

# **The Effects of Changing AIS on User Experience and Business Role**

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# Abstract

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Technology has become a dominant factor in many aspects of modern life. This research explores how technology has influenced the field of accounting through the advancement of Accounting Information Systems (AIS). To address the issue of the qualification of students entering the accounting profession, two populations were surveyed. Students who were previously enrolled in an AIS class at SUNY Brockport were surveyed about their comfort level with AIS before and after the class, along with their outlook on technology in the workforce. Accounting professionals were surveyed on their usage of systems in their companies, their preference towards change, and their first-hand accounts of changing technology in the workplace.

The results of this research shows that while having an AIS class significantly helps prepare students for the real world, there are ways to improve the course content to provide even better professional candidates. To be successful, students must achieve a foundational grasp on system usage the same way that debits and credits are a foundation to the whole accounting cycle. Students should be exposed to a multitude of different accounting software so that they learn to move beyond “point and click” to a stage of analysis that will allow them to adapt to whatever systems they see later in their careers. For this to occur, either a second AIS class would be required, or a whole new major should be added, focusing on the importance of AIS. In the professional world, the changes in technology and AIS are causing restructuring of both the company structure and the human resource usage. Soon the new-hire data entry position will be obsolete as computers take over and the whole process becomes automated; thus ushering accounting into the age of analysis and forecasting as opposed to book keeping and data entry.

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# Focus

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My first experience with accounting involved a binder, a pen, and manually recording transactions and financial statements. Following this was an experience with an older software package called Automated Accounting Version 7.0. Within the last year I have gained experience with reporting via Excel, QuickBooks 2013, Sage 50 (Peachtree), and Mas 90. Drawing off my own experience I believe that newer versions of programs create a different user experience than older versions or especially manual recording.

For one thing, newer programs appear to have a lot more features and possible outcomes for the data entered. With manual recording, nothing happens unless you physically write down the transaction and write up the financial statement. Human error is very common, finding errors is likely time consuming and tedious, and there is little time left for analysis after all the entries are recorded. For older programs, such as the Automated Accounting Software 7.0 that I used, manual recording of all entries was still needed. The main difference here was that after recording the journal entries, the reports would be generated with a few clicks of mouse and a few parameters set. This was a step up from manual accounting but still left invoices, credit memos, and checks in paper form to be rummaged through when looking for past transactions.

With the newer software that is being developed such as QuickBooks, Peachtree, and Mas 90, the issue of rummaging through paper stacks is decreased as now these programs have you inputting the data on the invoice and the software package generates the journal entry for you. This leaves you an electronic form of the source document that can be searched quickly as well as taking out the repetition of manually creating journal entries for each sales invoice and purchase order that comes in the door. In addition to this, there are more ways to display the data using the newer programs. Instead of only

being able to generate standardized financial statements, the click of the mouse can now also bring up computer generated graphs, charts, and ratios instantly.

Focusing on this progression from manual to advanced accounting software, concentrating on accounting packages typically found on the shelf for small to medium sized companies, I wanted to look at exactly how these different accounting programs change user experience, the role of accounting in business, or the rules and accounting standards that govern industries. The importance of examining the effects of change comes from the assumption that change will continue to happen. In order to see where the accounting profession is heading in the future we need to examine what's already happened. By looking at prior changes in user interaction with accounting programs we can predict if the future will lead to a loss of basic accounting knowledge or if new doors will be opened. The questions driving my research involved:

- Are people becoming too dependent on technology and losing core knowledge that previously was needed to perform day to day operations; or does new software allow more doors to open within the accounting profession?
- Is there a resistance to these technological and AIS changes?
- Are the outcomes of the AIS class at SUNY Brockport sufficient to prepare students to be qualified entry-level accountants?

# Research Methodology

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In order to answer the above questions, I created two surveys to start my research. The first survey was designed and sent out to professionals working in organizations and accounting firms. I got my addressees from a list of SUNY Brockport alumni who graduated with an accounting degree in the last 35 years and had left a contact email with the alumni relations. Using Survey Monkey I sent out the survey to 413 people and ended up receiving roughly 54 anonymous responses.

When I created this survey, the idea was to see if factors such as age, gender, organization type, and years of experience influenced people's reaction to change or their feelings toward updating accounting systems. Therefore I created seven questions asking for demographic information such as age, gender, and job. After that I asked a series of questions on how the respondent felt about change, technology, and their preference for manual accounting versus using computer programs. In order to look deeper at the possible underlying reasons for the prior responses, I then asked for separate lists of all the accounting information systems used and all the programs they've heard of, even if not used. After that was a series of questions asking about willingness to change programs, both of the company they worked for and of themselves. I wanted to see if there was a correlation between the amount of programs used and how that individual felt about manual accounting versus computer programs, or their willingness to change programs.

The last section of my survey consisted of questions about how the individual felt regarding if new programs make work easier or faster, if they feel that they are giving up any underlying accounting knowledge by using the software, and if they think accounting is changing because of technology. The opinions gathered from these last questions are the main heart of what I wanted to know. This was based on my suspicion that people would feel that AIS helps in all aspects, by increasing efficiency,

decreasing errors, and essentially being the best thing to happen to accounting. My fear is that while people may feel this way, they are putting these AIS on a pedestal, while there are still flaws in the system. For example, these AIS may help protect from human errors, but they also may create errors when there are inexperienced users involved.

Another theory is that using these programs turns entry level accountants into data entry monkeys, or completely wipes out today's entry level jobs completely by having technology take over. By having entry level accountants sit at a desk and enter invoices into a software program for 40 hours a week they require little or no prior accounting knowledge and only have to be told what numbers go where. So while the programs may mean you can get your reports faster and in ten different formats in a matter of minutes, you have the entry level accountant who just wasted half a month inputting all the forms you already have in paper form. However, when you are trying to find the forms weeks later, it is much quicker to do a program search and find the invoice in a matter of minutes rather than searching through stacks of papers for hours. In this case, it was well worth the time of the data entry accountant.

However, like previously stated this job requires little or no accounting knowledge and can be done by computers just as easily, given the proper advancement of technology. So, while having a company use a software program may at first degrade a new accountant into a mindless data input service questioning why they have a degree at all, once computers are able to take over this mindless task, the new entry level job will be one that previously sat one rung higher up the totem pole than before. In this theory, new accountants need more accounting knowledge than prior entry level accountants, as their jobs will now require using the data in analysis rather than simply inputting the data. My reasoning behind my final questions to professionals was to get to the bottom of which of these theories is actually occurring, if any at all.

The second survey I created was designed to find a base level for the entry level accountant. I wanted to examine how students felt in regards to their eligibility as a prospective entry level employee in the accounting field. I devised different questions from the first survey, this time using the Likert scale. With the help of the AIS professor at SUNY Brockport, my survey was sent out to an audience of students who had been enrolled in SUNY Brockport's AIS class within the last three years. I received 28 anonymous responses.

The intent of this survey was to showcase whether or not teaching an AIS class would influence how students react to accounting information systems and what the general perception is of technology in the accounting field. While the first survey was designed to look at people currently in the accounting world and using software packages, the second survey was designed in hopes of seeing the reactions of people typically newer to the accounting field and with generally limited knowledge of different accounting programs.

For the first half of this student survey, the questions focused on if students felt comfortable using (1) AIS prior to taking an AIS class, (2) using the same exact AIS as used in class, (3) using newer versions of the systems used in class, (4) using new programs they've never seen before, now that they've experienced a couple of basic systems, and (5) creating spreadsheets from scratch. These questions were asked of both general ledger packages and tax packages. The second half of this survey asked students their opinion about succeeding in the accounting world now that they have a basic knowledge of some accounting packages. Along with that, there are questions as to if they think they need extensive AIS knowledge entering a new job or if they will be given on the job training for everything they need to know. A few questions were also thrown in about the perception of technology's effect on business, such as if technology drives business or business drives technology and how reluctant or eager are companies to advance their technology when they've already invested so much into the possibly outdated system they currently use.

One of the main purposes for this survey was to see if teaching an AIS class is beneficial to students entering the accounting field, now that software is so widely used. By teaching an AIS class, is this taking away from the teaching of basic accounting processes such as revenue recognition or lease agreements? Or does this enhance the student's knowledge and better prepare them for the real world? Does AIS need to be taught in more depth or is one class enough, leaving the rest of the responsibility to on the job training and self-teaching?

Supplementing my data from my two surveys, I am using internet research and scholarly journals to supply facts, rather than opinions about how the software, accounting field, and teaching of AIS have physically changed over time.

