

**NORTHERN ILLINOIS UNIVERSITY**

How Do Universities Prepare Students for a Data-driven Business Environment?

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**By**

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As big data becomes a more and more important asset of many organizations, recruiters expect upcoming accounting majors with some data analytics skills. Therefore, many universities actively response the new skill demand and incorporate data analytics in their accounting programs differently. The purpose of this research is to investigate and compare how and to what extent different universities prepare their accounting major students for a data-driven business environment. The scope of the research is limited to the universities that have requested data analytics course syllabus and information from an accounting faculty at Northern Illinois University and some universities within the state of Illinois. There is also limitation that many universities don't publish the course information in detail on their websites. I firstly searched on the data analytics learning experience expected by AACSB. Then, I investigated how different universities respond to this new learning experience suggestion. According to my sample universities, I collected and prioritized popular data analytics topics, other popular course options, and common use of application software. Based on my finding, universities equip their accounting major students with data analytics skills differently from incorporating small data analytics assignments into traditional accounting courses to offering a data analytics degree.

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# How Do Universities Prepare Students for a Data-driven Business Environment?

Ziwei Wei

## Honors Capstone Thesis

### Abstract

As big data becomes a more and more important asset of many organizations, recruiters expect upcoming accounting majors with some data analytics skills. Therefore, many universities actively respond to the new skill demand and incorporate data analytics in their accounting programs differently. The purpose of this research is to investigate and compare how and to what extent different universities prepare their accounting major students for a data-driven business environment. The scope of the research is limited to the universities that have requested data analytics course syllabus and information from an accounting faculty at Northern Illinois University and some universities within the state of Illinois. There is also limitation that many universities don't publish the course information in detail on their websites. I firstly searched on the data analytics learning experience expected by AACSB. Then, I investigated how different universities respond to this new learning experience suggestion. According to my sample universities, I collected and prioritized popular data analytics topics, other popular course options, and common use of application software. Based on my finding, universities equip their accounting major students with data analytics skills differently from incorporating small data analytics assignments into traditional accounting courses to offering a data analytics degree.

Contents

Introduction ..... 6

Literature Review ..... 8

    Increasing Demand in Business Professionals with Data Analytics Skills ..... 8

    Roles of Data Analytics in Accounting (use & benefits) ..... 10

Methodology..... 12

Results ..... 13

    AACSB International Accounting Accreditation Standard A7 and How Different Affiliations Respond . 13

    Common Topics in Data Analytics Course and Other Popular Courses ..... 18

    Application Software..... 22

Conclusion..... 23

## Introduction

Big data is changing the business world rapidly and is regarded as an important asset by most organizations. Data analytics, defined as qualitative and quantitative techniques and processes to enlarge productivity and business gain ("What is Data Analytics? - Definition from Techopedia", 2017), has been identified as a useful tool to extract valuable information from overwhelming data for decision makers and has been a popular topic in the field of accounting for a long time. The use of data analytics facilitates accountants to perform more intricate analysis on the entire data sets, discover implicit patterns, and communicate the results to clients more efficiently through data visualization. Data analytics provide better insights, greater efficiency, and improved coordination of risk and compliance. Both accountants and clients benefit from the better experience with data analytics ("Data Driven: What students need to succeed in a rapidly changing business world", 2015).

More and more recruiters expect accounting students coming with some education and skills related to data analytics. According to Roshan Ramlukan, EY principal and global assurance analytics leader, "the human element of data analytics is the most critical factor in building a successful program, but it's also the least understood and impediment to the future growth in this area." To encourage universities accounting programs to prepare their students with new skills, the standard A7 published by Association to Advance Collegiate Schools of Business (AACSB) suggests universities with separate accounting accreditation to include new learning experiences to better prepare students with skills and knowledge related to the integration of information technology in accounting and business. Data analytic is one of the new learning experiences it advocates. How different affiliations response to this suggestion? How do they make progress to help students to obtain new skills? Whether their accounting programs which incorporate data

analytics actually benefit prospective accountants? What are the perceptions of students regarding the role of data analytics in accounting? Do students with some data analytics skill really have the competitive advantage when they first enter into job markets? Many questions need to be addressed in order to build a successful program to fulfill the emerging need.

