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# Harnessing Business Analytics: Analyzing Data Analytics Programs in U.S. Business Schools

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## Abstract

Companies are collecting data at a greater pace and volume than ever before. However, they are struggling to develop expertise and the know-how to aggregate, analyze and more importantly provide executives and managers with the insights needed for informed decision making. As a result, the need for data analysts has never been higher. In fact, the shortage of data analysts is expected to reach 1.5 million within the next two years. As demand for data analysts continues to grow, colleges and universities are rushing to offer programs to equip their graduates with the necessary analytical skills to meet today's data-centric workplace. This study explores masters in business analytics programs from top ranked business schools in the United States and investigates the content of these programs. Our results offer interesting perspectives covering data analytics, interdisciplinary skills, online versus on-campus programs, as well as different geographical areas. Implications and future research opportunities are also discussed.

**Keywords:** Data Analytics, Business Analytics, Business Intelligence, Business Analytics program, TABLEAU

## 1. INTRODUCTION

According to Google CEO Eric Schmidt, we create as much information in two days as we did from the dawn of civilization up until 2003 (Schmidt, 2010). While big data is more readily available than ever before, businesses, governments, and institutions around the world are struggling to develop the expertise to create value and most importantly to monetize the unprecedented amount of available data. Today, corporations

have come to realize that the collection and storage of large amounts of business operations data has become increasingly easy and inexpensive. However, the ability to leverage computing power to make sense of the data and influence effective decision making is what provides an organization with a competitive edge.

While datasets are readily available in volume, variety and velocity, there is a shortage of professionals capable of analyzing these ever-

growing datasets and professionals who can translate analysis into effective organizational decision-making (Cegielski & Jones-Farmer, 2016). These professionals, referred to as data/business analysts, are individuals with a strong background in statistical analysis, operations research, management of information systems, and computer science. Their main aptitude resides in their ability to aggregate, analyze and provide insights from contextualized data (Chiang, Goes, & Stohr, 2012). According to a McKinsey Global Institute assessment, by 2018 the United States alone could face a shortage of 1.5 million data and analytics managers.

As the global demand for data analysts continue to grow, colleges and universities rushed to offer programs to equip their graduates with the necessary analytical skills. In the past decade, data analytics have evolved from elective courses such as data mining (Jafar, Anderson, & Abdullat, 2008) to full fledge degrees and majors in business analytics to respond to the growing demand (Wixom, Ariyachandra, Goul, Gray, Kulkarni, & Phillips-Wren, 2011).

Business Analytics is defined as the process of using data, skills sets, and technologies to make more evidence-based business decisions (Seddon, Constantinidis, Tamm, & Dod, 2016). Business analytics is an interdisciplinary area combining skills from statistics, information systems, business and communication. Universities strive to achieve the following learning goals and objectives: 1) stakeholder value by applying competencies within a focused environment. 2) problem solving and critical thinking skills through the process of conceptualizing, applying, analyzing, and/or evaluating information as the basis for solving problems and making decisions. 3) interpersonal/communication skills by developing the ability to correspond effectively and persuasively with individuals and within teams.

With the plethora of business analytic programs emerging, the question that is posed: How are business analytic programs aligned against industry demand for analytics, statistics, information systems and communication skills? To answer these research questions, we examined MS Business Analytic programs categorizing the required courses into analytical, IT and communication. This research looks at a number of factors such as geographic location, tuition cost, and the number of credit hours and electives.

## 2. RESEARCH METHODOLOGY

For our data collection, we gathered data from top US business schools that offer MS degrees in business analytics. We used the 2015 TFE Times rankings to identify top traditional and online programs of MS business analytics. For the traditional program, we used the TFE Times (2015) which provided a comprehensive rankings of graduate business analytics programs in the United States. There was a total of 35 on ground programs that were analyzed. For the online Masters in Business Analytics programs 22 programs were identified (Master's in Data Science, 2016). A total of 62 programs were evaluated. Five of these institutions were not used for a variety of reasons, such as link not working, a certificate program or course program were not available. Table 1 provides descriptive details about the type of programs. For purposes of data analysis, required and elective courses were included in the data set for each university. Appendix A shows the number of elective and required courses for each university.

