CHAPTER 4

DATA ANALYTICS IN THE ACCOUNTING CURRICULUM

Vernon J. Richardson and Yuxin Shan

ABSTRACT

The accounting profession is beginning to demand data analytics skills from its professionals to handle the increasing amount of data available to address accounting questions. Indeed, the explosion of data availability and data are changing the accounting profession, providing accountants the opportunity to continue as key financial information providers to decision-makers. We conducted a survey of accounting department chairs to help understand if, when and how accounting programs would include data analytics in its curriculum. The authors find that 90.7% of accounting department chairs believe that data analytics belongs in the accounting curriculum, with 59.3% planning to introduce an accounting data analytics course in the next three to five years. Most (66.5%) prefer an accounting data analytics course as compared to the general business analytics course and more than half of respondents (56.2%) predict that their coverage of data analytics will be incorporated both throughout the regular accounting curriculum and in a standalone data analytics course. Combined with the requirement of 2018 Association to Advance Collegiate Schools of Business standards, the authors propose that data analytics should be incorporated both in the undergraduate level and graduate level, starting from basic analytics tools and ending with advanced emerging techniques.

Keywords: Accounting curriculum; data analytics skills; Accounting profession; the Association to Advance Collegiate Schools of Business (AACSB) standards; survey; Accounting Analytics
We argue that data analytics knowledge and skills increase the competitiveness of students in the job market and help them be ready to jump into modern businesses embedded in the big data environment. Instead of being overwhelmed by too much data, accountants with knowledge of data analytics take the opportunity to play a more predictive and proactive role within their organization by leveraging new technology and using the right data (Forbes, 2019).

To properly prepare accountants for these emerging needs in the accounting profession, accounting firms argue that its professionals and its new hires need an analytics mindset to be effective in their profession (Ernst & Young, 2017). Ernst & Young Academic Resource Center (EYARC, 2017) states that an analytics mindset is the ability to: (1) ask the right questions; (2) extract, transform, and load relevant data; (3) apply appropriate data analytic techniques; and (4) interpret and share the results with stakeholders. Except for perhaps the ability to interpret and share the results with stakeholders (#4 above), accounting curriculums have not traditionally included these increasingly required abilities for its graduates to develop an analytics mindset.

To illustrate the demand for analytics-minded business graduates, Gartner predicted a shortage of 1.5 million managers who have the capability to interpret and explain the analytical results of data scientists by 2018 (Manyika et al., 2011). Yet business and accounting curricula in universities lag behind the demand for graduates with data analytics skills. “Accountants lack a practical understanding of what tasks data analytics involves and how to implement and carry out a sophisticated data analytics function” (Bauer, 2017). Companies complain that it is difficult to find accountants with data analytics skills (Agnew, 2016; Bramwell, 2016). A panelist of the second Journal of Information Systems Conference who is a recruiting partner at one of the Big 4 accounting firms indicated that he would like to hire as many graduates with data analytics skills as universities could produce (Huerta & Jensen, 2017). To bolster this point, our sample survey suggests only about 32% of universities presently incorporate data analytics in their accounting curriculum.

Indeed, while the traditional accounting curriculum typically delivers knowledge of how to perform manual accounting practices, the availability of technology, the explosion of accessible accounting and related data, and the expectation of the accounting profession to produce accounting graduates with an analytics mindset requires accounting programs to consider how to most effectively change accounting curriculums.

Our research question is to understand if, when and how data analytics will ultimately be included in the accounting curriculum. The remainder of this chapter provides some background on how data analytics affects the accounting profession and accounting accreditation, a discussion of research questions/hypotheses, survey methodology used to elicit department chair’s perceptions, and finally a discussion of the findings and a conclusion.

This study contributes to the accounting education literature by providing survey results summarizing the current coverage of data analytics courses in the accounting curriculum as compared to the level of data analytics employers. The responses
of chairs of the accounting department additionally describe their prospectus of new data analytics courses for accounting to be introduced in the next few years. In terms of their responses, we propose the prescriptive strategies structuring and instructing the data analytics courses in accounting that contributes to the implication of data analytics in the accounting education.