# Introduction & Literature Review

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Accounting dates back to as early as 2600 B.C. where scribes would record sales, hiring, money-lending, and other transactions on clay slabs or papyrus (Brown, 1968). There is evidence of accounting regulations as far back as the Code of Hammurabi in 2250 B.C. with other ancient practices facing laws such as the Calpurnian Law of 149 B.C, or Charlemagne's commands of 812 A.D. (Brown, 1968). However, when AIS is defined as the combination of traditional accounting practices, telecommunications technology, and computers, AIS can only be traced back as recently as the 1920s (Badua & Watkins, 2011).

Since the dawn of accounting, many changes have occurred. Not only has there been the update from abacus to calculators, but starting in the 1900s, there was the development and usage of computers and corresponding software programs (Pepe, 2011). After software programs were initially developed they were applied to the accounting cycle and expanded the abilities of accountants while simultaneously making the process more efficient. E-Business took off, computer file rooms were created, margin of error decreased, and accountants transitioned from number crunchers to advice givers, as accounting took on an area of forecasting and analysis (Pepe, 2011).

There are multiple reports (Burns & Vaivio, 2001; Caglio, 2003; Chapman & Kihn, 2009; Taipaleenmäki & Ikäheimo, 2013) that harness the idea that updates in AIS systems are restructuring traditional accounting. Burns & Vaivio (2001) quoted a study performed in 1997 by Aktinson et al. about how communication between and within organizations has changed due to the introduction of the internet, e-commerce, electronic data interchange, and enterprise resource planning (ERP) systems. Burns and Vaivio's study goes on to conclude that this is resulting in management accounting changes. Caglio (2003) goes on to suggest that the adoption of ERP systems challenge the roles of accountants

leading to new hybrid positions. Similarly, Taipaleenmäki & Ikkäheimo (2013) discuss what appears to be the merging of financial accounting with management accounting in the areas of accounting standards, processes, performance measurement, incentive programs, control of business networks, and other aspects. Zimmerman & Yahya-Zadeh (2000) point out that accounting has changed purposes to where the main concern is now control and decision making.

Through all of this restructuring, the effects of ERP software is the type of AIS that is usually studied and referenced. This leaves an apparent lack of acknowledgement that there are other AIS that could be influencing these changes. Not only is there ERP software, but there are supply chain management (SCM) systems, general ledger packages, tax software, and audit programs to name a few other categories. A study performed by Olanmi in 2013 demonstrated that computer aided audit tools (CAAT) helped increase fraud detection so that fraud can be limited to insignificant levels within organizations.

Additionally, new laws, such as Sarbanes Oxley, have added to the restructuring. After multiple accounting scandals of the 1990s, the Sarbanes Oxley Act was issued in 2002 which required internal controls to be increased, and any material misstatements disclosed (Sarbanes-Oxley Act 2002). This regulation in particular impacts financial reporting, which is usually done via general ledger packages, and auditors, who use audit programs. Thus more focus should be put on the changes resulting in financial reporting software and how general ledger software changes affect the accounting profession.

One of the problems with advancements of technology is that the workforce is not always able to keep up. One of the conclusions of a study performed by Hussain in 2010 was that the only way to successfully join accounting with technology is to have competent employees. The easiest way to have competent employees is to start at the source and educate students before they even enter the workforce. However, according to Badua, Sharifi, & Watkins (2011), there is no standardization of topics

for AIS classes. The American Accounting Association (AAA) and the American Institute of Certified Public Accountants (AICPA) have set some frameworks for what they think are the important topics to be covered, but it is unlikely, and due to ever-changing technology, inappropriate for the curriculum of AIS to be a settled, standardized issue (Bain, Blankley, & Smith, 2002).

Within the last thirty-five years, multiple studies (Wu, 1983; Davis & Leitch, 1988; Doost, McCombs, & Sharifi, 2003; Badua, Sharifi, & Watkins, 2011; Bradford, Taylor, & Badua, 2012) have analyzed AIS teaching practices with the intent of forming a standardized foundation of what students should be taught about AIS. The suggestion for an AIS course was first recommended in the 1950's by the AAA and Wu (1983) endorsed the idea of integrated case studies, programming, and theory as the basis for the class.

Doost, McCombs, and Sharifi (2003) add to the research by pushing for continuously updated topical coverage which would increase the rigor at which AIS is taught and expand the course beyond an introductory level. If this suggestion were to be taken, AIS coverage could be expanded into two courses (Badua, Sharifi, & Watkins, 2011), or several specialized AIS courses within the accounting major (Davis & Leitch, 1988). An optimistic option would be to add a whole new major in accounting information systems. Dillon (2004) explored not only how this is an option but how after the 1990 AAA recommendation that accounting educators place more emphasis on accounting systems, some colleges actually began implementing AIS majors at both the undergraduate and graduate level.

The most recent recommendation for an accounting education framework was issued in 1999 by the AICPA. This core competency framework for entry into the accounting profession includes the functional competencies of decision modeling, risk analysis, measurement, reporting, research, and use of technology (Daigle, Hayes, & Hughes, 2007). AIS Classes would do best to focus on the use of technology, research, and risk analysis categories by implementing software usage, spreadsheets, and

internal control concepts (Daigle, Hayes, & Hughes, 2007). Professors also need to use system diagramming (SD) and system flowcharts (SF) to help students understand not only how to run the software programs but also the accounting and business processes that go on in real practice (Bradford, Taylor & Badua, 2012).

# Critical Analysis & Discussion

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## Student Survey

### **Trend 1: Accounting Information System classes are important!**

**89% of students agreed that they felt comfortable creating a spreadsheet from scratch. The other 11% was unsure but did not disagree.**

Spreadsheets are the foundation of financial analysis. In order to find ratios and create graphs, the totals on financial statements are analyzed. Starting in the introductory classes, accounting students should start being familiarized with the formats of these spreadsheets. In the intermediate stages, the students should begin creating the worksheets, thus giving them an understanding of where the numbers come from. This paves the way for deeper financial analysis at the advanced stages of teaching.

The Accounting Systems and Software class at SUNY Brockport is ranked as an introductory class, with the only accounting prerequisite being Principals of Financial Accounting (SUNY Brockport Course Catalog). This ranking sets this class up as a lower level accounting course. To have 89% of

students come out of these introductory courses confident in their ability to create spreadsheets, means that there is a sufficiently strong emphasis early on.

This area should continue to be strongly emphasized as these spreadsheets will continue to be a basis for analysis, even as technology gets more advanced. As the computer systems take over the process of creating the spreadsheets, accountants don't necessarily need to know how to manually create these documents. However, by having this background knowledge, they will have the knowledge of where the numbers come from and are more likely to be able to spot and correct errors.

An alternative benefit is that the analysis done will not simply be numbers and ratios but the accountant will have the understanding of what the numbers mean because they actually know how the results came out of the system. For example, inventory turnover ratio will mean more to the accountant if they had to at least once take a physical inventory and create the ratio themselves of how fast product flies out the door, as opposed to only seeing a number on the screen of a computer. Another example is how gross profit rate comes from the difference in sales revenue and cost divided by revenues; if the accountant knows this is the formula behind the ratio, the result will actually make sense to the accountant and be something that they can then relay in untechnical terms to others.

For these reasons, it is particularly important for students to learn base knowledge such as how to create simple spreadsheets.

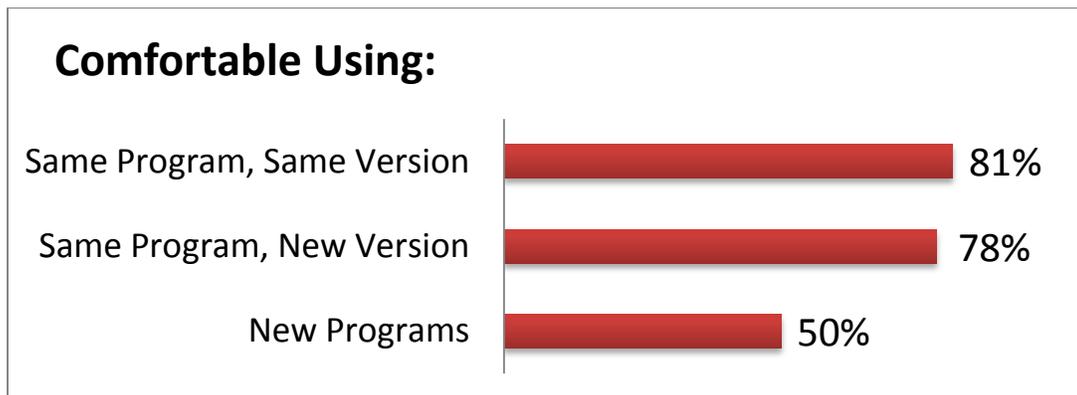
**At least 80% of students surveyed said that they did not know a lot about AIS before taking an AIS class, whether at Brockport or another college.**

Most accountants use software programs on a daily basis. While there is the possibility of on the job training for the specific software programs used by a company, the general ability to use this technology needs to be added to the core accounting knowledge. Just like the basic knowledge of debits

and credits allows accountants to record inventory purchases and pay employees, the software needs to be familiar just like a calculator or a balance sheet.

