Beyond Excel: Software Tools and the Accounting Curriculum

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Abstract

The ability to use various software and tools is important for students entering the accounting profession. In an exploratory study, we develop a survey to assess accounting practitioners' evaluations of the importance of various software tools, as well as the importance of data analytics and data visualization skills. Responses from 197 practitioners indicate that Excel is the most frequently utilized software / tool, the most important software tool for new hires, and that Excel should be emphasized in university accounting programs. We find that the importance of Excel is consistent across different accounting areas (audit, tax, advisory, and corporate) and across all experience levels. In addition, Adobe Acrobat, PowerPoint, accounting / ERP software, and the FASB Codification were identified as frequently utilized across the various accounting areas and experience levels. Finally, practitioners in each of the different accounting areas and at all experience levels indicate data analytic skills and data visualization skills are important, but that data analytic skills are perceived as more important than data visualization skills. Our study contributes to the accounting information systems literature by identifying the specific software and tools that are relevant to the profession and provides guidance on the software and tools that should be emphasized in university accounting programs.

INTRODUCTION

The accounting profession is closely associated with numerous technologies and applications that enable the more efficient and effective processing and analysis of financial data. From basic spreadsheet software such as Excel to complex enterprise resource planning applications like SAP, accountants use numerous software and tools to accomplish a range of objectives. With the variety of software used in the profession, it becomes important for accounting educators to understand the following question: What specific technology software and tools should accounting programs emphasize?

The importance of information technology (IT) in accounting is recognized by the Pathways Commission (2012), which calls for academic accounting programs to identify and integrate current and emerging accounting and business information technologies throughout the accounting curricula. Specifically, the Pathways Commission (2012, p.72) identifies specific technologies, such as "data visualization, enterprise business services, telecommunication, cloud infrastructure, integrated audit modules, database dashboard metrics…" as "dramatically reshaping the policies and processes of the profession." The Pathways Commissions (p. 73) goes on to refer to the lack of focus on technologies in accounting programs as a "curricular deficit," creating a risk for graduates who "are expected to effectively and efficiently utilize and understand technologies and their capabilities, impacts, risks, and opportunities to add value to their organization."
Incorporating IT into the accounting curriculum is often problematic, in part due to the rapid pace of technology change and innovation (Badua et al. 2011), the limited experience and education of faculty in the specific technologies (Boritz and Stoner 2014), and the lack of recognition and incentives for faculty to focus on curriculum development (Boulianne 2016). With these barriers, it becomes even more critical for accounting educators to hone in on the specific technology areas that should be emphasized in accounting programs.

This paper answers the call by the Pathway Commission (2012) for additional research focused on enhancing learning experiences to integrate technology into accounting courses and across the accounting curriculum. In an exploratory study, we develop a survey to assess accounting practitioners' evaluations of the importance of various software tools as well as the importance of data analytics and data visualization skills. Responses from 197 practitioners indicate that Excel is the most frequently utilized software / tool, the most important software tools for new hires, and that Excel should be emphasized in university accounting programs. The importance of Excel is consistent in different accounting areas (audit, tax, advisory, and corporate) and across all experience levels. In addition, Adobe Acrobat, PowerPoint, accounting / ERP software, and the FASB Codification were identified as frequently utilized across various accounting areas and experience levels. Finally, practitioners in each of the different accounting areas and at all experience levels indicate data analytic skills are more important than data visualization skills.

The remainder of the paper is organized as follows. First, we begin with a review of the accounting literature for recommendations on specific software and tools that should be integrated into accounting programs. Second, we develop and deploy a survey to explore the specific types of software and applications that are important to accounting professionals. Third, we present the results of the survey. Fourth, we develop recommendations based on the results and identify areas for future research.

LITERATURE REVIEW

Within the accounting discipline, a stream of research has investigated the general topics that should be covered in the AIS curriculum. One of the early works in this area is Davis and

Leitch (1988), who survey accounting professionals and faculty to develop a list of topics applicable to undergraduate and graduate AIS courses. Bain et al. (2002) focus on the topical coverage of the first AIS course in the undergraduate program and identify the following as especially important topics: 1) an introduction to systems; 2) internal control; and 3) transaction processing. Badua et al. (2011) recognize the swiftly changing nature of AIS and use content analysis to identify 70+ possible topics that have been addressed in AIS classes, from expert systems to flowcharts to XBRL. From a broader, IT perspective, Tam (2013) identifies 18 topics in IT knowledge and skills particularly relevant to accounting graduates. In contrast, Sledgianowski et al. (2017) focus on a specific timely topic of integrating big data competencies into the accounting curriculum. A common theme among these studies is the growing expectation that AIS educators in particular provide leadership in technology-related decisions relevant to the overall accounting curriculum.

As the list of technologies relevant to AIS grows longer and broader, one tool remains at the forefront in importance to the profession: Excel. Numerous articles concerning Excel have appeared in practitioner-oriented journals, e.g., Collins 2017, Lenning 2014. In the academic literature, Brown and Pike (2010) cite a KPMG study where Excel has been identified as being used almost twice as often as other software such as Audit Control Language (ACL) or Access. More recently, Ragland and Ramachandran (2014) confirm that public accounting firms are seeking graduates proficient in Excel and identify specific topics and functions of Excel particularly applicable to new graduates. Similarly, Rackliffe and Ragland (2016) explore Excel in the accounting curriculum from the perspective of accounting faculty, finding that faculty understand the importance of Excel in public accounting and the need to improve students' overall proficiency in Excel.