ENVIRONMENT FACING DATA ANALYTICS

Data Analytics and the Accounting Profession

According to Ernst & Young, “Analytics is at the heart of every business decision” (Ernst & Young, 2017). To remain relevant, as key business and accounting information providers, accounting professionals and in turn, accounting students need to develop a capability in data analytics by developing an analytics mindset.

Indeed, accounting is changing due to the (1) availability of technology and (2) the availability of data increasingly available at the workplace. For example,

1. Technology and data availability will increasingly allow accountants and auditors to remove themselves from recording transactions and allow them to focus on those transactions that focus on necessary professional judgment.
2. Technology and data availability provide auditors with the tools to audit the full population of transactions instead of just a sample. Technology allows accountants access to real-time information (through Enterprise Resource Planning packages), the ability to compare and analyze data from different databases, and the potential predict accounting outcomes using statistic models.
3. Technology tools and data availability allow visualization of data from internal and external data sources to help make actionable decisions. Implementation of visualization tools provides professional interpretations of information instantly allowing dashboards to see how accounting ratios change over time or visualization of unusual patterns that might be anomalies that need further investigation (Cunningham & Stein, 2018).

What is the impact of changing technology on the accounting profession? A number of non-judgmental and repeat work has already been replaced or simplified by accounting technologies. Routine accounting tasks that require little or no professional judgment are being automated (Huerta & Jensen, 2017). For example, in 2016, 7,000 hourly and invoicing accounting jobs have been eliminated due to automation at Walmart (Nassauer, 2016). As part of a PricewaterhouseCoopers (PwC) analysis, it is predicted that around 3% of jobs will be affected by automation by the early 2020s, and 30% of jobs are facing the risk of automation by the mid-2030s (PWC, 2018).

Accounting students need to equip themselves to resist the threat of automation to the accounting profession. Routine tasks of accountants, like bookkeeping, will be replaced by a machine with appropriate programing. Accordingly, data collection in auditing is likely to be automated and extended to the entire
population of transactions rather than just auditing a sample of transactions (Krahel & Titera, 2015). Advanced technologies available for remote data extraction, transform, analysis, and dynamic analytics results will serve as a complement to the professional judgment of accountants and auditors. While we can train a machine to report anomalies pre-defined by human beings, the supposed anomalies need additional professional judgments of accountants in the big data environment. Consequently, the accounting profession needs to continue to adapt itself to the development of technologies, to infuse advanced technologies into accounting practice and to filter and find valid information in an age of potential information overload (Vasarhelyi, Kogan, & Tuttle, 2015).

Data Analytics and Accounting Accreditation

The 2018 Association to Advance Collegiate Schools of Business (AACSB) standard for accounting accreditation proposes even higher expectations on integrating data analytics in accounting and business curriculum than the 2013 AACSB standards (tabulated in the Appendix). Specifically, the 2018 AACSB standards ask students to demonstrate the ability to master current technologies and adapt to emerging technologies, including statistical techniques, clustering, data management, modeling, analysis, text analysis, predictive analytics, learning systems, or visualization. The 2018 AACSB standards ask the faculty to embrace and master technologies and provide data analytics for accounting at both the undergraduate and master’s levels. We can clearly see the increasing expectations in the 2018 accreditation standards as compared to the 2013 accreditation standards with respect to technology, information systems, and data analytics. These increasing standards continue to push change into the accounting curricula.

