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MORE ACCOUNTING THEORY OR MORE INFORMATION TECHNOLOGY?

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Abstract

It has been said that accounting faculty should teach theory and let students figure out how to apply the theory in the real world. This argument assumes that students arrive with technology skills sufficient to serve as a base for their college and even their professional careers. This paper uses survey methods to analyze the technology skills of undergraduate accounting students to determine their technological strengths and weaknesses. With this information, it is possible to gain a more accurate undergraduate student technology profile. We find that a large fraction of students are not proficient in requisite technologies even after completing the majority of their undergraduate accounting course work. We believe this supports the argument that the accounting curriculum would benefit from an increase in technology training. The technologies students were most interested in learning were tax software, small business accounting, generalized audit software and spreadsheets.

INTRODUCTION

A colleague at a large research university recently told one of the authors that accounting faculty should teach theory and let students figure out how to apply the theory in the real world. He clarified that accounting faculty should not have to teach spreadsheets and databases. Our first reaction to this assertion was that technology is inseparable from accounting theory. How could anyone argue for less technology in the accounting curriculum? Later, as we considered the other venues for learning technology, we began to see how our colleague arrived at this argument. It certainly is true that many students are learning mainstream technologies before taking their first college business courses. The world of technology is not as exclusive as it was 20 years ago when the first introduction to spreadsheets was in the business school computer lab.

We would like to thank participants at the 2008 Midwestern meeting of the American Accounting Association and two anonymous reviewers for their insights and helpful comments. Data is available upon request from the correspondence author.

Today, it is not unusual for students to have some introduction to spreadsheets long before college. However, this seems to be part of the trouble. While the mean level of technology knowledge (TK) is rising, we would argue that the distribution of technology skills varies widely among students. From our experience, a fraction of accounting students have taken courses in office suite applications in high school, while others have little or no knowledge of the most fundamental spreadsheet operations. As the mean level of TK among entering accounting students rises, justifying a dedicated spreadsheet course, for example, or any other dedicated technology course, becomes more difficult, and a theory-oriented curriculum becomes the default. Quite frankly, the students with great technology skills have become the enemy of the students with lesser skills. There is nothing a college professor likes to hear less than, "we already learned this in high school." Whether or not to teach technology is not just an issue in accounting, it is an issue across business disciplines and perhaps across the university.

The purpose of this paper is to examine the technology vs. theory teaching dialectic by garnering information about the technology competencies of students in undergraduate accounting programs as a subset of students in the business school and to form arguments and inferences using this information. The examination of student TK requires benchmarking on industry and academic literature focused on the appropriate technology competencies for accounting graduates. Another benefit of this research is that it may help accounting programs with the Association to Advance Collegiate Schools of Business (AACSB) assurance of learning requirements as they relate to teaching computer technology in accounting coursework. According to AACSB Standard 15 (2009) schools should use "…a well documented systematic process to develop, monitor, evaluate and revise the substance and delivery of the curricula of degree programs and to assess the impact of curricula on learning." In current research we analyze professional, academic and other literature to determine appropriate topics and delivery methods for critical technologies. This research can help answer questions about what students should learn and perhaps how they will learn it. Another purpose of this paper is to analyze student opinions of where a technology should be introduced. We believe that student opinions reveal useful information about a possible expectations gap between what students believe should be part of the accounting and business school curriculum and what is possible to include. Student opinions of where a technology should be introduced also provide some evidence about the level of difficulty of a technology and when, in terms of grade level, the technology can be implemented.

This study also considers the appropriate theory-practice mix for teaching technology. We interpret *theory* as lecture and *practice* as working hands-on with technology. Assuming that some technology will be taught in the accounting curriculum, we are curious to know what students believe the optimal ratio of theory and practice should be. However, we admit that making practical usage of this information is difficult. We suspect that students will prefer more hands-on usage of technology than lecture. This might provide useful information to our theory-only colleagues.

This study is helpful because it provides information to accounting and to other business school educators about the technology profiles of undergraduate accounting students. This will help educators make more informed decisions about the information technologies appropriate for the classroom as well as the level of emphasis appropriate for a particular technology. The remainder of this paper is organized as follows: The next section reviews prior pronouncements and literature examining technology in the accounting curriculum from the perspective of professionals and faculty. Following the relevant literature, there is a discussion of the survey instrument and methods used to collect data. After a discussion of the research methods, the data is analyzed followed by conclusions.

LITERATURE

Technology in the accounting and business school curriculum has a number of stakeholders: students, faculty, employers, professional groups as well as corporations marketing their software. The American

Institute of Certified Public Accountants (AICPA), the leading accounting professional group in the U.S., has published the list of Top 10 Technologies every year since 1990 (Spinelli 2006). This list has contained applications that have become staples in accounting such as databases in 2001 (spreadsheets predate the list), but more recently the list has taken on a technology *du jour* flavor. Also, there is no weighting of the technologies to help determine their priority in the classroom. The Top 10 Technologies, while useful in practice, have had perhaps a minor impact on the classroom. The AICPA also publishes a list of core competencies for persons entering the accounting profession (AICPA 2008). The AICPA (2008) core competency document lists spreadsheets and spreadsheet applications as very important to new accountants. The AICPA also specifies that new accountants should be familiar enough with technology to assess risk and automated business processes. In our interpretation, automated business processes involve business/accounting software such as enterprise resource planning (ERP) but could be interpreted more broadly as *any* accounting application in business. In prior years, business accounting software was specifically included in lists of technologies essential for accountants (IFAC 1995), but this is no longer the case (AICPA 2008, IFAC 2007).

Many accounting and business curriculum researchers have studied technology (Heagy and Rakow 1991; Heagy and Gallun 1994; Borthick 1996; Groomer and Murthy 1996; Theuri and Gunn 1998; Bain, Blankley, and Smith 2002; Chang and Hwang 2003; Greenstein and McKee 2004; Borokowski, Bukics, and Welsh 2007; Roberts, Kelley, and Medlin 2007). Among this research, Roberts, Kelly, and Medlin (2007) report that "…although technology in the workplace has exploded, the integration of technology into the curriculum has been slow." Borokowski, Bukics, and Welsh (2007) report "no uniform approach…in developing Excel proficiency" by surveyed institutions. The lack of uniformity is well entrenched as shown in the Heagy and Rakow study (1991) where 24 percent of the AIS faculty reported a heavy emphasis on spreadsheets compared to 37 percent who report no emphasis at all.