This research addressed how different universities include data analytics in their accounting curriculum to prepare their students with newly desired skills in the field of accounting. The remainder of the paper is organized as follows. The second section summarizes the literatures regarding the demand, roles, and benefits of data analytics in the field of accounting. The third section introduces the methodology I used to conduct the research. The fourth section presents the results of my findings. The final section draws the conclusion and discusses some limitations regarding this research.

## Literature Review

### Increasing Demand in Business Professionals with Data Analytics Skills

The development of technology makes changes on business models, business strategies, and the way they operate. To adapt to an increasingly data-driven world, business professionals with data analytics can overcome the technology disruptions and obtain valuable insights from the overwhelming data. As big data becomes an increasingly important asset for organization, it raises the awareness of this unsatisfied skill gap. Finance and accounting professionals with data analytics skills are especially in high demand. Data analytics skill is broad in use and can be applied to all service lines according to Roshan Ramlukan, EY principal and global assurance analytics leader (Tschakert, Kokina, Stephen, & Vasarhelyi, 2016). Employees with data analytics skill are both very versatile and valuable to the organization. For instance, Brad Ames, CPA, internal audit director at Hewlett-Packard said, “We differentiate candidates who are experienced in data exploration, data visualization, and predictive modeling.”



However, businesses currently are in need of accounting and finance professionals with the technical and nontechnical skills required for data analytics initiatives and are having difficulties finding the qualified people to satisfy their demand (Krumwiede, 2016). Again, for instance, Brad finds out that data analytics skills are not common among accounting firm personnel, therefore people in HR post job titles such as “data scientist” or “data solution architect.” There is a need for 181,000 people with deep analytical skills and a requirement five times that number for people with data management and interpretation skills by 2018, predicted by International Data Corporation (Big Data, Big Problem: Coping with Shortage of Talent in Data Analysis, 2017). In addition, 1.5 million more data savvy managers are needed to take advantage of big data in the U.S. according to McKinsey Global Institute.

There are many methods available for companies to acquire the new skill sets. The top five common methods are: in-house training, mentorship, outside industry courses/events, working with a consultant, and tuition reimbursement. On the other hand, AACSB issued standard A7 regarding information technology skills and knowledge for accounting graduates. Universities also incorporate data analytics in their accounting programs through different ways to better prepare their students to be more competitive in the job markets.

## Roles of Data Analytics in Accounting (use & benefits)

The most valuable pieces of data analytics are to provide better experiences for accounting professionals and clients, and obtain better insights. By using data analytics tools, we can save a lot of time by automating the collecting process and move our focus on the logic and rationale behind the data. We can communicate our ideas to our clients in a more clearly and understandable way by using data discovery and visualization tools.

In a data-driven world, clients expect professional services firms to provide better insights, greater efficiency, and improved coordination of risk and compliance activities ("Data Driven: What students need to succeed in a rapidly changing business world", 2015). And there are many ways to make use of big data as an accountant. For example, accountants can provide their client with real-time decision-making support. They can increase the scope for aggregating data across all clients within a market and generate meaningful performance benchmarks. Small business clients will pay more attention to your findings if you can show that their peers are performing much better than they are and pay for your higher-value services such as budget forecasting and cash-flow management. Another example is that accountants can leverage big data to help their clients to mitigate risks. External forces such as regulatory changes, supply-chain risks, mergers and acquisitions bring more concerns to accountants. More internal and external data available, accounting professionals are more likely to identify potential risks. Additional data can help accountants to create a bigger and more comprehensive picture though there is risk of overwhelming data (Four Ways to Make Use of Big Data as an Accountant, 2016).

One problem associated with big data is that much of business data is stored in a unstructured format. Even business data which is structured perfectly is stuck in disconnected systems.

