Although BSBA students had to complete several statistics and QM courses with a grade of C or higher to receive their diploma, those courses did not significantly advance the goal of creating graduates a data-driven decision-making mindset. They provided exposure to analytics but insufficient at using the software or exposure to the practical experiences that perspective employers expected. For example, many prospective employers would like business school graduates to have Excel expertise, which the university in question was not offering to all of its BSBA students. The university also felt that ensuring exposure of analytics in more theory-based courses could strengthen the ties of analytics to theory.

This section has laid out the BSBA curriculum, at the university in question as it currently stands, and the need to graduate students with a data-driven decision-making mindset. The subsequent section will clearly lay out the goals and objectives of this initiative.

## Objectives of the Data Analytics Initiative

This university's objective is consistent with that of other academic institutions. That overarching objective is to graduate students whose skills set matches the needs of prospective employers. As discussed in the preceding section, the business school identified areas it needed to strengthen their undergraduate academic curriculum to

meet employer needs; that self-realization set the stage for the data analytics initiative as described in this section.

Table 1 is a comparison of courses contributing to a data-driven decision-making mindset offered by this university and peer institutions in the region. An analysis of the comparison indicates that the university that is the focus of this study may not be providing adequate analytical learning opportunities to its business students that are pursuing careers in business analytics.

**Table 1:**
*Comparison with Peer Institutions*

| Courses Required by Peer Institutions | Peer 1 | Peer 2 | Peer 3 |
|---|---|---|---|
| Foundation Math | Business Calculus | Calculus and its applications | Calculus with applications |
| Statistics Course | Several Business Analytics electives and Big Data I and II, QM and Predictive Modeling I and II | Applied Business Statistics I and II | Business Statistics I and II |
| Business Analytics | Business Analytics I and II | | Introduction to econometrics |
| Information System | Intro. to MIS; Personal Computer Applications | Advanced computer applications | Computer applications in business |
| Business Communication | Oral Communication | Composition I and II | Freshman Composition I and II |

Prospective employers expect new hire business school graduates to have certain skills sets to perform their job responsibilities effectively. The university has the immense responsibility of meeting this need by graduating qualified students who, upon graduation, will become successful career professionals. Failing to do so will not only hurt the university's reputation among prospective employers but also has implications for the institution's long-term viability because a university that develops a reputation for producing inadequately prepared students will see its enrollments decrease to unsustainable levels.

One critical skill set demanded by prospective employers is for employees to be proficient in using a variety of software packages for analyzing data such as Excel and with statistical software such as SAS. In short, employers expect business school graduates to have a data-driven decision-making mindset, and they expect business schools whose employees they hire to have practical exposure to the kinds of software that they utilize.

As can be seen from the preceding paragraph, the data analytics initiative at the business school in question is one of necessity and not one of luxury. The university realized that their current curriculum was not meeting the needs of prospective employers and so it was critical to the business school's long-term survival that they adapt their curriculum to stay contemporary.

An analysis of the accounting education curriculum indicated that undergraduate business school graduates with better Excel competency are more professionally

prepared (Brown & Pike, 2010). The Indeed website, which searches millions of jobs from thousands of job websites reports that over one-third of the jobs posted have the world "Excel" listed in the job posting ("Excel Job Trends," n.d.), a trend that has been steady since 2014. Microsoft Excel is a base analysis tool that is most widely required. SAS is a popular package used for analytics in the commercial world and provides technical support for academics. SAS is also employed in academia (Wixom et al., 2014), making SAS a practical choice to use as an advanced analytical tool.

The identified difficulties in implementing business intelligence involved finding software and support as well as providing a larger pool of trained instructors. Hence, the objective of the data analytics initiative was to modify the current BSBA curriculum in a manner in which future graduates of the program would have SAS certification as well as Excel Level I and II certifications. The subsequent section, of the paper, will discuss how the data analytics objective was implemented at the business school that is the focus of this article.

We also wanted to strengthen the expertise of our faculty following the example of other institutions (Wymbs, 2016). The university values its teachers and desires that they can expand their expertise so that they may pass this onto their students. Business analytics is cross-functional, and it would be unethical not to provide our faculty the opportunity to expand the skill sets that they may need as they advance their careers. By training current faculty, we also attempt to address the difficulty of finding faculty capable of teaching business intelligence and analytics. A bonus of the course of action is that faculty can find additional data sets that directly apply to their areas of expertise.

