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ABSTRACT

Research regarding accounting program curricula design has been extensive. While attention has been given to generic skills, the relative importance of specific functional skills has been lacking. The importance of accounting information systems (AIS) knowledge and skills has been assumed but rarely tested although it is an integral part of most accounting programs. Little attention has been given to the comparative value of AIS topics within the overall accounting curricula. In this study, 56 CPAs were surveyed to elicit opinions about the importance of individual accounting skills and determine the importance of AIS to the program. Responses support the value of AIS skills to practitioners and compare well to generic and other functional skill sets. Accounting educators will benefit from this research by gaining a new perspective on the importance of AIS within the overall accounting program and external stakeholders ranking of skills.

Keywords: Accounting information systems, accounting education research, accounting program design, accounting skills, AACSB.

INTRODUCTION

Research regarding the importance of specific accounting knowledge and skills has been lacking. While specific skill sets, such as auditing, have been surveyed there is no overall ranking of skills within a typical undergraduate accounting program. Perceptions of external stakeholders such as CPAs regarding these skills are important to educators, researchers, and students. Educators are interested in creating programs that are responsive to market demands. Researchers want an instrument for comparing knowledge and skills. Students wish to acquire those skills that maximize career opportunities.

Accounting curricula are also of interest to accrediting agencies. The Association to Advance Collegiate Schools of Business (AACSB) has increased emphasis on assurance of learning (AOL) so that accounting programs will reflect the needs of external constituents and to provide a model for continuous improvement based upon a system of measurements (AACSB, 2006). Research indicates, however, that accounting curricula may not be correctly aligned with market needs. Moreover, there is little research that examines the relative value of accounting information systems (AIS) in the undergraduate accounting program.

Albrecht and Sack (2000) found that an AIS course is more likely to be included at larger schools than at smaller ones. However, an examination of the top 10 accounting schools in the U.S. reveals that only five have an AIS class in the undergraduate accounting core. Two schools offered AIS as an elective and two other schools offered other information systems classes (U.S. News & World Report, 2012). Given the importance of technical skills to accountants we must ask: Is AIS properly valued and represented within our accounting programs?

The purpose of this study is threefold: (1) to examine the relative importance of accounting skills to CPAs, (2) to determine if there is a significant difference in how CPAs value AIS skills compared to other skill sets that comprise undergraduate accounting programs, and (3) to offer an instrument for measuring the relative value of these skills in the marketplace. This study adds to existing knowledge by extending our knowledge of how an important group of external stakeholders perceive the relative importance of specific accounting skills, by providing a basis for valuing AIS skills within the accounting program, by raising questions about why there are gaps between what CPAs and accounting educators consider important, and by providing information for establishing course learning objectives.

BACKGROUND

Practitioners Perspective of Accounting Skills

The American Institute of Certified Professional Accountants (AICPA), the Institute of Management Accountants (IMA), the Institute of Internal Auditors (IIA), the International Federation of Accountants (IFAC), and the American Accounting Association (AAA) share concerns regarding the quality of accounting education. Programs accredited by the AACSB strive to define learning goals that meet the needs of various external stakeholders, including practitioners and employers, as well as students. Thus, the curriculum should to some extent be aligned with the views of the external constituents.

Educators value and benefit from the views of practitioners (Hanaray and Robertson, 2002). However, there is a gap between the weight given to knowledge and skills in the curriculum and those assigned in actual practice. This can be largely explained by practitioners' failure to use or value a particular skill which could reflect the time it takes for new knowledge and skills to be adopted in the workplace (Dugdale, 1994). For example, Carr et al. (2006) found that employers generally ranked audit skills lower than educators when compared to more general topics such as global and social perspectives. This difference in perceptions does not necessarily mean the skill should not be included in the curriculum. It could imply the skill is one with emerging importance that is expected to have future value (Horngren, 1989).

Personal competencies reflect the generic skills of oral and written communication, team and social skills, and problem-solving. These skills may be taught in accounting courses within the context of the functional competencies but are generally not perceived as major learning objectives. Although critical thinking is recognized as part of the broad business perspective discussed below, it is difficult to separate it from problem-

solving and may also belong equally in the personal competencies which, overall, reflect the generic skills that have been identified in past research.

Functional competencies represent those skills that educators are most likely to equate with the core accounting discipline and the subjects that comprise the traditional undergraduate accounting major. These include learning objectives such as financial statement preparation and analysis, depreciation, budget variance analysis, and leases. Educators and accounting graduates largely attribute success to the mastery of these functional skills (Rebele, 1985). A student's discipline grade point average – which often receives more attention than the overall grade point average in the hiring process – reflects mastery of functional, discipline specific, skills.

Broad business perspective competencies include critical and strategic thinking, legal, management, marketing, economics and perspectives on industry and global requirements. These topics are acquired in the business core courses and are the knowledge and skills that allow the accounting graduate to operate in both the internal and external environments. An accounting student is not expected to master the management or marketing disciplines but should have sufficient knowledge to make decisions and communicate within these perspectives.

Information Technology pervades and leverages each of the above three competencies. For example, functional competencies such as financial statement preparation and analysis require knowledge of spreadsheets and databases. All broad business competencies depend upon and benefit from office production software. IT competencies important to accountants include spreadsheet, database, and generalized accounting software skills as well as knowledge of IT governance frameworks, IT internal controls, and computer fraud and security issues. These are topics included in the learning objectives of an AIS class (Chang and Hwang, 2002). Some of these topics are also taught within the management information systems (MIS) business core course.

Accounting Curricula and Program Design

Accounting program design is an important and popular research topic (Bolt-Lee and Foster, 2003) and has uncovered significant differences between what is actually taught and what external constituents deem important (Russell et al., 1999; Albecht and Sack , 2001; Bierstaker et al., 2004; Taylor and Rudnick, 2005). Siegel and Sorensen (1994) identified fifteen areas of knowledge and skills typically included in accounting programs and noted educators often emphasize topics of lesser importance and called for curriculum reform. The gap between the competencies being taught by educators and practitioner identified needs has also been noted by the American Accounting Association (Dyer, 1999).

