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Data Analytics in Top Accounting Programs in the US

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I. Introduction:

Data analytics is a huge trend many industries including accounting are shifting towards. Though people assume that technology is replacing accountants, it is argued that technology has enhanced accountants by improving their technical proficiency, critical thinking, and problem-solving skills. Instead of completing the manual processing of data, accountants now use tools that do that as well as reduce the margin of error by validating the quality and accuracy of the ledgers for the accountants according to the Forbes Insights Team (2019). On top of this, people are now starting to expect data analytical skills of their accounting professionals. The CPA and CMA examinations have adjusted certain aspects as well in order to incorporate more testing of candidates' data analytics skills. There is also an increasing number of professors who are emphasizing their beliefs in the importance of incorporating data analytics in accounting courses. Due to these various shifts and the fact that top accounting programs in the United States produce a substantial amount of accounting professionals in the industry, it is important to investigate how these universities are adjusting their curriculums to prepare students, the next generation of the accounting profession, for this trend shift.

By using rankings from US News and College Choice, 19 universities were identified as the top accounting programs in the United States as the sample for the study. More than one ranking was used in order to make the sample more objective. The university websites were then investigated to determine if there were relevant courses. Once relevant courses were identified, the corresponding professors or heads of accounting programs were inquired of for the syllabi of the relevant courses. The information in these syllabi was then analyzed to better understand how top accounting programs in the United States incorporate data analytics throughout their curriculums. The specific questions are whether the universities have a stand-alone accounting

data analytics course, what data analytics programs are taught, how their students' performances are measured, and how the data analytics programs taught in the universities compare to the ones used in practice by industry professionals.

The general results are that a few data analytics programs, such as MS Access, Tableau, and MS Excel, are taught in many courses and numbers of classes, while there are some data analytics programs, such as Power BI, NetSuite, and XBRL, that are used and taught a very limited number of times. It is important to note that in this thesis, a "class" refers to the period of time when students are being taught, while a "course" refers to the collection of classes over the semester. In terms of measuring students' performances, the most commonly used methods are "Projects" and "Exams," whereas "Class Participation," "Quizzes," and "Homework" are typically weighted less heavily. None of these courses use all of these measurement options, and there is a large range in terms of percentages used for "Projects" and "Exams," ranging from 0% to 100%.

As an additional analysis, I compare my findings in terms of top data analytics programs taught to the top technologies public accounting professionals use the most/deem are the most important. My fellow classmate examines the top technologies used/perceived to be most useful by public accounting professionals by surveying the alumni of the Master of Science in Accounting program at the University of New Hampshire believed to be working at an accounting firm or working in accounting. After the comparison, I find that there are some discrepancies. Two of the top technologies found by Francis were MS Excel (1st) and Tableau (4th); however, the top data analytics programs used are MS Access, Tableau, and MS Excel ranked in the most number of courses, and MS Excel, Tableau, and Alteryx in terms of average number of classes spent. As seen, there are a few differences in the rankings for MS Excel and

Tableau between the two studies. Furthermore, Alteryx was in the top four rankings in courses and classes spent, but it was not one of the top technologies by professionals. Yet, there are also similarities in our findings. As previously mentioned, MS Excel is the top technology and is focused on in the most number of classes on average. MS Access is in the top five data analytics programs in terms of courses and classes spent, as well as the top technologies used/perceived as most important in industry (as part of “Other MS Tools” (3rd)).

Top accounting programs may lead the curriculum practice in academia and are starting to incorporate data analytics in their programs potentially in response to the growing need for data analytics skills in the accounting industry. It is therefore important to understand what these accounting programs are doing, especially in terms of course material and how they teach that material. Understanding this related preparation of the next generation of workforce is helpful to accounting firms as well in order to know how prepared their recruitments are. Lastly, determining whether there is a discrepancy between what is being taught at universities and what is being utilized most often at work may help educators to consider how to address this knowledge gap.

II. Literature Review and Institutional Knowledge:

Though data analytics related to the accounting field is a growing field, it is notable that there is not an abundant amount of research regarding the subject readily available to the public. This is especially so for information about data analytics related to accounting being taught at universities. Despite this, there has been some general information on the topics of data analytics’ impact on the accounting industry, the CPA as well as CMA exams, and college curriculums.

II.1 Impact of data analytics on the accounting profession

Tschakert, Kokina, Kozlowski, and Vasarhelyi (2016) argue that all CPAs need to adapt to technological disruptions and now perform tasks that require data analytics skills. Today, both internal and external auditors use data analytics to facilitate practices such as continuous monitoring, continuous auditing, and analysis of full data sets in situations where there were only samples that were audited.