Accounting Curricula and Data Analytics

Potential goals of data analytics in the accounting curricula include teaching students to: (1) ask the right questions that are able to be answered with available data; (2) extract valid data from large datasets; (3) apply appropriate analytical techniques; and (4) communicate effectively the analytics results to decision-makers. While it is unrealistic to expect accounting graduates to be at an expert level with data analytics skills and professional accounting knowledge (Drew, 2018), accounting graduates are expected to understand data analytics techniques and work side by side with decision-makers and data scientists to answer accounting questions (Baccala & Ponagai, 2018). More importantly, accountants are expected to serve as the bridge between managers with questions and programmers that can access the data. Accountants are expected to know data analytics techniques and interpret and communicate analytics results that create value for the business (Vasarhelyi & Tschakert, 2017).

RESEARCH QUESTIONS

Supporting our hope to understand and articulate if, when and how data analytics will be included in the accounting curriculum, we investigate specific questions
by surveying accounting department chairs to get an idea of where we stand as a profession in getting data analytics in the accounting curriculum (the survey is presented in the Appendix):

(1) Should a data analytics accounting course be part of the accounting curriculum?
(2) In the next three to five years, do you plan to have an accounting data analytics course as part of the accounting curriculum?
(3) Do you feel the need for a specific accounting data analytics course or is a more general, business data analytics course sufficient?
(4) If you could predict the future, which do you think will happen at your school regarding data analytics in the accounting curriculum? A formal data analytics course or covered throughout the curriculum?

METHOD

We disseminated a survey with these questions to chairs of accounting departments in December 2018 to collect their views about the role of data analytics in accounting. For each question in the survey, respondents could either click on a multiple choice answer or skip the question. In addition to responding to the multiple choice questions, the participant could also include any comments they have about the question. We received 159 department chairs’ responses out of 917 emails sent to department chairs using the Hasselback directory as the primary source. We received 51 returned emails back that were either incorrect email addresses or from people who no longer serve as department chairs.

RESULTS

Does Data Analytics Fit in the Accounting Curriculum?

Responses from department chairs show a high demand for data analytics courses in the accounting curriculum responding specifically to the question “Should a data analytics accounting course be part of the accounting curriculum?” Most of the respondents (90.7% of the 150 responses to this question) believe that data analytics should be included in the accounting curriculum. More specifically, some chairs of accounting departments made comments on the importance of infusing data analytics throughout the accounting curriculum, particularly emphasizing the inclusion in the auditing and management accounting courses. They suggest that data analytics could either be embedded into existing courses or be delivered using standalone courses devoted exclusively to data analytics. The biggest constraint to a standalone data analytics course seems to be that the accounting curriculum is already packed full and they don’t know which other topic in the curriculum to replace with data analytics.

While a great number of respondents in favor of a data analytics course being included in the accounting curriculum, only 31.8% of respondents (of the 148 respondents) confirm that their business school already has accounting data analytics courses as part of the accounting curriculum. This result shows that
the demand for data analytics courses is much higher than the current supply. For those universities which have data analytics courses in the accounting curriculum, most of these universities provide a data analytics course at the graduate level. In the undergraduate program, some universities include some coverage of data analytics in certain courses, such as accounting information systems. Some respondents suggest that data analytics should be included at the junior core level. For those universities that have no room for a new required course, some of them provide a data analytics course as an elective. One respondent said that they provide a graduate certificate in data analytics for students to take after degree completion, which helps students get closer to the 150 credit hour eligibility requirement for the Certified Public Accountant exam.

In the Next Three to Five Years, Do You Plan to Have an Accounting Data Analytics Course as Part of the Accounting Curriculum?

While most of the accounting department chairs recognize the importance of data analytics in accounting, they believe it may take some time to develop a new course or sprinkle data analytics throughout the existing accounting courses. In our survey, 59.3% of respondents plan to have an accounting data analytics course in the next three to five years, 16.4% of respondents do not have a plan for an accounting data analytics course in short term, and 24.3% of respondents already have a data analytics course in the accounting curriculum (140 respondents answered this question). Two respondents said, even though they do not have a data analytics course yet, the new course is going to be available in 2019. One of their concerns is the process of designing an accounting data analytics course. Some respondents mentioned that a textbook is needed to support a standalone data analytics for accounting course. In addition, new faculty qualified in data analytics may need to be hired to teach this course as well as an investment made in needed software and facilities support.

