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ABSTRACT

This study investigates whether AIS instructors' selection of topics adequately prepares graduates for the expectations of employers seeking candidates who can adapt to the pace of technological change. As businesses adopt new technologies, stakeholders of the accounting profession must periodically reassess educational needs in the area of accounting information systems (AIS). Because AIS is a field that encompasses a wide variety of conceptual and skill-based topics, the selection of course topics can result in a "gap" between what academics and CPA firms expect from new accountants. Given the variety of topic areas, do academics and CPAs agree on which ones to emphasize, or what levels of proficiency are appropriate for each topic?

In this study, academics and accountants, primarily in public practice, completed identical surveys regarding desired levels of proficiencies. The results suggest agreement on desired levels of proficiency regarding computer operation and use of accounting software to complete basic tasks and create reports, while suggesting differences of opinion in six other areas (understanding business cycles in an electronic environment, understanding data-sharing technologies, using XBRL, comprehending business needs and how technology could solve problems, understanding e-commerce, and the basics of safeguarding electronic accounting records). Participants concluded by offering observations about the strengths and weaknesses of newly employed accountants.

Introduction

This study compares the preferences of CPAs, primarily in public practice, and academics regarding nine key topic areas traditionally presented in accounting information systems (AIS) courses. The continuing work of the Pathways Commission provides the latest reminder of the need to reevaluate AIS topics, especially considering ongoing technological changes. As noted in the final draft of the Commission's report, "The significant gap between academic instruction and professional practice places the profession at tremendous risk of not being able to fulfill our value proposition" (Pathways Commission 2012, 73). This study contributes to the literature by investigating whether a perceived gap in AIS curricula persists.

Among accounting courses, AIS instructors typically enjoy great flexibility in course content—described as a "lack of unanimity in AIS course objectives" (Borthick 1996). Considering differences in the number of required courses and the limitations of class time, accounting programs and AIS instructors in particular face difficult decisions, including the following:

1. Which combination of AIS topics best prepares our graduates?
2. How much emphasis should programs place on each topic?
3. How skilled in each topic should accounting graduates be?

Accounting professors often reconcile the needs of their students against a number of outside influences. Differing requirements of academic institutions and efforts to plan completion of undergraduate and graduate degrees within 150 hours have reduced some program flexibility. Despite intentions to expand or integrate AIS into other courses, AIS often remains isolated as a single course in accounting curricula.

The AAA, AICPA, and other professional organizations formed the Pathways Commission to revise accounting education so that its graduates remain competitive. Researchers have identified a gap in interests between academics and accountants in practice (Hadley and Balke 1979, Marshall et al. 2010, Madden 1970, Inman, Wenzler, and Wickert 1999, Krause 2005, Lee 1989, Grumet 2001). More than a decade ago, the executive director of the New York State Society of CPAs described the education gap by saying that ". . . the academic community . . . is growing increasingly out of touch with the real world of CPA professionals" (Grumet 2001, 9). Grumet noted that despite calls for accounting faculty to have both academic and professional qualifications, accounting professors frequently do not hold professional certifications and often have limited interaction with accounting professionals. As the profession changes, this lack of certifications and interactions with the profession can hamper efforts to bridge this gap.

The accounting profession is undergoing a massive turnover in personnel. In their analysis of 2008 data, the U.S. Department of Labor notes "In addition to openings from job growth, the need to replace accountants and auditors who retire or transfer to other occupations will produce numerous job openings in this large occupation" (Bureau of Labor Statistics, 2011). As for accounting professors, ". . . the inadequate supply of accounting faculty has been exacerbated by the number of existing baby-boomer faculty beginning to retire. The exodus will increase over the next decade, since the most prevalent age of existing accounting PhD holders is 63. . . . ." (O'Reilly-Allen and Wagaman 2008, 1). In addition, " . . . A 2005 study by the American Accounting Association (AAA) and the Accounting Program Leadership Group (APLG) projects that the supply of graduating PhDs will meet only 50 percent of the demand for new professors from 2005-2008. . . .". Despite efforts by the profession and academia to combat projected shortages, researchers predict the unmet demand for accounting PhD's will extend well into the future. Dramatic changes in technology as well as historic growth in practitioner positions and turnover among academics present an opportunity to make meaningful adjustments to the AIS curricula.

To maintain fundamental skills as well as cope with technology-driven changes, the current study employed nine AIS proficiencies, organized into three broader categories:

Operational Systems Proficiencies

- Navigate computer's operating system/minor troubleshooting.
- Understand business cycles in an electronic environment.
- Navigate a major accounting software package to accomplish basic accounting tasks.

Reporting and Data-Sharing Proficiencies

- Using accounting software package to create reports.
- Understand data-sharing technologies commonly used with business partners.
- Use XBRL to meet financial statement reporting requirements.

Organizational Systems Proficiencies

- Ability to comprehend business needs and envision how technology could solve ongoing business problems.
- Understand basics of e-commerce, including the implications on accounting when using outsourced web services.
- Basics of safeguarding electronic accounting records, including backup media, network security, and disaster recovery.

Borthick described the rationale for focusing on the most basic knowledge level in this study:

> Because we are preparing accountants for 40-year careers in which user-information requirements and information technology will change many times, our responsibility is to ground students in concepts and principles that will ensure their ability to grow into a succession of jobs using evolving technologies. (Borthick 1996, 83).

However, balanced with that long-term view is the immediate need of accounting program graduates to function competently upon their entry into the profession. As a result, potential topics may include those related to basic computer operations, business cycles, internal controls and auditing, accounting software, and new technology requirements (i.e., XBRL) – all activities that new accountants may find themselves performing as they enter the profession. Given the wide variety of available technologies and functions available for accountants to work in, the choice of topics presented in this study represents an attempt to present a relatively compact list of topic areas that satisfies these competing views of "proper" AIS preparation.