Going from a sample-based model to one using continuous monitoring that analyzes and verifies larger data sets results in a lower margin of error offering more accurate recommendations. The authors also describe how tax accountants can employ data analytics to analyze complex investment scenario related taxation questions. This allows investment decisions to speed up, which offers companies the ability to respond faster to opportunities to beat their competition. For accountants that aid or act as investment advisors, big data can be used to find behavioral patterns in consumers and the market, which helps businesses build analytical models that aid in identifying investment opportunities and generate higher profit margins (“Why does (should) data analytics,” 2017).

Meyer (2015) discusses how organizations can gain a competitive advantage if they are able to successfully interpret the high volume of data that technology has made available to them and use them to make business related decisions. Furthermore, she highlights that some experts, professors and industry workers, state that data analytics coursework could benefit accounting students as it helps with organization and problem solving skills as well as with the ability to work better with other departments such as an auditor working with an IT auditor. The article also mentions how Big Four Accounting firms are forecasting an increase in demand for students not only with a degree in accounting, but also a double major in information systems.

Vasarhelyi (2017) discusses how there is an increasing demand for accountants with data analytics skills. A McKinsey Global Institute study mentions that graduates from data science programs could increase by 7% per year; however, a high-case scenario shows there could be a 12% annual demand growth, which leads to approximately a deficit of 250,000 data analysts. This study also highlights the adapted accountant role of the business translator, an important job of being the linkage between the analytical employees and the application of the data to address business situations. These business translators, therefore, need an understanding of the data as well as the organization and industry in order to pull the relevant information from the data analysts. This article also describes how executives in Europe and the United States report that analytics and big data are going to be the most important digital competency for their organizations in the upcoming years. This trend is causing more organizations to allocate more resources to analytics initiatives.

II.2 Institution Knowledge and the new CPA and CMA examination requirements on data analytics

Tysiac (2019) describes how the data analytics trend now requires newly licensed Certified Public Accountants (CPAs) to have skills and knowledge on business intelligence; data management, analysis, and reporting; predictive analytics; cybersecurity risk management; IT risks, controls, and assurance; and information security governance.

The AICPA's Revisions to the Uniform CPA Examination Blueprints (2019) made changes to the Auditing and Attestation (AUD) as well as Business Environment and Concept (BEC) sections in terms of data analytics that have been effective since July 1st, 2019. For AUD section, the nature and scope of the eligible testing content did not change; however, there have

been a few adjustments to add more detail to the AUD Blueprint about audit data analytics. The section introduction has been revised to include more data analytics terminology in two sentences. There have been four added analysis representative tasks that include data analytics specifically. One task in the “Assessing Risk and Developing a Planned Response – Identifying and assessing the risk of material misstatement, whether due to error or fraud, and planning further procedures responsive to identified risks - Further procedures responsive to identified risks” topic requires assessing the “risks of material misstatements using data analytic outputs (e.g., reports and visualizations) to determine relationships among variables and interpret results to provide a basis for developing planned audit procedures” (AICPA, 2019). Another task in the topic, “Performing Further Procedures and Obtaining Evidence – Performing specific procedures to obtain evidence - Analytical procedures” requires performing “analytical procedures using outputs (e.g., reports and visualizations) from audit data analytic techniques to determine relationships among variables and interpret results in an audit or non- audit engagement” (AICPA, 2019). Two other tasks in the “Performing Further Procedures and Obtaining Evidence – Performing specific procedures to obtain evidence - All other procedures” topic include determining “sources, structure, and attributes of data needed to complete audit data analytic procedures;” and using “audit data analytic outputs (e.g., reports and visualizations to determine relationships among variables and interpret results to meet objectives of planned procedures in an audit or non- audit engagement” (AICPA, 2019). The BEC section was mainly adjusted to take one task in Information Technology, regarding the role of information technology in business, and split it into two tasks to: “recognize the role of big data in supporting business decisions and use business intelligence (including data analytics and statistics) to support business decisions” (“Data Analytics”, 2019).

Similarly, the Certified Management Accountant (CMA) exam added a new section called Technology and Analytics to Part 1: Financial Planning, Performance, and Analytics in January 2020. This new section that makes up 15% of Part 1 (“CMA 2020”) incorporates the following topics: information systems, data governance, digital transformation (simplifying and centralizing finance functions using technology), and data analytics. These new topics were included to ensure the exam keeps its relevance and still answers to the accounting market demand (Wylie, 2019).

II.3 Impact of data analytics on college curriculum

As previously determined, there is an increasing impact data analytics has made on the accounting industry and licensure examinations. It is important to see how universities have been responding to these changes and how they are implementing data analytics in their accounting programs.

Meyer (2019) extends Meyer (2015) by describing different strategies to incorporate data analytics into accounting curriculums such as looking at teaching cases, having the accounting programs include courses offered in other departments such as data analytics, and PwC’s recommendations. These recommendations include learning classic technologies such as Microsoft Excel and Access; understanding of structured and unstructured databases (SQL, MongoDB, and Hadoop); obtaining and cleaning data; introduction to data visualization (Tableau, SpotFire, and Olikview); and early coverage of programming languages such as Python, Java, or R.