**Table 1. Business Analytics Programs**

<b>Business Analytics Programs</b>	<b>Total</b>
On Campus	35
Online	22
Totals	57
<b>Totals by Region</b>	
• Northeast	20
• Southeast	9
• Midwest	17
• West	4
• Southwest	7
Average Tuition	\$31,178
Maximum Tuition	\$63,000
Minimum Tuition	\$11,568

For the data analysis, we adopted the 2012 classification scheme of Chiang, Goes, & Stohr to classify each business school's program (Chiang, Goes, & Stohr, 2012). Chiang, et al. (2012), provides a list of 29 distinct skills that are needed for success in the field of business analytics. Their research broke down the 29 skills across three categories: 1) Analytical skills which integrates the disciplines of statistics and computer science are mostly used for predictive analytics, 2) Information Technology (IT) Knowledge and Skills which covers a variety of data related skills are mostly used for descriptive analytics and 3) Business Knowledge and Communication Skills are used to support prescriptive analytics.

These three categories can also be mapped to the

three types of analytics (descriptive, predictive, and prescriptive) as proposed by Watson (2014). Descriptive analytics examines and summarizes what has happened. Predictive analytics examines and forecasts what might happen in the future and prescriptive analytics is a type of predictive analytics that explores what should happen, i.e., what is the best course of action.

Expanding on Chiang’s list some additional skills were included in the analysis. Table 2 presents the total number of skills upon which analysis was performed. The individual skill for each category are given in Appendix 2.

**Table 2. Skill Category**

Skill Category	# of Skills
Analytic Skills	10
IT Knowledge and Skills	19
Business Knowledge and Communication Skills	16

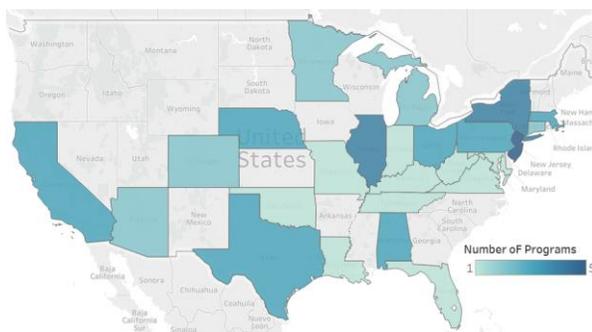
The curriculum for every program was analyzed with each course coded to fit into one of the categories described by Chiang, et al. (2012). Many of the program course titles were vague. Though some of the courses were easy to classify (such as database management, or statistics), other courses especially those related to data analytics were not as clear. A thorough analysis of the course description and/or the syllabus was helpful in the coding process.

### 3. FINDINGS AND DISCUSSION

In the following, we provide some of the major findings and analysis based on the data collected on the top-ranking universities in the US offering on-campus and online graduate programs in business analytics.

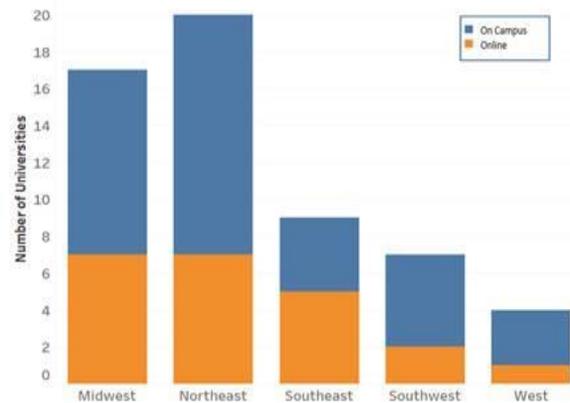
#### General Program Characteristics

Figure 1. Number of Programs by State



Figures 1 and 2 show the geographical locations of the schools and the number of schools in the various states and regions that offer business analytics programs. When comparing where most top ranked universities are located vis-a-vis their geographical region, the Northeast and Midwest have the highest concentration of online programs and the Northeast has the greatest number of on-ground programs.

Figure 2. Programs by Region



#### Program Cost and Credit Hours

Appendix 3 shows the total cost of the business analytics program along with the average cost per credit hour. The overall average cost of a master’s is \$31,178 with an average cost of \$881 per credit hour. Online programs tend to be less expensive with an average program cost of \$29,929 vs on ground of \$31,963.