As discussed above, the role of information systems and technological change in the preparation of accountants poses ever-changing challenges and opportunities. Studies in accounting education beginning more than forty years ago have recommended a curriculum that includes AIS content and that is responsive to the evolving needs of the profession. Despite involvement between both groups in creating and revising the model curriculum, a long-standing gap between accounting academics and public practitioners persists. Issues including the AIS curriculum gap, turnover in the accounting profession, and changes in accounting technology support the periodic reexamination of this topic.

Literature Review

A number of groups and researchers have examined accounting education and AIS topics in particular. First, professional groups have examined these areas. Most recently, at the urging of the U.S. Treasury Department, the American Accounting Association and the major U.S. professional organizations formed the Pathways Commission to update the model curriculum for the next generation of accountants. According to an update presented at the 2015 AIS Educators Conference (Hoover-King, 2015), the Commission has approved these Learning Objectives as Accounting Competencies in the area of Information Systems, with the appropriate level of Bloom's Taxonomy following in brackets:

- Explain how transactions are captured in an enterprise-wide information system. [Comprehension]
- Describe a conceptual framework for an information system that supports robust, real-time reporting. [Comprehension]
- Describe a conceptual framework for an information system that supports robust, real-time management reporting (e.g., activity-based costing, balanced scorecard) [Comprehension]
- Create an information system for management reporting (e.g. activity-based costing) [Application]
- Describe the information system control environment. [Knowledge]
- Identify control weaknesses (e.g., privacy risks) in an information system control environment. [Comprehension]
- Recommend appropriate controls for a specific information system control environment. [Analysis]
- Use current technologies to generate data required by SEC regulations for external reporting. [Application]
- Identify the emerging technologies available for organization information systems. [Comprehension]
- Describe the benefits, costs, and changes to risk for various emerging technologies in a given context. [Comprehension]
- Apply an emerging technology to a specific organization's information system. [Application] (Hoover-King, 2015)

In addition to standard setters, researchers have also focused on issues related to AIS education. In her dissertation on the topic, Cynthia Heagy (1987) conducted a national survey examining differences in accounting systems courses from the perspectives of academics and practitioners. In a related paper, Heagy found that both academics and practitioners agreed on the degree of emphasis needed for 20 of 59 identified AIS topics. Among the remaining 39 topics, the authors found that practitioners preferred more emphasis on 31 topics and that academics preferred more emphasis on the remaining 8 topics (Heagy and McMickle 1988, 100). This study offered evidence supporting the existence of a gap between academics' and practitioners' perspectives in the area of AIS.

Research since the mid-1990s has reflected continuation of the gap. Borthick describes systems proficiencies as "competence in the categories of information use, documentation, data modeling, system development, and internal control." (Borthick 1996, 76). She also favored a more interactive (hands-on) approach to develop problem-solving and analysis skills transferable to multiple applications. Groomer and Murthy (1996) surveyed both accounting department leaders and instructors assigned to teach AIS courses.

The researchers reported the AIS instructors tended to rank as an assistant professor or lower, were "self-trained" in the majority of cases, and placed the majority of emphasis on transaction cycles, controls and auditing. Bain, Blankley, and Smith (2002) examined twelve AIS textbooks and current AIS course syllabi as well as a survey of academics and accounting practitioners. These researchers report agreement in teaching internal control and transactions processing (greater importance) as well as software and hardware issues (moderate importance). Daigle, et al. (2007) suggested adoption of the skills-based competencies in AICPA Core Competency Framework to mitigate differences between idealistic and practical considerations. They also conducted a case study to examine implementation of the framework and reported improvement in these competencies measured by students' self-assessments. Bradford, et al. (2011) advocate for including additional documentation techniques into the accounting curriculum to support graduates with consulting interests. These studies all reflect the presence of a gap between different stakeholder groups and, to a lesser extent, among academics.

Apostolou et al, (2014) summarized AIS education research over the past thirty years appeared in the literature, organized AIS education articles into categories (empirical, descriptive, and instructional) and noted the relative dearth of research in relevant AIS education issues. Neely et. al (2015) reported on panel discussion that highlighted that AIS coverage in college programs vary greatly in instructional approach employed, AIS topics covered, and positioning of the course (year and undergraduate/graduate). Additionally, the panel discussed results of a survey of AIS educators (Herron and Premuroso, 2012) that found, among its respondents, ". . . the AIS course seems to be very eclectic, with topical coverage and content covered by instructors answering our survey all over the board."

Curtis, et al. examined the needs of both generalist and IS auditors and concluded that "To fully address the concerns of practitioners and academics alike, a renewed investment in education research on the IS preparedness of accounting students is necessary." (Curtis et al. 2009, 92). These findings highlight an apparent auditors' preparation gap.

Management accountants also view a limited preparation in AIS topics as short-sighted—noting that accounting graduates' careers potentially follow many different paths:

> . . within three to five years (of joining a large public accounting firm), 80% to 90% of these men and women have usually left public accounting . . . public accounting isn't typically the final career point for the majority of folks. It's usually management accounting. . . .
> (Schea 2008, 6).

Management accountants, like other accountants, have identified a gap between the accounting that is taught and accounting in practice (Siegel et al. 2010a). These researchers found that 63% of accounting graduates entering the workforce from 2000 to 2004 were hired outside of public accounting. This same research group also noted that the role of management accountants continues to evolve toward a "business partner" role, requiring greater proficiency in topics often taught in accounting information systems courses (Siegel et al. 2010b). These findings, coupled with openings created by retirements and position growth, result in added incentive for accounting graduates to close any gaps in their AIS preparation.

This study addresses issues omitted from earlier research. First, technology has advanced significantly since the time of the national survey presented earlier (Heagy and McMickle 1988). Second, that study focused exclusively on the undergraduate AIS course. Since that time, a number of states have adopted the 150-hour rule and other eligibility requirements. The notion of a 150-hour program actually predates the Heagy and McMickle study. An AICPA task force in the 1970s recommended a 150-semester-hour program, which included an introductory computer course and six semester hours in "Computers and Information Systems" (1979, 126). The report does not suggest, however, which courses are appropriate for graduate study.

The present study addresses the issue more broadly by asking what levels of proficiency are needed for entry into the professional workforce.