Accounting competencies sought by employers have been identified in various surveys. Carr et al. (2006), for example, found communication, strategic and critical thinking, client and market focus, interpretation of information, and technological adeptness as important skills sought in the marketplace. Chang and Hwang (2001) found interpretation of information and technological adeptness to be important learning outcomes for AIS courses. In a study of 174 graduates, Jackling, and De Lange (2009) found that, while functional skills are valued, employers require a broad range of generic skills that are not being taught in major accounting programs.

Misalignment between marketplace demand and the accounting curriculum may place accounting students at a disadvantage in job-seeking especially when educators emphasize topics that are deemed important by practitioners. Some research points to alignment between the perceptions of educators and practitioners. In one study of 25 audit topics both educators and practitioners surveyed were in substantial agreement (McCartney, Marden, and Adair, 2002).

Researchers and professional organizations have called for a revision in the accounting curriculum with increased emphasis given to generic skills (Henderson, 2001; Albrecht and Sack, 2000; Birkett, 1993). Because educators are attuned to the guidelines of accrediting agencies and professional organizations it follows that they will be cognizant of and strive to align their learning objectives with these guidelines. Thus, they will attempt to strike a balance between the generic and functional topics with attention given to IT which leverages both. For this reason, this study adopts the AICPA categorization of skills as *generic*, *functional* and *information technology* related.

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Generic Skills are those that can be taught within the accounting courses within the context of functional skills or in other courses outside the accounting program. These include oral and written communication, teamwork, ethical behavior, critical thinking and problem solving (Bloch, Brewer and Stout, 2012; Jackling and DeLange, 2009). There is evidence that accounting graduates are lacking in oral and written communication skills although research has shown these to be highly important to employability and continued success (Schmidt, Green and Madison, 2009; Fernandes, 1995; Novin and Pearson, 1994.) In a survey of 422 accounting and financial officers by CFO.com, almost 60 percent said accounting staff lacked the proper communication skills and that this was a barrier to promotion (CFO.com, 2013).

Likewise, problem solving and critical thinking are highly valued by practitioners and educators alike (Albrecht and Sack, 2000). In managerial accounting where there may not be a definitively right or wrong answer it is important that students be able to think in terms of solutions that are not necessarily the product of specific approaches (Stoner and Milner, 2010; Albrecht and Sack, 2000).

Functional Skills are the traditional skills associated with the mastery of accounting knowledge and will always be in demand (Birnberg, 2000). Employers will always value accounting skills such as budgeting, income tax and financial statement preparation and analysis, and auditing and variance analysis (Tan et al., 2004). Educators may focus on knowledge and skills that are not currently valued by employers (Boer, 2000). For this reason, it is important that curriculum design also reflect the needs of external constituents.

Information Technology Related Skills can be acquired outside of the accounting program. Most schools of business include basic computer instruction and MIS courses in the program core (Murthy and Ragland, 2009). These include basic to intermediate level instruction in office productivity software (spreadsheet, database, word processing, email and slide presentation) and foundation knowledge regarding systems. AIS classes frequently extend these skills and include an array of other IT knowledge (such as IT governance frameworks and internal controls, IT security, and IT audits). The mix and emphasis of IT skills changes over time. Today, for example, there is increased emphasis on spreadsheet tools and IT governance. Topics such as extensible business reporting language (XBRL), enterprise resource planning (ERP), and fraud continue to gain in importance. As practitioners assign more importance to each of these it is expected that they receive more emphasis in the curriculum.

Importance of AIS Skills

One indicator of a skill's importance is the ability of that skill to leverage other areas of knowledge and create the ability to solve semi-structured and unstructured questions. In the U.S. those accounting functions that are highly structured and require the least amount of individual decision-making have been outsourced (Ramakrishnan and Frangulescu, 2007). Skills that are unique, provide competitive advantage and require company-specific knowledge should be retained in-house (Alvarez et. al, 2007). For this reason it is imperative that accounting educators shift the focus away from structured skills to ones that cannot be highly automated and are enabled by technologies such as spreadsheets, databases and computer assisted audit tools and techniques.

Technology skills are important to accountants. In a study by Albrecht and Sack (2000) accounting faculty and professionals ranked IT skills second in terms of importance to accounting students. Information technology specialization has been identified as one of the most difficult areas to staff for internal auditors (Sumners and Soileau, 2008) and the Public Company Accounting Oversight Board (PCAOB) has recommended that auditors receive more IT training (O'Donnell and Moore, 2005). In an analysis of 595 job listings for IT auditors many specifically mentioned technical skills/abilities including networking, security, database, IT controls, and generalized accounting software (Merhout and Buchman, 2007). Based on a survey of practitioners, Abu-Musa (2008) finds that accountants need IT

security and IT documentation techniques, and fraud and forensic techniques (Kearns, 2006), database architectures and computer-based analytical software (Hunton, Bryant and Bagranoff, 2004) are all important skills for accountants and are covered in AIS textbooks. Given the multitude of generic and technical skills that accounting students must acquire, it would be insightful to understand how practitioners, CPAs specifically, rank the various knowledge and skills that comprise the undergraduate accounting curriculum.

RESEARCH QUESTIONS

The following three questions are the focus of this study. Research question one is important to extend educators' understanding of how specific knowledge and skills are valued by CPAs in order that they do not invest inordinate time on subjects that are less highly valued. Educators can be expected to heed the recommendation of accrediting agencies and professional organizations to seek input from external constituents. Thus,

RQ1: How do CPAs value specific accounting knowledge and skills?

Research question two is important to extend educators' understanding of how different skill sets are valued in the marketplace. Skill sets are defined as areas of knowledge such as financial accounting, tax accounting, or managerial accounting. Generic skills are those that can be acquired within or outside the discipline. These include written and oral communication and critical thinking. Functional skills are discipline specific such as auditing, variance analysis, and income tax theory. Thus,

RQ2: How do CPAs value specific generic and functional accounting skill sets?