It is troublesome that 80% of students surveyed said they did not know much of anything about AIS before taking an AIS college course. That means that if the accounting major did not require this course, 80% of students would be trying to find jobs having never experienced software packages that are as crucial and basic as knowing debits and credits.

**50% of students said they would be comfortable using new general ledger programs (not seen before), 78% said they would be comfortable with a new version of the same program they were exposed to in class, and 81% said they feel comfortable using the same program, same version as taught in class.**



81% of students came out of SUNY Brockport's AIS class having learned enough of a general knowledge to at least be able to use the same AIS program again after leaving the class. This means that the teacher was able to connect, and plant this knowledge in more than three quarters of the students.

It is expected that the closer the program is to one the student has seen before, the more likely they are to feel comfortable using it. The fact that 78% of the students surveyed said they would be comfortable with a newer version of a program used in class highly follows this expectation; especially when it is considered that only 81% (3% more) said they would be comfortable using the same exact

program as class again. By comparing these numbers the odds are almost the same. The main reason would probably be that newer versions may change some features and appearances but the program will run generally similar to older versions.

Gravitating further into the unknown, a new program saw a 20% decrease in ease with only about half of those surveyed answering in the affirmative towards being comfortable using a different program. This is not a surprising result as it is unusual to be comfortable with the unknown. However, the goal of teaching an AIS class should be to help satisfy this unease by teaching the students not about all the different programs in existence, but how to deal with using software that is different than what they are familiar with.

**Just over 50% of students surveyed said that after taking an AIS class they would be comfortable using any type of software program, even if it's a program they've never seen or heard of before.**

This should be the main goal of any AIS class. Rather than make a student an expert on one type of software, such as QuickBooks, they should be exposed to a range of packages. This way, the student learns not to simply click the top right button whenever a bill needs to be recorded, because that's what they did the last time, but rather they have to learn to problem solve. By showing the student multiple packages, they have to re-learn the processes and reason out why they are taking the steps that they are.

While many AIS programs are similar in style, the small change in screen display is enough to throw off the inexperienced user. By teaching an AIS class where multiple programs have been experienced, even if only briefly, this helps better the accountant by making them understand more deeply the reason behind the data input. The result is accountants that they will be able to go out and find a job using a different software package without being completely thrown off.

## **Trend 2: AIS classes taught at SUNY Brockport are narrowly focused on general ledger software. This should be expanded.**

**Survey results showed much lower percentages for all of the tax questions, with only about 50% answering in the positive for any of these questions, and multiple people answering as not applicable (N/A).**

Without taking other colleges into consideration, the syllabus for SUNY Brockport's only AIS class currently states that there will be three projects. One project teaches manual accounting with an incorporation of technology in the form of Excel. The other two projects focus on using two different general ledger software packages. While this may max out the time limit for this class, there are large gaps left by only using two general ledger programs.

Yes the benefits are gained from seeing a diversified approach to general ledger packages, but nowhere in the Accounting Program at Brockport is there any exposure with tax or audit software. Based on the lukewarm responses to my survey about tax programs this may be an issue that needs to be addressed and changed. After all, everyone who works has to file taxes yearly which means that most accountants will probably file their own taxes if they don't go into the business of tax altogether.

In addition, the accounting profession has spread out from simply corporate accounting to four or five main categories: corporate, tax, auditing, consulting, and governmental. Each of these categories uses its own general type of software with audit and tax packages varying greatly from general ledger packages.

My suggestion would be to add a second AIS class that provides the basics to some of these other types of software programs generally encountered by post-grad accountants. Similar to how there are senior level accounting classes required in both taxation and audit, now that all accounting paths

rely heavily on technology and software programs, there should be a senior level technology class that supplements the tax and audit courses by allowing the students to see what these programs may look like and how they are typically used.

This additional course could also serve as a refresher course for the prior AIS class. By senior year, accounting students have a much greater knowledge base than when they take the AIS course earlier in their career. With this new knowledge perhaps a third type of general ledger program (not seen in the other AIS class) could be explored and utilized for more complex issues such as bonds, leases, or consolidation. The level of analysis could go into greater depth and better prepare students for careers where the main responsibility is not data entry but rather data analysis.

Even more outgoing than just adding one course there could be enormous benefits from adding an AIS Major or AIS minor. Some colleges such as Canisius College and Illinois State University already have majors focused around Accounting Information Systems. Looking at the course requirements for the AIS major at Canisius College, there are only about four classes that are specialized towards AIS rather than just accounting. These include e-business, database management, information systems auditing, and enterprise systems (Canisius Courses & Curriculum). The specialty classes according to the Illinois State website include computer programming for business, business systems analysis, information systems in organizations, management information systems, and advanced accounting information systems (Illinois State University).

If SUNY Brockport were to add an AIS major, my suggestion would be that the first class that should be added is Information Systems in Organizations. This class could teach students the difference between the broad categories of AIS. For example most students have never heard of Enterprise Resource Planning (ERP) or Supply Chain Management (SCM) software. Few have seen tax software, and

most would have no clue what audit programs such as ACL or IDEA do. This could be a great entry level course, on an equivalent level to Principles of Financial Accounting.

Additional courses that could be helpful are classes that specialize in the use of the above mentioned programs. These courses should be project based, and simulate real world use. There should be an AIS course that introduces three or four different general ledger packages, a course that familiarizes students with one or two audit packages and the reasoning behind what it going on, and a course that teaches tax software for personal returns as well as corporations and partnerships. These courses could tie together with the upper level accounting classes that are required, namely advanced accounting, auditing, and tax. There should also be an upper level course that teaches how to pick the best program for your business and other aspects of e-business.

### **Trend 3: Learning to use technology better prepares accounting students for the professional world.**

Learning to use technology is very helpful for students who will be entering the accounting field after college. Since the age of technology is constantly updating, it is very important to keep up. Almost all the students surveyed agreed that they will be a more valuable potential employee if they are able to use the technology that is utilized in the real world. In fact, every student surveyed agreed that adaptability is key when it comes to changing technology.

**When looking at the student survey results, 88% of the responses agreed that technology changes the way the students learn accounting.** If 23 out of 26 students feel that technology affects the way they learn, then the classes should be tailored more toward that learning style. In order to do that,

more classes could be integrated with technology, such as the previously suggested additional classes that require real life simulated projects using actual programs from the profession.

Since every student surveyed agreed that there will continue to be new technology in the future of accounting, it is pointless to continue teaching accounting based solely on the books. While this method of teaching may have been the best method while manual accounting was around, the tech-savvy generation is starting to feel like classes are more and more out of touch with real application. Much like how a history major will never use the Pythagorean Theorem, accounting students feel like some of the teaching practices are equally disjointed even within the major.

However, this does not mean that fundamentals can be given up. On the contrary, fundamentals still need to be taught, but perhaps there is a way to integrate the fundamentals into the technology. A good way this could be accomplished includes having hybrid classes. Instead of solely teaching the fundamentals in a normal classroom, there could be classes in computer labs, online homework, and computer based projects.

#### **Trend 4: Technology has changed the way accountants do business.**

**Students and professionals alike agreed when asked if they thought technology has changed the way accountants do business within the last ten years.** While students were only asked if they agreed, the professional survey gave more room for explicit responses. Some of the biggest changes that professionals saw were an increase in digital documents, more focus on testing of internal controls, and e-filing of taxes. More analysis is given on this subject later.

## **Trend 5: Students assume there will be on-the-job training on the specific technology their employer uses.**

**72% of the students surveyed responded as assuming they will be able to get complete training on the technology that their job requires them to use. Only 12% disagreed with this statement, leaving the remaining as uncertain.** This is interesting as not all companies have complete on the job training. Usually there is a grace period where the company expects you to still be learning the ropes, but not every company sits you down and walks you through the steps of everything you will be doing or the way their AIS works.