The purpose of this study is to examine whether accounting programs produce graduates with the appropriate levels of AIS proficiencies. Based on the perspectives offered by professionals, does the AIS curriculum favored by academics properly prepare graduates entering the job market? Disagreement will indicate the continued presence of a gap.

Hypotheses Development

One definition of AIS is

> . . . the information subsystem within an organization that accumulates and processes information (both financial and non-financial) from the entity's various subsystems and communicates this information to the organization's users. . . . (Bagranoff, Simkin, and Norman 2010, 511).

Though these subsystems may consist of manually prepared physical ledgers, businesses increasingly operate electronically: completing transactions using e-commerce, reporting results on-screen, and sharing data and information with internal and external stakeholders remotely. For its many benefits, interconnectivity among systems also poses threats to information security and privacy. Accountants have varying degrees of responsibility for information systems, but certainly always have responsibility for the integrity and accuracy of the accounting information reported. This definition of AIS provides a suitable framework for this study.

Measuring the levels of AIS proficiencies recommended by academics and accounting practitioners offers insights into selection of course content that can benefit all stakeholders (students, programs, profession, and prospective employees). With numerous journal articles referring to the gap phenomenon over the course of decades, the first overall hypothesis should test its current existence. Considering the notion that academics tend to favor broader, more conceptual topics while public practitioners favor more practical topics, the first hypothesis is as follows:

> ***Hypothesis 1****: There is a difference in the perceptions of the level of AIS proficiencies in nine topic areas needed by accounting graduates entering the marketplace held by accounting academics and those held by accounting practitioners.*

Hypothesis 1 considers these issues broadly. A more detailed examination appears in the supporting hypotheses, discussed in the following sections.

In 1996, the AICPA published implementation strategies to support IFAC's International Education Guideline 11 – Information Technology in the Accounting Curriculum. The International Accounting Education Standards Board (IAESB), an independent board within IFAC, revised its education guidelines and, in 2008, replaced the earlier guideline with revised International Education Standard (IES) 2 – Content of Professional Accounting Education Programs (IAESB 2008a) and the related International Education Practice Statement (IEPS) 2 – Information Technology for Professional Accountants (International Accounting Education Standards Board (IAESB) 2008b, a). IES 2 stated the content of professional accounting education should consist of three knowledge components, including information technology knowledge and competencies. IES 2 further described the third knowledge component, stating:

> "The information technology component should include the following subject areas and competencies:
>
> - general knowledge of IT
> - IT control knowledge

- IT control competences
- IT user competences, and
- one of, or a mixture of, the competences of, the roles of manager, evaluator, or designer of information systems." (IAESB 2008b, 44).

In revising its standards, the IAESB sought to update its standards and offer improved guidance to various roles served by the accounting profession. The standards delineate its guidance into pre-qualification, qualification, and post-qualification phases. This study primarily focuses on the minimum (i.e., pre-qualification) phase, of the IT knowledge component.

The IAESB's IT Knowledge describes knowledge and skill requirements in great detail through its practice statement IEPS 2. In IEPS 2's Table 1: General Knowledge of IT Topics (See Appendix B), this practice standard lists six broad topics and with a competency description sentence for each broad topic:

- "Information Technology Strategy – Candidates can explain, describe, or discuss the importance of aligning IT strategy with business strategy.
- Information Technology Architecture – Candidates can explain, describe, or discuss how IT architecture relates to the entity's business model.
- IT as a Business Process Enabler – Candidates can explain, describe, or discuss how IT impacts on the business model and business processes, and associated risks.
- Systems Acquisition and Development Process – Candidates can explain, describe, or discuss the stages of the systems acquisition and development process and understand the role of the accountant within it.
- Management of Information Technology – Candidates can explain, describe, or discuss how IT is managed within an organization, with (a) a focus on accounting systems, (b) performance monitoring, and (c) change management and procedures for updating hardware and software.
- Communication and IT – Candidates can explain, describe, or discuss IT, and the benefits and risks of IT, in relation to communication." (IAESB 2008b, 131-132).

While developed to satisfy a broad audience, the six broad topics and competency sentences are somewhat sterile and lack the appeal needed to attract potential survey participants – particularly accounting practitioners who may have never encountered these standards. Through informal pilot testing, supporting hypotheses in three areas were developed to further explore desired proficiency levels in accounting graduates.

Supporting hypotheses were organized around three categories: operational systems proficiencies, reporting/data sharing proficiencies, and organizational systems proficiencies. Prior studies have addressed the capability to simply operate a computer (operational systems proficiencies), including transaction processing. Different forms of reporting and data sharing technologies have consistently appeared in these studies as well. Lastly, organizational systems proficiencies have grown in importance—Stocks and Romney (1987) found that accountants in industry favor the "innovation" trait (the "problem solver" role) and many studies since have noted increased interest in safekeeping records and e-commerce topics. The details of these three categories are described in the following paragraphs.

The first supporting hypothesis addresses whether the prospective accountant can functionally operate a computer. "Operating a computer" includes the ability to navigate an operating system, fix minor problems,

understand business cycles (such as revenue cycle, expense cycle, etc.) in an electronic environment, and accomplish basic accounting tasks in a modern accounting software package. These topics largely appear in the subject matter discussion of Appendix 2: Topic 2 – *Information Technology Architecture* section of Table 1 (IAESB 2008b, 141-170). Though Edmonds (1988) reported differences in importance of these topics based on size of organization, the degree of importance varies among accounting practitioners. Perceptions in achieving a level of functional operational systems proficiencies are tested in the first supporting hypothesis, as follows:

> ***Hypothesis 1a****: There is a difference in the perceptions of the level of operational systems proficiencies needed by accounting graduates entering the marketplace held by accounting academics and those held by accounting practitioners.*