“Unstructured data represent the largest proportion of existing data and the greatest opportunity for exploiting Big Data,” according to a recent editorial in the Journal of Information Systems published by the American Accounting Association (Katz, 2014). It’s easy to get frustrated with so much messy data, therefore little value of data has been extracted to gain better insights. Accounting professionals as intensive data users should utilize data analytics tools to clean the unstructured data and make it into ready-to-use format, so that decision makers can gain better insights from new data and that business functions will work as intended.

Other barriers to be overcome are low accuracy and quality of the data, users’ inability to identify what data is useful, and senior management’s inability to work with data. Accountants should also ensure the existence and the function of data governance and better alignment of resources with organizations’ strategies. Data analytics plays an important role in achieving these goals, at the same time, improving accounting jobs in different areas.

In other words, people with data analytics skill can drive innovations and lead changes instead of being disrupted by a constantly changing world that the big data and data analytics are influencing our workplace.

## Methodology

To begin with, I searched on what is data analytics and what specific contents should be included in the data analytics course according to AACSB standard A7. Then, I investigated how different universities respond to this new learning experience suggestion. To narrow the scope of my sample, I obtained a list of schools that have requested data analytics course syllabus and information from Dr. Ann Dzurainin, a leading professor with experience of teaching data analytics in accounting class at Northern Illinois University. Besides these schools, I also searched on schools in the state of Illinois since I am currently an undergraduate accounting student in Northern Illinois University. I obtained the course information by looking at the course descriptions provided by the official websites of their accounting programs. I also gained more detailed course information if the course syllabus were published online.

To summarize my findings, I laid out a table and classified them into different degrees of responses from the lowest to the highest. At the same time, I collected and prioritized popular topics covered in the data analytics course, other popular course options advocated by AACSB, and common use of application software according to my sample universities.

## Results

### *AACSB International Accounting Accreditation Standard A7 and How Different Universities Respond*

This initial white paper does not provide detailed, specific guidance about the contents of data analytics course. But, it does emphasize that the learning should focus on information management and analysis. The standard is broad, providing opportunities for faculties to design learning experiences that may involve modules, several different courses, and/or one course to address the new learning experiences need ("Eligibility Procedures and Accreditation Standards for Accounting Accreditation", 2016). Therefore, different schools include data analytics in their accounting program differently. Some offer standalone data analytics course. Some incorporate data analytics learning in their traditional accounting courses. Some response in other different ways. There are also other types of responses which I will discuss later.

To provide more guidance on new course offerings, standard A7 mentions four key skill areas: statistical techniques related data analytics, computational analytics related to data mining, basic information management related to relational and nonrelational databases, and data visualization and interpretation. For statistical skill, most business schools offer required business statistic courses. They cover most concepts related data analytics, but they rarely incorporate use of technologies in their courses. For computation analytical skill, many related courses such as data mining are not offered under business/management school. For information management skill, many business schools offer standalone database management and design courses. For data visualization and interpretation, they are mostly designed as a part of learning experience in a data analytic course or other related courses.

Besides the four key skill areas, other expected learning experiences listed on standard A7 include data creation, data sharing, data reporting, and data storage. Therefore, some schools

offer other related standalone courses such as spreadsheet modeling for business decisions. In addition, standard A7 suggest student should experience integrated real-world strategies, privacy, and security concerns, ethical issues, technology-driven changes in practice, and the complexities of decision making. Relevant topics are touched briefly on Dr. Dzurinin’s current data analytics course. Brigham Young University also offers standalone course, Data Communications and Security, to discuss these topics.