Excel's importance, however, is not limited to public accounting. For example, Bradbard et al. (2014) explore spreadsheet usage by management accountants and identify a list of 37 skills and competencies associated with spreadsheet expertise. Jacobs et al. (2016) position Excel as the tool of choice in facilitating strategic managerial decisions, and Ojua (2016) studies the perception of Excel usage and financial reporting in manufacturing firms, with emphasis on the control risks associated with spreadsheets.

With this prominence of Excel in the accounting profession, accounting educators have embraced Excel in the development of teaching cases. For example, Hinson et al. (2015) develop an instructional case related to billable hours using an Excel spreadsheet, while Cornell et al. (2014) use Excel as the foundation for a multi-year accounting cycle project. From an audit perspective, Bagley and Harp (2012) demonstrate the concept of electronic work papers and tick marks through an Excel-based case of auditing property, plant, and equipment.

It is within this rapidly changing technology environment and the conflicting objectives of breadth of exposure to various software tools versus depth of expertise in Excel, as well as the growing expectation that AIS faculty provide technology guidance and leadership, that AIS educators in particular are faced with this question: What specific software tools and technologies should be emphasized in accounting programs? To answer this fundamental question, we perform an exploratory study to better understand the relevant software tools applicable for today's graduates. Specifically, we address the following questions:

Q1: Is Excel the most important software tool for accounting professionals?
Q2: Are there other software tools that university accounting programs should prioritize?
Q3: To what extent should data analytics and data visualization be incorporated into the technology mix of university accounting programs?

METHODS

Survey Development

In order to investigate our research questions, we developed a survey targeted at accounting professionals in various stages of their careers. The primary effort in the development of the survey focused on identifying the list of software tools applicable to the profession. We focus our survey on public accounting because public accounting represents the entry-level job placement for many graduates of accounting master's programs. We started the development of the list by identifying the current software tools that are used in our university's accounting program. We then reviewed this list with the accounting faculty members in the department to ensure we had coverage of the different topical areas in accounting (e.g., audit, tax, financial, managerial, and systems). Next, we reviewed our items with two practitioners from Big 4 accounting firms and one practitioner from a large regional firm. Our final list consists of the 14 software and tools presented in Table 1. For our analysis, we grouped IDEA and ACL together and presented the combined results as "Audit Software," and we grouped SAP, Quickbooks, and Peachtree as "Accounting / ERP Software."[1]

TABLE 1: Software Tools Included in Survey	
Brand	**Category**
Microsoft Excel	Spreadsheet Software
Microsoft Access	Database
Visual Basic For Applications	Programming Language
ACL	Generalized Audit Software
Caseware (IDEA)	Generalized Audit Software
SAP	Accounting / ERP Software
Sage 50 (formerly Peachtree)	Accounting / ERP Software
Quickbooks	Accounting / ERP Software
Checkpoint	Tax Research Software
Microsoft Project	Project Management
Tableau	Data Visualization
Microsoft PowerPoint	Presentation Software
FASB Accounting Standards Codification	Accounting Standards
Adobe Acrobat	PDF Document Management

The survey first gathers participants' demographic information including years of accounting experience, gender, age, CPA certification, and primary accounting area.[2] Next, participants evaluate their frequency of use for each of the 14 software tools. Participants then evaluate how much emphasis they believe university accounting programs should place on teaching each of the 14 software tools, as well as select which of the software tools they believe are the most important for new hires during the first two years in the accounting profession. Finally, participants indicate the importance of incorporating data analytics and data visualization skills into a Masters of Accountancy program and the importance of those skills for audit associates, tax associates, and advisory associates. Data analytics is defined for participants as "the examination of data to uncover hidden patterns, correlations, and insights," while data visualization is defined as "a general term that describes any effort to help people understand the significance of data by placing it in a visual context."

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[1] We thank an anonymous reviewer for suggesting the grouping of similar software tools.
[2] The full survey is available upon request from the lead author.

Sample

The survey was implemented with Qualtrics and deployed online to graduates from the Masters of Science in Accountancy program from a regional university in the Southeast United States. The survey was emailed to 703 participants. We had 197 completed responses, for a response rate of 28.0 percent. As shown in Table 2, participants have a mean age of 31.67 years and a mean of 6.44 years of accounting experience. Participants consist of 89 females (45.2 percent) and 106 males (53.8 percent) with two other participants choosing not to indicate their gender. One-hundred twenty-two (61.9 percent) participants have an active CPA license. Lastly, 63 (32.0 percent) participants indicate public accounting audit as the primary area of accounting in which they currently work, 39 (19.8 percent) in public accounting tax, 21 (10.7 percent) in public accounting advisory, 52 (26.4 percent) in corporate, nine (4.6 percent) as sole-practitioner / self-employed, seven (3.6 percent) in not-for-profit, three (1.5 percent) in education, and 30 (15.2 percent) in another area.[3]