## Implementing the Data Analytics Initiative

The preceding section of the paper has laid the foundation for the data analytics initiative. In this section, the authors discuss the initiative implementation process at the business school in question.

The process began with the formation of a strategic committee, titled the Data Analytics Working Group (DAWG), comprised of 14 full-time College of Business faculty, from many of the college's departments. The committee met once a week using Cisco Webex as the platform for the weekly meetings, which was necessary as members of the committee are distributed over several campuses and geographic locations. During the meetings, DAWG members discussed integration and implementation issues associated with the data analytics initiative.

The goals of the initiative, identified by the DAWG early on, was that 100% of the university's business school graduates were to be certified in Excel Level I, as well as SAS. Excel Level II certification would be an option for some students, that had an extra upper level business course elective available. Excel certification is a rather straightforward process, but since SAS is an independent external partner to the university in question, we needed to work with them to set the requirements for graduating students to possess SAS certification.

SAS stipulated that for university graduates to receive a SAS Joint Academic Certificate (JAC), students needed to complete 12 credit hours of coursework associated with the certificate program, where at least six hours uses SAS as the analytical tool for exercises and projects. Additionally, an independent research project using SAS and real world data must be completed and presented to a faculty evaluator. Since virtually all courses offered by the business school are three credit hours, this stipulation translated into four courses offered by the business school offering SAS exercises and projects, matching the goal of providing exposure to analytics throughout the curriculum.

The second part of this initiative was the Excel certification. Students are initially exposed to Excel in a computer applications course, usually taken during the first semester in school. This course provides an introduction to computers, file management, cybersecurity, and office productivity applications to all incoming freshman. Excel is only about 20% of the course, with insufficient opportunities for students to achieve mastery of the application. Thus, since Excel Level I and II certification was the desired objective, two courses were needed where each level of proficiency could be attained. Hence, the data analytics initiative affected six courses offered by the business school.

Having identified the number of impacted courses, the DAWG had to identify specific courses that would be subject to the data analytics initiative. Only required courses were considered for the SAS JAC program since elective courses might enable some students to "fall through the cracks" in the system. The DAWG also decided that the Excel certification must precede the SAS certification and must occur early in the educational process (freshman or sophomore level). The SAS JAC would then be incorporated into several upper-level courses.

Having made that decision, a course that students are required to take before starting the upper-level business curriculum was selected for the Excel Level I certification. The Excel Level II certification was added to a class that is an eligible elective for all majors and concentrations. Four upper-level courses, including the capstone course, were selected for the SAS JAC.

Having identified the courses that would potentially be impacted by the data analytics initiative, the DAWG had to develop a roadmap for the implementation. This phase of the operation involved identifying key individuals who would develop SAS exercises and courses in the impacted courses.

As is usually the case, the implementation phase of the project comprised a larger group than the objective phase. This phase of the operation involved faculty who teach the impacted courses partnered up with subject matter experts (SOEs) who in many cases were also DAWG members. The "experts" helped the impacted faculty receive the necessary training that was needed to implement SAS exercises and projects in their courses. The SOEs also helped faculty develop SAS exercises and projects that were incorporated into the four impacted courses. Training was identified as a key component of the initiative. All of the DAWG members were required to take a basic online programming course in SAS. Two members of the DAWG were selected to receive additional training to "train the trainers."

## Continuous Improvement

As with any strategic initiative and its associated implementation, a feedback loop has to be an integral part of the process. This section discusses the feedback mechanisms that are built into this data analytics initiative.

The feedback loop includes both current students as well as those who have graduated. As mentioned in the preceding section, this initiative spans several courses at all levels of the BSBA curriculum. In latter stages of the data analytics initiative, students would be expected to know more about Excel and SAS programming than those students who are in earlier stages of the program, but the ultimate test is if the students are ready to provide data-driven decision making support in the real world. So, BSBA graduates will also be tracked after graduation. Feedback surveys will be conducted of both graduates and their employers, using an online survey tool, following Institutional Review Board (IRB) approval. The objective of the surveys is to ascertain how effectively the

university's BSBA curriculum prepared these individuals to be data driven professionals in the workplace.

Based on the performance of existing students in various stages of the data analytics initiative as well as feedback received from alumni and their employers, the initiative will be adjusted as needed. The objectives of any potential adjustment, of the data analytics initiative, would be aligned with the needs of the contemporary workplace.