The second supporting hypothesis in this area addresses various alternatives for accounting output. Accounting software packages commonly include a standard report component with some built-in features. Additionally, internet-based technologies such as XBRL (eXtensible Business Reporting Language) and EDI (Electronic Data Interchange) offer a wider variety of reporting alternatives. These topics also largely appear in the subject matter discussion of Appendix 2: Topic 2 – *Information Technology Architecture* section of Table 1 (IAESB 2008a). Accounting practitioners have placed higher emphasis on reporting, but only moderate importance on new technologies, such as EDI. XBRL has not been included in previous studies. To test for the preferred levels of proficiency in the area of reporting and related technologies, a second supporting hypothesis is:

> ***Hypothesis 1b****: There is a difference in the perceptions of the level of reporting and data sharing proficiencies needed by accounting graduates entering the marketplace held by accounting academics and those held by accounting practitioners*

The third supporting hypothesis in this area considers the place of the accounting information system within the organization. Today's use of technology pervades the structure of modern businesses and organizations. Remaining attentive to technological changes for possible opportunities to further expand business or better serve existing customers also impacts general planning. This role of "problem-solver using technology" fits into IAESB's *IT as a Business Process Enabler* section (IAESB 2008a). Furthermore, storage of sensitive data and increased interconnectivity highlight the responsibility of protecting that data from outside intrusion as well as physical dangers of carelessness and nature disaster.

These aspects of security management appear in the IAESB's *Management of Information Technology* section. From Table 1, newer technologies were not tested previously and some disagreement persists about the importance of safeguarding accounting records and using technology to problem solve (IAESB 2008a). The third supporting hypothesis tests preferred levels of proficiencies benefitting the organization at large:

> ***Hypothesis 1c****: There is a difference in the perceptions of the level of organizational systems proficiencies needed by accounting graduates entering the marketplace held by accounting academics and those held by accounting practitioners.*

The present study approaches AIS proficiencies from the micro to macro perspectives. At the micro level, the study examines which basic operational skills are required to function as an accountant. The study explores proficiencies among reporting alternatives, useful both internally and externally. At the macro level, broader organizational proficiencies needed to meet the needs of others and the business. This study updates prior studies as described in the next section.

Research Methodology

To test the hypotheses above, a brief questionnaire inquiring about the desired level of proficiency for accounting graduates and the best method for obtaining the proficiencies was administered to participants. Much like IEPS 2's Table 1: General Knowledge of IT Topics (See Appendix B), participants were presented a brief description (less than 20 words each) and then asked a question for each topic. The topics and related descriptions follow:

- Operating systems navigation/minor troubleshooting – "Skills to navigate within a computer's operating system as well as troubleshoot minor problems."
- Understanding business cycles – "Understand business cycles (revenue cycle, expense cycle, etc.) when applied in an electronic environment."
- Accounting software navigation/task completion – "Navigate a major accounting software package to accomplish basic accounting tasks, such as receipting A/R payments."
- Report creation in accounting software – "Use accounting software package to create company financial, sales, and special reports."
- Understanding data-sharing technologies – "Understand extranet, EDI, and similar data sharing technologies commonly used with business partners, such as suppliers, customers, and other external parties."
- XBRL – "Use XBRL to meet financial statement reporting requirements."
- Use of technology to meet needs/problem solve – "Ability to comprehend business needs and envision how technology could solve ongoing business problems."
- E-commerce and its implications – "Understand basics of e-commerce, including the implications on accounting when using outsourced web services."
- Safeguarding accounting records – "Basics of safeguarding electronic accounting records, including backup media, network security, and disaster recovery."

Participants answered questions about the desired level of proficiency. They choose from a six-point Likert scale on levels of proficiency ranging from "No" Proficiency to "High" Proficiency, similar to the four-point Likert scale of emphasis (Heavy, Medium, Light, None) employed in earlier work (Heagy 1987). Response rates differed by group, with CPAs responding to the survey at a much lower rate than academics (Table 1). One reason for this discrepancy could be greater reliability of academic contact information vs. that of practitioners, who may change positions more frequently. Another reason may be that academics, understanding the nature of academic research, may be more inclined to support fellow researchers by responding to surveys such as this one.

The questionnaire also included two comment boxes. The first comment box gave participants the opportunity to suggest AIS topics that may have been omitted from the reduced survey list. In the second comment box, participants could comment about the study subject or the instrument itself. Forty-nine participants—twenty-four academics and twenty-five public practitioners—offered commentary in the first comment box, with some offering more insight in the second comment box. Further discussion of the comments appears in the Conclusions section.

With the exception of demographic questions customized for each group, both accounting academics and CPAs received identical survey instruments. Both instruments asked for the participants' highest level of

education and professional certifications. The academic version of the instrument, however, additionally inquired about the research interests of the academic as well as the number of AIS and total courses taught by the academic. The practitioner version of the instrument additionally inquired about the participants' industry, title, role in hiring decisions, years of professional experience, and estimates of the amount of time spent in accounting areas (e.g., auditing/attestation, taxation, etc.). The instrument was designed to thoroughly address both long-standing and emerging AIS topics, while remaining respectful of academics' and CPAs' time limitations.

The survey was conducted using an online survey hosting website. A list of accounting professors with a systems interest was identified using Hasselback's Accounting Faculty Directory. The list of accounting practitioners was obtained by purchasing an address list from a marketing firm. In all, the list of academics totaled 969 and the list of certified public accountants (hereafter, simply "CPAs") obtained from the marketing firms totaled 17,105.

Table 1 – Response Rates		
	Practitioners	Academics
Actual Number of Names on the E-Mail List	17105	970
Less: Number of Bad E-Mail Addresses (Undeliverable Mail)	953	4
Functional Number of Names on the E-Mail List	16152	966
Number of Responses after Initial E-Mail Invitation	99	16
Number of Responses after First E-Mail Reminder	126	31
Number of Responses after Final E-Mail Reminder	127	57
Less: Incomplete or Unusable Responses	(18)	(3)
Usable Responses	109	54
Response Rate	**0.67%**	**5.59%**

An initial email invitation containing the link to the online survey instrument was distributed to both groups. Two additional reminders were distributed over the next six weeks. Following examination of the data, the survey resulted in 54 usable responses from accounting academics and 109 usable responses from practicing accountants.