University	Part	Workshop	Certification	Data Analytics Course	Related Course- BS	Related Course- MS	Concentration	Data Analytics Degree	Cooperate
Alfred University	<a href="#">MBA</a>								
American University of Sharjah						<u>1</u>			
Arizona State University					<u>3</u>			<a href="#">Undergrad</a>	
Brigham Young University	<a href="#">BS</a>	<a href="#">5/29/2017</a>			<u>3</u>	<u>2</u>			
Columbus State University			<a href="#">Online</a>						
East Tennessee State University	<a href="#">BS</a>			<a href="#">MS</a>					
Georgia State University	<a href="#">Cohort MPA</a>							<a href="#">MS</a>	
Grand Valley State University		<a href="#">4/4/2015</a>			<u>3</u>				
Indiana University									<a href="#">Training</a>
John Carroll University	<a href="#">MS</a>			<a href="#">MS</a>					
Montclair State University			<a href="#">9 credit hours</a>	<a href="#">BS</a>	<u>2</u>				
Providence College			<a href="#">5-day bootcamp</a>		<u>3</u>				
Southern Illinois University				<a href="#">BS</a>					
St. Johns University	<a href="#">BS &amp; MS</a>								
Troy University				<a href="#">MS</a>		<u>1</u>			
UNC – Charlotte			<a href="#">15 credit hours</a>					<a href="#">Grad</a>	
The University of Texas at Austin	<a href="#">BS&amp;MS</a>		<a href="#">Online course</a>	<a href="#">BS</a>					
UIUC					<u>1</u>		<u>3</u>		<a href="#">Master Degree</a>
Ohio State University					<u>2</u>	<u>1</u>		<a href="#">Undergrad &amp; MBA</a>	<a href="#">Master Degree</a>
University of Notre Dame				<a href="#">BS &amp; MS</a>					<a href="#">Master Degree</a>
University of Illinois at Chicago					<u>1</u>	<u>1</u>			
Illinois State University					<u>1</u>				
University of Chicago		<a href="#">Roundtable</a>							
St. Mary’s University								<a href="#">Undergrad</a>	
Eastern Illinois University					<u>1</u>				
Loyola University Chicago								<a href="#">MSBDA</a>	
DePaul University			<a href="#">5 courses</a>			<u>1</u>			
Benedictine University							<u>4</u>		
National Louis University					<u>1</u>	<u>1</u>			
Purdue University					<u>1</u>				
University of South Florida			<a href="#">12 credit hours</a>	<a href="#">MBA</a>					
Arizona State University			<a href="#">18 credit hours</a>		<u>1</u>				
North Carolina State University					<u>1</u>				

Above is the summary table of how different universities include data analytics and other related skills into their accounting programs.

“Part” represents that data analytics are designed as part of their traditional accounting course.

For example, Accounting Information Systems course offered by Alfred University MBA

program has computer lab assignments using advanced data modeling and enterprise applications including SAP. Auditing and Control course offered by The University of Texas at Austin accounting programs has ACL Mini-Case assignments.

For “Workshop”, Grand Valley State University once offered a one-day Data Analytics Workshop to provide a brief overview of how to organize data and perform statistical methods using the R statistical programming language. The workshop had two sessions: session 1 introduced R, R studio and data structure, basic statistical methods, data cleaning and manipulation; session 2 introduced predictive modeling and more advanced visualization in R.

There are many different ways in earning a “Certification in Data Analytics”. The fastest one is the five-day boot camp offered by Providence College, it helped students to develop proficiencies in areas such as data sourcing, query development, and data mining techniques.

There are also long time options such as 9 credit hour requirements for earning a Decision Analytics Certificate offered by North Carolina State University which aim at developing management professionals who can understand and apply big data analysis to make meaningful decisions. More convenient option is the online certificate offered by Columbus State University.

The skills covered by its online courses are analyzing data in a business setting, comparing groups for differences, understanding the underlying statistics, performing inquiries, and communicating results through graphs and text.

Many schools start to offer the standalone “Data Analytics Course”. The highly popular topics will be discussed later. Well-known accounting organizations such as American Institute of Certified Public Accountants (AICPA), Ernst & Young Academic Resource Center, KPMG offer

online data analytics course. PwC offers data analytics and presentation skills course on Coursera.

The undergraduate and graduate accounting programs of many business schools provide courses covering other key skill areas advocated by standard A7. The number in the table refers to how many related courses each program currently has. The Business Database Concepts course offered by Arizona State University helps students to learn essential database and spreadsheet concepts, develop critical and logical thinking skills, know standard symbols and notation for data modeling and relational database design, and identify design issues in the implementation of the database through audit techniques.