TABLE 2: Sample Descriptive Statistics			
	n[a]	Mean	SD
Years of Accounting Experience	195	6.44	4.82
Age	197	31.67	6.42
Gender:	Count	Percentage	
Male	106	53.8%	
Female	89	45.2%	
Missing	2	1.0%	
Primary area in which accounting participants currently work[b]:			
Public Accounting – Audit	63	32.0	
Public Accounting – Tax	39	19.8	
Public Accounting – Advisory	21	10.7	
Corporate	52	26.4	
Sole-Practitioner / Self-Employed	9	4.6	
Not-for-Profit	7	3.6	
Education	3	1.5	
Other	30	15.2	
Active CPA:			
Yes	122	61.9	
No	75	38.1	
[a] Final sample consisted of 197 participants. An "n" not equal to 197 indicates some participants did not provide the information.			
[b] Twenty participants selected multiple primary areas of accounting.			

[3] Participants were allowed to select multiple primary areas of accounting. Twenty participants did select multiple primary areas of accounting.

RESULTS

All of the statistical analyses presented in the following results section were also performed utilizing comparable nonparametric analyses. The nonparametric results were consistent with the parametric results except where specifically noted.

Research Questions One and Two

The first research question explores whether Excel is the most important tool for accounting professionals, while the second question explores what other software tools university accounting programs should prioritize in the curriculum. To investigate these questions, we ask participants to respond to three questions about each of the 14 software tools. First, participants indicate how frequently they use each software tool as part of their current job (or most recent accounting-related position).[4] Respondents ranked their frequency of use on a seven-point Likert-type scale with 1: "Not at all," 2: "Infrequently," 3: "Somewhat Infrequently," 4: "Neither Frequently Nor Infrequently," 5: "Somewhat Frequently," 6: "Frequently," and 7: "Very Frequently." Second, participants indicate how much emphasis university accounting programs (undergraduate or graduate) should place on teaching and using each software tool.[5] Responses are on a five-point Likert-type scale with 1: "Do not emphasize at all," 2: "Emphasize a little," 3: "Emphasize somewhat," 4: "Emphasize," 5: "Emphasize strongly." Third, participants select which of the 14 software tools they believe are the most important for new hires during their first two years in the accounting profession (participants may select more than one).[6]

Frequency of Use

Results for the frequency of use question are shown in Table 3. Participants indicate that Excel (6.92), Adobe Acrobat (6.34), PowerPoint (4.27), and accounting / ERP software (3.68) are the four most frequently utilized software tools. Each of these four are significantly different from each other (all $p < 0.012$, two-tailed), and they are each significantly different from each of the other seven software tools (all $p < 0.001$, two-tailed) with the exception of accounting / ERP software and the FASB codification ($p = 0.207$, two-tailed). Responses for the top four [Excel ($p < 0.001$, two-tailed), Adobe Acrobat ($p < 0.001$, two-tailed), PowerPoint ($p = 0.052$, two-tailed), and accounting / ERP software ($p = 0.079$, two-tailed] are also significantly greater than the scale midpoint of 4.0. Together, these results suggest that professionals utilize Excel the most, followed by Adobe Acrobat, PowerPoint, and accounting / ERP software.

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[4] Participants evaluated their frequency of use for SAP, Quickbooks, and Peachtree. The highest assessment of the three software was utilized as their accounting / ERP software frequency assessment. Participants evaluated their frequency of use for IDEA and ACL audit software. The higher assessment of the two software was utilized as their audit software frequency assessment.

[5] Participants evaluated their emphasis for SAP, Quickbooks, and Peachtree. The highest assessment of the three software was utilized as their accounting / ERP software emphasis assessment. Participants evaluated their emphasis for IDEA and ACL audit software. The higher assessment of the two software was utilized as their audit software emphasis assessment.

[6] If a participant selected SAP, Quickbooks, or Peachtree as most important, the participant was counted as having evaluated accounting / ERP software as most important. If a participant selected IDEA or ACL audit software as most important, the participant was counted as having evaluated audit software as most important.

Table 3: Frequency of Use in Participants' Current Job

Survey item: How FREQUENTLY do you use this software / tool as part of your current job (or most recent accounting-related position)?

Scale: 1: "Not at all" 2: "Infrequently" 3: "Somewhat Infrequently" 4: "Neither Frequently Nor Infrequently" 5: "Somewhat Frequently" 6: "Frequently" 7: "Very Frequently"

Software	All Participants[a]	Years of Accounting Experience[b]			Sole Primary Accounting Area[c]			
		Less Than 4 Years	4 – 7.5 Years	Greater Than 7.5 Years	Audit	Tax	Advisory	Corporate
	(n=190)	(n=64)	(n=60)	(n=64)	(n=49)	(n=27)	(n=13)	(n=45)
Excel	6.92[d]	7.00[d]	6.85[d]	6.89[d]	7.00[d]	6.93[d]	7.00[d]	6.98[d]
Adobe Acrobat	6.34	6.20	6.38	6.44	6.41	6.85	6.39	6.00
PowerPoint	4.27	3.63	4.63	4.63	4.04	2.93	5.62	4.89
Acctg. / ERP Software[e]	3.68	3.38	3.33	4.25	3.27	3.93	4.46	3.24
FASB Codification	3.38	3.52	3.07	3.47	5.18	2.15	2.77	3.11
Tax Research	2.33	2.53	1.95	2.52	1.74	4.85	1.23	1.84
Audit Software[f]	2.25	2.63	2.03	2.06	2.98	1.89	2.23	1.93
Access	1.91	1.77	1.88	2.09	1.61	1.44	2.23	1.84
Microsoft Project	1.60	1.45	1.73	1.56	1.61	1.04	2.62	1.62
VBA	1.43	1.53	1.30	1.45	1.39	1.07	2.08	1.47
Tableau	1.36	1.20	1.38	1.50	1.29	1.04	2.15	1.20

[a] Participants were included only if they completed frequency questions for all software.