Research question three is directed towards specific AIS skills. These skills support problem solving which involves the ability to think critically (Kavanagh et al., 2008). Business problems are often complex and require various IT skills to develop solutions. These IT skills are most often taught in AIS courses and an understanding of the comparative importance will assist educators to adjust emphasis towards the more important topics. Information technology (IT) has had a profound impact on the accounting profession. Accounting graduates are expected to be able to use spreadsheets, word processing, slide presentation, database management systems, accounting, and communication software at an advanced level. In the white paper *What Corporate America Wants in Entry-Level Accountants* (1994) the IMA and FEI reveal that information systems design is one of the knowledge and skill sets considered most important by employers. The paper also notes a significant gap between the IT skills employers expected and what is taught at most schools.

In their survey of management accounting skills McCartney et al. (2002) found that IT is ranked higher than average in terms of importance by educators and practitioners. Chang and Hwang (2002) found that undergraduate accounting graduates should master spreadsheets, business graphics, word processing, presentation, and generalized accounting software. Additionally, information security, internal control and database management systems are the most important IT topics taught for accountants. AIS literature focuses on other important IT topics including security and organizational governance frameworks such as the Committee of Sponsoring Organizations (COSO) and Control Objectives for Information Technology (COBIT) (Nidumolu and Subramani 2003). Thus,

RQ3: How do CPAs value individual AIS related skills?

STUDY METHOD

The purpose of this study was to gain insight into how professional accountants view the relative importance of knowledge and skills that comprise a typical undergraduate accounting curriculum. The study methodology employed a survey of 191 CPAs in the Tampa Bay area. The Tampa Bay area population is about 2.8 million and ranks 19th in size of U.S. metropolitan areas.

Research Instrument and Implementation

The survey listed knowledge and skills identified by nine accounting faculty members who teach at the University of South Florida St. Petersburg. Both the College of Business and Program of Accountancy are accredited by the AACSB. These faculty members were asked to identify the most important topics taught within the program. The separate lists were reduced to a single draft list of topics and then circulated among all nine faculty members for comments. Using the comments, modifications were made to the the survey questions which resulted in the final list of 36 skills. The research instrument was created and administered on Survey Monkey©. Participants were asked to rate the importance of each of the 36 skills that are current learning objectives for undergraduate accounting majors. Government and non-profit accounting was omitted as it was felt that many respondents would not rate the skill which would pose a problem with analysis if incomplete responses were dropped.

Prior research has provided only limited taxonomies of accounting skills. Massey, for example, delineated 18 skills in her survey of 309 entry-level accounting practitioners in Pennsylvania and found that oral communication were valued highest after ethics. In her dissertation she listed soft skills such as oral and written communications, interpersonal communication, analytical and critical thinking, teamwork and cultural awareness. Accounting information systems ranked fourteenth (Massey, 2011). For this research it was decided that a more expanded skill set would capture a fuller understanding of market needs. The survey in fact represents an expansion of the Massey taxonomy.

Ranking of the knowledge and skills used a five-point Likert-type scale with the following five weights and dimensions: (0-Not Important; 1-Less Important; 2-Average Importance; 3-More Important; 4-Very Important). The anchors (Not Important and Very Important) represented extreme views of the value of the knowledge and skills while the middle dimension (Average Importance) represented acknowledgement of only average value.

E-mails were sent to 191 CPA's drawn from lists of CPAs attending continuing education conferences in the metropolitan area over the past two years. The cover letter stated that participation was entirely voluntary, anonymity was assured and participants could elect to enter a drawing for a free Barnes & Noble Nook.

Survey Results

Completed surveys were received from 42 CPA's within two weeks of the mailing. Non-respondents were sent a reminder e-mail and within another two weeks another 14 usable surveys were received. Two surveys were discarded because all questions were answered with a score of 4. Another was discarded because the recipient stated that he was not a CPA and had no experience as an accountant. Thus, the adjusted population was 188 and the 56 usable responses provided a response rate of 29.3 percent which is in the expected range of 25 to 30 percent for online surveys found by Cook et al. (2006). However, one study found the average response rate to be 52.7 percent with a standard deviation of 20.4 (Baruch and Holton, 2008).

Table 1 shows the mean responses for the 36 skills ranked in descending order by the weighted mean. One concern was that respondents would not provide sufficient differentiation and would provide similar ratings for all of the skills. This was not the case. The wide divergence in ratings illustrates that respondents viewed these skills as having significantly different importance in practice. Weighted means were calculated by multiplying the responses by the skill weights of 0-4. Skills commonly covered in AIS courses are shown in bold.

Industry type and firm size of survey respondents are shown in Table 2. Returns were dominated by Insurance and Real Estate (18.2%), Construction (10.9%), Accounting Services (10.9%), Manufacturing (9.1%), and Banking/Finance (9.1%) which accounted for nearly 60 percent of the responses. Industry type was not reported in 20 percent of the cases. Firm size for 70 percent of the respondents was 500 or fewer employees although 22.6 percent had in excess of 1000 employees. The number within industry types were too low to provide for statistically significant results when measuring responses by industry.