Data Analysis and Findings

Survey respondents represent a variety of accounting specializations and experience. Considering the disparity in the number of respondents among the groups and lack of evidence to support the normality assumption, nonparametric Mann-Whitney U-value test was applied to analyze the data collected in this study. "The Mann-Whitney U test is a nonparametric counterpart of the t test used to compare the means of two independent populations." The other assumption is that the level of data is at least ordinal (Black 2001, 692). Data collected in the study fit these criteria.

Hypothesis 1, through its three supporting hypotheses, tests whether accounting academics and practitioners agree on the level of AIS proficiencies they would recommend to accounting graduates entering the marketplace. The first of three supporting Hypothesis 1 addresses an accountant basic operational skill set, including the ability to navigate an operating system, fix minor problems, understand business cycles (such as revenue cycle, expense cycle, etc.) in an electronic environment, and accomplish basic accounting tasks in a modern accounting software package:

Table 2 – Demographic Information				
	Practitioners		**Academics**	
	Details	Totals	Details	Totals
Number of Respondents		109		54
Highest Degree Attained				
Bachelor's Degree		73		0
Master's Degree (Total):		33		6
MBA or Master's in Management	14			
Master's Degree in Accounting	13			
Master's Degree in Taxation	6			
Doctorate Degree		1		46
Other (Associate's Degree or "Some" College)		2		0
No Response		0		2
Certifications				
Certified Public Accountants (Total):		95		46
Certified Public Accountant (CPA) only	76		32	
CPA plus one other certification	11		8	
CPA plus two or more certifications	8		6	
Other Certifications (Total):		3		2
Certified Management Accountant only			1	
Certified Fraud Examiner only			1	
Certified Fraud Examiner & Accredited Valuation Analyst	1			
Chartered Accountant only	1			
Professional in Human Resources	1			
No Certifications		10		6
Place of Business				
Public Accounting		103		
Industry		3		
Other		3		
Education				54

***Hypothesis 1a**: There is a difference in the perceptions of the level of operational systems proficiencies needed by accounting graduates entering the marketplace held by accounting academics and those held by accounting practitioners.*

The results for Hypothesis 1a appear in Table 3.

Table 3
Recommended Levels of *Operational Systems Proficiencies*

AIS Topics: Operational Systems Proficiencies	Mean Rank-Practitioners (n = 109)	Mean Rank-Academics (n = 54)	Mann-Whitney U	Significance
Navigate computer's operating system/ minor troubleshooting.	83.87	78.22	2739.0	0.461
Understand business cycles in an electronic environment.	74.19	97.77	2091.5	0.001*
Navigate a major accounting software package to accomplish basic accounting tasks	82.51	80.96	2887.0	0.840

*= Significant at the 0.025 (two-tailed) level.

With regard to operational systems proficiencies, accounting academics and practitioners agreed on the level of proficiency for navigation of the computer's operating system/minor troubleshooting and navigation of major accounting software packages. While often considered basic, CPAs surprisingly favored lower levels of proficiency for understanding business cycles. As a result, hypothesis 1a is only partially supported.

Next, the second hypothesis supporting Hypothesis 1 tests for agreement about the recommended proficiencies in standard report features as well as internet-based technologies such as XBRL, extranets, EDI and other data-sharing technologies.

***Hypothesis 1b**: There is a difference in the perceptions of the level of reporting and data sharing proficiencies needed by accounting graduates entering the marketplace held by accounting academics and those held by accounting practitioners*

The results for Hypothesis 1b appear in the Table 4.

Table 4
Recommended Levels of Reporting and Data Sharing Proficiencies

AIS Topics: Reporting and Data Sharing Proficiencies	Mean Rank-Practitioners (n = 109)	Mean Rank-Academics (n = 54)	Mann-Whitney U	Significance
Using accounting software package to create reports.	83.31	79.35	2800.0	0.604
Understand data-sharing technologies commonly used with business partners.	72.03	102.12	1856.5	0.000*
Use XBRL to meet financial statement reporting requirements.	72.19	101.80	1874.0	0.000*

*= Significant at the 0.025 (two-tailed) level.

With respect to reporting and data-sharing proficiencies, accounting academics and CPAs only agreed on the level of proficiency for using accounting software package to create reports. CPAs favored lower levels of proficiency for understanding data-sharing technologies and, surprisingly, XBRL. As a result, hypothesis 1b is only partially supported.

The third hypothesis supporting Hypothesis 1 tests agreement about recommended systems proficiencies impacting the organization. These issues include e-commerce, safeguarding electronic accounting records, and ability to solve problems using technology.

Hypothesis 1c*: There is a difference in the perceptions of the level of organizational systems proficiencies needed by accounting graduates entering the marketplace held by accounting academics and those held by accounting practitioners.*

Table 5
Recommended Levels of Organizational Systems Proficiencies

AIS Topics: Organizational Systems Proficiencies	Mean Rank-Practitioners (n = 109)	Mean Rank-Academics (n = 54)	Mann-Whitney U	Significance
Ability to comprehend business needs and envision how technology could solve ongoing business problems.	76.37	93.37	2329.0	0.025*
Understand basics of e-commerce, including the implications on accounting when using outsourced web services.	73.96	98.22	2067.0	0.001*
Basics of safeguarding electronic accounting records, including backup media, network security, and disaster recovery.	73.62	98.91	2030.0	0.001*
*= Significant at the 0.025 (two-tailed) level.				

With respect to organizational systems proficiencies, accounting academics and practitioners disagreed on the level of proficiency required for all three related AIS topics. Accounting practitioners favored lower levels of proficiency for problem-solving with technology, understanding e-commerce, and safeguarding electronic accounting records. As a result, the null for hypothesis 1c is rejected; evidence supports that accounting academics and practitioners differ strongly in this area. Taking the results of H1a, H1b and H1c as a group, support for the overall Hypothesis 1, is inconclusive.