However, that does not mean that you have to enter the job already knowing everything. Managers expect new hires to ask questions and take time to get used to the flow of the company. Every company can potentially run a different software program than you have used before. If the software is completely foreign to you, you will probably have to ask a manager or co-worker where to go and how to do certain tasks. In a lot of companies, this “ask as you go” technique replaces any on-the-job training. The only issue with this technique is when a new hire refuses to ask questions thus trying to figure the problem out on their own and creating errors, or when a new hire asks the same question too many times.

## **Trend 6: Business needs drive technology... or vice versa... or both?**

**The student survey I created included a question that asked if technology drives business, or if business needs drive technological advances.** This is a very thought provoking question and there was no clear defined answer based on student opinion. In fact just as many people responded as unsure as

the amount that agreed or disagreed. The opinions were very split. There was only a slight lean in opinion towards the idea that business needs drive technological advances.

Further research into this topic can be executed by surveying companies. Questions could include asking about what influences their decisions to update their technology, and when they decide to advance their company into new areas, are they doing so because they're technology is now allowing them to do so? Or do they search for a new technology when they want to do something that their current technology is not equipped to handle?

The problem that this may hit is that every company is run differently. It is highly likely that some CEOs like the idea of having the newest technology so they update their technology frequently and then see where that technology allows their company to go. Other companies may be more rigid in their ways and only update their technology when their current program cannot account for a new type of transaction they encounter or the system is too old or outdated to keep up with the business needs.

There is also the concern that software programs are not cheap. Whether the company develops its own software and capitalizes the costs, or purchases software developed by outside companies, there is still a significant investment made. Does this investment deter companies from pursuing more frequent software updates? Perhaps size of the business may influence this decision, or how profitable the company has been in recent years. Perhaps this is only a consideration when the company is already in the red, or a small family owned business. My speculation is that there is no clear formula, no definite answer, and that there will always be variation one company from the next.

## Student Testimony

Some of the students who responded to the student survey also supplied their opinions on technology, AIS advancement and student transitions into the work force. Here are five of those opinions straight from the students.

“I think that technology is important because it infiltrates many aspects of the modern world, but the very premise of accounting and the principles behind it need to be learned just as they were many years before. I think that introducing technology before one has a good basis and understanding of accounting is doing that person an injustice because it makes it more difficult to see the big picture of what's going on in any problem or situation before you.”

“I believe the [AIS] class has given me a good overview of the different technologies available, however, I am a firm believer in on-the-job training and it makes more sense to learn the specific version and package that an employer uses once I have a job with them. Exposure is very good, but it is not as important as on-the-job training.”

“I think the use of technology when it comes to accounting can help boost productivity and decrease manual errors as long as there is a deep understanding of the technology being used. I have found that learning through these technologies has made it easier and more fun to learn!”

“There are many more accounting systems in the real world than we learn about in class. It was a good exercise to learn what goes on behind the screen in the programs because then it is easier to understand other programs.”

“I have not used any tax software yet. I am confident with general ledger software though.”

In conclusion, there is much to learn from students entering the accounting world. SUNY Brockport's AIS class gives students good exposure in a couple general ledger packages. However, there

is room for improvement when it comes to tax software, and other types of packages such as ERP, SCM, or audit packages.

Even though on-the-job training is essential for new employees, there is also an importance on knowing the basics. Without introduction to the technology, students will be flustered and are more likely to make errors or fall behind in work when they get to a job site. Finally, the principles behind the software must be taught and understood in order for students to become employees of any value.

## Professional Survey

### Demographics

Female	Male	Total	Age	15-24	25-34	35-44	45-54	55-64	Total
24	30	54	Responses	4	24	13	9	3	53
45%	55%	100%	Percentage	7%	45%	25%	17%	6%	100%

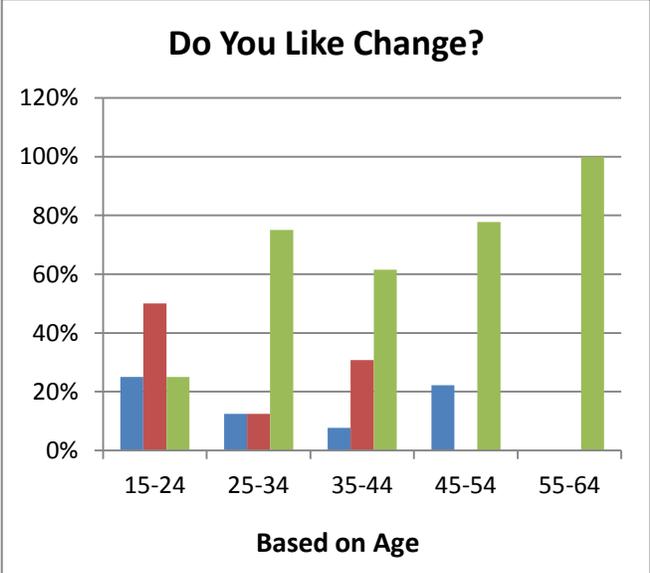
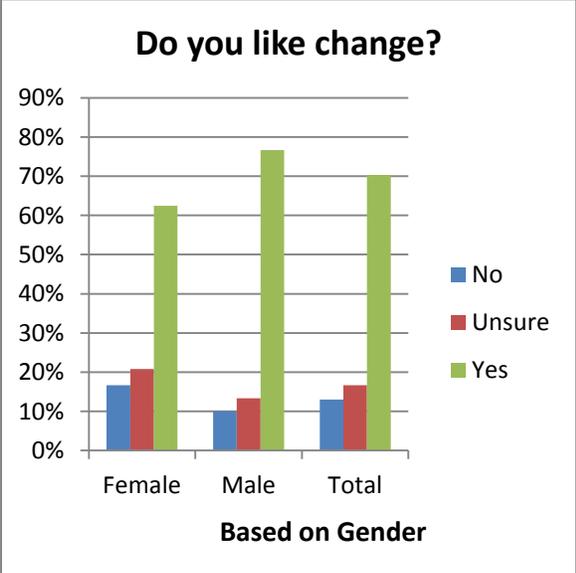
Years of Experience	0-4	5-9	10-14	15-19	20-24	25-29	30+	Total
Responses	19	11	12	5	4	1	2	54
Percentages	35%	20%	22%	9.5%	7.5%	2%	4%	100%

In response to my professional survey, I received 54 responses. Out of these responses 7% were new accountants under the age of 25, 70% were between the age of 25 and 45, and 23% were above the age of 45. The gender was split pretty evenly with a 45% to 55% ratio with slightly more male responses.

35% of responses came from people working 0-4 years in the professional field, 20% of the people who responded had 5-9 years of experience, 22% had 10-14 years of experience, and the remaining 23% had more than 15 years of experience.

These demographics show a decent spread of data and there is no bias towards gender. While there are slightly more inexperienced people having worked less than 5 years, there is an equal amount of people with 5-10 years of experience, 10-15, and 15+ years. This shows that the data is not taken from solely new accountants but also from people with moderate work experience and lots of work experience. The age dispersion also shows that although most of the individuals are 25-45 years of age, this was split with 45% of individuals 25-34 years of age, 25% at 35-44 years of age and 23% over 45 years old. Overall, age and experience is quite diversified with only slight peaks in the 0-4 years of experience and 25-34 years old age brackets.

**Opinions about change**



When the professionals were asked about their opinions towards change, there was a remarkably positive reaction. Overall 70% of respondents like change, with 63% of females and 77% of males responding in the affirmative. Gender plays little difference in this opinion although men had a slightly more positive reaction. This is on par with a study performed by Smith and Gao in 2014 that found men have a slightly more positive outlook than women when it comes to future technological developments. However, the percentages in Smith and Gao's study produced numbers of 51% of women and 67% of men being positive about change.

Other than gender, the biggest issue I was concerned with as affecting opinions on change was age. The results of my survey show that 83% of the 45+ population responded as liking change. This is even higher a number than the 66% gathered from the under 45 years old population. However, these averages may be subject to change with additional testing as the over 45 years old crowd was only composed of 12 responses and the under 45 years old crowd had 41 responses. Additional analysis of the over 45 years old crowd shows that the affirmative responses of this group equaled 27% of all the positive responses and 19% of the whole sample.