[b] Participants that provided years of accounting experience and completed frequency questions for all software were divided into three groups based on years of accounting experience.

[c] Participants were included only if they indicated audit, tax, advisory or corporate as their only primary accounting area and completed frequency questions for all software.

[d] Bold numbers denote top four software in each participant group.

[e] Participants evaluated their frequency of use for SAP, Quickbooks, and Peachtree. The highest assessment of the three software was utilized as their Acct. / ERP Software frequency assessment.

[f] Participants evaluated their frequency of use for IDEA and ACL audit software. The higher assessment of the two software was utilized as their Audit Software frequency assessment.

To further analyze the frequency of use, we divide our participants into three groups based on years of accounting experience: 1) less than four years; 2) four to seven-and-a-half years; and 3) greater than seven-and-a-half years. As shown in Table 3, for each subgroup, the top three most frequently used software tools are Excel, Adobe Acrobat, and PowerPoint. For the lowest experience group, the fourth most frequently used software is the FASB codification, while the fourth software for the two more experienced groups is accounting / ERP software. Interestingly, the frequency of use for PowerPoint is significantly greater ($p = 0.003$ for each, two-tailed) for the two more experienced groups (4.63 each) as compared to the lowest experience group (3.63). This may be due to changing roles as accountants advance in their careers, with more data analysis and detailed work at the beginning of their careers and more client and firm presentations at later points.

We also investigate the frequency of use for participants who identified a specific primary accounting area of audit, tax, advisory, or corporate.[7] As shown in Table 3, audit associates most frequently utilize Excel (7.00), Adobe Acrobat (6.41), the FASB Codification (5.18), and PowerPoint (4.04). Tax associates most frequently utilize Excel (6.93), Adobe Acrobat (6.85), tax research software (4.85), and accounting / ERP software (3.93). Advisory associates most frequently use Excel (7.00), Adobe Acrobat (6.39), PowerPoint (5.62), and accounting / ERP software (4.46). Corporate accountants most frequently use Excel (6.98), Adobe Acrobat (6.00), PowerPoint (4.89), and accounting / ERP software (3.24). These findings suggest that regardless of accounting area, all accountants most frequently utilize Excel and Adobe Acrobat to perform their duties. Furthermore, PowerPoint is frequently used by the accountant groups, with the exception of tax professionals, and accounting / ERP software is frequently used by the accountant groups, with the exception of audit professionals.

University Accounting Programs

Table 4 highlights the software tools that should be emphasized in university accounting programs. Participants indicate that Excel (4.86), Adobe Acrobat (3.95), the FASB Codification (3.63), and PowerPoint (3.52) should be emphasized the most in accounting programs. Excel is significantly different than every other software tool (all $p < 0.001$, two-tailed), as is Adobe Acrobat (all $p < 0.021$, two-tailed). The FASB Codification and PowerPoint are not significantly different from each other ($p = 0.442$, two-tailed), but they are both significantly different from each of the other nine software tools (all $p < 0.021$, two-tailed). Responses for the top four (Excel, Adobe Acrobat, the FASB Codification, and PowerPoint) are also significantly greater than the scale midpoint of 3.0 (all $p < 0.001$, two-tailed). Together, these results suggest that accounting professionals believe that all four of these software tools should be emphasized in University accounting programs, with Excel receiving the most emphasis. To further analyze which software tools should be emphasized, we again divide our participants into subgroups. As shown in Table 4, for each of our three subgroups based on years of accounting experience, the top four software tools to be emphasized continue to be Excel, Adobe Acrobat, the FASB Codification, and PowerPoint, although accounting / ERP software does move into a tie for fourth with the FASB Codification for participants in the middle experience group. Consistent with the findings for frequency of use, the emphasis to be placed on PowerPoint for the lowest experience group (3.16) is significantly less than the middle experience group (3.79, $p = 0.008$, two-tailed) and the most experienced group (3.74, $p = 0.011$, two-tailed)[8]. Again, this may be due to the changing roles as accountants advance in their careers, with more data analysis and detailed work at the beginning of their careers and more client and firm presentations at later points.

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[7] We excluded the twenty participants who selected multiple primary areas of accounting in order to focus on participants with a sole primary area of accounting. We believe this gives us the best sub-samples to investigate software tools use separately for audit associates, tax associates, advisory associates, and corporate accountants.

[8] Nonparametric comparisons of medians across groups provide inconsistent results suggesting the lowest experienced group assessed the emphasis for PowerPoint as significantly lower than the highest group ($p = 0.021$, two-tailed) but not the middle group ($p = 0.297$, two-tailed).