Discussion

In addition to scaled responses, the academics and accounting practitioners participating in the survey offered interesting responses and commentary. Both groups recorded their perceptions about the appropriate levels of proficiency regarding the same nine AIS topics. They then provided insights into themselves by answering demographic questions. Finally, many participants offered their opinions in the two open-ended inquiries near the end of the questionnaire:

- ”What other important AIS issues should be included, if any omission exists? Please comment below.”
- “Please include any comments about this subject or the survey itself below.”

Data from these three sources combine to provide greater insights into the study’s central purposes. Recall that these three questions were posed earlier in this paper:

1. Which combination of AIS topics best prepares our graduates?

2. How much emphasis should programs place on each topic?

3. How skilled in each topic should accounting graduates be?

Recommended proficiency levels reported by participating academics and CPAs follow in Table 6 below. To facilitate data analysis, participants' responses were coded from "0" to "5", with "0" indicating "No" Proficiency and "5" indicating "High" Proficiency levels along the continuum.

Table 6
Recommended Levels of Proficiency
By AIS Proficiency Group and Topic

Operational Systems Proficiencies			
Topics: Mean Recommended Levels of Proficiency (Standard Deviation) by	Navigate computer's operating system/ minor troubleshooting	**Understand business cycles in an electronic environment***	Navigate a major accounting software package to accomplish basic accounting tasks
Practitioners	3.3 (1.2)	**3.9 (1.1)**	3.3 (1.4)
Academics	3.1 (1.5)	**4.4 (0.9)**	3.3 (1.4)
Reporting and Data-Sharing Proficiencies			
Topics: Mean Recommended Levels of Proficiency (Standard Deviation) by	Using accounting software package to create reports	**Understand data-sharing technologies commonly used with business partners***	**Use XBRL to meet financial statement reporting requirements***
Practitioners	3.5 (1.4)	**2.5 (1.3)**	**2.2 (1.4)**
Academics	3.4 (1.4)	**3.4 (1.0)**	**3.1 (1.2)**
Organizational Systems Proficiencies			
Topics: Mean Recommended Levels of Proficiency (Standard Deviation) by	**Ability to comprehend business needs and envision ongoing business problems***	**Understand basics of e-commerce, including the implications on accounting when using outsourced web services***	**Basics of safeguarding electronic accounting records, including backup media, network security, and disaster recovery***
Practitioners	**3.6 (1.1)**	**2.8 (1.1)**	**3.5 (1.3)**
Academics	**4.0 (1.1)**	**3.4 (1.0)**	**4.2 (1.1)**

Notes: Responses on a six-point Likert scale from 0 (No) to 5 (High).
*= Recommended proficiency levels reported as significant at p=0.025.

Among "Operational Systems Proficiencies", accounting academics and practitioners agreed that graduates should know how to navigate the operating system and perform minor troubleshooting. They also agreed on the level of proficiency in using accounting software packages to create reports under "Reporting and Data Sharing Proficiencies". Accounting academics and practitioners, however, differed in the remaining areas.

Academics recommended a significantly higher level of proficiency in the remaining six AIS topics than the public accounting practitioners participating in this study. In the topics clearly aligned with those in the Heagy studies (Heagy 1987, Heagy and McMickle 1988), the results are consistent; disagreement arose in newer topics with weaker analog topics. This pattern emerged in the reporting/data-sharing and organizational systems proficiencies as well.

Many of the practitioner comments seem to address survey questions in this area. The most mentioned and stressed area related a weakness in the fundamentals of accounting. Whether it was described as a need for improvements through "manual accounting systems", "understanding basic paper ledger and journal systems", or "basic bookkeeping skills"; as "better understanding of debits and credits"; or "computer software prevents a complete understanding of the accounting cycles", numerous (12) remarks addressed this area. For example:

> "(A)s an 'old guy' (MBA 1972, i.e. pre-personal computers) we have a challenge with the young graduates. . . many of them have learned to 'evaluate output'. Thus they make entries which make no sense. But since the entry was accepted, and there was no error message, they proceed. A similar situation occurs in their evaluation (or lack thereof) of transaction patterns. Since they have never hand posted a general ledger, they have never visually observed the pattern of transactions which is evident in each account in a hand general ledger."

Other similar comments suggest that a number of these remarks came from small or medium firms, who indicate that providing educational support in this area was surprising, but has become somewhat routine.

The inquiry about AIS topic omissions elicited other comments in the area of operational systems proficiencies. Some comments were straight-forward and direct: ". . . As an accounting firm manager, I don't care where my new hires got their proficiency—but if they can't navigate a computer and operate QuickBooks, I won't hire them, period." Other (somewhat) related comments include network operating systems, using Windows wireless connectivity, generating cash flows and projected cash flows from basic financial statements, using online tools, online research techniques, payroll and sales tax (reporting) preparation, statistical tools in spreadsheets, present value/amortization calculations, MS Outlook, and ability to adapt to changing software. A few of these items – especially the last one – will be discussed later in this section.

In this group of topics, CPAs and academics only agreed about appropriate level of basic reporting proficiency and disagreed about the appropriate levels for the advanced reporting topics (data-sharing and XBRL). Academics and CPAs agreed that graduates should know how to use accounting software packages to create reports (see Table 6), reported at a mean levels of 3.4 and 3.5, respectively, which is well above the mid -point of 2.5. This group of public practitioners favored a lower level of proficiency for data-sharing technologies and XBRL than the participating academics.

As mentioned previously, almost all practitioner participants worked in public accounting and many reported spending much of their time in tax and auditing activities. Some public practitioners indicated omissions related to common fraud techniques and understanding databases, both in connections with forensic accountants. Beyond obtaining the reports needed for their area of specialization, this group of practicing accountants apparently have little interest in these advanced topics. Other accountants, especially management accountants and those in industry, would likely have a stronger appreciation for the latter two reporting topics.

Academics and CPAs reached no agreement about the appropriate levels of proficiency for the organizational systems proficiencies. Academics favored much higher levels of proficiencies (mean levels of 4.0 for "envision solutions to business problems through technology", 3.4 for "e-commerce", and 4.2 for "safeguarding electronic accounting records"). CPAs favored lower levels of proficiencies (3.6, 2.8, and 3.5, respectively) (See Table 6).