There were a total of 7 people who responded as not liking change. All 7 of these people were under the age of 55, and 4 out of 7 of them were under 35. None of these numbers are conclusive enough to say that there is a correlation between age and preference to change. However, the results from this survey vaguely disprove my premonition that the older you are, the less likely you are to like change.

## **Technology & the Preference of Computer Programs over Manual Entry**

**All but 1 person from the professional survey responded as being favorable toward using a computer program rather than manual entry.** This rules out any possible analysis of variation by age, gender, or any other classifications or answers. Additionally, only 1 person responded as being unfavorable to technology. Oddly enough these were not from the same people so it is possible to like technology and still prefer manual accounting, and it's possible to dislike technology but still prefer the use of software programs over manual recording.

The problem with the above mentioned conclusion is that one response is not nearly enough to draw any real conclusions from. Perhaps a further study could use this as a testing parameter to see if there can be this disjointed feeling towards technology and computer systems. Feasibly this further research may explain something about how systems make the work easier than manual, even if you dislike technology in general.

**When asked explicitly why they preferred computer programs over manual accounting, the reason that acquired the most responses was that it was quicker and more efficient.** 40 of the respondents included this in their answer with some specifying reasons such as allowing greater speed of data entry, preventing work duplication, and reducing processing time so that there are quick financial statements and up to date reports. This supposedly allows more time for data analysis and decreases the need to fumble through stacks of papers looking for a problem invoice from weeks or months ago. A final reason that was supplied through the survey was that tax returns would take too long to do by hand. Overall, the process is sped up, whether in the corporate world or tax business.

**The second largest category of responses is that computer programs are preferential because they make the work easier.** Using the computer, accountants have an easier time dealing with massive amounts of data. From recording journal entries, to storage, to looking for a certain transaction later, the whole process is easier when the files are documented electronically. Electronic files are quicker and

easier to do a history search on, easier to make changes to, and in the age of technology, a lot of people are becoming more comfortable with these, especially since they cut out a lot of the manual work. The electronic format also helps significantly with auditing by making it easier to navigate data, perform formulas, and perform substantive procedures.

**Eliminating or decreasing errors is also very important to accountants.** Roughly 20 people responded that computer programs help decrease errors thus increasing accuracy. When software takes over the process of journalizing and posting transactions, fewer errors occur. Additionally, any changes that are made are carried through the system thus reducing the possibility of missing relevant changes. When ratios are calculated, there is a lot of room for human error if these are calculated manually. By having the system take over this task, the formulas are standardized and more meticulously calculated. Thus, systems are said to significantly reduce errors so that only human errors in programming, data input and analysis are to remain.

**This decrease in errors not only makes the data more accurate but also more reliable.** There are now the capabilities of internal systematic controls. This allows a better audit trail and auditors can look for misstatements by utilizing the company's own mainframe to help, rather than having to audit around the computer. Some professionals would even go so far as to argue that utilizing software programs creates a more secure environment since all the data is kept together, backed up, and password protected. The problem is that there is an equally sound argument that says cloud storage, online capabilities, and software programs, opens up the data to risk of cyber-attack or complete loss of data if software becomes corrupt or crashes.

**With the online capabilities comes a more organized work environment.** Storage of invoices, credit memos, checks, and bills within the software program allows for quick and easy access without the mess of searching through piles upon piles of papers. When an employee needs to access historical

data, the information is only a few clicks away as opposed to hidden somewhere in stacks of boxes out in a warehouse. This increases accessibility to data and makes the process more organized as well. An additional related issue is that information sent via email as opposed to fax or mail consumes less paper. This helps make companies more environmentally friendly without giving up the information that they still require.

**The last professionally picked benefit of computer programs over manual accounting is that software programs improve analysis capabilities.** As computers are taking over the lower level accounting tasks, more time is left for accountants to perform data analysis. In addition to more time, the software provides the accountants with ready-made ratios and financial statements that the professional only has to compare to prior years, industry averages and other factors. The age of where the accountant had to spend hours figuring different proportions can now be done mostly by the computer, freeing up the professional to look for the trends and relationships and analyze what those mean and what actions should be taken relevant to the conclusions.

**The very few responses received in opposition to technology is that technology allows the opportunity for fraud and that systems can sometimes hinder the business when the technology is not keeping pace with the changing environment.** Not only is keeping up with a changing technological environment an issue but mismatched technology may also be a debacle. If a company does not employ a system that best fits their needs, they are not fully utilizing the glory of the software program. Ultimately, this could end up creating more work for the accountants than actually needs to be performed, had the company selected a program better fit to their particular needs and concerns.

<b>Summary of Reasons for Preferring Computer Programs Over Manual Accounting</b>	
Quicker / More Efficient	<ul style="list-style-type: none"> <li>• Quicker data entry</li> <li>• Prevents work duplication</li> <li>• Instantaneous Financial Statements</li> </ul>
Easier	<ul style="list-style-type: none"> <li>• To look up history</li> <li>• To make changes</li> <li>• To perform substantive procedures</li> </ul>
Eliminate / Decrease Errors	<ul style="list-style-type: none"> <li>• Transposition and calculation errors eliminated</li> <li>• Only human error remains in programming, data input, &amp; analysis</li> </ul>
Reliable	<ul style="list-style-type: none"> <li>• Internal Controls built in the software</li> <li>• Increased audit trail</li> </ul>
Organized	<ul style="list-style-type: none"> <li>• Online storage of all necessary information</li> <li>• Increased accessibility</li> <li>• Less paper used</li> </ul>
Improve Analysis Capabilities	<ul style="list-style-type: none"> <li>• Ready-made statements and ratios</li> <li>• Less data entry, more time for analysis</li> </ul>
Opposition of Technology	<ul style="list-style-type: none"> <li>• Security concern</li> <li>• May allow fraud</li> <li>• Outdated / Mismatched software can hinder, not help</li> </ul>

## **AIS Usage**

Since almost all respondents preferred computer programs to manual accounting, the number of AIS used does not have any effect on this preference. Additionally, there seems to be no correlation between the number of AIS used and how long the professional has been working in the field. If there was a correlation, it would be expected that the number of AIS programs used would increase proportionally with the number of years someone works in the professional field. This is not the case, with the three quarters of the people surveyed having used only six or less programs regardless of if they've been working less than five years or over twenty-five years. In fact, out of the people surveyed,

all of the respondents who used more than ten programs have only been working in accounting field less than twenty-five years. And of those five people, four of them used that many systems in under fifteen years.

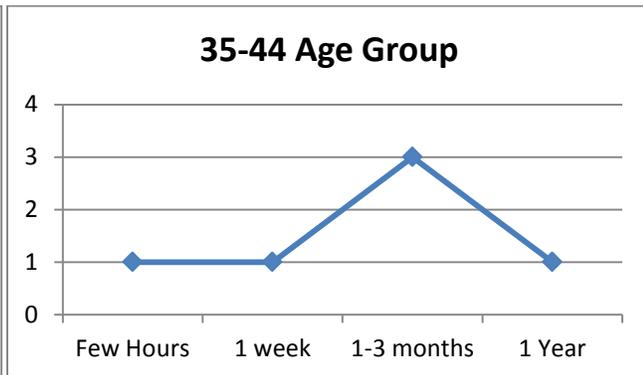
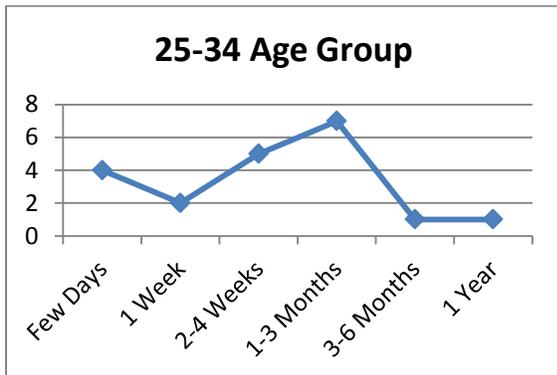
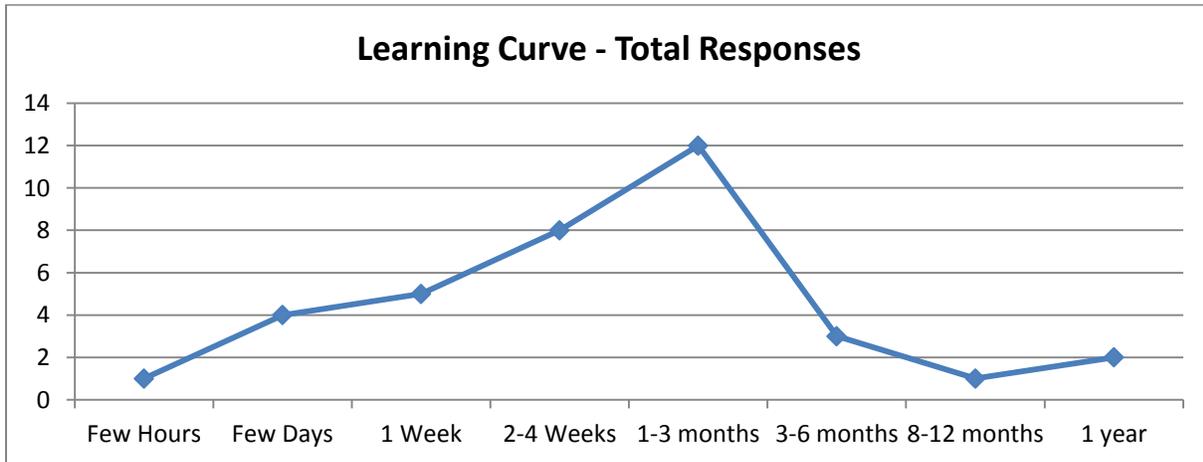
There are multiple explanations for this. It is probable that my sample was too small to get accurate results. There is also the possibility that the people surveyed have not held many different jobs and the companies they work for have not changed programs very frequently. There could also possibly be a sheer increase in the number of programs available since 1990 or 2000.