Table 4: Emphasis of Software in University Accounting Program

Survey item: How much EMPHASIS should university accounting programs (undergraduate or graduate) place on teaching and using this software / tool?

Scale: 1: "Do not emphasize at all" 2: "Emphasize a little" 3: "Emphasize somewhat" 4: "Emphasize" 5: "Emphasize strongly"

Software	All Participants[a]	Years of Accounting Experience[b]			Sole Primary Accounting Area[c]			
		Less Than 4 Years	4 – 7.5 Years	Greater Than 7.5 Years	Audit	Tax	Advisory	Corporate
	(n=174)	(n=62)	(n=52)	(n=58)	(n=50)	(n=24)	(n=13)	(n=40)
Excel	**4.86[d]**	**4.94[d]**	**4.89[d]**	**4.78[d]**	**4.92[d]**	**4.75[d]**	**4.85[d]**	**4.95[d]**
Adobe Acrobat	3.95	4.07	3.87	3.95	3.98	4.21	3.85	3.93
FASB Codification	**3.63**	3.76	3.35(tie)	**3.72**	**4.46**	2.67	3.08	**3.68**
PowerPoint	**3.52**	3.16	**3.79**	**3.74**	**3.40**	2.42	**3.92**	**4.10**
Acctg. / ERP Software[e]	3.13	2.95	3.35(tie)	3.10	2.88	**2.79**	**3.23**	3.33
Tax Research	2.81	2.74	2.65	3.00	2.24	**4.04**	1.92	2.85
Audit Software[f]	2.56	2.77	2.44	2.43	2.76	2.29	2.39	2.78
Access	2.47	2.27	2.60	2.57	2.32	1.88	2.77	2.68
Microsoft Project	1.91	1.74	2.21	1.81	1.88	1.21	2.08	2.03
VBA	1.82	1.89	1.77	1.78	1.80	1.21	2.39	1.90
Tableau	1.62	1.42	1.73	1.69	1.52	1.25	2.08	1.58

[a] Participants were included only if they completed emphasis questions for all software.
[b] Participants that provided years of accounting experience and completed emphasis questions for all software were divided into three groups based on years of accounting experience.
[c] Participants were included only if they indicated audit, tax, advisory or corporate as their only primary accounting area and completed emphasis questions for all software.
[d] Bold numbers denote top four software in each participant group.
[e] Participants evaluated their emphasis of each SAP, Quickbooks, and Peachtree. Whichever of the three software participants rated as highest was utilized as their Acct. / ERP Software emphasis assessment.
[f] Participants evaluated their emphasis of each IDEA and ACL audit software. Whichever of the two software participants rated as highest was utilized as their Audit Software emphasis assessment.

For each of the four subgroups based on a specific primary accounting area, we find that audit associates and corporate accountants identify Excel, Adobe Acrobat, the FASB Codification, and PowerPoint as the four software tools to emphasize the most. Tax associates select Excel and Adobe Acrobat as the two highest, followed by tax research software and accounting / ERP software. Advisory associates select Excel and PowerPoint as the two highest, followed by Adobe Acrobat and accounting / ERP software. These findings suggest that regardless of accounting experience or accounting area, accountants believe Excel and Adobe Acrobat should be emphasized in University accounting programs, whether in the accounting classes themselves or as part of the overall business curriculum. Furthermore, the results show that PowerPoint, accounting / ERP software, and the FASB Codification are also important to emphasize, as well as tax research software for tax accountants.

New Hires

Table 5 identifies the software tools that are the most important for new hires in the accounting profession. For this question, participants were allowed to select more than one answer. Of the 196 participants that completed this question, 195 (99.5 percent) selected Excel, 118 (60.2 percent) selected Adobe Acrobat, 72 (36.7 percent) selected the FASB Codification, and 69 (35.2 percent) selected PowerPoint. For each of our three subgroups based on years of accounting experience, the top two software tools were always Excel and Adobe Acrobat. For the lowest experienced group the FASB Codification and audit software were third and fourth, respectively. For the middle experienced group, PowerPoint and accounting / ERP software were third and fourth, respectively. Consistent with the overall results, for the most experienced group, the FASB Codification and PowerPoint were the third and fourth, respectively. For each of the four subgroups based on a specific primary accounting area, Excel is the most selected software tool, with Adobe Acrobat in the top four for each group. Audit associates selected the FASB Codification and audit software in their top four; tax associates selected accounting / ERP software and tax research software in their top four; advisory associates selected PowerPoint and audit software in their top four; and corporate accountants selected the FASB Codification and PowerPoint in their top four. These findings suggest that regardless of accounting experience or accounting area, accountants believe Excel and Adobe Acrobat are two of the most important software tools for new hires in accounting.

Overall, the analysis of these three areas (frequency of use, emphasis in accounting programs, and importance for new hires) reveal a consistent story. Regardless of experience or accounting area of expertise, Excel and Adobe Acrobat are perceived as essential skills for all accountants. Clearly, university accounting programs need to provide students with enough knowledge and hands-on learning exercises for both of these tools. Furthermore, programs that can provide students with strong PowerPoint skills, exposure to accounting / ERP software, and experience with the FASB Codification will help their graduates succeed in the accounting profession throughout their career. The results also show that university accounting programs with different accounting tracks or concentrations (e.g., audit, tax, advisory, corporate) may benefit from including area-specific software tools in the tracks' curriculum instead of or in addition to the above core software tools. For example, students in a program with a tax track may benefit from less coverage of the FASB Codification and PowerPoint and more coverage of tax research software and accounting / ERP software. Likewise, students in an advisory track may benefit from less FASB Codification coverage and more emphasis on accounting / ERP software.