Hinson (2019) discusses the perspectives of four accounting professors at Baylor University, University of Missouri in Columbia, Marquette University, and University of

Southern California, who are trying to teach more technology. The innovations they are including at their universities are teaching a data analytics course for graduate students; teaching information systems and auditing; launching a master's degree in accounting analytics; and teaching SAS and Python, and creating required Excel modeling labs for students in all introductory financial and managerial accounting classes. These professors describe their hands-on teaching philosophies in order to better prepare their students and allow them to apply what they learned to new technologies they come across in the future. They also discuss assignments they have given to their students as well as advice such as how they are learning only a bit earlier than students due to the fast changing nature of data analytics and still able to teach the subjects like Tableau.

Smith (2019) describes the ways he included his predictions of future changes in accounting roles in his courses. Smith believes there will be more open-ended and complex problems for accountants to try and solve leading him to incorporate purposeful activities. One activity specifically mentioned that he uses to help develop problem solving and analyzing skills is having his students find a technology related headline story then dive past the technology aspect to find the business implications, which helps his students recognize that every event is influenced by external forces that they need to analyze for their clients.

Another prediction is that tools for continuous reporting and real-time analytics will change or evolve, but the trend itself will remain rather than having periodic reporting of data. This assumption is due to many companies having more news articles than the number of days since their last SEC filing. Furthermore, Smith (2019) foresees CPAs will need to know more about technology. He describes how technologies that used to be emerging are becoming mainstream causing clients to want CPAs to be able to explain these technologies to them. Smith

(2019) recommends having students complete writing assignments on questions that lead students to make connections between technology and business.

III. Research Questions:

Data analytics has made significant impact on the accounting industry and university curricula. Despite this, I have only recently started to learn about this trend, and to my best knowledge, there is little that has been done in terms of understanding how schools are teaching data analytics in accounting. I believe this understanding is important to make sure future accounting professionals are best prepared with data analytics skills and are exposed to the data analytics programs used in the industry. By better understanding how data analytics related to accounting is taught, more universities might be more inclined to adopt the topic and people might be able to figure out the best practices to prepare accounting students in terms of data analytics.

The first major question that will be investigated is whether the top accounting programs offer stand-alone data analytics courses. My prediction is that most universities with the best accounting programs will have an accounting related data analytics course offered in their accounting programs.

The second major question is to understand the ways in which data analytics are taught in the top accounting programs. Specifically, what data analytics programs are being taught in these courses? Further, how is student performance measured (such as through learning the distributions of assigned hands-on projects, examinations, and homework)? The last major question is to understand whether the data analytics tools taught in these university programs are consistent with the usage in practice by industry professionals.

IV. Research Methodology and Sample:

The US News Best Undergraduate Accounting Programs 2020 rankings and College Choice 2018 rankings were used to select the top accounting university programs. US News's 2020 rankings were used as they are the most recent. US News's methodology includes 35% based on success at retaining as well as graduating students within six years. 20% is based on faculty resources which comprises of class size, faculty salary, the proportion of full-time faculty with the highest degree in their field, student-faculty ratio, and the proportion of full-time faculty. Another 20% is based on expert opinion of academic reputations. These opinions are determined as two year weighted average ratings from presidents, provosts, and deans of admissions who peer review academic institutions. Student excellence makes up 10% of the rankings, which consists of standardized test results and high school class standings under the assumption that students who did well in high school have the highest probability of succeeding in college coursework. The last 5% is alumni giving, which is the average percentage of living alumni with bachelor's degrees who donated to their alma maters. This percentage indicates the level of satisfaction and post-graduate engagement (Morse, 2019).

College Choice's 2018 rankings were used as they are their most recent rankings, they list 50 universities, giving a larger range, and they include many factors in the methodology. This methodology is based on three larger categories: retention, program appeal, and finances. Retention makes up 30% and considers the graduation, full-time retention, transfer out, and part-time retention rates. 40% of the ranking consists of program appeal, which factors in the enrollment rates, total programs offered, and student to faculty ratios. Finances are the last 30% considered and includes the tuition changes over time, proportion of students receiving financial aid, and total scholarships and fellowships ("Methodology").

Insert Table 1 here

In order to narrow down the research sample, the 12 and top 20 universities from the US News ranking and College Choice rankings, respectively, as seen in Table 1 were chosen to be looked deeper into for this thesis. These two lists were cross-referenced to determine the number of universities that were on both lists, which ended up being 11 schools. Following this, the websites of the total of 21 universities such as their course catalogues, accounting major or concentration websites, and undergraduate business program websites were researched to determine if any data analytics related accounting courses are offered. These courses were chosen based on a search for key words such as “accounting,” “data analytics,” “information systems,” “data,” “analytics,” and “information technology.” The universities without any accounting related data analytics courses were removed, which led to 19 schools remaining. The websites of the 19 schools as well as other unaffiliated websites on the internet such as Course Hero and Coursicle were then looked further into to find a professor of the course. If none of the professors were disclosed, the heads or administrative assistants of the accounting departments were identified. These individuals were directly emailed to request the syllabi of their data analytics related accounting courses. A sample email is provided in Appendix A. Out of the 19 universities, 10 responded with 14 syllabi that were used in this thesis, offering a high response rate of over 50%. The identity of the universities which provided the syllabi remain anonymous.