## **Program Updates / Switches**

**Companies are not predictable as to how frequently they will update their software. Out of the professionals surveyed there was a wide range of answers to the question, “When was the most recent accounting program switch in your company?”** About 25% of responses said their company updated software within the last two years. On the other hand there were multiple responses as high as 20 years with the same software.

My hope was that there would be a correlation between company type and frequency of updates. However, there appears to be no such trend in my data with the only notable points being that taxes are the best reason to stay up to date, whether company or personal, self-employed professionals tend to stay with the same program longer than average, and a lot of people were unaware of any changes in their company’s software; meaning that either there was never an update while they worked there or they cannot remember such a disruption as to make the event memorable.

## New Program Learning Curve



**The amount of time it takes a person to learn a new skill varies by a lot of factors, which can be chalked up to mainly just being dependent on the individual.** I wanted to explore how age affects the learning curve related to using a new accounting program. The result was inconclusive. There is no clear pattern showing that a certain age group typically favors more or less time. Age therefore does not seem to be a determining factor that affects the amount of time it takes to learn a new program. When considering total responses of the responses by age group, the learning curve is almost bell shaped with the peak being around 2-4 weeks or 1-3 months. This narrows out with the tail ends being as little as a few hours and as long as a year.

Additional issues relating to learning curves are that this can vary program to program, and prior experience can affect thought processes. While some programs are very user friendly, others are more complex. Also, if a similar program was used prior, this may give the user an easier experience learning a complex program than a counterpart who has never seen a similar program. A final note is that while a program may be easy to learn the basics on, there can be a long span of time after the program is “learned” to work out all the problems or bugs.

## **Changes Due to AIS**

**Do you feel like you need more or less background knowledge to do the same job now versus when you started working?**

**One of the blatant questions I asked of the professionals was if they thought they needed more or less background knowledge than when they started working.** This was a central focus to my research and I wanted opinions straight from the people who experience this change to technology. I wanted to see if the professionals themselves felt like they needed to know less about accounting going into the field now that the computers do so much of the work for you, or if there needs to be more background knowledge of accounting now since more areas of accounting are surfacing.

The problem I found was that most people did not understand my question and what I was asking. I wanted to know that if you could warp time and put an entry level accountant from ten years ago in a room with an entry level accountant today, which person would require more basic accounting knowledge to be successful in the business. However, I received multiple responses of people comparing the knowledge level they have currently versus the amount of knowledge they had when they started working. Reading the question this way, their responses saying that of course you require less

background knowledge the more experience you have, would make sense. However, these responses don't help prove or disprove the idea that technology is decreasing the need to know basic accounting knowledge.

Looking at responses such as the above mentioned, I realized that this question was too ambiguous. Therefore, the results are inconclusive without even considering that about half the respondents said more knowledge and half said less knowledge. There is room for further exploration into this area so long as the question is more straightforward.

Despite the ambiguity, the responses are still worth analyzing. Interestingly, all the respondents over the age of 55 said that more knowledge was needed now. Regretfully this was only a small sample of two people. This would be interesting to examine further in a valid sample size to see if a trend occurs with age as a factor.

Some of the reasons given for why more knowledge is needed now versus years earlier are that there are ever changing accounting laws and regulations. As accounting laws or tax regulations are updated there needs to be changes in the day to day practices for accountants. Hence the need for continuing professional education (CPE) classes for CPAs. Additionally, technology updates create changes in software capability. In order to properly set up and utilize any software, you have to have an understanding of what you need the program to do and the accounting practices that go on behind the computer screen.

Once the program is set up, you still need solid background knowledge because without it, you will have no clue when something goes wrong. If you don't understand that an invoice is supposed to get posted to the sales register, the accounts receivable subsidiary ledgers, and then the financial statements, you will not be able to trace transactions through the system. Ultimately, the more you know about accounting processes, the easier time you will have using the systems. If you are

incompetent with basic accounting knowledge, you will struggle with even the best software, while a knowledgeable person can make even the worst software produce the results needed, be that creating a specific financial statement or simply finding an invoice entered in error as a credit memo.

Auditors have the task of finding these errors and utilizing the programs to assist in their tests that there are no material errors. Since auditors are auditing the material, not the programs, there needs to be more knowledge on the part of the auditors since they need to find where the system is lacking and where the controls are missing.

For the opposition, one of the reasons given is that with more automated actions, less knowledge is needed. Essentially technology has changed the entry level accounting job from one of continuous routine transactions (entering invoices with a debit to accounts receivable and a credit to sales) into a job that is data entry (inputting customer information, dates, and amounts). While manual recording required the accountant to go into the sales journal then follow up with a debit into individual customer's accounts receivable subsidiary ledgers and tally the applicable accounts for the balance statements, income statement, and statement of retained earnings, the process using a computer program requires the accountant to create an electronic form of the invoice and the computer creates the entries in the applicable journals and tallies the journals into the financial statements. By only creating an electronic form of the invoice, all the information is supplied on the paper document and little thought is needed as to what goes where. The following table is courtesy of E. Lamberg's article *Obstacles to the Perception of the Traditional Accounting Cycle in the Learning Process* (2012) and summarizes these differences in the accounting process in the IT era (now) versus the Industrial Era (the past).

Table

<b>The accounting process in the industrial era versus in the IT era</b>		
accounting activities	in the industrial era	in the IT era
Preparation	1) Collecting documentation 2) Analyzing data from business activities	Filing of documentation to an electronic archive. Spending time on creating a database.
Recording of data	3) Recording business activities in journals 4) Posting to ledgers Data recording 2 times	1) Recording of data into the database to use the data set for data mining.
Summarizing data into information	5) Preparing the unadjusted general ledger trial balance 6) Preparing and posting adjusting entries 7) Preparing the adjusted trial balance Spending significant amounts of time on summarizing.	2) Retrieving data from the database to present relevant information.
Converting information into knowledge	8) Presenting information in annual financial statements. 9) Preparing closing entries	3) Linking information with financial statements in real time. No need to prepare closing entries

OBSTACLES TO THE PERCEPTION OF THE TRADITIONAL ACCOUNTING CYCLE IN THE LEARNING PROCESS.

Journal of Business Management, 2012 Issue 6, p161-169, 9p, 6 Diagrams, 3 Charts  
Chart, found on p166

The process has been simplified so that whoever is entering the data no longer needs a Bachelor's Degree to complete the tasks since the computer provides assistance. In fact, there are scanners being developed that can replace even this data entry task (scanstore.com). This would work by the scanner pulling the key information such as dates and amounts from the paper document and feeding it right into the program, filling out an electronic invoice in the same step. The moment that the last company transitions to this technology, there will be no more data entry to do as entry level accountants, thus eliminating the need for this job. This can be seen as taking away any need of basic accounting knowledge since now the computers can do the whole process and they don't even have a brain. Or, this can be seen as increasing the threshold for accounting knowledge needed since now the new entry level position is higher up the ladder with more analysis responsibilities than before technology took over the entry level position.