Appendix 4 shows the number of credit hours required by the different programs. Most schools require 30-35 credit hours for graduation, with an average credit hour requirement of 35 hours and mode of 30 hours.

#### Type of Skills

There are three categories of skills that courses in business analytics can be classified by: Analytics, IT, and Communication. Appendix 5 shows the percentage of courses for each university that fall into each category. From this chart we note which universities have more Analytical courses compared to Business or IT. The percentages vary greatly by university to university. For example, Fordham University’s program is highly focused in the area of Analytics. Fifty-five percent of their program is focused on Analytic skills, 9% Business knowledge & Communication, and 36% IT knowledge. Whereas, Capella University focuses strongly on Business Knowledge and Communication. Sixty-

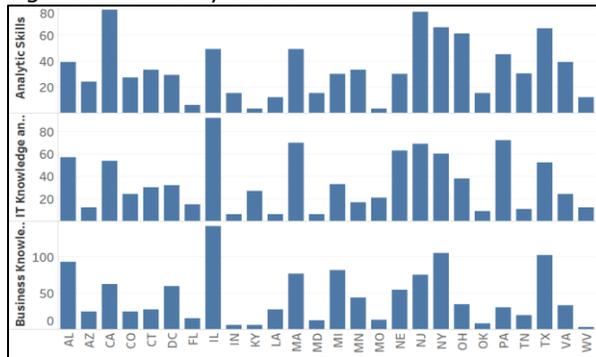
three percent of their course offerings focused on Business knowledge & Communication, 31% applied skills, and 6% IT knowledge. Table 3 shows the average coverage by skill for all of the universities.

Table 3 Percentage Skill Coverage

Skill Category	Average Percentage of total credit hours
Analytic Skills	31%
IT Knowledge and Skills	38%
Business Knowledge and Communication Skills	31%

To analyze this data in further detail, a chart of each type of skill by state was created (see Figure 3). Further data and research is needed to investigate other factors such as job market demands (type of businesses hiring) and type of university (research versus teaching institution) and how much they impact the variation in these percentages.

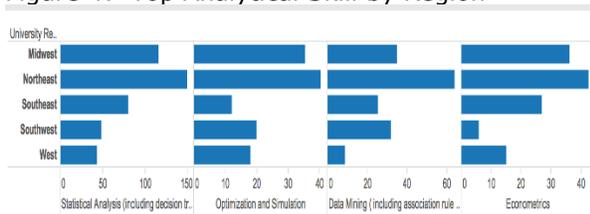
Figure 3: Skills by State



**Analytical Skills**

Appendix 6 shows the analytical skills for each skill by university and region. The most popular offerings within the Analytical Skills category is data mining, statistical analysis, and optimization. Universities in the Northeast and Midwest concentrate heavily on statistical analysis, data mining and optimization (See Figure 4).

Figure 4: Top Analytical Skill by Region



Many universities offer more statistical analysis skills, which provides students with a basic understanding of how to read and interpret data (statistical analytics). However, very few of the universities offered courses in special statistical analytics applications such as Econometrics and the use of specialization tools such as Deviatonal Analysis and Anomaly Detection.

Another important course that universities are not offering is Deviatonal Analysis and Anomaly Detection. This skill provides students with the understanding of why businesses fail and at the same time it provides tools to prevent and understand these errors. The data also demonstrates that while some universities focus on what the local job market demands from students, other universities provide a variety of courses to give their students choices to compete in their job market.

**IT Skills**

Based on the graph "IT Skills Provided per University" shown in Appendix 7, it appears that most universities are interested in providing IT skills. This may be because in today's world computers play an important role in business management and society in general. Businesses are being managed through technology, therefore it is important to study analytical skills. However, due to technology, it is necessary to learn analytical skills through the reading and understanding of databases. Even though IT is not required before taking analytical courses, the IT skills and analytical skills learning process will be parallel.