Practitioners are much more emphatic about the need for technology in the accounting curriculum and rank spreadsheet skills the highest among applications appropriate for the AIS course (Bain, Blankley, and Smith 2002). Although spreadsheet skills are generally rated very high in importance by practitioners, the actual amount of class time devoted to them by faculty tends to be very small (Bain, Blankley, and Smith 2002), and some suggest that spreadsheet skills should be a pre-requisite or pretest rather than a major course topic (Davis and Leitch 1988; Borkowski, Bukics, and Welsh 2007). Recent research shows that spreadsheet skills are the most covered technology topic in managerial accounting courses (Chandra, Cheh, and Kim 2006).

The existing literature tends to support the assertion that certain technologies, including spreadsheets and databases, are very important in accounting and that practitioners are generally more emphatic in recommending technology than faculty. There also appears to be a theory-practice divide among faculty with some preferring a theory-only course as evidenced by the large percentage of faculty who place no emphasis on spreadsheets. We mention spreadsheets because these skills are the technology most highly emphasized by practitioners (Bain, Blankley, and Smith 2002) and to allow the discussion to remain concrete. We do not intend to promote or to depreciate spreadsheets except to illustrate general trends in teaching technology. While not specific to any particular database technology, McCarthy (2003) suggests that the resources, events, and agents (REA) business process modeling theory become the core accounting technology. We certainly see the potential of the REA methodology as a unifying force in the systems curriculum, an area of accounting that is largely unstandardized. Programs that are resource scarce and have only one required systems course may find the REA methodology difficult to shoehorn into an already crowded course.

Software vendors and publishers also need to be considered in our review of important applications and theory vs. practice in the classroom. A few years ago, technology was not nearly as accessible to students; a full suite of office productivity applications could easily set a student back over a thousand dollars, and

computers were orders of magnitude more expensive when compared to today's technology. Today, software publishers have bundled applications making them available to students (and often faculty) at very-low cost. Publishers also offer site licenses and reduced cost software for publication along with accounting textbooks for use in computer labs. Software that might cost many thousands of dollars retail is now shrink wrapped with a textbook (Brunsdon, Romney, and Steinbart 2006; Arens and Ward 2006; Arens 2004). The effect of this democratization of software is greatly expanded choices of technologies and a deeper questioning of whether technology training is needed at all.

Absent from the TK literature is an analysis of student technology skills. It is clear that industry groups recommend certain TK for accounting students, but this does not provide the ultimate rational for teaching a technology. Practitioners are also very positive about TK in the accounting curriculum. We believe that ultimately students are the moderating variable in the technology teaching function, and that having data about student TK is critical to making appropriate teaching decisions. The question that lingers is: do we teach theory and let students figure out how to implement the theory using modern information technology, or do we (re)emphasize technology as a toolkit for the accounting profession?

METHODS

To better understand the student technology profile, we surveyed accounting students at three AACSB-accredited, Midwestern university business schools. Students selected for the survey were enrolled, or recently enrolled, in a junior/senior level undergraduate accounting information systems course. We selected junior/senior level students because they are more likely to provide a valid assessment of their technology skills after taking college courses with other students rather than as new freshmen. We likewise believed that junior/senior level students could provide an objective opinion of where technology should be taught, according to their recent experiences in the educational system. We were also of the opinion that students need some college training before they can evaluate whether a technology is most appropriate for college or another setting.

The surveys were given in class about two weeks before the end of the semester at two schools. At the third school, the surveys were given after the conclusion of the class using an on-line survey technique. The survey instrument asked students to read descriptions and record their knowledge of 36 technologies drawn from prior research by Greenstein and McKee (2004). The 36 technologies introduced by Greenstein and McKee (2004) and used in this paper represent a broad spectrum of technologies from common office automation applications to esoteric encryption techniques. These technologies give the students surveyed an opportunity to express their abilities and desires for technology training. Table 1 (located in the appendix) catalogs the 36 technologies surveyed. TK levels were recorded by students on a seven-point scale ranging from 1, for no knowledge, to 7, for expert knowledge.

The survey also included a number of questions to solicit opinions about the appropriate teaching locus for introducing a technology, which technologies were most wanted, and the type of teaching methods students found most effective. Completion of the survey was voluntary, and 324 surveys were completed or partially completed. The entire survey process, including required disclosures, took approximately 20 minutes.

RESULTS

Of the 324 surveys received, 319 contained valid gender information identifying 51 percent of the participants as female and the remaining 49 percent as male. The mean(modal) age of participants was 23(21); the minimum age was 19 and the maximum was 53. Students identified themselves as 67 percent seniors, 28 percent juniors, 2 percent sophomores, and 3 percent graduate students. Fifteen percent of the sample had completed internships. Sampled students completed a mean(mode) of 2(1) AIS and 2(1) MIS

courses. On general technology knowledge, 1 percent rated themselves very high, 18 percent rated themselves high, 62 percent rated themselves adequate, 18 percent low, and 1 percent very low.

Knowledge Level

Students were asked to rate their knowledge of 36 technologies on a seven point scale with one being no knowledge and seven being expert knowledge. Results are tabulated in table 2.

Table 2

Student Technology Knowledge and Descriptive Statistics by Mean Knowledge Level

Technology	Mean	StdDev	Min.	Max.	N
Email	5.90	0.93	3	7	323
Internet Srch	5.76	0.98	2	7	320
Word Proc	5.51	0.85	3	7	323
Presentation	5.09	1.21	1	7	323
Sprdsheet	4.76	1.01	1	7	323
Image Proc	4.46	1.58	1	7	322
Wireless	3.77	1.64	1	7	320
DB Search	3.75	1.44	1	7	322
Wrkpapers	3.57	1.54	1	7	319
Flowcharting	3.57	1.39	1	7	321
SB Account	3.19	1.66	1	7	318
Tax software	3.03	1.75	1	7	320
DB Design	2.91	1.45	1	7	319
Firewall	2.82	1.51	1	7	321
Time Billing	2.70	1.52	1	7	318
ERP	2.54	1.44	1	7	321
GAS	2.52	1.51	1	7	322
Simulation	2.52	1.40	1	7	321
Digital Com	2.44	1.53	1	7	318
Internal Net	2.35	1.37	1	6	320
User Auth	2.34	1.38	1	6	319
EDI Web	2.33	1.43	1	7	319
External Net	2.32	1.38	1	7	321
Work Flow	2.29	1.34	1	6	318
EDI Trad'l	2.23	1.40	1	7	320
Client Serv	2.22	1.32	1	7	320
CASE	2.18	1.33	1	7	321
Test Data	2.14	1.30	1	7	316
Expert Sys	2.04	1.34	1	7	322
Agent Tech	2.03	1.33	1	7	321
ASP	2.01	1.19	1	6	321
Groupware	2.00	1.35	1	7	318
Intrusion	1.98	1.24	1	7	320
RT Aud Mod	1.84	1.15	1	6	322
Encryption	1.80	1.04	1	6	319
Embeded AM	1.78	1.07	1	6	322