Another reason that less background knowledge may be needed is that there is sometimes on the job training or people learn solely what is required for the position without being concerned with any deeper knowledge than what the tasks at hand require. When the task at hand is the only concern, background knowledge is shed aside and not seen as that important unless it directly benefits the current situation.

There was also a decent amount of respondents that said there is no change in the amount of knowledge needed. Due to how some companies still process general ledgers manually using programs such as Excel, there can still be a need for all the basic knowledge even when technology is added into the equation. Even for the programs that do most the processing, the accountant still needs the background knowledge to make sure the programs are working how they are supposed to be and following the correct accounting practices.

There was a large split in the data showing varying opinions. This helps us conclude that at this point, experience is the main factor influencing whether someone thinks they need more or less background knowledge. The longer someone works in the profession, they can feel that they need less background knowledge since they now have a lot of experience under their belts, or they can see the changes going on from manual accounting to software that creates the journal entries for you, and conclude that there is less knowledge needed to be an accountant today.

Basically, the opinions I gathered are really focused on personal experiences and how much knowledge that person used in their own career path and the companies they worked for. Some of the people perhaps did see what was going on in the companies and positions surrounding them as having a decrease in perquisite knowledge for new accountants. Others may still work for companies in the “dark ages” of manually accounting and thus see absolutely no changes. And additional people may see some

entry level jobs vanishing and the rise of the new entry level as more analysis and technology based as requiring more knowledge as these are new areas in addition to the debits and credits.

Perhaps this will change more in future years as technology continues to take over accounting in even more ways. It would be interesting to study this further. My suggestion would be to survey a group of people about their use of technology and the basic knowledge they need to use that program satisfactorily. Then in five or ten years, survey the same people, with the same questions, and see if, or how, the responses change. Another way to study this could be to survey current entry level accountants about the skills they came out of school with and the knowledge they are utilizing in their first accounting job. Again in five or ten years conduct a survey using the same questions, only with a new batch of entry level accountants and see how their responses vary from the earlier test group. Either of these tests would help prove whether or not technology leads to a decreased need for accounting knowledge as an entry level accountant.

### **Do you feel like new programs increase your knowledge of underlying processes?**

Like the above question, this inquiry received very split responses. This serves to confirm that opinions vary widely on this topic based on personal experiences. Roughly twenty responses said that programs do help increase knowledge, while about twenty said no, and ten said they were unsure of any real change. In addition to personal experience, this could also be affected by how people learn. Someone whose brain is very tech-savvy may take to a software program as a better learning tool for the whole accounting process. On the contrary, others may learn the process better by learning via manual accounting so unless they experience manual accounting they will never gain the base knowledge if they are solely faced with computer use.

### **Have new programs and information systems sped up work?**

When asked if accounting systems sped up work, majority of the answers were yes. This is consistent with the fact that efficiency and speed was previously mentioned as a major benefit of programs over manual accounting. Additionally, everyone that said yes, programs speed up work agreed that this was a good thing. Everyone that said no, programs do not speed up work, said that this was also not good, or they were unsure as to if it was good or bad. Whether looking at this from the positive or negative side, both these trends point to the idea that speeding up work is a priority & that it is a good thing if the accounting programs speed up the work.

### **Is knowledge of underlying Processes Given Up for Speed?**

The result of this question was almost dead even split. This makes the question inconclusive from the sample opinion. Considering I was hoping that this question would have some really interesting results, the fact that this question is so inconclusive is a letdown. However, I fully believe there is more to explore in this area. Perhaps the problem was that this was another ambiguous question. Perhaps there should have been a spot for elaboration to understand the opinions behind why there is such an even split. I think this would be a good question to re-work and use in further analysis.

### **Are accounting programs used in different ways now versus when you started working?**

When asked solely about the use of accounting programs (forgetting about manual accounting and other previous practices), there was to a certain degree, a split in responses, but most said that the programs are used for the same fundamental purposes. However, in the elaborations, some of the

responses showed that while the use may be the same or similar, there have been additional features added over the years.

For tax accountants, the biggest change is e-filing. The IRS is demanding that all companies e-file their tax-returns, and within a few years all individuals will probably be required to e-file as well. The reason for this is security, since electronic forms go straight to the IRS without the possibility of getting lost in the mail, efficiency, since the files are transferred almost instantly, and convenience for the IRS to view the files.

In corporate accounting and auditing, various updates have occurred, the largest one being more integration. As programs are becoming more compatible for data sharing, the double entry of the same data is eliminated, exponentially saving time. Additionally, the added integration and decreased time spent on inputting data allows for more focus on advisory services and checking to make sure there are no errors. Programs such as Engagement allow easy communication with other software such as pdf writer, as well as allowing add-ons such as research tools.

Additional corporate accounting benefits include increasing capabilities and users. With the electronic system, different areas of the company can tap into the system (so long as they are provided authorization), not only the accounting department. The finance department, budgeting department, and IT department can all have access to the reports just as easily as the accounting department. You can also use more capabilities of the software. You can present deeper analysis through supplementary reports, graphs, ratios, and charts that were not feasible before, whether out of time constraints or other limitations. As a company grows or ages, more complex issues will surface such as bond offerings, lease contracts, or consolidation of subsidiaries. These processes can be significantly simplified for example if the subsidiary's financials can be electronically shared with the parent, time and effort can be saved in the consolidation process.

While AIS were originally created as a data entry location, they have advanced far beyond that and are becoming increasingly more automated which decreases the workload for many, and changes the type of work for others. Some would even say that the updated programs are more user-friendly and you don't need substantial technical training to use the systems. One of the respondents specifically said that as they have been working for thirty years a lot has changed. To quote this anonymous response, "Basically everything was done by hand when I first started working, which required a lot of knowledge. Now there are systems to do a lot of the work for you, so people do not always have to have an Accounting degree to do all tasks."

However, for some firms, they are still in the "dark ages". These firms may be using technology, but the technology may be sub-par to what their competition is using. For example, using Excel would be a more manual form of technology that could be less efficient than employing software programs such as QuickBooks or Peachtree. These companies stuck in the "dark ages" could be behind the trend and thus not see many updates in the way that the system usage has changed.

Concerning misconduct, there is possibility for increased misappropriation of assets when there is a larger access to the data. Since electronic files mean more people are able to access the data, there has to be increased controls put into place. Without these controls, a disgruntled employee could access the account and be sneaking money out. With the ease of making changes when something was input incorrectly, comes the liability that this ease can be used by a manager to make inappropriate and unsanctioned changes.

A good way to protect against this is to have controls set up in the computer systems that monitor any changes to past entries. Thus internal controls now need to be a part of the computer, and auditors need to audit through the computer not around the computer. Auditors must conduct tests of

controls to make sure there are not any errors or fraudulent activities occurring within the company and being hidden within the financial statements.

Basically, no matter the position, whether it's corporate accounting or auditing, you need to know the whole process so that you can correctly input the data to receive the desired output. While some of the software may seem to make the data entry easy and lacking for need of background knowledge, without that background knowledge the program will not be set up correctly, errors will be made and go undetected, and controls can be lacking to stop any inappropriate practices. So essentially you need to know the underlying procedures and what is supposed to happen in order to be able to run through the procedures using the software without any major problems occurring.

Since all the programs are working towards the same desired financial statements, essentially the programs do not change any major aspect except where the data is filed. Instead of using a pen and a large book of ledgers and journals, accountants type the data into the computer. As a company uses more automated technology, the accountant switches from journalizing every sales entry to instead creating an electronic sales invoice and the computer creates the journal entry. While the technology may appear to be changing the systems, the main goal of all the systems, new and old is essentially the same, to provide financial statements for investors, creditors, and internal use.

### **Changes in Business Field and Industry Standards due to Technology and AIS changes**

**Two thirds of professionals have witnessed changes in the business field and about two thirds of professionals have witnessed industry standards changing due to technology.**

Looking at the business field of accounting as a whole, a lot of the modifications due to technological and AIS changes mirror the changes already mentioned. For example, internal controls

have changed. With changes in technology there are often opportunities for fraud. The Sarbanes Oxley Act was implemented in 2002 to try and curb this fraud by increasing standards on internal control and reporting of material misstatements (Sarbanes-Oxley Act 2002). Consequently, in a world with frequent increases of electronic business transactions, it is very important that internal as well as external control standards evolve along with technology.

Utilizing computerized systems can make installing and programming internal controls into the program easy. However, these controls still need to run properly and there still needs to be external controls such as segregation of duties and limitations on who has access to what areas of the system. Additionally, as the software systems become more automated, the controls need to be reevaluated and updated to insure that new holes are not created.