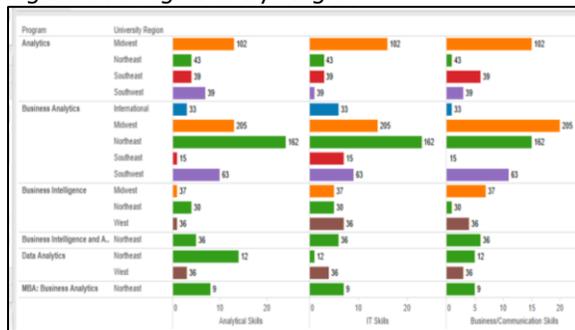
**Business Skills**

Appendix 8 shows the business skills courses that are offered by the different universities. Courses in Finance, Marketing and other business courses that are part of a traditional MBA are now being offered as courses in the BAN program. Many universities are probably utilizing their MBA courses in order to offer more flexibility and options for their Business Analytics program.

**Skills by Region**

Figure 5 shows the number of programs offered with respect to regions and three skills, and the numbers which are visible on the horizontal bar charts represent the total number of credits required in that particular region.

Figure 5. Programs by Region



### Programs by Skills

Based on graphs (Appendix 7 & 8) of the number of hours required by each university and categorizing it by program, it demonstrates the disparity of credit hour requirements by university within business analytic programs. As you can see in the category of universities that offers Business Analytics programs, Michigan Technological University requires the most total credit hours. Based upon this graph, it will require substantially more money and time to complete a degree at this university. The disparity in the number of credits, particularly amongst the outliers demonstrates that a consensus for what constitutes core curriculum in a master of science in business analytics program does not yet exist.

### Actionable Insights

Data Analytics is currently one of the fastest growing professions in the job market. It combines a unique set of technical and analytical skills along with business acumen. The goal of a data analyst is to turn data into actionable insights for companies, organizations and researchers to use to progress in their goals. There are a number of colleges and universities that have created programs to help facilitate the growth of students and working professionals into data scientists.

The graduate program in business analytics is appropriate for students in functional business units, the sciences, as well as information technology because it leverages information technology and business thinking to turn data into actionable intelligence. The graduate programs in Business Analytics provides students with the skills, insights and capability to transform data into insightful information that will lead to better results. Not all relevant skills are taught by universities. Based on the current dataset, there is no uniformity among the universities with respect to the skills covered. While some programs focus on the statistical methods, modeling tools, and data collection and reporting

techniques needed to practice successful business intelligence others focus on students gaining more applied analytical functions in marketing, management, operations, finance, and innovation.

The career choices within a business analytics degree span a wide spectrum ranging from very technical, to statistical to excellence in communication and leadership. Prospective students should choose programs based on their career aspirations. Due to the large variety of IT Skills courses offered, universities need to make clear to prospective students what skills they will be learning so that students can ensure they are going to gain the skills they are looking for. This dataset can be leveraged not only by universities and businesses who are trying to teach/acquire the right skills, students should also closely look at the curriculum of every institution to make sure that it meets their career goals. With the availability of competitive programs online, geographic locations are no longer a limitation.

This information can be used to analyze which courses the university is currently providing to its students and which ones should be added or even removed based off other universities and job requirements. If any university wants to improve their Business Analytics enrollment for graduate or undergraduate courses they should consider adding courses targeting a variety of industries. This can help the university attract students from all around the states.

## 4. CONCLUSION

Google's chief economist explains that while data is abundant and widely available, "what is scarce is the ability to extract wisdom from them" (Cukier, 2010). This highlights how critical business analytics is in preparing organizations to solve 21st Century business challenges.