Table 2 shows that e-mail is the most well-known technology among accounting students with a mean knowledge level of 5.90 out of 7 and standard deviation of 0.93. Any student with a less than adequate knowledge of email (below 4) would be a very low probability statistic. Upon a review of the data, 5 of 323 student subjects, or less than 2 percent, rated their knowledge of email as below adequate. Given the amount of communication that goes on through email, we find it hard to believe that anyone in their late teens or early twenties might have email deficiencies. Descending through internet search, word processing, presentation software, and spreadsheets, the percentage of students whose knowledge falls into the less-than-adequate range (below 4) grows. Using reported mean and standard deviation for spreadsheets, assuming a normal distribution for the responses, one standard deviation below the mean scores 3.75 (4.76 - 1.01) or below adequate skills. Two standard deviations from the mean, the area encompassing about 95 percent of the students, proficiency falls to 2.74 (4.76 – (2 x 1.01)) or well below adequate on the lower end of the distribution. In reviewing a frequency analysis of the spreadsheet data, the students who are below adequate knowledge (below 4) constitute 9 percent of the distribution (Table 3).

Table 3

Student Spreadsheet Knowledge Frequency Analysis

Response	Frequency	Percent	Cumulative Percent
1 (no knowledge)	1	0.31	0.31
2	2	0.62	0.93
3	26	8.05	8.98
4 (adequate)	100	30.96	39.94
5	123	38.08	78.02
6	58	17.96	95.98
7 (expert knowledge)	13	4.02	100.00

On average, about 3 in a class of 30 students are likely to report inadequate spreadsheet skills even after completing many, if not all, of the courses in the undergraduate accounting/business curriculum. We admit that 3 in 30 is not a huge number, but considering that these students have passed through almost the entire accounting curriculum, we wonder how they have managed.

There are many reasons that students can pass through university work and not gain the requisite skills. Transfers from two-year colleges are becoming more common and it is possible that in doing so students either intentionally or unintentionally sidestep beneficial courses. We certainly do not wish anyone to infer that four-year institutions always have more rigorous courses; we do not believe this is the case. Our point is that transferring credits is an imperfect business as one institution cannot rigorously enforce quality control standards at another. Another explanation for high TK variance among students is that as mean knowledge levels rise among students, justifying technology tools courses in the accounting curriculum is more difficult. As we have mentioned previously, no professor wants to teach what most students already know. This leads to a dilemma: do we provide technology courses that help the students with weaker technology skills, or do we simply teach theory and let students figure out how to use the technology? Most curriculums do provide some type of technology training, but these courses are often general and overview a number of technologies without approaching any with significant depth.

There has been a call for accounting professionals to be able to query electronic databases (AICPA 2008) and there is some debate about meaning. Most professionals and academics agree that learning a query language like SQL, while it may be very useful, is a lower priority than spreadsheet skills (Bain, Blankley, and Smith 2002). In our opinion, becoming technologically literate requires relational database skills. However, faced with a choice of spreadsheets or databases, spreadsheets are clearly the most valuable to new accountants (Bain, Blankley, and Smith 2002). Students mean score for database search skills is 3.75 (out of 7) showing that database search skills could be improved. Students may not be comfortable searching tax, legal, financial or Securities Exchange Commission (SEC) databases.

In a review of accounting information systems (AIS) syllabi, it was found that the most frequent AIS projects were database related and that about 36 percent of AIS classes involve the use of database software or projects (Bain, Blankley, and Smith 2002). Chang and Hwang (2003) show that educators plan to teach databases second only to information security and internal control in AIS courses. Perhaps part of the low reported database knowledge is due *not* to insufficient instruction, but rather to the complexity of the technology. In our experience with teaching database technology, we have found that even databases designed for end-user development are highly complex and represent a major paradigm shift from other office suite applications.

Small business accounting software used to appear frequently in lists of technology appropriate for the accounting curriculum (Heagy and Rakow 1991; IFAC 1995; Groomer and Murthy 1996), but is no longer *explicitly* listed as necessary for new accountants entering the profession (AICPA 2008, IFAC 2007). Some research links accounting software to the AICPA Core Competencies as a "use of technology" (Daigle, Hayes, and Hughes 2007) which seems entirely appropriate. There are a number of other common accounting technologies that might be inserted under the AICPA heading of "use of technology" including enterprise resource planning (ERP) software, generalized audit software (GAS), or any other technology skill that might be useful in the accounting profession. Focusing only on accounting software, the survey reveals that student knowledge is less than adequate, or 3.19, where 4 is adequate. We certainly see room for accounting software in the curriculum under the AICPA recommendations that students be able to use technology (AICPA 2008). However, devoting an entire course to such technologies might be more appropriate for a MAcc or MBA program.

A number of other common business technologies have very-low knowledge scores. Enterprise resource planning software (ERP) and electronic data interchange (EDI) have almost identical mean knowledge scores of 2.54 and 2.33 respectively. Accounting textbooks are beginning to include greater coverage of ERP systems, but this technology remains mostly a low-priority topic in courses (Bain, Blankly, and Smith 2002). In the opposite manner, EDI has been around as an accounting topic for decades but seems to be eclipsed by newer technologies such as extensible markup language (XML) and radio frequency identification tags (RFID). We have noticed that students are no longer impressed by a technology that simply transmits business data from one entity to another. Given the march forward in technology, we are less concerned with the low knowledge of EDI than we are of the low knowledge of ERP, and we can see good reasons that XML and RFID technologies should eventually replace a discussion of EDI.

Near the bottom of the knowledge spectrum, encryption techniques have one of the lowest knowledge ratings of 1.8 out of 7. In our experience, the encryption discussions included in accounting textbooks, usually a discussion of public key cryptography, are superficial and provide a very-small incremental benefit. The area of cryptography is relevant, interesting, and theory rich, but would require a significant digression from accounting theory to teach. Part of the appeal of encryption techniques is their interaction with current information technology. Current cryptographic techniques require many layers of technology including networks, certificate authorities, security enabled software, and multiple encryption algorithms capable of scrambling and unscrambling large chunks of binary digits. The discussion can be fascinating.