Data analytics courses both benefit students in junior-level courses and senior-level or masters-level courses. At the undergraduate level, data analytics might teach students to use software to automatically format trial balances, perform bank reconciliations, calculate depreciation and amortizations, summarize and evaluate receivables, detect fraud and errors, and analyze and compare accounting ratios to other companies, etc. As part of the graduate level curriculum, advanced techniques and software enable students to conduct comprehensive financial report analysis, achieve remote data extraction and analysis, and display analysis outcomes in a reader-friendly visualization or as part of an instant interactive dashboard.

In our survey, about 64.1% of respondents plan on providing one standalone course in data analytics, while 20.4% of respondents plan on providing two courses both at the undergraduate level and graduate level (of the 142 respondents). The rest of the respondents do not have a plan for a data analytics course yet. Respondent comments show that accounting programs which have one course already in data analytics in the accounting curriculum are more likely to develop
a second course in data analytics at the alternative level (undergraduate level or
graduate level), while universities with no experience in data analytics are more
likely to start with one course in data analytics for accounting. Some respondents
who are in favor of data analytics in the accounting curriculum plan to have one
undergraduate course, one graduate course, and one elective course. Specifically,
some respondents suggest that in the short term, one or two standalone courses
in data analytics will be included; and in the long term, data analytics will be
integrated into all, or nearly all, accounting courses in addition to the standalone
courses. Even though some universities may not have a current plan for a data
analytics course, some respondents suggest that data analytics will be covered in
the regular accounting curriculum (e.g., cost, AIS, financial, and audit courses).

**Do You Feel the Need for a Specific Accounting Data Analytics Course or Is a
More General, Business Data Analytics Course Sufficient?**

There are many specific accounting questions that need to be addressed through the
use of accounting data which may not be adequately addressed by a more general
data analytics. Examples of this type of accounting questions include the following:

(1) What is the chance the company will go bankrupt?
(2) Do we extend credit or not to customers based on customer background
   (credit score, employment record and existing debt)?
(3) Can the Internal Revenue Service (IRS) find those individuals or corporations
   evading taxes using predictive techniques?
(4) Can we predict when the financial statements might be misstated?

However, many of the universities currently provide more general business
data analytics courses for their accounting students. The responses from chairs of
accounting department (of the 158 respondents) show that 66.5% of respondents
would prefer to have a specific accounting data analytics course for their account-
ing students, while 29.1% of respondents believe general business data analytics
course is a preferred course.

**If You Could Predict the Future, Which Do You Think Will Happen at Your
School Regarding Data Analytics in the Accounting Curriculum? A Formal Data
Analytics Course or Covered Throughout the Curriculum?**

We are also interested in the way that data analytics will be included in the
accounting curriculum, whether as a formal data analytics course or covering
data analytics throughout the existing accounting curriculum.

The 153 responses from chairs of accounting department show that 56.2% of
respondents believe data analytics will be covered in the regular curriculum (e.g.,
cost, AIS, financial, and audit courses) and in at least one standalone data ana-
litics for accounting course; 23.5% in one or two standalone courses; and 20.3%
believe data analytics will be covered in the regular curriculum (e.g., cost, AIS,
financial, and audit courses).
In total, it appears that 79.7% (56.2% + 23.5%) of respondents plan to have at least one standalone data analytics course in their curriculum, suggesting the importance of data analytics in the accounting curriculum.

CONCLUSION

The explosion of data availability and the technology to handle that data are changing the accounting profession, providing accountants the opportunity to continue as the key financial information providers to decision-makers. Modern accountants develop an analytics mindset by being familiar with data and technologies, understanding what data is available and which data analytics techniques are required to appropriately analyze data and eventually making appropriate conclusions to help the company create value. We argue that including data analytics in the accounting curriculum is needed to properly prepare accounting graduates.