Table 1. Survey responses and weighted means (Scale: 0-4)

Rank	*Skill*	*Mean*	*Rank*		*Mean*
1	Ethical Behavior	3.80	19	Accounting Changes	2.27
2	Communication Skills	3.69	20	IT Security	2.23
3	Critical Reasoning	3.53	21	Audit Reports	2.17
4	Spreadsheet Tools	3.42	22	Leases	2.00
5	Team Skills	3.24	23	Fixed Asset/Depr Accounting	1.91
6	Financial Statement Analysis	3.07	24	Business Law	1.89
7	Financial Statement Preparation	2.96	25	Present Value Analysis	1.89
8	Analysis of Variances	2.93	26	Cost Volume Profit Analysis	1.54
9	Social Skills	2.89	27	XBRL	1.53
10	Budgeting & Analysis	2.78	28	Inventory Management	1.53
11	Governance /Internal Controls	2.73	29	Audit Software & Tools	1.49
12	Risk Assessment	2.69	30	Segment Reporting	1.47
13	Database Tools	2.67	31	Troubled Debt & Reorganizations	1.44
14	Fraud Detection & Prevention	2.57	32	Activity-Based Costing	1.40
15	Financial Forecasting	2.52	33	International Accounting	1.38
16	Computer Networks	2.38	34	Job Order & Process Costing	1.36
17	FIT (average of 5 responses)	2.38	35	Foreign Currency Transactions	1.31
18	Audit Standards & Evidence	2.31	36	Decentralization	1.29

Table 2. Survey Respondent Industry and Firm Size

Industry	Percent of Returns
Insurance and Real Estate	18.2%
Construction	10.9%
Accounting Services	10.9%
Manufacturing	9.1%
Banking, Finance	9.1%
Transportation	3.6%
Services	3.6%
Public Administration	3.6%
Law	3.6%
Education	3.6%
Communications	3.6%
Not reported	20.0%
	100.0%

Firm Size	Percent of Returns
1 to 100	52.8%
101 to 500	17.0%
501 to 1000	7.5%
1001 plus	22.6%
	100.0%

Faculty members unanimously agreed that the generic skills were properly classified as a separate group based upon past research and the distinction that they can be developed outside the accounting program. It was also agreed that there should be six other areas of classification: financial accounting, management accounting, auditing, AIS, FIT, and business law. FIT was measured by five skills that related only to federal income taxes. Business law had only a single measure. The weighted mean for all other skills were calculated in the same manner by multiplying the responses by the weights of 0 (Not Important) to 4 (Very Important).

Some AIS skills are taught both within the AIS course and in the management information systems (MIS) business core course. Also several skills were identified with both the AIS course and the audit course. These were Governance & Internal Control, Fraud Detection & Prevention, and Audit Software & Tools. For this reason, those three skills were associated with both skills sets.

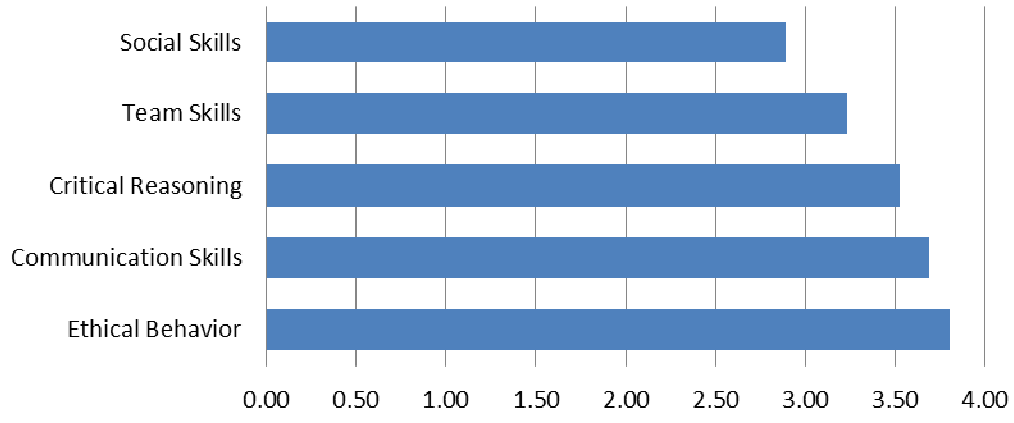
Each of the four faculty members then separately classified the remaining skills into sets. Most of the assignments were straight-forward. For example, the AIS skill set represented skills acquired primarily in the accounting information systems class while managerial accounting skills were acquired in the principles and two cost accounting classes. Results were then compared and differences noted and discussed. Only a few differences existed and these were cases in which the knowledge or skill was developed in multiple classes. The deciding factor was to select the area that provided the greatest emphasis. The final composition of the skill sets is shown in Tables 3-9 and discussed separately below.

Data Analysis

Each of the data sets was organized based upon subjective rather than natural selection. The generic skills were selected to represent general skills acquired at the program level (within any business core class). The other skill sets were arranged to reflect related discipline skills. While specific accounting programs might exhibit small differences the discipline specific skill sets are those frequently found in accounting texts. A brief discussion of each skill set follows.

The *Generic Skills* set, as shown in Table 3, is represented by five skills and has a mean score of 3.43. The mean score for each skill set is calculated as the average of all the skills in the set. All are rated strongly and four are among the top five rated skills. Ethical behavior is rated most strong and social skills least strong. All of the generic skills have above average ratings which strongly supports previous research that indicates employers value ethical behavior, communication, critical reasoning, team and social skills. This set differs in that the skills do not represent related competencies whereas each of the functional skill sets represents a grouping of related competencies.

Table 3. Generic Skills Mean Responses (c=3.43)



Federal income taxes (FIT) are represented by the five questions shown in Table 4. Again, the responses illustrate that the CPAs viewed each of these knowledge areas as being of varying importance. Not surprisingly, basic principles were deemed as most important. While knowledge of tax credits is important it is of lesser importance than the other four skills.

The *Financial Accounting* set, as shown in Table 5, has a mean score of 1.93. Financial statement preparation and financial statement analysis are highly ranked. Financial forecasting is ranked third which might surprise some educators who might rank it as less important than others in the set. Seven of the twelve skills have rankings of below average importance which is interesting because financial accounting comprises such a significant part of the accounting curriculum.