Supplemental texts that explain some of the history and mathematics behind current encryption standards are available (Singh 1999).

In a factor analysis performed in their 2004 paper, Greenstein and McKee found that all but five of the 36 key technologies loaded on five underlying constructs: 1) e-commerce and advanced technologies, 2) *office* automation, 3) *audit* automation, 4) databases, and 5) accounting firm automation. Using the same factors discovered by Greenstein and McKee (2004) we analyzed the competencies of the students sampled in our survey. The results are tabulated in table 4 (in the appendix). Technologies not loading on a factor were expert systems, simulation software, flowcharting/data modeling, groupware, and test data.

The analysis in table 4 provides a summary picture of the technological competencies of undergraduate accounting students. Office automation software, which roughly equates to the basic office productivity software installed on virtually all computer workstations, shows a high level of competency (92 percent) while databases and other more esoteric applications show less than 50 percent competency.

Technology Locus

The appropriate teaching locus for a technology is critical because certain applications must be combined with theory to be fully understood. We would argue that this is certainly the case with relational databases. Similarly, certain technologies, though not necessarily complex, become applicable within the accounting environment (either education or practice) and students are unlikely to see their relevance until reaching an appropriate level where the technology is applicable. This could be the case for generalized audit software (GAS) which is most applicable after some auditing training. In some cases, the appropriate teaching locus may be more difficult to determine because students enter college with a fairly high level of technology knowledge, yet there may be significant theory that needs to be learned in addition to the technology. Spreadsheet software is a technology that is much more easily mastered than the theory necessary to build a well-designed spreadsheet model. With this in mind, students were asked where a technology should be *initially* taught—before college, during college or after college (no opinion was a 4th option).

College

Table 5 shows from a student perspective the most appropriate technologies for a college teaching locus. Predictably, many of the technologies for which students report high knowledge are at the bottom of the college appropriate list.

Table 5

Technology Locus Preferences by College or University Frequency

Technology	College or University Freq.	%	Before College Freq.	%	After Graduation Freq.	%	No Opinion Freq.	%	Total Freq.
Flowcharting	274	86.2	13	4.1	10	3.1	21	6.6	318
GAS	248	78.5	3	0.9	48	15.2	17	5.4	316
DB Search	240	75.7	48	15.1	14	4.4	15	4.7	317
DB Design	235	74.4	11	3.5	40	12.7	30	9.5	316
Simulation	231	73.1	5	1.6	53	16.8	27	8.5	316
Tax Software	214	68.4	17	5.4	58	18.5	24	7.7	313
CASE	203	63.8	13	4.1	43	13.5	59	18.6	318
SB Account	192	60.8	12	3.8	94	29.7	18	5.7	316
ERP	190	59.9	2	0.6	85	26.8	40	12.6	317
Wrkpapers	187	58.8	52	16.4	26	8.2	53	16.7	318
Groupware	175	55.7	11	3.5	65	20.7	63	20.1	314
Encryption	172	54.6	4	1.3	75	23.8	64	20.3	315
Test Data	164	52.2	9	2.9	84	26.8	57	18.2	314
External Net	161	50.9	20	6.3	82	25.9	53	16.8	316
Embeded	161	50.6	2	0.6	122	38.4	33	10.4	318
Internal Net	159	50.3	16	5.1	84	26.6	57	18.0	316
Time Billing	156	49.4	25	7.9	104	32.9	31	9.8	316
RT Aud Mod	155	49.2	3	1.0	127	40.3	30	9.5	315
Digital Com	155	48.9	31	9.8	61	19.2	70	22.1	317
Client Serv	153	48.4	14	4.4	93	29.4	56	17.7	316
EDI Trad'l	151	47.6	20	6.3	72	22.7	74	23.3	317
EDI Web	149	47.2	23	7.3	75	23.7	69	21.8	316
User Auth	146	46.3	25	7.9	77	24.4	67	21.3	315
Intrusion	146	46.1	13	4.1	98	30.9	60	18.9	317
Wireless	145	45.7	104	32.8	37	11.7	31	9.8	317
Expert Sys	143	44.8	3	0.9	139	43.6	34	10.7	319
Firewall	139	44.0	80	25.3	45	14.2	52	16.5	316
Work Flow	137	43.9	15	4.8	95	30.4	65	20.8	312
ASP	127	40.1	6	1.9	119	37.5	65	20.5	317
Agent Tech	121	38.3	6	1.9	114	36.1	75	23.7	316
Sprdsheet	108	33.9	206	64.6	2	0.6	3	0.9	319
Presentation	78	24.5	238	74.6	0	0.0	3	0.9	319
Image Proc	61	19.2	222	69.8	7	2.2	28	8.8	318
Internet Srch	21	6.7	291	92.4	0	0.0	3	1.0	315
Word Proc	20	6.3	298	93.4	0	0.0	1	0.3	319
Email	13	4.1	302	94.4	0	0.0	5	1.6	320

At the very bottom of the college list is email, the application for which students showed the highest knowledge. Clearly, the six technologies for which students report the highest knowledge (Table 1) are very likely introduced prior to college. This lends support to the idea that many students have some experience with office automation prior to college, and courses that introduce office automation technology (other than databases and spreadsheets) might be considered remedial rather than standard curriculum. Interestingly, about 65 percent of students report that spreadsheets should be introduced before college. However, we have garnered that students are still very interested in learning useful, advanced features of spreadsheets even at a graduate level. It is also worthy of noting that flowcharting, GAS, databases, tax software, and small business accounting software rank high among applications student believe are most appropriate for college introduction.

It is surprising that the highest frequency response for college appropriate technology is flowcharting. This topic is certainly not the most exciting or theoretical topic, but it has come back into vogue with the Sarbanes-Oxley act of 2002 and appears to be getting some traction with students. Flowcharting software varies from Microsoft Visio to drawing tools included with all major office suite software. While flowcharting can seem antiquated, there is still much value in being able to read and prepare systems documentation. The next most frequently selected college-appropriate topic after flowcharting is GAS. Until recently, there were few materials for teaching GAS, and software was difficult to obtain. Today, teaching materials exist for teaching GAS using either IDEA or ACL software (Arens 2004; Rittenberg and Schwieger 2002) and GAS dovetails nicely with databases because the software is essentially a query tool that searches data tables for qualifying matches. In addition, GAS software can do audit sampling enabling the application of audit theory.