## Results

All academic institutions have a set of peers that they use for benchmarking purposes. These peers typically constitute other academic institutions that operate in the same geographic region and compete for comparable clientele as the institution in question. The regional university that is the subject of this paper is no exception. As mentioned earlier in the article, the university that is the topic of this article is located in the SE United States and as such its peer institutions, that it uses for benchmarking purposes, are also located in the same geographic region. For comparison purposes, three peers were selected from the established list of peer institutions for the university in question.

### *Peer Comparison*

Benchmarking against one's peers could constitute a large number of criteria. For starters, graduates of all peer institutions, more or less, compete for jobs with employers of a comparable caliber. Hence, it is vital that graduates of all peer institutions possess similar skills sets acquired during their educational process. Hence, benchmarking needs to ensure that degree programs, although not necessarily identical, are comparable across all peer institutions. Specifically, for this effort, what is of interest is the level of data analytics incorporated into the respective institution's undergraduate business curriculum, which is critical to the data analytics initiative at the university in question since the initiative needs to be comparable, but not necessarily identical, to those of peer institutions.

Table 1 was developed by reviewing the undergraduate catalogs of all peer institutions and "zeroing in" on the level of data analytics in their respective undergraduate business curriculum. In doing so, it was apparent that some peers (such as Peer 1) had a higher level of data analytics and quantitative methods built into their curriculum in comparison to certain other peer institutions (such as Peer 2). These peer comparisons provide a foundation for the data analytics initiative at the university in question. The goal of the initiative is to provide a sufficient level of data analytics to ensure that graduates have a data-driven decision-making mindset. Hence, the purpose of the data analytics initiative is to model this university's business analytics curriculum along the lines of peer institution #1 in the appendix.

## Discussion

The data analytics initiative has several financial consequences for both the university and the students who enroll in its BSBA program. These financial implications are discussed for both groups in the succeeding paragraphs.

### *Financial Implications*

"You have to spend money to make money" is a cliché that has withstood the test of time. That is true in the business world, and it holds true in the world of higher

education.  The data analytics initiative discussed in this article is not exempt from the implications of this cliché.

To graduate with a data-driven decision-making mindset, which is the goal of this initiative, students have to complete several exercises and projects that they otherwise would not have to do; they also need to have an account with SAS.  Completing these projects and exercises, and establishing an SAS account, will inevitably entail an upfront time cost to the student.  In some cases, these costs may be explicit and transparent, while in other situations, it may be more implicit and bundled into the tuition rates. For example, the cost of the Excel certifications can be reduced by purchasing in bulk and adding the cost to the student lab fee.

As is often the case, a front-end cost does have the potential to lead to a back-end return.  In this case, those returns might come in the form of a higher salary and a superior position upon graduation.  It is noteworthy that, just like in the corporate world, there is uncertainty that is inherently present in any potential future return.  However, it is the goal of the data analytics initiative that this project will yield a positive net present value (NPV) from the student's perspective.

Having discussed the financial implications from the student's perspective, this issue to the institution will be analyzed.  The general premise is identical to both stakeholder groups; there is a front-end cost, which will hopefully translate to a back-end return on investment. From the institution's perspective, front end costs include, but are not limited to, subscribing to SAS, costs associated with training impacted faculty, holding seminars and webinars for both students and faculty and advertising costs. The back-end return is expected to come in the form of increased enrollment in the BSBA program.  As the data analytics initiative is rolled out and becomes an integral part of the BSBA curriculum, perhaps more students will find the curriculum attractive and a good return on their time and money.  As with the students, it is the goal of the data analytics initiative that this project will yield a positive NPV from the institution's perspective.

One of the most fundamental finance concepts is that of risk and return.  The two concepts go hand in hand and cannot be separated from one another.  Return is the potential reward associated with a given course of action; risk, on the other hand, is the downside potential of the same course of action.  The preceding few paragraphs have highlighted the return aspect of the data analytics initiative.  The subsequent paragraph will discuss the risk associated with this venture.

It is entirely plausible, and perhaps even probable especially in the short run that the data analytics initiative at the university in question will place a strain on enrollments in the BSBA program.  In other words, some students who are wary of the increased emphasis on statistical software tools and quantitative analysis may choose to take their business to another college within the university or enroll in another institution altogether.  However, this initiative will attract those students who are interested in developing a data-driven decision making mindset.  In other words, it is expected that there will simultaneously be those students who are drawn to the initiative and other students that are opposed to this initiative.  Only time will tell which effect has a greater overall impact on college enrollment numbers and subsequently on the university's revenue stream.