Using the syllabi and course schedules if offered along with the syllabi, I analyzed the data analytics programs taught, how performance was measured, and the number of classes spent on each data analytics program for each class. Not all of the data analytics programs used or number of classes spent on each program were disclosed, thus some analyses are conducted based on a smaller sample size. In addition, these findings were compared with a fellow student's research of the top technologies used/perceived as most important by professionals in the accounting industry (Francis, 2020), which was found by surveying alumni of the University of New Hampshire's Master of Science in Accounting program. These comparisons were used to determine if there is a correlation between the data analytics programs being taught in the top data analytics programs and those being used/perceived as most important by public accounting professionals.

V. Empirical Results

V.1 Numbers of Courses Teaching Data Analytics Programs and Top Technologies

Used/Perceived as Important By Public Accountants

Insert Table 2 here

Table 2 shows that 18 different data analytics programs are taught. Nine of the data analytics programs are used by more than one course. The top two tools that are taught are Microsoft Access (MS Access) (in six accounting courses), and Tableau (in five accounting

courses). Other programs include Microsoft Excel (MS Excel) (in four accounting courses), Alteryx (in three accounting courses), Systems Applications and Products (SAP) (in three accounting courses), Statistical Analysis System (SAS) (in two accounting courses), Visio (in two accounting courses), Robotic Process Automation (RPA) (in two accounting courses), and Structured Query Language (SQL) (in two accounting courses). The remaining programs that are taught in one course include NetSuite, UiPath, Power BI, CountThings, ExPrep, Python, Smart Draw, GoogleDrawing, and eXtensible Business Reporting Language (XBRL). These programs are a mixture between database management systems (DBMS), spreadsheets, visualization tools, and coding languages.

Francis (2020) surveyed 185 alumni who were believed to be currently working at an accounting firm or working in accounting and received 34 responses that were studied to find that MS Excel, CaseWare IDEA, “Other MS Tools,” and Tableau are most often used and perceived as most important. The last column of Table 2 shows that the top five technologies in order are: MS Excel, Skype, CaseWare IDEA, “Other MS Tools (Word, Access, Power BI, and Outlook),” and Tableau. Comparing to the accounting analytics programs in the context of this thesis, the relevant technologies are MS Excel, CaseWare IDEA, “Other MS Tools (Access and Power BI),” and Tableau, which will have the rankings 1, 2, 3, 4, respectively, in this thesis. MS Excel is a spreadsheet program also used for data visualization and analysis; CaseWare IDEA is a data analytics software; Access is a database management system; and Power BI and Tableau are data visualization tools. All of these programs allow users to perform either data visualization or data analysis.

MS Access, which is part of the “Other MS Tools” category or the third top technology according to Francis’ research, is also one of the top data analytics programs in terms of the

number of courses used. MS Excel, which is first in Francis’ research is still the third highest data analytics program taught as it is only taught at two less courses than MS Access. These results surrounding MS Excel show that in terms of this software program, generally, one of the top data analytics programs is aligned with the most important technology according to professionals.

Though it was not specified why MS Access is covered the most frequently, it is possible that this is because accountant may need to deal with large datasets in their work, so MS Access is useful in teaching the basics of how databases work and understanding the relationship of datasets as it is important to know. MS Access may also be used the most often as it is fairly well known, so it might be easier for students who are having technical issues with the program to search online for support and solutions. Additionally, it may be due to the fact that many universities use Outlook 365, which MS Access is included in.

V.2 Statistics on the Number of Classes Spent on Data Analytics Programs

Insert Table 3 here

Table 3 presents statistics on the numbers of classes spent on each data analytics program. From calculations from the syllabi and course schedule, it was found that the total number of classes found from the 13 out of 14 courses that offered these numbers is 334 classes. It was found that most of the courses hold two classes a week, and out of those courses, the

average number of classes per semester is 26.22 classes. In addition to this, two courses held classes once a week and one course held them three times a week. For the number of classes spent on the different data analytics programs, it is interesting to see the large range between means for the different data analytics programs. The highest mean is a little over 8 classes per semester spent on MS Excel. On average, 5.5, 5, 4.5, and 4 classes are spent on Tableau, Alteryx, RPA, and MS Access, respectively. The mean is 2.5 classes for SAS and 2 classes for SQL and Power BI. Universities spent an average of one class on SAP, Visio, NetSuite, Python, and XBRL. It is important to note, however, that not all of the courses disclosed the number of classes that are scheduled for each analytical technology.