Databases are an application that requires a significant amount of theory to properly understand, so they lend themselves particularly well to a college setting. The business rules implemented as well as controls present in modern relational databases are an excellent application of theory and technology that will help students to realize the practical implication of internal control concepts. Having a deeper knowledge of how data is stored will also help accountants become more innovative and exercise leadership in the profession. After all, accounting information is simply data, and the more accounting students know the more capable they will be in their professions.

Small business accounting software is also high on the list of college appropriate technologies. About 29 percent of AIS courses use some form of general ledger software program and about 36 percent use a manual accounting practice set (Bain, Blankley, and Smith 2002). Because many students enter AIS without a clear knowledge of how accounting systems work, the manual accounting practice set provides the concrete foundation necessary for a discussion of internal control and other more abstract topics. Apparently, accounting faculty believe that the manual practice set is superior to small business accounting software for teaching transactions processing and other downstream systems concepts. Naturally, it would be best to follow the use of a manual system with small business accounting software, and resources exist to do so (Arens and Ward 2006).

Tax and simulation software are also ranked very high on college appropriateness by students, but neither of these is ranked as especially important in discussions of accounting topics (AICPA 2008, IFAC 2007). It seems appropriate that tax software would be a topic within the tax curriculum, and that spreadsheet simulations might be distributed across the accounting curriculum as well as in other business school courses.

Pre-College

A high level of consensus occurred when subjects selected technologies appropriate for pre-college introduction. Over 90 percent of the student subjects responded that email, word processing, and internet search should be classroom topics before college. Only about 75 percent recommended that presentation

software be introduced before college. The lowest number of pre-college responses of all the office suite applications was received by spreadsheets, about 65 percent. While the majority of subjects do view spreadsheet introduction prior to college as appropriate, about one third view spreadsheets as appropriate for *within* college introduction. Our experience in teaching technology has been that spreadsheet skills vary significantly across students. Even students whom we suspect of having had early exposure to spreadsheets seem to have developed habits that reflect an incomplete understanding of both how the technology works and of good spreadsheet design. Students who have learned some spreadsheet applications before college tend to view the technology as a calculator on steroids, probably because they have not yet been trained in the applications of accounting and finance that would allow the development of more sophisticated spreadsheet simulations.

As many students will be exposed to spreadsheets before college, teaching spreadsheets in college can be a frustrating experience. When teaching spreadsheet fundamentals, such as formula creation, students who have been exposed to spreadsheets before college are unchallenged. When teaching more complex functions, students with no prior spreadsheet experience often hold the rest of the class hostage while receiving one-on-one tutoring so that the lesson can move on. Neither situation is very desirable. In a perfect world, software that did not require a theoretical underpinning, such as word processors or presentation software, would be taught prior to college, and software that implements college-level theory would be reserved for college instruction.

Practice

For all 36 technologies in the survey, students reported that college was a more appropriate teaching locus than practice implying that all 36 technologies should be introduced before graduation. Clearly, there is an expectations gap surrounding technology topics and what can and should be taught in the accounting curriculum. In order to bridge this gap, the accounting curriculum would need to be expanded considerably, particularly in the technology area, and all accounting classes would need to become more technology integrated. While expansion of coursework in the technology area has support (Borthick 1996), and increasing technology integration across the curriculum is a good idea, if students expect that every significant technology will be addressed sometime during their undergraduate accounting education, then a significant expectations gap exists.

Given the modest resources of most accounting and other academic programs, there is still something to be gained from the survey responses even if the expectations gap cannot be immediately bridged. The highest-ranked practice technology (table 5) is expert system software which is commonly used in practice to assist professional decision making. This software is most often proprietary and has a very small learning curve, so there is very little that the accounting curriculum can or should do to introduce this technology topic. In fact, many of the high-ranking practice technologies are either proprietary in nature or are applications of other technologies.

We want to emphasize that our survey needs to be interpreted somewhat pragmatically. Certainly students would like to be as prepared as possible so that they can take pride in their performance and be successful in their careers and future lives. It is likely that concern over the unknown future has biased the student responses toward more college preparation. As professionals and educators, there is no reason to abandon professional guidance such as that provided by the AICPA (2008) and other established research in favor of chasing technology rabbits.

Technology Students Want

In the survey students were asked to list three technologies from the list of 36 that they would be most interested in learning. The most frequently selected technology topic in table 6 was tax software. Our interpretation of this finding is that tax software is a direct application of accounting knowledge and students have the highest preference for technology topics that apply to their major.

Table 6

Student Preferred Technical Knowledge by Frequency

Technology	Frequency	Percent	Cumulative Percent
Tax software	111	12.9	12.9
SB Account	85	9.9	22.8
GAS	83	9.7	32.5
Sprdsheet	67	7.8	40.3
Encryption	45	5.2	45.5
ERP	39	4.5	50.1
Simulation	33	3.8	53.9
DB Design	33	3.8	57.7
Firewall	33	3.8	61.6
Wireless	31	3.6	65.2
Intrusion	25	2.9	68.1
Expert Sys	21	2.4	70.5
RT Aud Mod	20	2.3	72.9
Groupware	20	2.3	75.2
Time Billing	20	2.3	77.5
Wrkpapers	19	2.2	79.7
Presentation	19	2.2	82.0
DB Search	18	2.1	84.1
Flowcharting	15	1.7	85.8
Internal Net	13	1.5	87.3
Embeded	12	1.4	88.7
Word Proc	11	1.3	90.0
EDI Web	9	1.0	91.0
Agent Tech	9	1.0	92.1
Test Data	8	0.9	93.0
User Auth	8	0.9	93.9
EDI Trad'l	8	0.9	94.9
Internet Srch	7	0.8	95.7
External Net	6	0.7	96.4
ASP	6	0.7	97.1
Email	5	0.6	97.7
Image Proc	5	0.6	98.3
Client Serv	5	0.6	98.8
CASE	4	0.5	99.3
Work Flow	3	0.3	99.7
Digital Com	3	0.3	100.0

The second most desired technology is small business accounting software which also meets the criteria of applying knowledge students have gained through their major. We were surprised to find that GAS knowledge was more desirable to students than spreadsheets. GAS topics were also rated by students as highly appropriate for a college locus. However, GAS receives little mention as a significant technology for graduating accountants in other literature describing critical technologies. In our opinion, GAS is useful for illustrating auditing concepts and helping students better understand the auditing profession and the tools available. We do not see GAS at the same level of importance as databases, small business software or spreadsheets; however, we do see GAS as an excellent way to integrate technology into an auditing course.