Some graduate accounting program offer the option of data analytics concentration. For example, the Data Analytics in Accountancy Concentration at the University of Illinois at Urbana-Champaign has 12 credit hours in total. It is designed to provide learning experience on applying data analytics in various accounting and business contexts, solving business problems using data-intensive business, and accounting information with critical thinking, and effectively communicating findings and conclusions to other parties such as clients and regulatory agencies.

The highest level of commitment is earning a Data Analytics Degree. Georgia State University offers Master of Science in Analytics degree program. The degree includes 23 credit hours of required courses and nine credit hours of elective courses. All of them focus on data analytics. There is also a two-week intensive “boot camp” to kick off the program.

In addition, famous organizations start to cooperate with universities to develop accounting programs catering data analytics needs. For instance, in 2011, two of the corporate partners of Indiana University at Bloomington, Deloitte and Booz Allen Hamilton, asked for help to create



data analytics certificate programs to training their employees. KPMG LLP has worked with The Ohio State University and Villanova University to develop a brand new approach which will be adopted in their master degree program. KPMG will pay the full tuition for 50 new students in the fall of 2017. These students will also work between semesters as KPMG audit interns to apply their learning in real business cases. Upon graduation in the summer of 2018, these students will join KPMG's audit practice.

There are many topics related with data analytics. By looking at the course descriptions and syllabus, I summarized the frequently mentioned topics as the most common topics in data analytics course. By looking at different accounting program paths and course selections, I summarized the other frequently mentioned data analytics related courses as other popular course offerings. The summaries are as follows.

## *Common Topics in Data Analytics Course*

- **Big Data and Data Analytics**

Big data is a collection of data sets that are too large or too complex to analyze them with traditional databases and tools (IBM Executive, Tech Experts Highlight Importance of Big Data, 2014). It has numerous volume with rapid growth and comes in different forms with uncertain veracity. According to Techopedia, data analytics are qualitative and quantitative techniques and processes used to enhance productivity and business gain. According to an article titled “The next frontier in data analytics”, there are four types of data analytics: descriptive analytics focus on what happened; diagnostics analytics focus on why it happened; predictive analytics focus on what will happen; prescriptive analytics focus on what we should do. Accountant are familiar with first two types of data analytics in their daily work but have insufficient experience in last two where real value actual falls.

- **Analytics Mindset**

Analytics transforms the business operations by providing powerful and insightful information for decision makers. An analytics mindset is the ability to ask the right questions; extract, transform and load relevant data; apply appropriate data analytic techniques; and interpret and share the results with stakeholders according to Ernst & Young Academic Resource Center. Data analytics requires critical thinking ability. And the quality of our thinking depends largely on the quality of the questions that we come up with. An insightful presenter, Susan Etlinger, said: “Data doesn't create meaning, but people do.” Our ability to process data is much stronger, but

the potential for us to make bad decisions out of data is also increased. People who interpret the data should improve critical thinking skills.

- Business Statistics and Decision Modeling

Many people don't like statistics. They think they will not use the complicated formulas in their lives. But statistic is not dealing with meaningless numbers. We can have a better understanding of our environment when we feel interested about statistics and try to use it to describe our world. And there is always discrepancy between our perception and reality described by statistics. The use of statistics in data analytics is not complicated as expected. We only need to recall our basic business statistics course materials such as numerical descriptive measures, basic probability, discrete probability distributions, the normal distribution sampling & sampling distributions, confidence interval estimation, fundamentals of hypothesis testing: one-sample tests two-sample, tests & one-way ANOVA, chi-square tests simple linear regression. Decision modeling focus on building the mathematical formulas according to our analysis of business problems, and then incorporating the data into the formulas to solve the problems.

- Problem Solving Using Application Software

It focuses on developing students' proficiency in current business software applications and cultivating students' ability to identify and apply appropriate techniques and create solutions to different business problems. For example, we can use queries to identify the abnormal records. We can also use regression analysis tool to find out the correlation between different business variables.