Table 5: Most Important Software for New Hires

Survey item: Please select the software / tools that you believe are the MOST IMPORTANT for new hires during their first two years in the accounting profession. (participants may select more than one)

Software	All Participants[a] (n=196)	Years of Accounting Experience[b]			Sole Primary Accounting Area[c]			
		Less Than 4 Years (n=66)	4 – 7.5 Years (n=60)	Greater Than 7.5 Years (n=68)	Audit (n=52)	Tax (n=27)	Advisory (n=13)	Corporate (n=46)
Excel	195 (99.5%)[d]	66 (100.0%)[d]	59 (98.3%)[d]	68 (100.0%)[d]	52 (100.0%)[d]	26 (96.3%)[d]	13 (100.0%)[d]	46 (100.0%)[d]
Adobe Acrobat	118 (60.2%)	44 (66.7%)	34 (56.7%)	40 (58.8%)	34 (65.4%)	24 (88.9%)	7 (53.8%)	21 (45.7%)
FASB Cod.	72 (36.7%)	24 (36.4%)	16 (26.7%)	30 (44.1%)	28 (53.8%)	2 (7.4%)	1 (7.7%)	21 (45.7%)
PowerPoint	69 (35.2%)	15 (22.7%)	26 (43.3%)	28 (41.2%)	17 (32.7%)	3 (11.1%)	9 (69.2%)	19 (41.3%)
Acct/ERP Soft[e]	52 (26.5%)	12 (18.2%)	19 (31.7%)	20 (29.4%)	8 (15.4%)	11 (40.7%)	1 (7.7%)	11 (23.9%)
Audit Soft.[f]	45 (23.0%)	18 (27.3%)	12 (20.0%)	15 (22.1%)	18 (34.6%)	5 (18.5%)	2 (15.4%)	10 (21.7%)
Tax Research	31 (15.8%)	8 (12.1%)	8 (13.3%)	15 (22.1%)	3 (5.8%)	10 (37.0%)	0 (0.0%)	7 (15.2%)
Access	21 (10.7%)	5 (7.6%)	7 (11.7%)	9 (13.2%)	2 (3.8%)	0 (0.0%)	1 (7.7%)	8 (17.4%)
VBA	8 (4.1%)	5 (7.6%)	1 (1.7%)	2 (2/9%)	2 (3.8%)	0 (0.0%)	1 (7.7%)	1 (2.2%)
Microsoft Proj	5 (2.6%)	1 (1.7%)	1 (1.7%)	3 (4.4%)	1 (1.9%)	0 (0.0%)	1 (7.7%)	2 (4.3%)
Tableau	2 (1.0%)	0 (0.0%)	0 (0.0%)	2 (2.9%)	1 (1.9%)	0 (0.0%)	1 (7.7%)	0 (0.0%)

[a] Participants were included only if they selected at least one software.

[b] Participants that provided years of accounting experience and selected at least one software were divided into three groups based on years of accounting experience.

[c] Participants were included only if they indicated audit, tax, advisory or corporate as their only primary accounting area and they selected at least one software.

[d] Bold numbers denote top four software in each participant group.

[e] Participants were able to select as most important SAP, Quickbooks, and/or Peachtree. If any of the three software were selected as most important participants were counted as having evaluated Acct. / ERP Software as most important.

[f] Participants were able to select as most important IDEA and/or ACL audit software. If either of the two software were selected as most important participants were counted as having evaluated Audit Software as most important.

Research Question Three

The third research question explores the extent that data analytics and data visualization should be incorporated into the technology mix of university accounting programs at the graduate level. To investigate this question, we ask participants to respond to two questions. First, participants assess the importance of incorporating data analytics into a Masters of Accountancy curriculum and then assess the importance of incorporating data visualization into the curriculum. Second, participants assess the importance of data analytic skills and data visualization skills for audit associates, tax associates, and advisory associates. Responses for all of these data analytic and data visualization questions are on a five-point Likert-type scale with 1: "Not at all important," 2: "A little important," 3: "Somewhat important," 4: "Important," 5: "Extremely important."

<u>Masters of Accountancy Programs</u>

Results exploring the importance of incorporating data analytics and data visualization into Masters of Accountancy programs are presented in Table 6. Participants assess the importance of incorporating both data analytics and data visualization as significantly above the scale midpoint of 3.0 ($p < 0.001$). However, the mean for the importance of incorporating data analytics (3.98) is significantly greater than the mean for incorporating data visualization (3.52) ($p < .001$, two-tailed). When looking at results across the three groups based on accounting experience, data analytics is assessed as more important by all three groups (all $p < 0.001$, two-tailed). Interestingly, the lowest experienced group assessed the importance of data analytics (3.65) significantly lower than the middle experienced group (4.10, $p = 0.017$, two-tailed) and the highest experienced group (4.18, $p = 0.004$, two-tailed).[9] The lowest experienced group also assessed the importance of data visualization (3.18) significantly lower than the middle experienced group (3.57, $p = 0.061$, two-tailed) and the highest experienced group (3.79, $p = 0.002$, two-tailed).[10] This may suggest that the importance of data analytics and data visualization increases as accountants gain more experience.