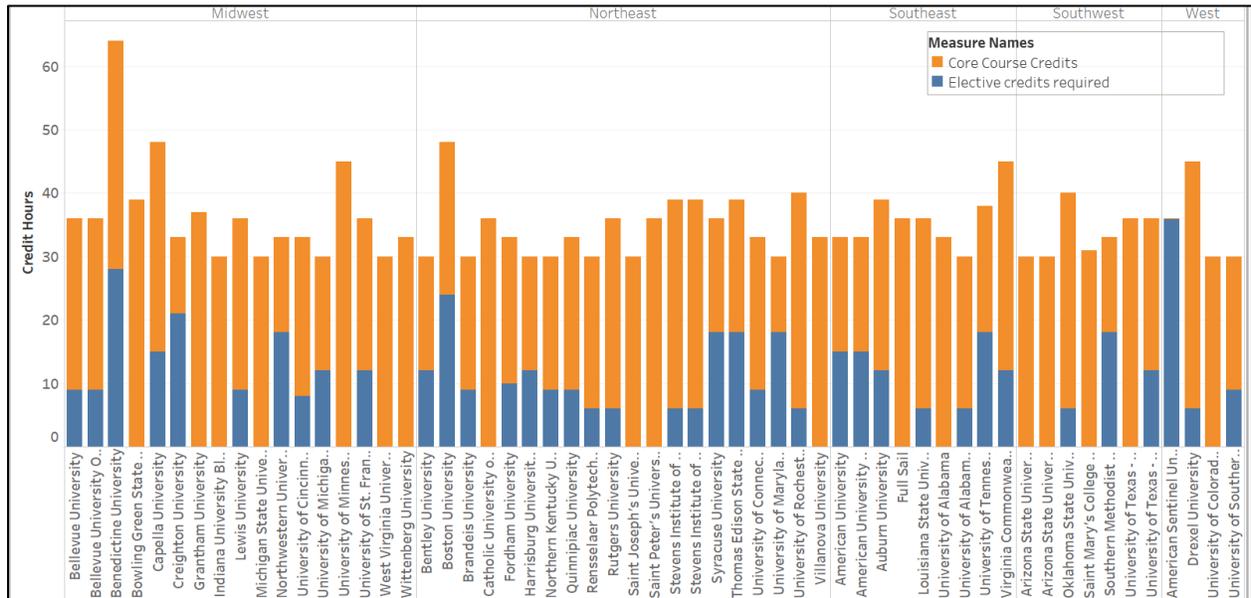
Business analytics is built upon the layer of Big Data available to most organizations in today's environment. Our analysis of top US analytic programs found little focus however on big data within the curriculum. Further, this analysis showing the disparity in curriculum and the number of program credit hours could serve as a call to action for the creation of a model curriculum for business analytics. We now have a somewhat lengthy history of model curriculums (and revisions therein) for information systems; the time is right to begin a similar effort for business analytics.

This paper contributes to both business analytics literature and practitioners by providing a preliminary analysis of top ranking business analytics programs in the US. The concentration depends on the orientation of the school, the geographical location and the businesses it is supporting. Future research should align these findings with job requirements.

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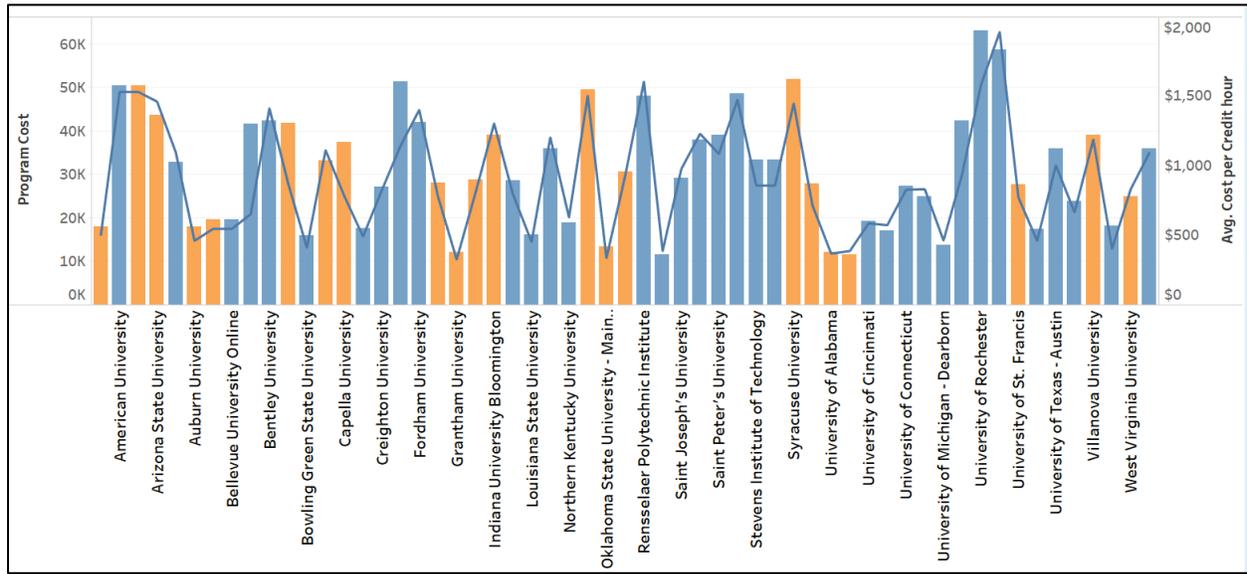
**Appendix 1**