In Table 3, the standard deviations ranges from 0 to 9.67. The minimums for most of the data analytics programs listed are 1 class. RPA, SQL, and Power BI have minimums of 2 classes. Five data analytics programs (SAP, Visio, NetSuite, Python, and XBRL) have maximums of 1 class as well. Two of the maximums are 2 classes for SQL and Power BI. The maximums for SAS is 4, MS Access is 9, RPA is 7, Alteryx is 12, and Tableau is 10 classes. The highest maximum is for MS Excel at 22 classes spent in one course. This was very interesting because the range for MS, especially, was fairly large at 21 classes.

The top three data analytics programs in terms of the number of universities teaching them (Table 2) are the same top three data analytics programs in terms of the numbers of classes spent (Table 3). Data analysis and visualization programs (e.g., Tableau, Alteryx, and MS Access) seem to be used more than coding platforms (e.g., SQL and Python).

V.3 Comparison of Top Data Analytics Programs (Number of Classes Spent) and Top Technologies Determined by Accounting Professionals

A discrepancy found between the number of classes spent on data analytics programs and the top technologies found by Francis is that though Tableau is taught in the second highest number of courses and the second highest amount of classes are spent on this data analytics program, it is surprising to see how it is the fifth technology program to be used/perceived as perceived as most important by public accounting professionals (Francis, 2020). Another difference is that Alteryx was in the top four rankings for the top data analytics program used in terms of both number of classes spent and number of courses, meanwhile, it was not in the top five technologies according to Francis' study. Despite these discrepancies, Tableau and Alteryx may still be pretty important to public accounting professionals, relatively, as there were only three other data analytics programs that are taught in the courses researched that were on the top five technologies ranking. On the other hand, there are some similarities that have been found. As previously mentioned, MS Excel is the top technology in Francis' study, but it is also the top data analytics program in terms of mean for the number of classes spent. Additionally, MS Access is the third top technology used/perceived as most important by public accounting professionals (Francis, 2020) as part of "Other MS Tools." Overall there is a balance of discrepancies and parallels between the technologies taught and used/perceived as important.

V.4 Statistics on Performance Measurements

Insert Table 4 here

Table 4 presents the percentages of each outcome measure being used in courses. For this table, if a course did not include one of the performance measurements in the way the final grades are weighted, it was taken out of the calculation. For example, if a one out of 14 syllabi did not offer “Projects” as a grading factor, the statistics only include the information from the other 13 syllabi rather than including the 0% from the one syllabi. A few assumptions had to be decided at the beginning. “Projects” includes either group or individual projects and presentations. Some universities do not offer an exact breakdown, therefore if there was one percentage for a group of performance measurements, the weighted amount was evenly distributed. For example, if the syllabus states that “Quizzes and Homework” make up 15% as a whole, 7.5% was assigned to “Quizzes” and 7.5% was assigned to “Homework” for that course.

It is interesting to see the range of statistics in Table 4. “Projects” has a mean and medium slightly below 50% as well as a minimum of 7.5%. One course relied solely on “Projects” for grading its students. For “Exams,” the mean and median is slightly above 50%, while its minimum and maximum are 22.06% and 93.75%, respectively. “Class Participation,” “Quizzes,” and “Homework” all had means less than 11%, medians less than 10%, minimums around 2-3%, and maximums under 25%.

Insert Table 5 here

As a robustness check, in Table 5, I then include the 0%'s of the courses that do not offer certain performance measurements in the calculations. For example, if a course does not have "Homework" as a performance measure, I excluded these courses from my analysis in Table 4. In Table 5, I instead include these courses with zero percentages as part of their students' grades. As seen in Table 5, all of the performance factors have at least one course that does not offer that performance factor, therefore, the minimum column consisting completely of zero percentages. It was interesting to see how the "Projects" calculations did not change too much between the two tables; however, for the means, "Exams" decreased from approximately 54% by over 10%, "Class Participation" decreased by approximately 2.5% to a bit higher than 6%, "Quizzes" decreased from about 10% to almost 6%; and "Homework" decreased from almost 8% to approximately 2%. Table 5 shows that "Projects" and "Exams" continue to be the most significant performance measures.

The standard deviations are similar in both tables. "Projects" and "Exams" had standard deviations on the higher end of the five performance measurements. Between the two tables, their standard deviations ranged from 0.23 to 0.31, which makes sense as these are the two heaviest weighted measurements and there is a larger range in general of the amount of weight "Projects" and "Exams" have in different courses. For example, as seen in both tables, at least one course relied completely on "Projects" for grading purposes while at least one only relied on them for 7.5% of the grades. With "Exams," the difference is bit smaller, but relatively large

compared to the other measurements, at 71.69%. On the other hand, the standard deviations for “Class Participation,” “Quizzes,” and “Homework” ranged between 0.05 and 0.07 in the two tables. These calculations also make sense as the means are lower to start with, and there are smaller ranges of weightings for these measurements in the courses.