## Conclusion

The world of business is increasingly becoming more complex and as such, the expectations, of prospective employers regarding the knowledge base of potential new hires, are greater than they were a generation ago.  As such, institutions of higher

learning are now challenged with equipping their graduates with the skills sets needed to succeed in the 21st century workplace.  Universities that do not "rise to the occasion" will inevitably become obsolete in an increasingly competitive industry.

A skill that is becoming rather crucial in the business world involves data analytics.  Employers are particularly keen on hiring employees who possess a data-driven decision making mindset and are proficient in using programs such as Excel and SAS.  Hence, business schools, across the country, are charged with incorporating these software tools into their undergraduate business curriculum.  Universities also owe it to their existing faculty to provide an opportunity to expand their skills to meet the needs of their students.

This paper chronicles the journey taken by one business school that is part of an SE United States regional university.  The study discusses how data analytics was incorporated into their BSBA curriculum.  However, in doing so, it is noteworthy that this is an ongoing process with numerous roadblocks and pitfalls that need to be tactfully navigated.  One potential roadblock is in getting the cooperation of faculty and other key stakeholders who might be impacted by this initiative.  These roadblocks could potentially put an end to this initiative altogether! This study has implications for other institutions of higher learning as they endeavor to incorporate data analytics into their respective curriculums.  In other words, the data analytics initiative undertaken by the university, that is the subject of this article, could serve as a case study for other institutions of higher education that have similar pedagogical objectives.

# References

Chiang, R., Goes, P., & Stohr, E. (2012) Business Intelligence and Analytics Education, and Program Development: A Unique Opportunity for the Information Systems Discipline. *ACM Transactions on Management Information Systems*, 3(3), 1-13.

Davenport, T. (2006). Competing on Analytics. *Harvard Business Review*, 84(1), 98-107.

Dunaway, M., & McCarthy, R. (2015). Case Study: Lessons Learned In Launching an Integrated Online Graduate Business Analytics Program. *Issues in Information Systems*, 16(4). 152-156.

Excel Job Trends. (n.d).   Retrieved from https://www.indeed.com/jobtrends/q-Excel.html

Gellman, L. (2014). Big Data Gets Master Treatment at B-Schools. *Wall Street Journal*, *Nov*, *5*, 2014.

Gorman, M., & Klimberg, R. (2014) Benchmarking Academic Programs in Business Analytics. *Interfaces*, 44(3), 329-341.

Hsinchun, C., Chiang, R., & Storey, V. (2012). Business Intelligence and Analytics: From Big Data to Big Impact, *MIS Quarterly*, 36(4), 1165-1188.

Mitri, M. and Palocsay, S. (2015).Toward a Model Undergraduate Curriculum for the Emerging Business Intelligence and Analytics Discipline, *Communications of the Association for Information Systems*, 37(31), 651-669.

Renzulli, K., Weisser, C., & Leonhardt, M. (2016). The 21 Most Valuable Career Skills Now. *Money.* Retrieved from http://time.com/money/4328180/most-valuable-career-skills/

Schwieger, D. & Ladwig, C. (2016). Protecting Privacy in Big Data: A Layered Approach for Curriculum Integration. *Information Systems Education Journal*, 14(3), 45-54.

Turel, O., & Kapoor, B. (2016). A Business Analytics Maturity Perspective On The Gap Between Business Schools And Presumed Industry Needs. *Communications of the Association for Information Systems*, 39, 96-109.

Wilder, C., & Ozgur, C. (2015). Business analytics curriculum for undergraduate majors. *INFORMS Transactions on Education*, 15(2), 180-187.

Wixom, B., Ariyachandra, T., Goul, M., Gray, P., Kulkarni, U., & Phillips-Wren, G. (2011). The current state of business intelligence in academia. *Communications of the Association for information Systems*, *29*(16), 299-312.

Wixom, B., Ariyachandra, T., Douglas, D., Goul, M., Gupta, B., Iyer, L., ... & Turetken, O. (2014). The current state of business intelligence in academia: The arrival of big data. Communications of the Association for Information Systems, 34(1), 1-12.

Wymbs, C. (2016). Managing the Innovation Process: Infusing Data Analytics into the Undergraduate Business Curriculum (Lessons Learned and Next Steps). *Journal of Information Systems Education*, 27(1), 61-75.