Table 4. Federal Income Taxes (c=2.38)

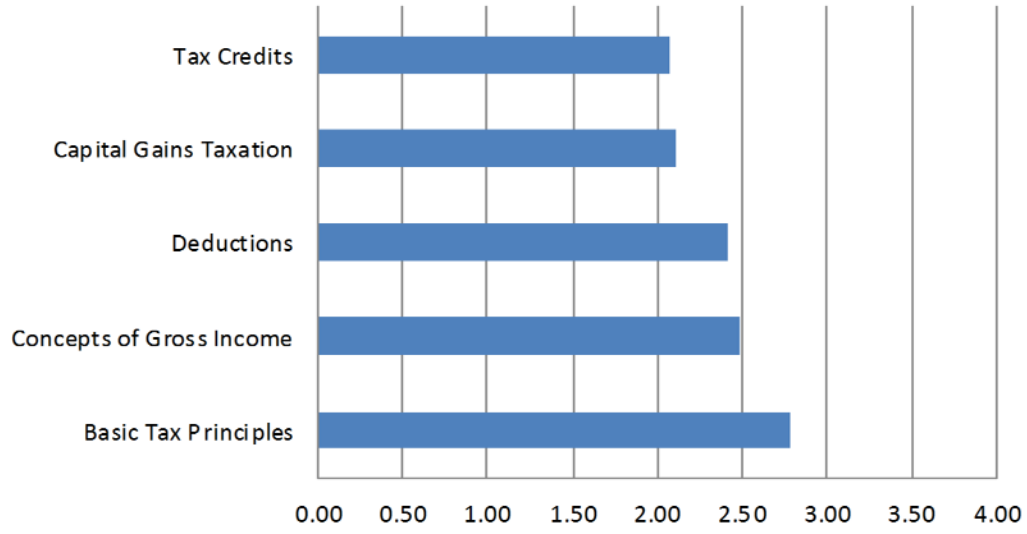
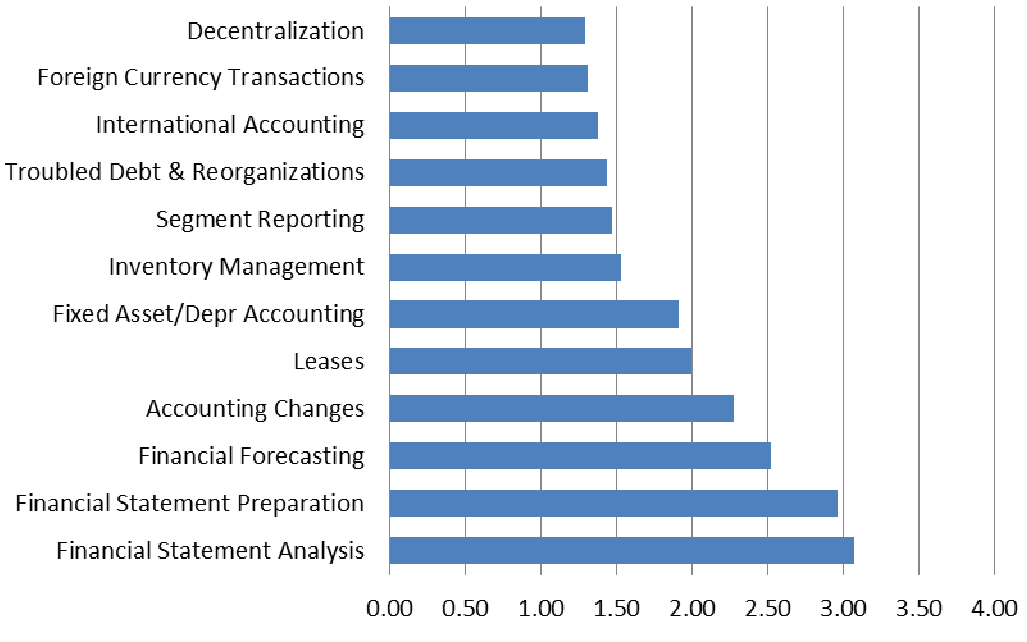
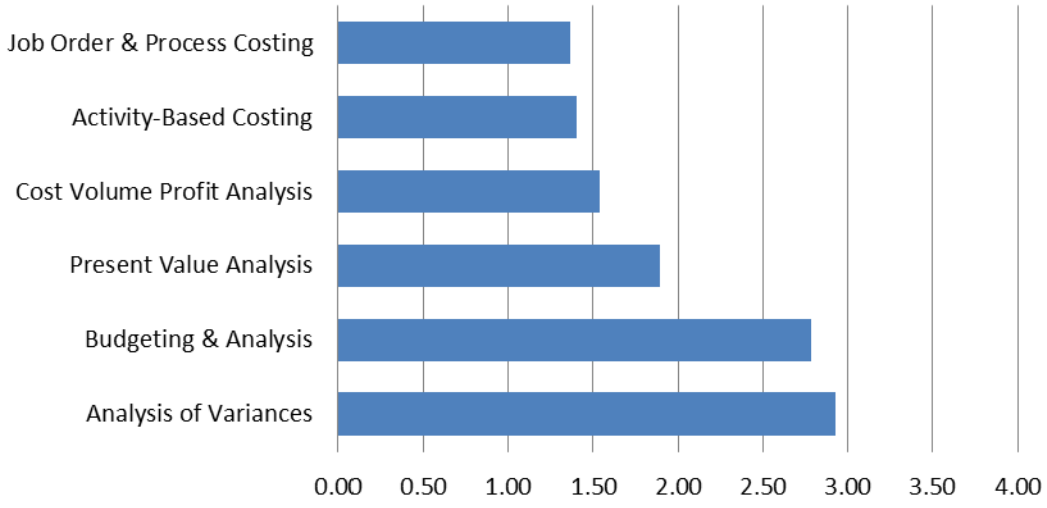


Table 5. Financial Accounting Mean Responses (c=1.93)



The *Managerial Accounting* skill set, as shown in Table 6, has a mean score of 1.98. Analysis of variances and budgeting are identified as the two most important skills. Four of the six skills have rankings below average importance. This is a skill set considered highly important by accounting educators and an important part of the accounting curriculum as evidenced by the inclusion of courses in managerial and cost accounting in nearly all undergraduate programs. The three lowest rated skills (cost-volume-profit analysis, activity based costing, and job and process costing) are some of the more difficult concepts for students to master and require advanced analytical thinking and problem-solving skills.