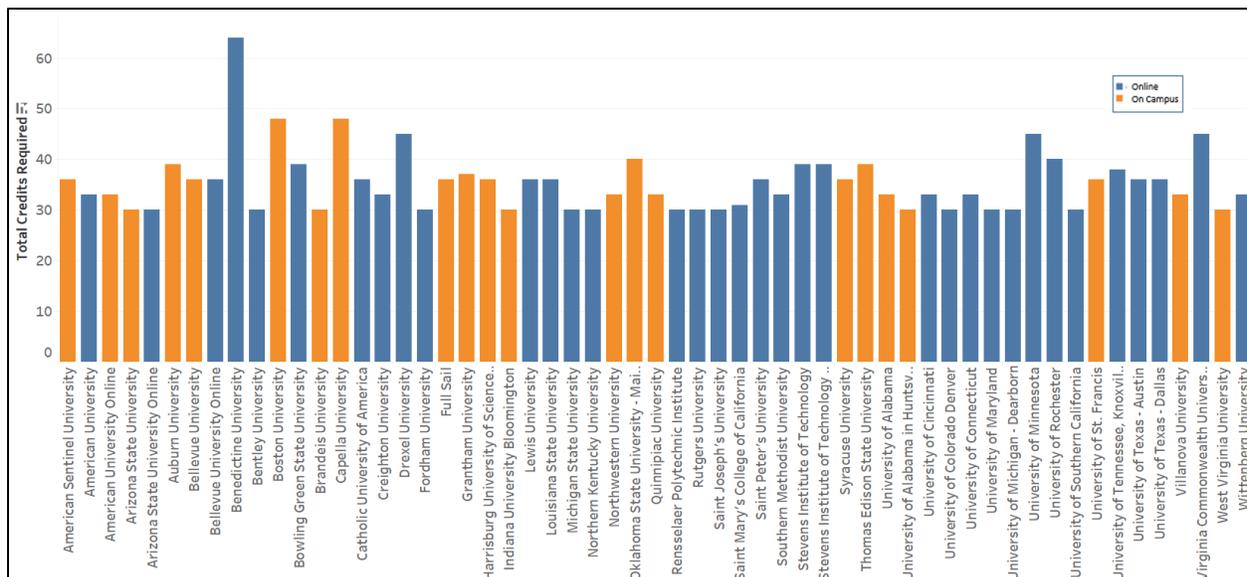
## Appendix 2. Skill Classification

Analytic Skills
Data Mining (including association rule mining, classification, cluster analysis, and neural networks)
Deviational Analysis and Anomaly Detection
Geospatial and Temporal Analysis
Network Analysis and Graph Mining
Opinion Mining and Sentiment Analysis
Optimization and Simulation
Statistical Analysis (including decision tree, logistic regression, forecasting and time series analysis)
Econometrics
Text Mining and Computational Linguistics
Statistical Computing (such as R)
IT Knowledge and Skills
Relational Databases
Data Mart and Data Warehouse
ETL (Extract, Transform, Load)
OLAP (Online Analytical Processing)
Visualization and Dashboard Design
Data/ Text/ Web Mining Techniques
Massive Data File Systems (such as Hadoop)
Software for manipulating massive Data (such as MapReduce)
Semi Unstructured and Unstructured Data Management (XML, tagged HTML)
Social Media and Crowd Sourcing Systems
Web services/ APIs/Mashups
Web Collection/ Crawling and Search Engines (both Surface and Deep Web)
Cloud Computing and OO Programming
Mobile Web and Location-Aware Application
Big Data and Machine Learning
Business Intelligence
Ethics/Privacy/Security
Project Management
General IS course
Business Knowledge and Communication Skills
Knowledge in Accounting
Knowledge in Finance
Knowledge in Marketing
Knowledge in Logistics
Knowledge in Operations Management
Leadership and Communication
Knowledge in Healthcare
Applied Analytics
Marketing Analytics
Supply Chain Analytics
Social Network Analytics
Healthcare Analytics
Financial Analytics
Operation Analytics
IT for Analytics
Business Analytics Project/Capstone