V.5 Additional Details

From researching the syllabi, there were a few details disclosed about extra resources that are offered in some, but not all of the courses. For the case studies and group projects, the courses use a variety of sources including: Harvard Business School, the Ernst & Young (EY) Foundation, PricewaterhouseCoopers, Systems Understanding Aid (SUA), Tableau, and SAP. Three of the courses either required or recommended a subscription to *The Wall Street Journal*. One course also recommended *The Financial Times* and *The New York Times*. Guest speakers are included in four of the courses. Between these four courses, guest speakers take up a total of eight class periods, ranging from one to three guest speakers per semester for each course. Topics for these guest lectures include data analytics in general related to accounting and accounting fraud.

Something interesting that was found during this research process is that out of the universities researched, there are a couple that offer a data analytics related accounting major concentration, minor, or graduate degree. Additionally, from researching the university websites, out of the 14 courses, 10 courses are required for their accounting programs. Three of the courses are not required and instead are electives. For one course it is not disclosed if it is required.

VI. Conclusion

The world has been steadily changing with the increased amount of technology readily available to the general public. This availability has led to more interest in data analytics due to its benefits on many professions including the accounting industry. The demand for accountants with data analytical skills continues to increase, and the top accounting programs deliver a substantial number of students each year to many auditing firms and accounting companies. This thesis intended to better understand how the top accounting programs address the need of data analytics in the industry and new data analytical skills requested of accountants.

US News and College Choice's 2020 and 2018 rankings, respectively, were used as a starting point to determine the top data analytics programs in the US. These 62 disclosed listings were narrowed down to 19 of the top accounting programs. These programs were then contacted to request syllabi to compare and study. MS Access, Tableau, and MS Excel are found to be taught in the most number of courses, and there are nine data analytics programs only taught in one course each. MS Excel is taught in the most number of classes and is the top technology used/perceived as most important by public accountants (Francis 2020). It has also been discovered that "Projects" and "Exams" are weighted the most overall on average in determining students' grades. This is in line with my personal experience in the accounting classes and information systems course I have taken.

I suggest the following for future research. One topic is regarding the correlation between the top accounting programs that offer data analytics related accounting programs and job placement rate and starting salary of the graduates from these programs. Additionally, it would be interesting to find the successfulness of graduates from these top accounting programs that

offer data analytics related accounting courses in the accounting profession in longer term (such as public accounting and data analytical accountants).

There are a few limitations with this thesis. First of all, it is limited in the number of universities and syllabi used as I only contacted 19 universities and studied 14 syllabi. Secondly, because the universities have data analytics infused in their accounting program, this study can only focus on stand-alone data analytics accounting courses rather than accounting data analytics degrees. The gaps of information such as the exact breakdown of number of classes spent on each data analytics program in each course is a third limitation to this thesis. Lastly, the limited amount of time and resources restricted the ability and scope of this study. Due to these limitations, this research only shows a piece how accounting programs at universities correspond to the impact of data analytics on the accounting profession. However, this research helps to provide some initial evidence on how some top accounting programs have incorporated data analytics in their accounting courses.

References:

- “CMA 2020 Exam Changes.” *Imanet.org*, Institute of Management Accountants, Inc.,
www.imanet.org/cma-certification/getting-started/cma-2020-exam-changes?ssopc=1.
- “Data Analytics: Not the Big Deal It's Made Out to Be.” *Gleim Exam Prep*, 7 Aug. 2019,
www.gleim.com/cpa-review/blog/data-analytics-not-the-big-deal-its-made-out-to-be/.
- Francis, Catherine. “Understanding the Importance & Impact of Technology in an Accounting Setting.” 2020. Honor Thesis. University of New Hampshire.
- Hinson, Yvonne. “How Top Innovators Teach Technology.” Edited by Courtney Vien, *Journal of Accountancy*, 16 July 2019, www.journalofaccountancy.com/newsletters/extra-credit/how-innovators-teach-technology.html.
- “Methodology.” *College Choice*, www.collegechoice.net/methodology/.
- Meyer, Cheryl. “Should Accounting Students Learn to Code?” *AICPA*, 14 July 2015,
www.aicpa.org/interestareas/accountingeducation/newsandpublications/should-accounting-students-code.html.
- Meyer, Cheryl. “What Your Students Need to Know about Tech.” *Journal of Accountancy*, 10 Sept. 2019, www.journalofaccountancy.com/newsletters/extra-credit/technology-in-accounting-education.html.
- Morse, Robert, et al. “How U.S. News Calculated the 2020 Best Colleges Rankings.” *U.S. News*

& *World Report*, U.S. News & World Report, 8 Sept. 2019,
www.usnews.com/education/best-colleges/articles/how-us-news-calculated-the-rankings.