Table 6. Managerial Accounting Mean Responses (c=1.98)



The *Auditing* skill set, as shown in Table 7, has a mean score of 2.33. Governance and risk assessment are ranked highest and may represent increased oversight post-Sarbanes-Oxley. Only one of the six skills was ranked lower than average in importance. Audit experience is very important for many CPAs and this might be expected to be a more highly ranked.

The *AIS* skills set, as shown in Table 8, has a mean score of 2.45. All but two skills – audit software and tools and XBRL – are rated higher than average in importance. The high rating for spreadsheet tools supports recent research findings and the overall high mean signifies the importance of these tools to accounting graduates (Brown and Pike, 2010). XBRL and audit software may be given lower importance because many practitioners have yet to master these skills and do not fully appreciate their value.

The mean score for *Business Law* is 1.89 and while relatively low does not signify that the topic is not an important component of the accounting curriculum. Practitioners might not use this knowledge directly but it is fundamental to accounting practice and decision making.

A comparison of the skill sets is shown in Table 9 which shows the relative importance of each set of skills. Notably, the AIS skill set is rated as high as or more highly than the more traditional functional competencies commonly identified with the accounting discipline. Generic skills, which may receive the least attention in accounting classes, are rated highest.

Table 7. Audit Skills Mean Responses (c=2.33)

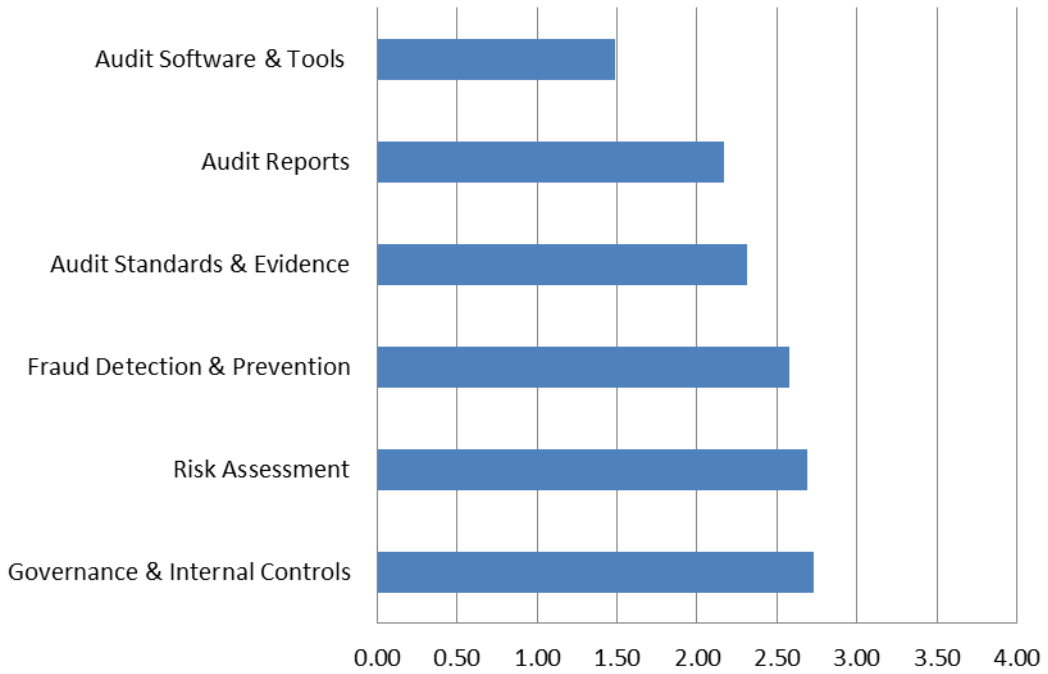


Table 8. Accounting Information Systems Mean Responses (c=2.45)

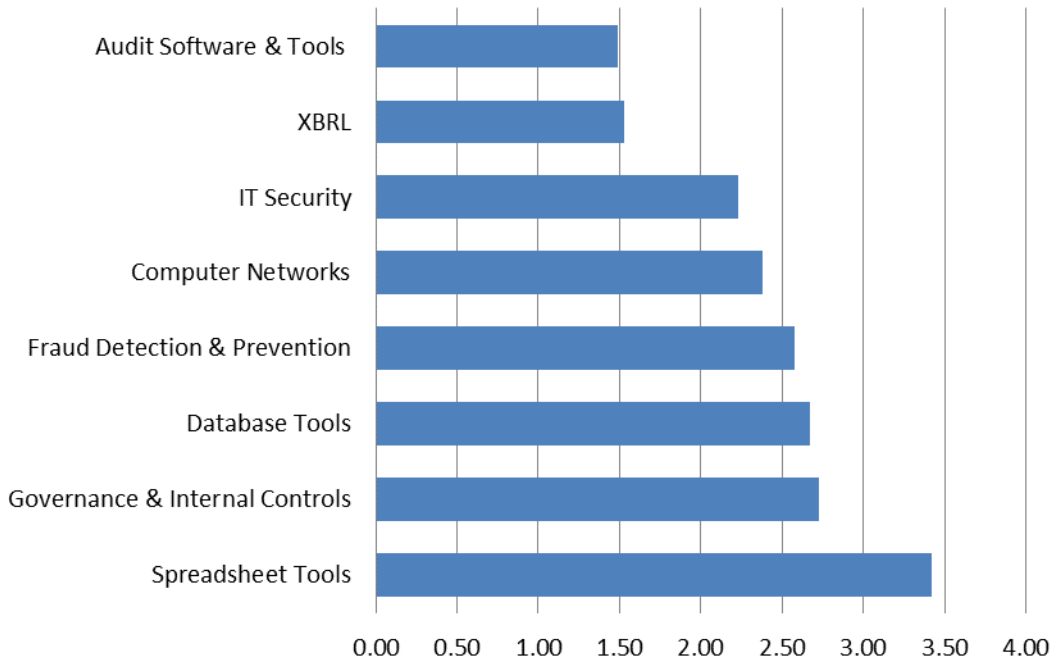
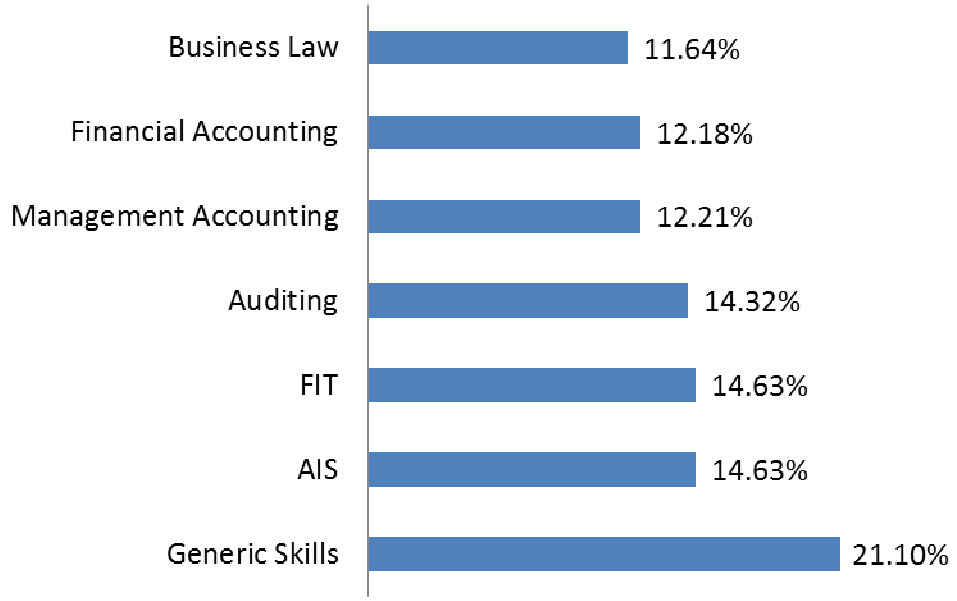