- Data Visualization and Presentation

It focusses on how to visualize data, tell a story and explore data by using data visualization and dashboarding. It also focusses on how to structure a well-organized presentation, to convey insights and supporting data, to design effective visuals and slides, and to cultivate skills for face-to-face communication with clients. Visualization and discovery tools help users and audiences to identify patterns, trends and anomalies in the complicated data sets. Telling a story helps us to convey our findings more effectively and interesting since the data is more make sensed and gives vision to future prediction when we present a story. The presentation will also become interactive when people put themselves into stories. In addition, it makes our jobs easier.

### *Other Popular Courses*

- Database Design and Management

Database is foundational to the successful business operations. Data is resource of competitive advantage if organization take advantage of it. Based on most of the course descriptions I searched on, the class mainly talks about building information systems that satisfy multiple needs for information outputs, while simultaneously providing valuable information for decision makers in different functional areas. It focuses on the design and use of conceptually modeled databases.

- Data Mining

Based on course description offered by Notre Dame University, it focusses on extracting knowledge from large structured data using methods such as machine learning, pattern recognition, databases, probability and statistics, information theory, and data visualization. Students have an opportunity to implement and experiment with concepts and to apply them to real-world datasets. It will introduce variety of practical data mining concepts and techniques

that are broadly applicable to recommendation, prediction, exploratory data analysis, and business analytics. Python programming language will be used for this course.

## *Application Software*

- Excel

Excel can be useful for both problem solving and data visualization. User can learn the basic and advanced functions of excel through plentiful online tutorials and practice with projects in different business scenarios. User should master how to perform simulation analysis and practice these skills by using Excel tools such as solver, data analysis, data tables, pivot charts, scenario manager, and goal seek. On the other hand, Excel can assist presenters in visualizing data and telling a story to convey meaningful insights to audiences.

- Access

According to Microsoft Support, access can be very useful when user wants to safely update the data in a database where many people working in, when user wants to add more tables to a data set that originated as a flat or nonrelational table, when user wants to run complex queries, and when user wants to produce a variety of reports or mailing labels. There are plentiful online trainings accessible for students.

- Tableau

Tableau is a Business Intelligence tool for interactive visualizations. By using tableau, user can quickly connect different worksheets, create interactive plots, build interactive dashboards, and structure a storyline. User can perform basic calculations by converting data into different measure types and run simple statistical analysis by adding the trendline because it has built-in support for R. Tableau is very easy to learn and not pricy. Students can get free tutorials in Lynda.com.

## Conclusion

Accountants with data analytics skills have strong competitive advantage in an increasingly data-driven world. It is hard for companies to recruit employees with qualified new skills since most of the current accounting graduates don't have broad and deep data analytics learning experience. But university accounting programs are actively preparing their students with this new skill. It takes time for companies to develop new training programs and for universities to develop new courses, but it is very easy for individuals to equip themselves with this new skill through plentiful online resources. Based on my findings on 40 universities, four of them have cooperated with professional organizations; six of them provide data analytics degrees; two of them have accounting programs with data analytics concentration; seven of them offer other related courses in their graduate program; 14 of them offer related courses in their undergraduate program; eight of them offer stand-alone data analytics course; eight of them issue data analytics certificate for students who meet their requirements; three of them have provided short workshop for preliminary introduction and discussion of data analytics; at least seven of them who published their course syllabus online shows that they incorporated some data analytics related assignments into their traditional accounting course; and nine of them don't show data analytics related offerings in their business programs. Therefore, majority of schools are offering some data analytics teaching though most of universities don't require students with data analytics learning experience.

The limitation of this research is the quantity of my sample schools. There are enormous universities providing accounting program in the world. I can only search on and summarize a few of them. Therefore, the sample may not be representative. In addition, universities may not want to disclose the detailed information of their course offerings and may not update their

websites in a timely manner. Therefore, there is no way to dig deep how professors design their courses and teach the new skill.



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