Smith, Sean Stein. "Prepare Students Today for Accountants' Shifting Roles." *Journal of Accountancy*, 8 Oct. 2019, www.journalofaccountancy.com/newsletters/extra-credit/new-accounting-careers-emerging-technologies.html.

"Summary of Revisions to the Uniform CPA Examination® Blueprints Effective July 1, 2019." *American Institute of Certified Public Accountants*, 1 Jan. 2019,
www.aicpa.org/content/dam/aicpa/becomeacpa/cpaexam/examinationcontent/downloadabledocuments/summary-of-changes-to-exam-blueprints-effective-july-2019.pdf.

Team, Insights. "The Next-Generation Accountant." *Forbes*, Forbes Magazine, 13 June 2019,
www.forbes.com/sites/insights-kpmg/2019/04/29/the-next-generation-accountant/#5ebef4afae67.

Tschakert, Norbert, et al. "How Business Schools Can Integrate Data Analytics into the Accounting Curriculum." *The CPA Journal*, 11 Oct. 2017,
www.cpajournal.com/2017/10/11/business-schools-can-integrate-data-analytics-accounting-curriculum/.

Tschakert, Norbert, et al. "The next frontier in data analytics." *Journal of Accountancy*, Journal of Accountancy, 1 Aug. 2016, www.journalofaccountancy.com/issues/2016/aug/data-analytics-skills.html.

Tysiac, Ken. "NASBA and AICPA Seek Input on Evolving Licensure Model." *Journal of Accountancy*, 12 June 2019, www.journalofaccountancy.com/news/2019/jun/cpa-licensure-model-input-201921411.html.

"Why Does (Should) Data Analytics Matter to Accountants?" *UNC Kenan-Flagler Business School - Top MBA Program - Top MBA School*, 12 Sept. 2017, www.kenan-flagler.unc.edu/news/macwp-why-does-should-data-analytics-matter-to-accountants/.

Wylie, Ian. "Data Analytics and Digital Business to Form Part of Accountancy Courses." *Subscribe to Read | Financial Times*, Financial Times, 17 June 2019, www.ft.com/content/acf60394-70e1-11e9-bf5c-6eeb837566c5.

Table 1. 2020 US News Best Undergraduate Accounting Programs and 2018 College Choice Undergraduate Accounting Programs Rankings

Accounting Ranking	Business Ranking	2020 US News Best Undergraduate Accounting Programs Rankings	Accounting Ranking	College Choice Best Accounting Degrees 2018 Rankings
1	5 (tie)	University of Texas - Austin	1	Brigham Young University
2	38 (tie)	Brigham Young University	2	University of Texas - Austin
2	19 (tie)	University of Illinois - Urbana-Champaign	3	Ohio State University
4	10 (tie)	Indiana University - Bloomington	4	University of Pennsylvania
5	12 (tie)	University of Notre Dame	5	Indiana University
6	3 (tie)	University of Michigan - Ann Arbor	6	University of Michigan
7	1	University of Pennsylvania	7	University of Illinois Urbana Champaign
8	12 (tie)	University of Southern California	8	University of Notre Dame
9	5 (tie)	New York University	9	New York University
10	15 (tie)	Ohio State University - Columbus	10	University of Southern California
11	22 (tie)	University of Florida	11	University of Georgia
12	22 (tie)	Boston College	12	University of Florida
			13	University of California - Berkeley
			14	Massachusetts Institute of Technology
			15	St. Joseph's University
			16	Fairfield University
			17	University of Washington
			18	University of Wisconsin - Madison
			19	Florida State University
			20	Michigan State University
			21	Wake Forest University
			22	Loyola Marymount University
			23	California State University Northridge
			24	University of North Carolina
			25	Seattle University
			26	University of Scranton
			27	Santa Clara University
			28	CUNY Brooklyn College
			29	CUNY Bernard M Baruch College
			30	Pennsylvania State University
			31	Rutgers University
			32	Canisius College
			33	University of Minnesota
			34	Boston College
			35	Texas A&M University
			36	Creighton University
			37	University of Virginia
			38	University of Massachusetts - Amherst
			39	Gonzaga University
			40	University of Missouri
			41	University of Alabama
			42	John Carroll University
			43	Miami University Ohio
			44	Arizona State University - Tempe
			45	Saint Louis University
			46	University of Mississippi
			47	University of South Florida
			48	Xavier University
			49	University of Maryland
			50	Loyola University Chicago

Table 1 lists the top universities in the rankings used to determine the sample for this study. The two rankings used are the 2020 US News Best Undergraduate Accounting Programs and 2018 College Choice Undergraduate Accounting Programs Rankings.