For groups based on the specific primary accounting area, audit associates and corporate accountants assess the importance of data analytics significantly higher than data visualization ($p < 0.001$ two-tailed and $p = 0.002$ two-tailed, respectively). While advisory associates and tax associates also assess the importance of incorporating data analytics higher than data visualization, the differences are not significant ($p = 0.463$ two-tailed and $p = 0.746$ two-tailed, respectively). Responses for data analytics for both audit associates and corporate accountants are significantly higher than responses from advisory and tax associates (all $p < 0.043$, two-tailed).[11] Together, these results suggest it is more important to incorporate data analytic skills (rather than data visualization skills) into Masters of Accountancy programs, especially for students planning to become auditors or entering corporate accounting.

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[9] Nonparametric comparisons of medians across groups provide inconsistent results suggesting the lowest experienced group is not significantly different from the middle group ($p = 0.483$, two-tailed) nor the highest group ($p = 0.159$, two-tailed).

[10] Nonparametric comparisons of medians across groups provide inconsistent results suggesting the lowest experienced group is not significantly different from the middle group ($p = 0.247$, two-tailed) but are different than the highest group ($p = 0.043$, two-tailed).

[11] Nonparametric comparisons of medians across groups provide inconsistent results with audit and tax associates assessing data analytics significantly higher than tax associates ($p = 0.056$, two-tailed and $p = 0.055$, two-tailed, respectively) but neither audit nor tax assessed data analytics significantly higher than advisory associates ($p = 0.558$, two-tailed and $p = 0.569$, two-tailed, respectively).

Table 6: Importance of Data Analytics and Data Visualization

Panel A: Importance of incorporating data analytics and data visualization into Masters of Accountancy Program

Scale: 1: "Not at all important" 2: "A little important" 3: "Somewhat important" 4: "Important" 5: "Extremely important"

Skill	All Participants[a]	Years of Accounting Experience[b]			Sole Primary Accounting Area[c]			
		Less Than 4 Years	4 – 7.5 Years	Greater Than 7.5 Years	Audit	Tax	Advisory	Corporate
	(n=195)	(n=65)	(n=60)	(n=68)	(n=52)	(n=27)	(n=12)	(n=46)
Data Analytics	3.98	3.65	4.10	4.18	4.17	3.15	3.33	4.04
Data Visualization	3.52	3.18	3.57	3.79	3.38	3.11	3.08	3.76

Panel B: Importance of data analytics and data visualization skills for audit, tax, and advisory associates.

Scale: 1: "Not at all important" 2: "A little important" 3: "Somewhat important" 4: "Important" 5: "Extremely important"

Skill	Sole Primary Accounting Area[d]		
	Audit	Tax	Advisory
	(n=52)	(n=25)	(n=12)
Data Analytics for Audit Associates	4.33		
Data Analytics for Tax Associates		3.04	
Data Analytics for Advisory Associates			3.67
Data Visualization for Audit Associates	3.52		
Data Visualization for Tax Associates		2.92	
Data Visualization for Advisory Associates			3.50

[a] Participants were included only if they completed questions for both skills.
[b] Participants that provided years of accounting experience and completed questions for both skills were divided into three groups based on years of accounting experience.
[c] Participants were included only if they indicated audit, tax, advisory or corporate as their only primary accounting area and completed questions for both skills.
[d] Participants were included only if they indicated audit, tax, or advisory as their only primary accounting area.

Different Public Accounting Areas

Table 6 also presents the results exploring the importance of data analytic and data visualization skills for audit, tax, and advisory associates.[12] Audit associates assess the importance of data analytic skills for auditors (4.33) as significantly above the scale midpoint of 3.0 ($p < 0.001$, two-tailed). Tax associates (3.04) and advisory associates (3.67) did not assess the importance of data analytic skills for tax associates and advisory associates as significantly greater than the scale midpoint ($p = 0.877$ two-tailed and $p = 0.136$ two-tailed, respectively). Similarly, audit associates assess the importance of data visualization skills for auditors (3.52) significantly greater than the scale midpoint of 3.0 ($p = 0.003$, two-tailed), whereas tax (2.92) and advisory (3.50) associates did not assess the importance of data visualization skills for tax and advisory associates as significantly greater than the scale midpoint ($p = 0.765$ two-tailed and $p = 0.256$ two tailed, respectively). It is important to note that while the raw assessments by advisory associates appear to be significantly greater than the scale midpoints, the small sample size of advisory associates (n=12) limits the power of our statistical test. Together, the results suggest that data analytic and data visualization skills may be important for future audit associates and perhaps advisory associates.

DISCUSSION

In this exploratory study utilizing 197 accounting practitioners, we find continuing strong evidence of the dominance of Excel in the accounting profession as consistent with prior research, e.g., Ragland and Ramachandran (2014); Rackliffe and Ragland (2016). Excel is the software tool most frequently used by accountants, both by new hires and by experienced accountants. In addition, Excel is identified as the tool that should be the most emphasized in university accounting programs. This finding is consistent across audit, tax, advisory, and corporate accounting.