We conducted the survey of department chairs to help understand the current coverage of data analytics in accounting curricula. As the 2018 AACSB standard for accounting accreditation proposes higher requirements on data analytics, our survey additionally investigates the plan of accounting department chairs on integrating data analytics in the accounting curriculum under the new standard.

The responses of the survey showed that while 90.7% of accounting department chairs believe that data analytics should be incorporated in the accounting curriculum, only about one third of accounting departments currently have an accounting data analytics course, many arguing that slow adoption is due to the limited room in the curriculum for required courses and the shortage of qualified faculty to teach data analytics for accounting. However, most of these departments (59.3%) are planning to introduce an accounting data analytics course in the next three to five years. While the 2018 AACSB standards for accounting accreditation recommends data analytics courses to be provided at both undergraduate and graduate level, only a small proportion of respondents (20.4%) in favor of two data analytics courses in the accounting curriculum and more than half of respondents (64.1%) believe one data analytics course is enough. The majority of responses (66.5%) support an accounting data analytics course as compared to the general business analytics course. More than half of the respondents (56.2%) predict that their coverage of data analytics will be incorporated both throughout the regular accounting curriculum and in a standalone data analytics course.

In terms of the responses of the survey, we propose that the prescriptive strategies of incorporating data analytics in accounting curriculum is to introduce a data analytics course for accounting at the undergraduate level that focused on basic analytics tools such as Excel and Tableau and an advanced course at the graduate level for advanced techniques such as remote desktop, Access, and Structured Query Language for data extraction, transform, load, and analysis. To help students better adapt data analytics skills in the working places, teaching materials, and lab practices should be specialized in accounting practices instead of general business questions.
This study contributes to literature in accounting education about integrating data analytics into the accounting curriculum. This study describes the coverage of data analytics in the accounting programs which provides a clearer understanding of the supply of graduates with data analytics skills and exposes the large gap between demands of employees and supplies of academic trainings. In addition, this study reflects the reaction of accounting department chairs to the 2018 AACSB standards for accounting accreditation. Chairs of accounting departments state their expectations and plans for the transition of their current accounting program to comply with the increasing demands of data analytics in accounting. While most accounting programs have begun to approach the 2018 AACSB standards for accounting accreditation, some of the chairs experience difficulties implementing an brand-new data analytics course into their already packed accounting curriculum.

We note that our conclusions come from respondents of the survey which is subject to sample selection bias, response and/or non-response bias. For this reason, we may not be able to generalize the results of this study to the general population of accounting programs. Future research could disseminate surveys or conduct interviews to accounting graduates with data analytics skills which would help accounting faculty to better understand the learning experience of students and adjust the accounting program for the benefits of students.

NOTES


2. In an earlier question we ask if the accounting curriculum has a data analytics course, 31.8% of respondents confirm that they have one. However, for this question, only 24.3% of respondents choose “N/A already have an accounting DA course.” It might be because respondents who currently have one data analytics course in their department are planning to have an additional data analytics course in the next three to five years.

REFERENCES


APPENDIX: SURVEY OF DATA ANALYTICS FOR ACCOUNTING TEXT/COURSE

Q1. Should a data analytics accounting course be part of the accounting curriculum?

A. Yes
B. No

Q2. In the next three to five years, do you plan to have an accounting data analytics course as part of the accounting curriculum?

A. Yes
B. No
C. N/A Already have an accounting data analytics course

Q3. Do you feel the need for a specific accounting data analytics course or is a more general, business data analytics text sufficient?

A. Specific Accounting Data Analytics Course/Text
B. More General Business Data Course/Text
C. N/A

Q4. If you could predict the future, which do you think will happen at your school regarding data analytics in the accounting curriculum?