With their recommendation of relatively lower level of proficiencies, public practitioners surprisingly offered a number of comments in this area. Examples include the omission of a topic regarding "IT confidentiality expectations when working with client data", "understanding redundancy and how to recover accounting information in the event of human/machine failure", "disaster recovery and backup systems", and "security and access". In an increasingly paperless society, this mundane, basic topic simply cannot be taken for granted. This could be a reflection of the large number of tax practitioners who responded to the survey.

Academics' comments echoed many of the same themes as CPAs' comments included above, perhaps best summarized in this sentence "Students should have a broad-based understanding of how data are created, shared, and integrated across organizational structures." Several comments included internal controls (which logically accompany business cycles, especially hands-on experiences using accounting software packages) and databases (which logically accompany the reporting topics, especially the advanced reporting topics of data-sharing technologies and XBRL). Still others mentioned (some of which are advanced topics) documentation, system development, analytics, business intelligence, data visualization, corporate governance, REA, data quality, COBIT, and hardware/software acquisition and implementation.

The overriding theme implied in posing those initial three questions is "Do the current aims of accounting education (specifically with respect to AIS topics) adequately equip graduates to meet the demands of workplace?" CPAs, through both the questionnaire responses and comments, broaden that question somewhat to address accounting education at large, in part because they may no longer be intimately familiar with the sequence of courses and topic areas covered in each course.

Perhaps the most fundamental point is that accounting graduates should be equipped with an "ability to grow into a succession of jobs using evolving technologies." (Borthick 1996, 83). As noted in a case study on the subject (Fordham 2005), replacement of computer programming with computer user classes has yielded unintended consequences—the analytic and problem-solving capabilities developed in programming has been replaced in some instances with a lecture/recitation requirement.

From this study's perspective, one's ability to successfully adapt to evolving technology starts with achieving a functional level of understanding manual accounting systems to form a template of how accounting is supposed to work. Then, students should engage in a "hands-on" experience that challenges and transforms that template into a more fully realized model of understanding. An experienced AIS or auditing academic would be best suited to lead such a potentially invaluable experience in a laboratory setting. Ideally, a capstone class modeling this experience would help students transform recited knowledge into more meaningful, actionable knowledge.

In addition to these practical considerations, the practitioner comments offered disturbing commentary about the non-technical attributes of the accounting graduates themselves. A review of the literature reveals employers' ongoing call to improve "lack of communication skills" and at least one comment was included here. One commenter remarked about students' tendency to "avoid face-to-face or telephone conversations", while preferring an email or text. Another commented the need for "preparation for work life" and yet another described the accounting culture as "a deadline-oriented way of thinking . . . filtering to find people who aren't sensitive to this issue would be helpful!" One final commenter summed it this way:

> "Teach the students how to be better entrepreneurs and self-starters. They need to be proactive to adapt to the constantly changing world. CPA's tend to be late adopters . . . not good".

CPAs' comments suggest at least some accounting graduates have shifted away from the "problem-solver" description that proves so valuable to employer and employee alike.

Limitations and Extensions

As with nearly any study, this one had some limitations. The study limited the number of topic areas presented in the survey to nine. This was a deliberate attempt to overcome "survey fatigue," frequently cited as one reason for decreasing survey participation in recent years. Responses to additional, or more detailed, topics may have added depth to the data collected.

Responses to the earliest versions of the survey suggested that the original survey length (over 2 pages) and approach of hand-distributing at academic or professional meetings were less than optimal. A strategy of online administration using email invitations with a link to the survey was adopted. To help increase the response rate among academics, emails were sent only to those professors appearing in Hasselback's Faculty Directory with a systems designation.

Also, distributing to CPAs in industry or governmental organizations (provided such email addresses are readily available) may have yielded a more diverse group of respondents. Though somewhat diverse, the marketing email list of CPAs purchased online attracted a larger proportion of tax and audit accountants. Contacting accounting practitioners in the early fall may have helped obtain these respondents, as timing occurred after the summer travel season and before tax extension deadlines in October and year-end activities.

Several extensions to this research study are possible, including a longitudinal/cross-sectional study to examine whether perspectives differ between staff, senior, and supervisory level positions, and whether perceptions change as professionals move ahead in their careers.

Increased participation from managerial and governmental accountants as well as additional demographic details would add depth to this study. Additionally, we note that the ongoing work of the Pathways Technology Task Force, which has recently distributed a similar survey that inquires of both academics and practicing accountants as well as asks about faculty's willingness to teach certain technology topics. As of this writing, survey results are still forthcoming (Hoover-King, 2015). Obtaining a few hundred responses from both groups and gathering those additional details would enable stratification and better comparison both between accounting academics and practitioners, and within practitioner groups. This group of professional participants differed greatly by length of service and highest degree held—perhaps an extension could examine how generational demographics differentiate the responses.

Conclusions

This study polled accounting practitioners and academics to determine which AIS topics new accounting graduates should be proficient in. With technology in a state of accelerating change, is it more important to learn specific software tools and techniques or is it more important to grasp basic AIS concepts and approaches to problem solving? The accounting profession regularly revisits this area to determine which proficiencies new graduates need in order to succeed in current and future business environments.

Evaluation of responses from accounting academics and practitioners revealed distinct differences of opinion between the two groups as a whole, with levels of emphasis significantly different for six of the nine topic areas. The results of this study support the existence of the reported "gap" between accounting academics and practitioners regarding the AIS topics investigated for this study. This agrees with the Heagy (1987) study with respect to the topics covered in the survey instrument. In addition to the survey items, CPAs responded with a number of open-ended comments calling for reemphasis on a number of fundamental accounting topics—many of which could be addressed in an AIS course or capstone accounting course. Public practitioners also recognize the value of office productivity software, but believe that students should be proficient in these tools before entering college or at least before taking their first AIS classes.