Spreadsheets were the fourth highest ranked technology topic among the preferences of accounting majors. Spreadsheets have the distinction of being a high-knowledge-level topic (ranked fifth for knowledge level) and also being a preferred technology topic. About 31 percent of the student subjects thought that spreadsheets should be introduced in college. Given high knowledge and low college locus scores, spreadsheets may at first appear to be something students would give up in favor of a more unfamiliar topic. However, based on students' expressed preferences, this is not the case. Apparently, many students believe that a study of spreadsheets should start before and continue throughout college.

In our experience, there is high variability in spreadsheet skills across accounting students. If spreadsheet fundamentals are taught, many students will feel unchallenged while other students may have difficulty with the same concepts. Teaching technology topics to students of varying backgrounds can be very challenging. Few prepared academic materials appeal to all levels of students, beginners or advanced. Perhaps an acceptable way to teach spreadsheets, given the variety in skill levels, is by using short technology projects that touch upon some of the more advanced spreadsheet features but are not exceptionally difficult. Thus, students with advanced spreadsheet skills may have exposure to a facet of spreadsheets they would not otherwise encounter, and beginning students have an opportunity to improve their skills on a project that is not beyond their reach. It has been suggested that macros are not a high priority spreadsheet topic (Heagy and Gallun 1994) although we have found them useful. Our interpretation of spreadsheet topic priorities is that good macro design cannot compensate for poor spreadsheet design, but macros continue to be very useful. Useful spreadsheet projects are available through technical columns in the *Journal of Accountancy* online at the AICPA website. These projects can be spread throughout the semester so that students can distribute their practice over time and improve retention.

It can be seen from table 6 that learning database technology is a moderate priority for accounting students. We believe that an understanding of relational database technology unlocks a higher level of knowledge that would be unavailable without understanding this important technology. A thorough database course can include many topics including data modeling and normalization, integrity constraints and validation checks, queries (SQL or query by example), form and report generation, security, and even web databases. Because relational databases are the dominant technology for storing financial information, we believe it is impossible to become technologically literate without a significant understanding of databases. There are various approaches to teaching databases from the theory discussion of accounting data models that are present in many AIS books to a project style workbook in which the student creates one or more accounting modules using a desktop database engine (Perry and Schneider 2003). As we discuss later, students prefer less theory discussion and more practical application, so we suggest using an approach that allows students to implement any theoretical discussion in a meaningful way.

Although flowcharting ranks near the middle of preferred technologies, students view it as the most appropriate college topic. The modest student popularity of this topic is fairly consistent with professionals who themselves modestly recommend flowcharting (about 26 percent recommend flowcharting in AIS courses) according to Bain, Blankley, and Smith (2002).

Theory vs. Practice

Students were asked what their preferred mix of theory and practice would be. The survey yielded 313 usable responses which are tabulated in table 7. According to the responses, students have a strong preference for practical applications of the concepts they are learning in accounting. The majority of students prefer 75 percent practice and 25 percent theory. Fortunately, teaching resources have improved with the availability of desktop relational databases, affordable small business software, manual and automated accounting practice sets, and generally more user friendly and powerful technology.

Still the question remains, should we implement a more practice, i.e., technology-oriented curriculum or should we teach theory and let students figure out the application on their own? The results of the theory vs. practice question strongly indicate that students prefer more hands-on experience as opposed to more theory. With the clear demand for technology training by employers, professional groups, and students, we wonder why technology is not a much stronger component of accounting course work. We admit that integrating technology into course work is not easy, requires significant curriculum development efforts and provides mostly intangible rewards. From our experience, technology integration is done by those who are intrinsically motivated.

Table 7

Student Preferred Theory vs. Practical Mix

Description	Frequency	Percent	Cumulative Percent
75% Theory - 25% Practice	18	5.8	5.8
50% Theory - 50% Practice	132	42.2	48.0
25% Theory - 75% Practice	159	50.7	98.7
0% Theory - 100% Practice	4	1.3	100

Conclusions

This paper challenges the notion that accounting educators should teach theory and let students learn how to apply the theory in the real world. It adds the student voice to those calling for a more technology-oriented curriculum in accounting and points out some of the shortfalls that currently exist. While student TK is increasing, there are still significant numbers of students that lack adequate technology skills. Because many technologies are being taught before college, there is often an expectation that students will come to the university with adequate skills and that dedicated, rigorous technology courses are not necessary. We assert that students who bring a technology background to the university continue to need technology training because their knowledge often lacks depth and sophistication. Students who learn to use technology, such as spreadsheets, before college often use improper techniques that lead to errors. In addition, significant numbers of students lack prior technology training and need to learn fundamental skills before moving on to more advanced knowledge.

Students generally report high levels of knowledge on the technologies they use everyday such as email, internet search and word processing. Of all these applications, students feel most knowledgeable on email.

Students report that office automation technologies are appropriate before college, although they report high interest in learning more about spreadsheets during their university training.

An expectations gap exists between the technology topics students report should be introduced in college and what can be accomplished given the limited resources of accounting and other academic programs. The four leading technology applications that students want to learn more in college are tax software, small business accounting systems, GAS, and spreadsheets.

Students report less than adequate levels of database knowledge in spite of the demands of professional groups and practitioners for these skills in graduating accountants. We doubt that students will develop sufficient expertise in relational database technology without significant technology instruction. Students also reported very-low knowledge on a number of relevant and useful technology topics including ERP and encryption. Because encryption underlies information security, we believe it is important to develop a deeper understanding of this technology somewhere in the accounting curriculum.

Students report moderate interest in learning flowcharting and suggest that it is appropriate for introduction in the college curriculum. Flowcharting knowledge is necessary to support additional concepts including transaction processing cycles and internal control. For this reason, we argue that learning some form of flowcharting technology is essential to the accounting curriculum.