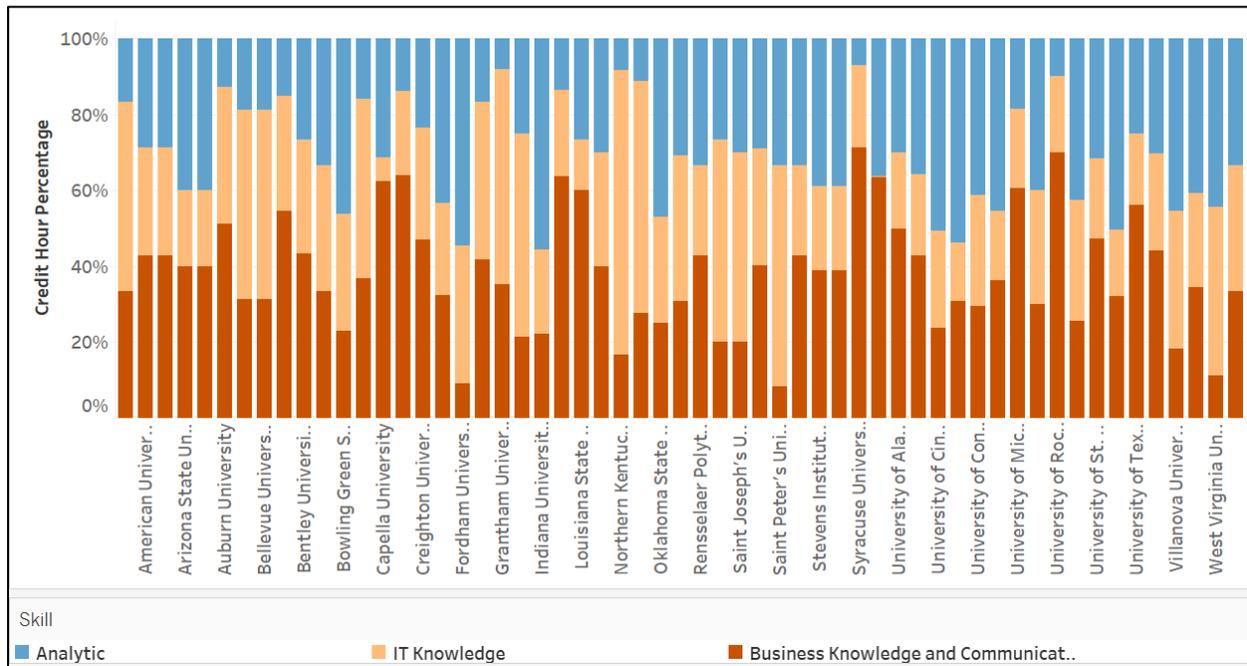
### Appendix 3. Program Cost



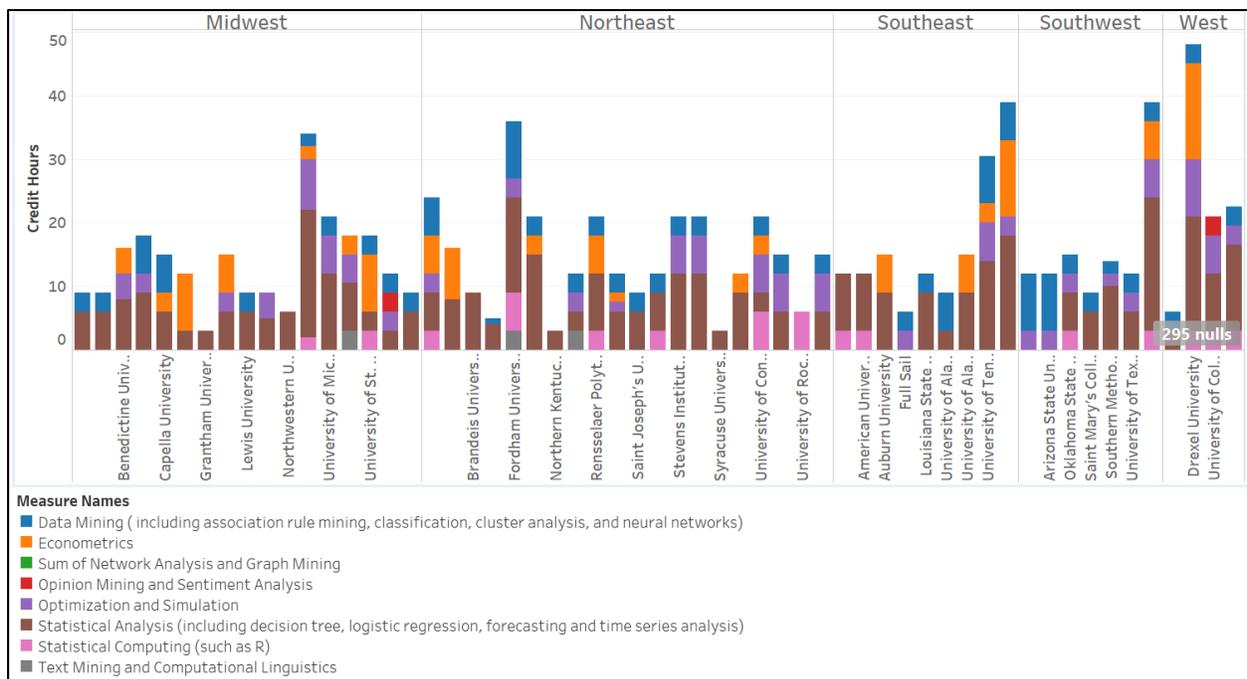
### Appendix 4. Number of Credit Hours Required



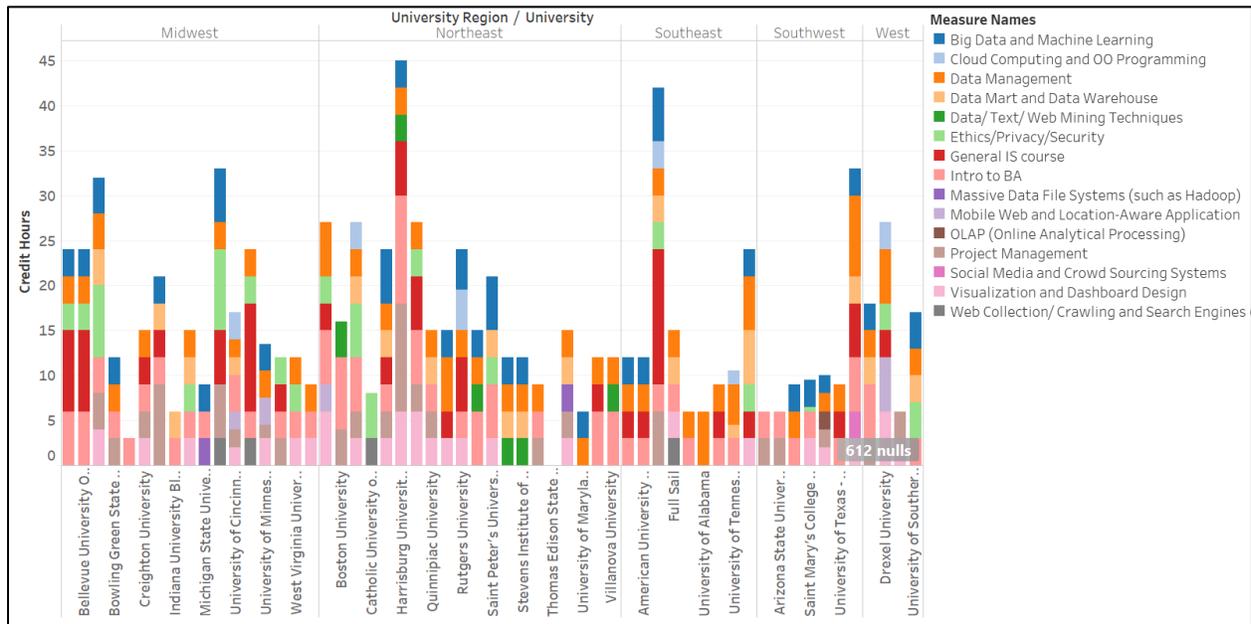
### Appendix 5. Percentage Skills by University



### Appendix 6. Analytical Skills by University and Region



### Appendix 7. I.T. Skills by University and Region



### Appendix 8. Business Skills by University and Region