Table 9. Relative Importance of Each Skill Set



DATA ANALYSIS

Data analysis was conducted using tests appropriate for ordinal numbers and non-parametric analysis. Ordinal numbers are those that have an order based on rating scales used in surveys. In the social sciences, educational researchers often treat survey data that has an ordinal scale as interval scaled and employ parametric tests that are inappropriate. (Romano, Coraggio and Skowronek, 2006). Results of the data analysis are shown in Tables 10 and 11 and are discussed below.

Table 10. Results of Wilcoxon Signed Ranks Test for Seven Groups

Z statistic (Asymptotic Significance 2-tailed)

	GENERIC	FINANCE	AUDIT	MGMT	AIS	FIT
FINANCE	-6.51 (.000)					
AUDIT	-6.33 (.000)	-4.39 (.000)				
MGMT	-6.44 (.000)	-9.69 (.000)	-3.39 (.001)			
AIS	-6.29 (.000)	-5.18 (.000)	-1.69 (.091)	-4.77 (.000)		
FIT	-5.60 (.000)	-3.55 (.000)	-.053 (.958)	-2.80 (.005)	-1.22 (.222)	
LAW	-6.40 (.000)	-0.74 (.460)	-3.26 (.001)	-1.03 (.302)	-4.30 (.000)	-2.72 (.007)

Unshaded areas represent comparisons for which the means were significantly different ($p<.007$)

Table 11. Friedman Test Statistics	
N*	54
Chi-Square	138.961
df	6
Significance	.001
*Missing data excluded	

Friedman Test

The Friedman test is a non-parametric alternative to the one-way ANOVA with repeated measures. It is used to test for differences between groups when the dependent variable being measured is ordinal (Siegel and Castellan, 1988). The Friedman test is used for one-way repeated measures analysis of variance by ranks and is similar to the Kruskal-Wallis one-way analysis of variance by ranks.

As shown in Table 11, the high Chi-square value (138.96, $p<.001$) demonstrates that there is an overall statistically significant difference between the mean ranks of the seven groups. While the Friedman Test measures whether at least one of the rankings differs from the others, it does not pinpoint which groups in particular differ from each other. This requires post hoc analysis using the Wilcoxon signed rank test.

Wilcoxon Signed Rank Test

The Wilcoxon signed-rank test is similar to t-tests but does not require the assumption of distribution normalcy and is a non-parametric test appropriate for groups of ordinal data. Because multiple pairwise comparisons are made with the Wilcoxon tests it is more likely that you will declare a result significant when you should not (a Type I error). Therefore, a *Bonferroni* correction must be calculated. This is done by simply dividing the significance level by the number of groups. A significance level of $p<.05$ is considered acceptable. Therefore the *Bonferroni* correction is .05/7 = .007. This means that if the *p* value is equal to or greater than .007 we may conclude that the difference is not statistically significant. Values lower than .007 indicate that the differences are significant and the respondents are truly discriminating between the importance of the skill groups.

For the seven groups there are 21 separate comparisons, as shown in Table 10. Sixteen of the comparisons have values which indicate significant differences ($p<.007$) and are shown as the unshaded areas in the table. Five of the comparisons (shaded areas in the table) have values that exceed .007. These are FINANCE/LAW ($p=.460$), AUDIT/AIS ($p=.091$), AUDIT/FIT ($p=.958$), MGMT/LAW ($p=.302$), and AIS/FIT ($p=.222$). From Table 9 it is apparent that, for each of these six cases, the two groups were similar in overall importance. For example, AIS and FIT were both 14.63%.

DISCUSSION AND CONCLUSION

Research Findings

Three research questions were posed and tested. The first question is "How do CPAs value specific accounting knowledge and skills?" The rankings in Table 1 provide a useful guide. Among the top 10 ranked skills, five can be considered generic and six can be developed outside of the accounting discipline. The top ranked functional skills were spreadsheets, financial statement preparation, financial statement analysis, analysis of variances and budgeting.