Finally, to answer the question of whether technology belongs in the accounting curriculum, we believe that teaching technology will be necessary until all students arrive at the university with the requisite technology skills. We can see many reasons to teach dedicated technology classes in important applications such as spreadsheets and databases. All students should have the opportunity to develop the requisite skills for the profession regardless of their prior background or lack thereof. Technology skills will be one of the tools that graduating students bring to the job. Theory is also necessary, but we believe that a curriculum heavily dominated by theory and underrepresented by technology is not what the profession wants and not what best serves students. There are also technologies with a significant theory component, such as spreadsheet simulation and relational databases, that must be taught concurrently with or after theory courses to be effective. We believe that these technology skills are best taught within a college technology curriculum.

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APPENDIX

Table 1

36 Critical Accounting Technologies

Item	Information Technology	Source	Description
1	Word processing	IFAC 11	Computer program that facilitates entry and preparation of documents such as letters or reports.
2	Electronic spreadsheets	IFAC 11	Software that allows the auditor to enter either alphanumeric or numeric data and manipulate it either via standard functions or auditor programmed functions.
3	E-mail	IFAC 11	Exchange of mail messages via Intranets and/or the Internet.
4	Electronic working papers	IFAC 11	Software that generates a trial balance, lead schedules, and other schedules useful for the recording of evidence in an audit or assurance engagement.
5	Internet search and retrieval	AICPA (1994)	Permits user to search text that is in electronic format and retrieve, view, and print desired text.
6	Image processing	Helms and Mancino (1998)	Conversion of paper documents into electronic form through scanning and the subsequent storage and retrieval of the electronic image.
7	Electronic presentations	IFAC 11	Software that facilitates the organization and use of text, voice, and/or images to communicate concepts.
8	Generalized audit software	IFAC 11	Computer program that helps the auditor access client computer data files, extract relevant data, and perform some audit function such as addition or comparison.
9	Expert systems	IFAC 11	Computer software that provides relevant information and/or decision models to assist a human in making a decision or accomplishing some task.
10	Embedded audit modules	AICPA (1994)	Programmed routines incorporated into an application program that are designed to perform an audit function.
11	Real-time audit modules		
12	Database search and retrieval	IFAC 11	Software that uses relational structures between data files and facilitates varying data retrieval and use.
13	Simulation software	Elliott (1994)	Abstraction of some aspect of real system via software. Auditor may use model to evaluate the reliability of information from real world sources. This may be thought of as a very high level analytical review of a company's data.
14	Flowcharting/data modeling	AICPA (1994)	Software using the source code version of programs to produce flowcharts of program logic.
15	Computer-aided systems engineering tools	IFAC 11	Integrated package of computer tools that automate important aspects of the software development process to increase software development effectiveness in terms of productivity of systems development and quality of developed systems.
16	Encryption software	Helms and Mancino (1998)	Changing data using some type of encoding/decoding algorithm so that unauthorized persons who can access the encrypted data will not be able to read it or use it.
17	Groupware	Glover and Romney (1997)	Software that permits auditors to categorize, store, and share data among themselves as well as communicate with each other about that data, preferably in a real-time mode.
18	Cooperative client/server environment	Helms and Mancino (1998)	Distribution of processing functions between two or more computers as in a local area network. This also

			includes end-user computing where users on the network also process and store data on their personal computers.
19	Workflow technology	AICPA Top 10 '97	Software and hardware that facilitates the capture of data in the work place to improve management of the business. For example, using an electronic scanner to record the movement of materials in a warehouse based on the barcodes on the materials.
20	Database design and installation	IFAC 11	Software that permits the creation and use of relational structures between data files.
21	Time management and billing systems	IFAC 11	Computer program that assists in capturing, managing, billing, and reporting time spent on professional activities.
22	Test data	IFAC 11	A set of transactions processed by the auditor to test the programmed or procedural operations of a computer application.
23	Small business accounting software	IFAC 11	Accounting software package used to record transactions, maintain general and subsidiary ledgers, and generate financial statements.
24	Digital communications	AICPA Top 10 2000	Bandwidth – telecommunications devices used to facilitate the rapid and unfettered transfer of data.
25	Tax return preparation software	IFAC 11	Software, perhaps incorporating expert knowledge, that assists the accountant/auditor in identifying relevant information, capturing and recording it in a manner that can be filed with tax authorities.
26	Firewall software/hardware	AICPA Top 10 2000	Part of "security technology" that enforces an access control policy between two networks.
27	User authentication systems	AIC PA Top 10 2000	Devices used to verify that a system user is who he/she claims to be.
28	EDI – traditional	IFAC 11	Transfer of data or payments electronically between computers using software that may, or may not, require human intervention to affect the transfer.
29	EDI – web based	Greenstein and Feinman (2000)	The extension to SML-based EDI
30	Wireless communications	AICPA Top 10 2000	The ability to transfer digital data without the use of cables, twisted-pair, or fiber optics.
31	Agent technologies	AICPA Top 10 2000	Programmed modules that are given certain levels of authority and autonomy to act on behalf of their "supervisor", such as to decide whether to order more inventory and from which supplier.
32	Intrusion detection and monitoring	AICPA Top 10 2000 and Greenstein and Feinman (2000)	Part of "security technology" that identifies unauthorized requests for services.
33	Internal network configurations	IFAC 11	Linkage of individuals and data through hardware and software systems that permit the exchange of various types of data.
34	External network configurations	AICPA Top 10 2000	Intranet, extranet, and Internet access devices that enable users physically separated from the server to access it.
35	Enterprise resource planning	McKee (2000)	Business-wide information systems that cross boundaries.
36	Application service providers	McKee (2000)	Companies that host (provide hardware, software and connectivity) for specific business applications.

Table 4

Student Competency in Critical Accounting Technologies Grouped by Factor Analysis

Factor	E-commerce and advanced technologies	Office automation	Audit automation	Databases	Accounting firm automation
Percent of Student Competency*	22%	92%	26%	47%	38%
Underlying technologies	Computer-aided systems engineering tools Encryption software Cooperative client/server environment Workflow technology Digital communications Firewall software/hardware User authentication systems EDI – traditional EDI – web based Wireless communications Agent technologies Intrusion detection and monitoring Internal network configurations External network configurations Enterprise resource planning Application service providers	Word processing Electronic spreadsheets E-mail Internet search and retrieval Image processing Electronic presentations	Electronic working papers Generalized audit software Embedded audit modules Real-time audit modules	Database search and retrieval Database design and installation	Time management and billing systems Small business accounting software Tax return preparation software

*Competency is defined as a score of four or higher on a scale of one to seven in self-reported competency.

Student Questionnaire (below)

A. Information Technology Knowledge and Education Location Questions

For each item, please complete both questions described below.