A somewhat surprising finding is the extent of usage of Adobe Acrobat in the accounting profession. Our results indicate that Adobe Acrobat is an important software tool across all accounting areas and experience levels and should also be emphasized in accounting curriculums. However, this study does not address the reasons Adobe Acrobat is important. Future research could delve further into the specific features of Adobe Acrobat that are useful to accountants, especially in support of document creation and the editing of workpapers. Relevant features in Adobe Acrobat include editing / version control, document security, comment management, and document approvals. Perhaps general word processing software (i.e., Microsoft Word) is used for initial document preparation and editing, and then Adobe Acrobat is used later in the document management process for creating final versions and publication. The creation, management, and tracking of workpapers is a possible area to incorporate into a case study or exercise in an accounting context that could be beneficial to accounting students.

In addition to Excel and Adobe Acrobat, this study finds that PowerPoint, accounting / ERP software, and the FASB Codification are three other important software tools for accountants across accounting areas and experience levels. Accounting programs can benefit students if the curriculum includes hands-on experiences with these software tools.

In the burgeoning area of data analytics and data visualization, we find that data analytics is perceived to be an important skill for most accounting areas and experience levels. Our line of inquiry makes the distinction between data analytics and data visualization, with the results indicating that while data visualization is somewhat important, it is currently not perceived to be as important as data analytics. Future research is needed to explore the reasons for the different

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[12] We focused on public accounting areas as the majority of Master of Accountancy students secure jobs in public accounting.

perceptions between data analytics and data visualization and determine if these differences are indeed consistent over time. Future research should also investigate whether these perceptions are consistent across firms (e.g., Big Four, national, regional, local). The results also suggest that the two more experienced groups assessed the importance of data analytics and data visualization as greater than the lowest experience group. This may suggest that accountants early in their career focus on learning the "basics" of their area and then progress later in their career to focus on more complex data analytics and data visualization. Future research could explore when accountants start utilizing data analytic and data visualization in their career and for what specific tasks.

Like all research studies, this study has limitations. First, the initial list of software tools was generated from the primary perspective of public accounting. Because public accounting represents the entry-level job placement for many graduates of accounting master's programs, we focused our software tools list for applicability in public accounting. We recognize this as a limitation in that we did not actively seek to include the perspective of other accounting areas, such as systems, corporate, or governmental accounting. This represents an opportunity for future research on assessing any differences in Excel skills required by the different accounting areas. Second, while the participants did come from a variety of accounting firms and corporations, the participants were obtained from the alumni contact list of one Southeastern United States regional university. Future research could investigate the generalizability of our findings across different geographic regions, accounting firms, and companies. Of particular interest may be the differences in software tools utilized in firms of different sizes. Finally, the relatively low sample size for our tax and advisory subgroups limits the power of our statistical tests and generalizability of our findings for these subgroups.

From the results of this study, we provide six recommendations to university accounting programs. Each of these recommendations is made with the understanding that programs cannot cover everything due to resource constraints such as contact hours with students, faculty expertise, funds for training and obtaining the software tools. First, it is clear that programs should emphasize Excel heavily throughout the accounting curriculum. Second, programs should also be emphasizing Adobe Acrobat or the concepts underlying Acrobat. Third, PowerPoint, accounting / ERP software, and the FASB Codification should receive significant coverage in the accounting curriculum. Fourth, for programs that have specific tracks or concentrations (e.g., audit, tax, advisory, corporate) the top four software tools to emphasize may vary. For an advisory track, our results indicate that PowerPoint and accounting / ERP software should be emphasized, and for a tax track, accounting / ERP software and tax research software should receive considerable coverage. Fifth, accounting programs should encourage students to take elective courses outside of accounting in disciplines (e.g., management information systems, computer science) that may have courses with more advanced topics and exposure to additional software and tools. Sixth, accounting programs should attempt to incorporate at least introductory-level data analytics and data visualization skills into the accounting curriculum.

The results of this study also provide four suggestions for future research. First, additional studies investigating the importance of different software tools are needed to increase the generalizability of our findings across geographic regions, firms, companies, accounting areas, and experience levels. Second, future research should explore the specific ways that Adobe Acrobat is being used by accountants and incorporate labs / exercises with Adobe Acrobat that can be utilized in different accounting courses (e.g., accounting information systems, audit, tax). Third, with the resource constraints of accounting programs, future research could investigate to what extent (i.e., breadth of coverage) each software should be covered. Fourth, our survey was designed to focus on specific software tools (brands) rather than on broader technology areas such as database querying languages (e.g., SQL) or standards related to the exchange of financial information (e.g., XBRL). A

Software Tools and the Accounting Curriculum

complimentary approach could focus on broader categories not tied to specific vendors.

   Our study contributes to the accounting information systems literature by identifying the specific software and tools that are relevant to the profession. As accounting educators, we want to ensure that students can think critically and solve problems using the applicable software and tools that are a part of the accounting profession. In order for accounting curricula to stay relevant, it is important to understand *what* software tools are being used. Future research should continue this line of inquiry and address *how* and *why* specific software tools are useful to the accounting profession.

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