A. Data analytics only will be covered in one or two standalone courses.
B. Data analytics will be covered in the regular accounting curriculum (cost, AIS, financial, audit), but not in a standalone data analytics for accounting course.
C. Data analytics will be covered in the regular accounting curriculum (cost, AIS, financial, audit) and in at least one standalone data analytics for accounting course.
The Comparison between 2018 AACSB Standard A5 and 2013 AACSB Accreditation Standard A7

<table>
<thead>
<tr>
<th>2018 AACSB Accreditation Standard A5</th>
<th>2013 AACSB Accreditation Standard A7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td><strong>Content</strong></td>
</tr>
<tr>
<td>Consistent with mission, expected outcomes, and supporting strategies, accounting degree programs include learning experiences that develop skills and knowledge related to the integration of information technology in accounting and business. This includes the ability of both faculty and students to adapt to emerging technologies as well as the mastery of current technology.</td>
<td>Consistent with mission, expected outcomes, and supporting strategies, accounting degree programs include learning experiences that develop skills and knowledge related to the integration of information technology in accounting and business. Included in these learning experiences is the development of skills and knowledge related to data creation, data sharing, data analytics, data mining, data reporting, and storage within and across organizations.</td>
</tr>
<tr>
<td>[INFORMATION TECHNOLOGY SKILLS AND KNOWLEDGE FOR ACCOUNTING GRADUATES – NO RELATED BUSINESS STANDARD]</td>
<td>[INFORMATION TECHNOLOGY SKILLS, AGILITY AND KNOWLEDGE FOR ACCOUNTING GRADUATES AND FACULTY]</td>
</tr>
</tbody>
</table>

**Basis for Judgment**

- Consistent with mission, accounting degree programs integrate current and emerging accounting and business practices in three primary components within the curricula.
  - Information systems and business processes including data creation, manipulation/management, security, and storage.
  - Data analytics including, for example, statistical techniques, clustering, data management, modeling, analysis, text analysis, predictive analytics, learning systems, or visualization.
  - Developing information technology agility among students and faculty, recognizing the need for continual learning of new skills needed by accounting professionals.

Learning experiences may be supported by business, accounting, and other academic units.

- Student experiences integrate real-world business strategies, business acumen, privacy and security concerns, ethical issues, information systems and processes, and data management and data analytics tools. Graduates understand the capabilities of these tools, along with the impact and the associated risks and opportunities.
- Incorporate a list of current and emerging technologies used in each accounting course in appendix A-6. Do not include ordinary and usual software programs such as word processing or presentation software.
- The expectations for alignment with this standard for an accounting unit offering both undergraduate and masters level programs would be higher than for an accounting unit offering only an undergraduate program.

- Consistent with mission, accounting degree programs integrate current and emerging accounting and business statistical techniques, data management, data analytics, and information technologies in the curricula. Learning experiences may be supported by business, accounting, and other academic units.
- Student experiences integrate real-world business strategies, privacy and security concerns, ethical issues, data management, data analytics, technology-driven changes in the work environment, and the complexities of decision-making.
- Consistent with mission, graduates demonstrate the ability to effectively utilize data analytics tools, data management tools, and information technologies; graduates should understand the capabilities of these tools, along with their impact and the concomitant risks and opportunities.
- Because the review process recognizes the dynamic, interdisciplinary nature of data analytics, data management, and other information technologies, there will be a transitional period of three years, from 2013 to 2016, related to this standard. During the transition period, there should be evidence of substantive progress to address the spirit and intent of the standard.
Guidance for Documentation

- Document the integration of the three primary components noted above in the basis for judgment.
- Demonstrate a commitment to fostering technology agility among graduates and faculty.
- Document the learning strategies the unit has deployed to develop accounting graduate competencies in learning relevant technology skills (e.g., information systems, data analytics, data management, and other business information technologies) and how they are consistent with the mission, expected outcomes, and strategies.

- Document the integration of data analytics, data management and other information technologies the impact of these technologies, and the concomitant risks and opportunities within accounting degree programs, including learning experiences from other business and non-business fields or disciplines.
- Document the learning strategies the unit has deployed to develop accounting graduate competencies in data analytics, data management, and other business information technologies and how they are consistent with the mission, expected outcomes and strategies.