Information Technology Knowledge Questions

WHAT IS THE EXTENT OF YOUR PERSONAL KNOWLEDGE OF EACH OF THE INFORMATION TECHNOLOGIES LISTED BELOW?

- If you believe you have **No Knowledge** of the technology, circle number 1.
- If you believe you have **Expert Knowledge** of the technology, circle number 7.
- If you believe your knowledge is somewhere between these two extremes, circle the appropriate number between them.

Education Location Questions

WHERE IS THE SINGLE BEST PLACE TO INITIALLY LEARN EACH OF THE TECHNOLOGIES LISTED BELOW?

- If you have No Opinion, either due to lack of knowledge or for other reasons, circle number 0.
- If you believe that the technology should INITIALLY be learned before attending a college or university, circle number 1.
- If you believe that the technology should INITIALLY be learned in colleges or universities, circle number 2.
- If you believe that the technology should INITIALLY be learned after graduation in accounting/audit practice, circle number 3.

(Note: The examples provided after some of the technologies may only be a small part of the overall technology!)

		No Knowledge						Expert Knowledge	No Opinion	Before College or University	College or University	After Graduation Accounting/ Audit Practice
1.	Word processing software	1	2	3	4	5	6	7	0	1	2	3
2.	Electronic Spreadsheets	1	2	3	4	5	6	7	0	1	2	3
3.	E-mail	1	2	3	4	5	6	7	0	1	2	3
4.	Electronic Working Papers	1	2	3	4	5	6	7	0	1	2	3
5.	Internet Search & retrieval	1	2	3	4	5	6	7	0	1	2	3
6.	Image Processing (e.g. scanning)	1	2	3	4	5	6	7	0	1	2	3
7.	Electronic presentations (e.g. PowerPoint)	1	2	3	4	5	6	7	0	1	2	3
8.	Generalized audit software (e.g. ACL)	1	2	3	4	5	6	7	0	1	2	3
9.	Expert Systems (e.g. credit approval system)	1	2	3	4	5	6	7	0	1	2	3
10.	Embedded audit modules (e.g. continuous extraction of data for later analysis)	1	2	3	4	5	6	7	0	1	2	3
11.	Real-time audit modules (e.g. real-time transaction extraction & analysis)	1	2	3	4	5	6	7	0	1	2	3
12.	Database search & retrieval	1	2	3	4	5	6	7	0	1	2	3
13.	Simulation software (e.g. business models)	1	2	3	4	5	6	7	0	1	2	3

		No Knowledge						Expert Knowledge	No Opinion	Before College or University	College or University	After Graduation Accounting/ Audit Practice
14.	Flowcharting/Data modeling software	1	2	3	4	5	6	7	0	1	2	3
15.	Computer Aided Systems Engineering Tools	1	2	3	4	5	6	7	0	1	2	3
16.	Encryption Software	1	2	3	4	5	6	7	0	1	2	3
17.	Groupware (e.g. Lotus Notes)	1	2	3	4	5	6	7	0	1	2	3
18.	Cooperative client/server environment	1	2	3	4	5	6	7	0	1	2	3
19.	Workflow technology (e.g., barcodes)	1	2	3	4	5	6	7	0	1	2	3
20.	Database design and installation	1	2	3	4	5	6	7	0	1	2	3
21.	Time management & billing systems	1	2	3	4	5	6	7	0	1	2	3
22.	Test data (e.g. evaluate computer software)	1	2	3	4	5	6	7	0	1	2	3
23.	Small business accounting software	1	2	3	4	5	6	7	0	1	2	3
24.	Digital communications & bandwidth	1	2	3	4	5	6	7	0	1	2	3
25.	Tax return preparation software	1	2	3	4	5	6	7	0	1	2	3
26.	Firewall software/hardware	1	2	3	4	5	6	7	0	1	2	3
27.	User Authentication Systems	1	2	3	4	5	6	7	0	1	2	3
28.	Electronic data interchange-Traditional	1	2	3	4	5	6	7	0	1	2	3
29.	Electronic data interchange- Web-based	1	2	3	4	5	6	7	0	1	2	3
30.	Wireless Communications	1	2	3	4	5	6	7	0	1	2	3
31.	Agent Technologies - (e.g. vendor search & approval)	1	2	3	4	5	6	7	0	1	2	3
32.	Intrusion Detection & Monitoring	1	2	3	4	5	6	7	0	1	2	3
33.	Internal network (intranet) configurations	1	2	3	4	5	6	7	0	1	2	3
34.	External network configurations (e.g. extranets And Internet gateways)	1	2	3	4	5	6	7	0	1	2	3
35.	Enterprise Resource Planning (ERP) Systems	1	2	3	4	5	6	7	0	1	2	3
36.	Application Service Providers (ASPs) (e.g. outsourced transaction processing)	1	2	3	4	5	6	7	0	1	2	3

B . Other Questions

Please omit any questions which you do not wish to answer. **Circle or write-in your answer** as appropriate.

1. Refer to the previous page and select the **three** technologies about which you would MOST like to know more?

   a._____ b._____ c._____

2. What proportion of theory and practical application (e.g. problems, cases, hands-on use) in information technologies do you believe would be BEST for a college or university education?

   a. 100% theory and 0% practical application
   b. 75% theory and 25% practical application
   c. 50% theory and 50% practical application
   d. 25% theory and 75% practical application
   e. 0% theory and 100% practical application

3. Which word BEST describes the OVERALL COVERAGE of information technologies in your:

University	College	Department
a. very low	a. very low	a. very low
b. low	b. low	b. low
c. adequate	c. adequate	c. adequate
d. high	d. high	d. high
e. very high	e. very high	e. very high

4. How would you evaluate **your** current OVERALL KNOWLEDGE of information technology?

   a. very low
   b. low
   c. adequate
   d. high
   e. very high

5. What is your opinion about the OVERALL LEVEL OF USE of information technology by professional auditing firms?

   a. very low
   b. low
   c. adequate
   d. high
   e. very high

6. What is your gender? a. female b. male

7. What is your age in years? _____

8. What year in school are you? a. freshman b. sophomore c. junior d. senior e. grad student

9. How many Accounting information system courses have you completed? a. one b. two c. three

10. How many MIS courses have you completed? a. one b. two c. three d. four

11. What is your cumulative overall GPA _____.

12. Have you completed an internship a. yes b. no

END OF QUESTIONNAIRE. THANK YOU FOR YOUR PARTICIPATION.