Table 2. Frequency of Data Analytics Programs Used across Courses and Comparison to Top Technologies Used/Perceived by Public Accounting Professionals

Data Analytics Program Name	Number of Courses Teaching the Program	Top 5 Technologies Used/Perceived as Most Important by Public Accounting Professionals (Francis (2020))
MS Access	6	4 (As part of "Other MS Tools")
Tableau	5	5
MS Excel	4	1
Alteryx	3	
SAP	3	
SAS	2	
Visio	2	
Robotic Process Automation (RPA)	2	
SQL	2	
NetSuite	1	
UIPath	1	
Power BI	1	4 (As part of "Other MS Tools")
CountThings	1	
ExPrep	1	
Python	1	
Smart Draw	1	
GoogleDrawing	1	
XBRL	1	
Skype		2
Caseware IDEA		3
MS Outlook		4 (As part of "Other MS Tools")
MS Word		4 (As part of "Other MS Tools")

Table 2 shows the data analytics programs used in the top accounting program courses, the number of courses that teach the program, and the top five technologies used/perceived to be important by public accounting professionals. The latter of these is from another student's research (Francis, 2020).

Table 3. Statistics on Number of Classes Spent on Data Analytics Programs

Data Analytics Program Name	Mean	Median	Standard Deviation	Minimum	Maximum	Classes Spent
MS Excel	8.25	5	9.67	1	22	33
Tableau	5.5	5.5	4.65	1	10	22
Alteryx	5	2	6.08	1	12	15
Robotic Process Automation (RPA)	4.5	4.5	3.54	2	7	9
MS Access	4	3	3.56	1	9	16
SAS	2.5	2.5	2.12	1	4	5
SQL	2	2		2	2	2
Power BI	2	2		2	2	2
SAP	1	1	0	1	1	2
Visio	1	1		1	1	1
NetSuite	1	1	1	1	1	1
Python	1	1		1	1	1
XBRL	1	1		1	1	1

Table 3 includes the statistics relating to the number of classes spent on the data analytics programs. This data was calculated mainly using course schedules that were offered in addition to the syllabi.

Table 4. Statistics on How Student Performance is Measured

	Mean	Median	Standard Deviation	Minimum	Maximum
Projects	46.45%	45.00%	0.30	7.50%	100.00%
Exams	53.68%	55.00%	0.23	22.06%	93.75%
Class Participation	8.61%	5.63%	0.07	2.21%	25.00%
Quizzes	10.39%	9.46%	0.06	3.33%	20.00%
Homework	7.86%	5.42%	0.07	2.22%	18.38%

Table 4 shows the statistics related to how the professors measure students' performance. Certain performance measurements that are not considered in different courses are excluded from the calculations, therefore none of the minimums are 0%.

Table 5. Alternative Statistics on How Student Performance is Measured

	Mean	Median	Standard Deviation	Minimum	Maximum
Projects	43.14%	40.00%	0.31	0.00%	100.00%
Exams	42.18%	40.00%	0.31	0.00%	93.75%
Class Participation	6.15%	4.64%	0.07	0.00%	25.00%
Quizzes	5.94%	4.17%	0.07	0.00%	20.00%
Homework	2.25%	0.00%	0.05	0.00%	18.38%

Table 5 is similar to Table 4; however, this one includes the 0%'s for the performance measurements that are not considered by the courses in calculating grades.

Appendix A: Sample Syllabus Request Email and Professor Email Attachment

Dear Professor _____,

My name is Amanda Lee and I am currently a senior accounting major at the University of New Hampshire (UNH). As part of my honors program at UNH, I am writing a thesis on how data analytics is taught in top accounting programs. From the University of _____'s website, I was able to find that you teach _____. I am hoping that you can generously share the syllabus of this course with me so that I can document how analytics is incorporated in top accounting programs in the nation. Upon request, I will be happy to share the findings from my thesis with you when they are available. I have attached a letter from my thesis faculty advisor confirming the purpose of my request.

If I should contact someone else regarding this matter at your school, please kindly share their contact information with me. I look forward to hearing from you and thank you so much!

Best,

Amanda Lee



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January 28, 2020

Dear Professor,

My name is Emily Xu, Associate Professor of Accounting, at the Peter T. Paul College of Business and Economics at the University of New Hampshire (UNH). I am the faculty advisor to Amanda Lee, an honor student at UNH. She is researching how analytics is incorporated in accounting curriculum at top programs and will be writing her honor thesis on this topic. Amanda is reaching out in hope to receive an electronic version of your recent syllabus, if you have taught an accounting course which has a significant component of analytics. We greatly appreciate your response.

Please contact me Emily.xu@unh.edu or (603) 862-3318 if you have questions about our inquiry.

Sincerely,

A handwritten signature in black ink, appearing to read 'Emily Xu'.

Le (Emily) Xu, Ph.D.
Associate Professor of Accounting