The second question is "How do CPAs value specific accounting skill sets?" The rankings in Tables 3-8 show that the generic skills set was ranked highest by CPAs and the AIS skills set was ranked second.

The third question is "How do CPAs value individual AIS related skills?" Responses clearly indicate that CPAs rated some of the AIS topics as more important than others. The top rated skill was spreadsheet tools (a skill that is also developed within other courses) and the lowest rated skill was audit software and tools (a skill that is also developed within the audit skill set). Thus, there is a gap between accounting educators and CPAs as regards learning objectives. As stated earlier, lower rankings for topics may reflect a natural gap between a skill's importance and its adoption in the marketplace. Part of the reason that many companies have not adopted XBRL, for example, is that many CPAs are not yet educated in its use and it has not received widespread adoption (Troshani and Rao, 2007). Most factors indicate, however, that XBRL will be an important tool in the future.

It must be noted that educators balance the course focus on individual topics, devoting greater attention based upon perceived level of importance. This perception is formed from information gathered from external constituents and researchers. More class time is devoted to financial reporting and analysis, for example, than to foreign currency transactions or decentralization. Over time, the balance of focus will shift as needs change. For example, today more time is allotted to spreadsheet and database skills than in past years (Harrast et al, 2010). However, it is not clear if IT is being integrated throughout the undergraduate curricula. For example, there is no evidence that IT tools and concepts are being used in accounting courses other than AIS. An exception may be auditing where ACL or an equivalent audit tool is taught and used.

Also, CPAs might rank skills as less important because they have not yet had a significant impact on the profession. A gap between theory and practice is expected (Dugdale, 1994) and skills that may viewed as very important in the future may be less appreciated now. Although audit software and tools are recognized as being important to certain firms, the majority of firms still rely upon spreadsheets for the majority of their analysis. As these tools become more familiar and practitioners acquire and rely upon them it can be expected that they will be valued more highly. An example of how an AIS skill have increased in importance is illustrated by the Bryan and Smith survey of 223 auditing educators that found spreadsheet skills to be the least important audit tool (1997). Recent surveys, including this one, show spreadsheet skills to be one of the most highly valued skills for accountants.

The respondents also reveal that AIS skills are valued by CPAs, perhaps exceeding the expectations and perceptions of many educators. For most undergraduate accounting programs, the AIS course is the last course to be added to the core requirements. Some schools do not offer an AIS course. Despite the importance of technical and systems knowledge, programs are slow to change in response to market needs. Educators who wish to design programs that are more attentive to the needs of employers should heed the message of this survey: AIS skills are highly valued by CPAs.

Limitations

Several limitations are noted. First, the respondents may not be representative of all accounting practitioners. Similarly, the skill ratings could reflect specific biases. CPAs involved in tax practice, for example, will certainly value the skills related to federal income tax more highly than practitioners who are not involved in tax practice. Likewise, CPAs who must regularly interact with clients are more likely to place high values on communication and social skills. Second, the sample size of 56 CPAs is small although the response rate of 29 percent is high for similar research. Third, the classification of knowledge and skill into skill sets was performed by four faculty members from the same institution and could reflect a specific vision of what comprises those sets of knowledge. Faculty at other schools might make different assignments or establish different classifications than the seven reported in this study. However, these differences would have to be minor as the classifications represent commonly used terminology and most accredited programs consist of a standard set of topics that are found in all popular accounting texts. Finally, the composition of the skill sets reflects the perspectives of faculty at one institution. These perspectives, however, reflect educational backgrounds from varied accounting programs, years of attending accounting conferences and industry experience as well. Thus, the formulation of the skill sets, like the survey, reflects a broad level of academic and professional experience.

Contributions for Educators, Researchers and Practitioners

This study makes several important contributions. First, the relative importance of individual skill sets from the CPAs' perspective has been largely ignored in past research. While much attention has been given to generic skills in past research and by accrediting agencies functional skills remain the primary product of the accounting program. Prior research has not ranked generic skills with an extended list of functional skills that comprise an undergraduate accounting program. Using the Massey (2011) skill set as a base, this study provides an expanded taxonomy of undergraduate accounting skills that contributes to the literature of accounting education and provides an understanding of how AIS is valued within the undergraduate program. This study provides insight into the relative importance of the individual functional skills and skill sets to practitioners. Without such knowledge, development of and revisions to programs might not reflect market realities.

Second, little attention has been given to the comparative value of AIS skills within the overall accounting curriculum. This study provides evidence that the AIS skills are valued highly by CPAs although they are given limited attention in most accounting programs. As such, these findings represent new material that should be of interest to accounting faculty and administrators. For example, institutions that are AACSB accredited can use the information to identify which topics should receive greater emphasis and revise learning -goals to align with the importance of topics as perceived by CPAs.

Finally, educators and researchers will note that the study findings mirror past and recent research that shows generic skills to be valued highly by employers. Based upon this and previous research (Henderson, 2001; Albrecht and Sack, 2000), educators should benefit by being motivated to alter accounting program design to better reflect the ranking of the specific generic and functional skills. Specifically, given that most accounting programs only offer a single AIS course, concern should be given to the balance between these topics and the other functional areas. AIS educators can also benefit from the support this study gives to the comparative value of the overall skill set and individual skills taught in AIS courses. Students will benefit when program design, based upon this and similar research, is more closely aligned with employer needs.

Recommendations for Future Research

Future research could recreate this study to validate its findings and increase the generalizability. Findings could also be enhanced by analyzing data along demographics such as firm size, time in profession, time in industry, job function, and management status. In an effort to provide full anonymity the age and gender of the respondent was not collected in this survey. In future studies it would be valuable to know if either age or gender influenced the perspective of the CPA. Future researchers might also address development of the constructs for the skills areas. Assignment of skills to areas is open to interpretation and might find improved justification in future studies. Educators would also be interested in the extent to which IT is integrated in other accounting courses. For example, the extent to which databases, spreadsheets, XBRL or CATTs are used in auditing courses.

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