This study contributes to the literature by supplying evidence that a gap persists between academics and CPAs regarding the relative importance of AIS topics in accounting curricula. Students face many choices in career path as they progress in the accounting profession. They are best served with a combination of professional and regulatory knowledge, technical skills, and an approach to investigating business organizations' processes and financial data. The accounting systems course provides an opportunity for students to begin assimilating and synthesizing their accounting knowledge. Considering the value added through this experience, reexamining accounting systems curricula is appropriate when significant gaps appear between what professionals and academics consider the most important topic areas in AIS.

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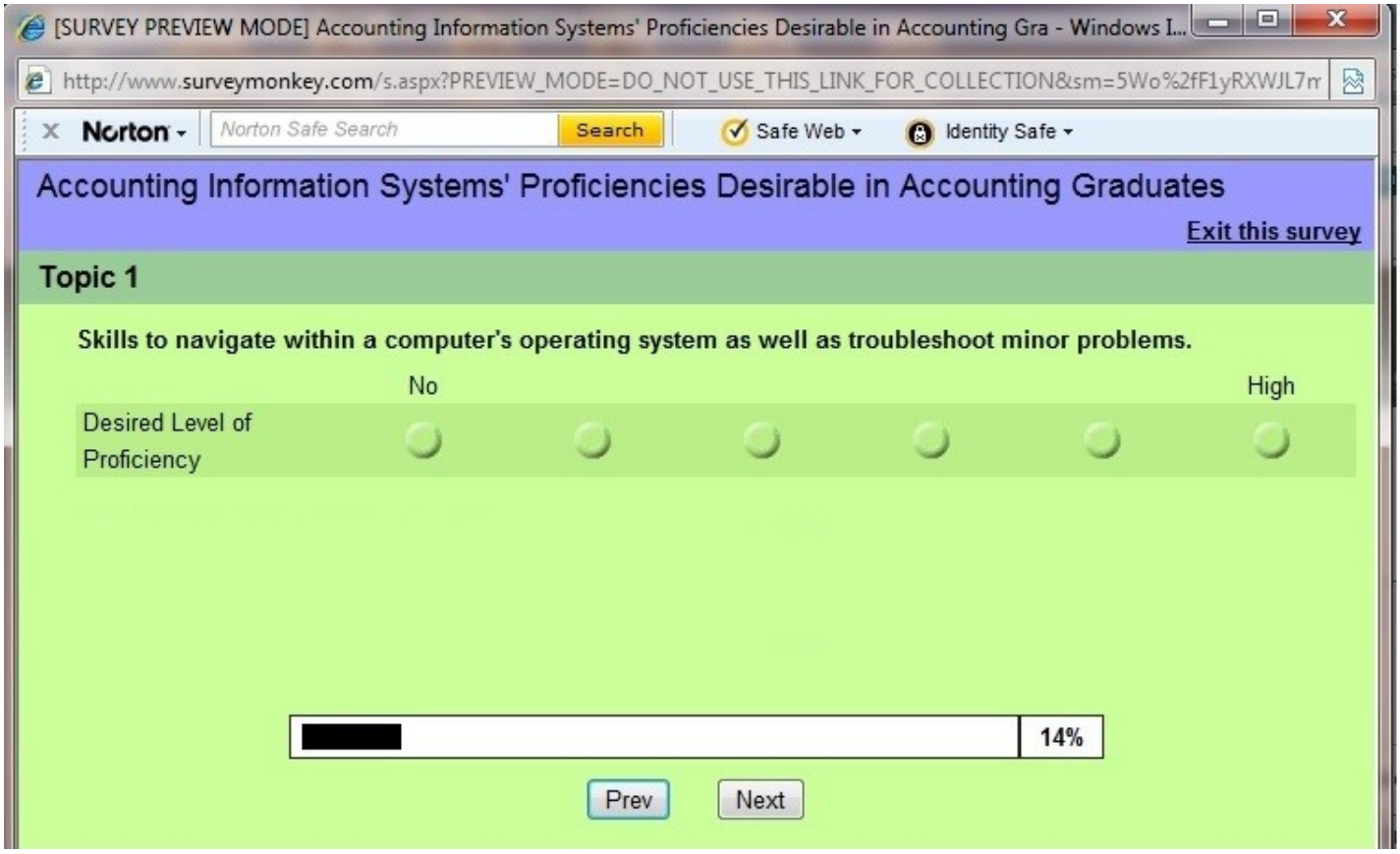
APPENDICES

Appendix A

Screenshot of Online Survey Instrument



Appendix B

Table 1: General Knowledge of IT Topics (Recreated from IEPS 2, pages 131-132)

Competencies	Topics
Information Technology Strategy	
Candidate can explain, describe or discuss the importance of aligning IT strategy with business strategy.	Enterprise strategy and vision Current and future IT environment IT Strategic Planning Ongoing governance and outcomes of monitoring
Information Technology Architecture	
Candidates can explain, describe or discuss how IT architecture relates to the entity's business model.	General systems concepts Transaction processing in business systems Hardware components Software Protocols, standards, and enabling technologies Data organization and access methods IT Professionals
IT as a Business Process Enabler	
Candidates can explain, describe or discuss how IT impacts on the business model and business processes and associated risks.	Stakeholders and their requirements The entity's business models Risks and opportunities related to IT Impact of IT on the entity's business models, processes and solutions
Systems Acquisition and Development Process	
Candidates can explain, describe or discuss the stages of the systems acquisition and development process and understand the role of the accountant within it.	Systems acquisition/development life cycle phases, tasks Investigation and feasibility studies Requirement analysis and initial design Systems design, selection, acquisition/development Systems implementation Systems maintenance and program changes Project management, project planning, project control methods and standards
Management of Information Technology	
Candidates can explain, describe or discuss how IT is managed within an organization, with a focus on (a) accounting systems, (b) performance monitoring and (c) change management and procedures for updating hardware and software	IT organization Management of IT operations, effectiveness, and efficiency IT asset management Change control, upgrades and problem management IT security management Performance monitoring and financial control over IT resources Software for professional use
Communication and IT	
Candidates can explain, describe or discuss IT and the benefits and risks of IT, in relation to communication	General concepts of IT communication Networks and electronic data transfer Risks in communication supported by IT