Audit procedures have increased with the addition of technology and e-business. Auditors must test the controls on automated processes to ensure they function as intended and that no information is lost or changed inappropriately. Some professionals say that having computerized procedures provides a greater audit trail, while others say there is less of an audit trail. Regardless of stance on that debate, the more technology advances, the more controls and tests of controls need to be implemented to keep up security.

Due to an increase in technology, the need for IT skills and joint work with IT departments is ever increasing. Applicants for jobs are better candidates, the better their knowledge of technology. Additionally IT risk has multiplied exponentially with the creation of cloud storage. Computer security has become utmost important as confidential information stored on the company's software cannot be leaked without major repercussions. Also, with electronic files backups are essential in case a computer or the whole network crashes.

For companies that are governmentally regulated, substantially more reporting is required now versus years ago. This is partially due to large scandals such as Enron and Arthur Anderson, but there are also other reasons for governmental updates to policies. One example of technology changing accounting rules and industry standards is the new XBRL reporting requirements for SEC registrants. In 2009 XBRL, or eXtensible Business Reporting Language started calling for financial information to be reported in “interactive data format” which essentially allows investors to access financial statement information and allows the information to be “downloaded directly into spreadsheets, analyzed in a variety of ways using commercial off-the-shelf software and used within investment models in other software formats” ([xbrl.sec.gov](http://xbrl.sec.gov)).

A governmental change that was already mentioned was the requirement that companies e-file their tax returns. Due to advances in technology, individual filing are also moving in this direction. As of 2014, in New York State, you are required to electronically file your return if (1) “you use software to prepare your own personal income tax return” (2) “your software supports the electronic filing of your return” and (3) “you have broadband Internet access” (NYS Department of Taxation & Finance).

Outside of auditing and taxation, there are general changes occurring in the corporate accounting world. Digital documents are the main change. Now digital signatures are acceptable and security concerns are much higher as to whether identities are both real and authorized. There is also paperless delivery of financial statements, tax returns, source documents and other information provided by a client.

Technology can also cause the monthly process to be faster, more accurate, and easier for the client or owner to understand when communicating with them. There should also be monitoring, or a checks and balances system on who enters and deletes transactions so that duties are still segregated despite tapping into the same computer system. All of these updates can cause the work force to be

shifted around to adapt to changing needs. Staffing needs will most likely be seeing a shift towards IT or management level positions and away from data entry positions, especially as technology continues to expand.

## **Professional Testimony**

There are a few accounts from professionals that are interesting perspectives on AIS changes. The first opinion is that “they are making systems more user-friendly”. This was one of my preliminary directives as to researching this topic. Not only did I want to know if knowledge was given up for technology (inconclusive), but I also wanted to see if the changes in AIS made the programs more user-friendly. Although only one person said outright that this is the case, this is an underlying theme that emerges throughout my research. Some of the changes suggest this, such as the increased ability to make changes, look up historical data, and how the software can create journals entries from the electronic documents.

Another personal account states that, “I have seen accounting systems increase speeds in the financial reporting world, especially when planning and comparing plans to actual results. The speed frees up time for analysis and understanding the underlying processes more.” This is an interesting thought. Before doing this research, I would’ve thought that less time spent on going through the process would mean less understanding. However, this person is suggesting that more time doing analysis after the process is done actually leads to greater understanding.

Although this makes more sense if you look at another professional’s comment about how, “You grow with a job and make better use of what is available to you. You find ways to better use technology to make your job easier.” To elaborate, the longer you stay at the same job, the better

understanding you have about what is going on behind the scenes. After becoming comfortable with the tasks at hand you start looking for better ways to perform these tasks, hence the entrance or updates of technology. Technology then frees up time, allowing for greater analysis of not just what you recorded, but what that transaction means for the company as a whole. Looking at the situation from this standpoint, with the knowledge already acquired about the process, it's easy to understand the previous person's remarks about gaining more understanding from the analysis afterwards as opposed to while going through the process.

A few of the perspectives were focused around people's reaction to change in general. One of these responses is, "In general, people hate change. The longer someone has been doing a job, the greater their hate of change. A way to curb this hate, and sometimes actually have 'senior' workers embrace the change, is to keep them involved every step of the way. Get their input, give them options to choose from and generally just keep them and all employees involved which will assist in a smooth transition."

Another opinion is that, "In short, I greatly appreciate the functionality and reliable processing of accounting software; inventory, receivables, asset management all become more manageable, but it is hard to change." Similarly, "I started in public accounting and now do corporate accounting. For general ledger software, corporate accounting is much more intensive in use of GL software. I cannot imagine a company changing ERP software unless it is absolutely necessary. This would be a massive project requiring large implementation costs and months of work." Not only does change have a mental impact on people, there is also huge costs to the company, lots of additional work to do, possible restructuring of the company, and delays in normal operation.

Lastly, there was one person who commented on how AIS is taught. This respondent said, "At universities, schools are radically changing course offerings and delivery systems due to the ability to

offer classes online.” This is significant for many of the reasons mentioned in the section above about why AIS classes are important. Students need to be prepared for the real world when they leave college, and the real world includes software packages. Additionally, in the age of ever-increasing technology, students want less to do with learning from a book and more learning via technology such as the actual software programs and online classes.

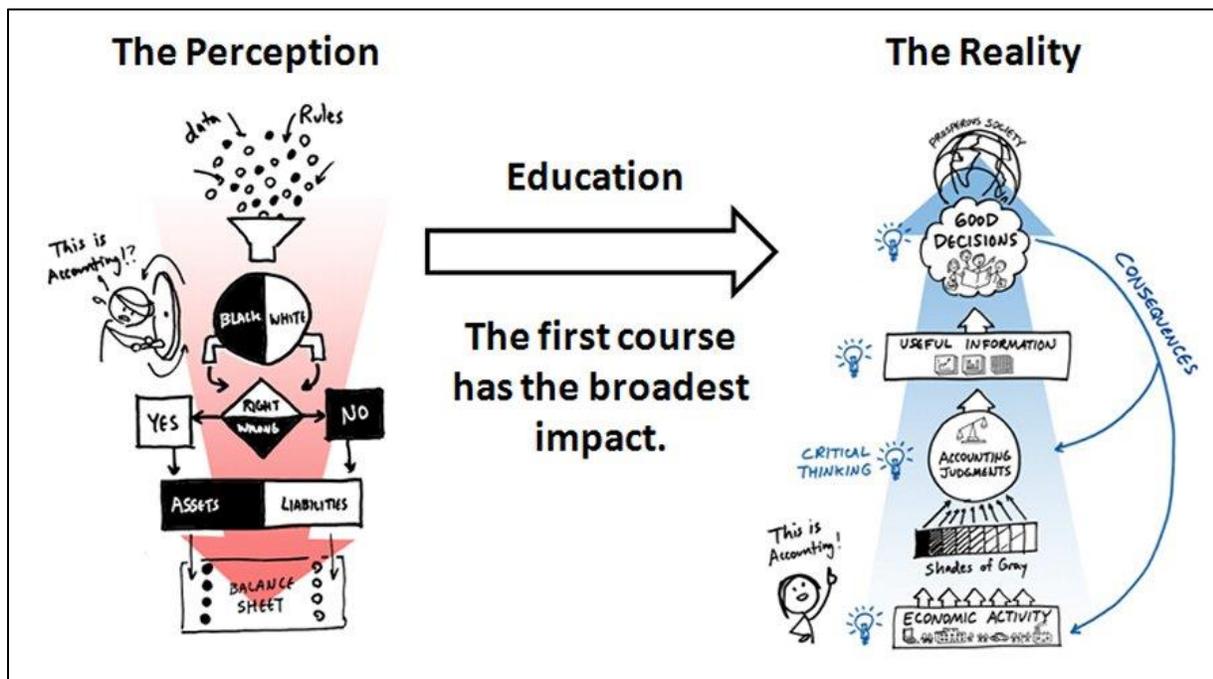
## Future

My predictions for the future are that accounting will continue to become more and more automated. Any processes still done by hand will become electronic, and eventually businesses will become paperless, with only digital documents being of any need. I also suspect greater need for mobility. This could come out of a growing population of people who desire to work from home, or just a result of people wanting the most recent information and constant updates right at their fingertips. Either way, I foresee greater use out of tablets and smartphones. Right now there are apps that allow scanning and faxing of documents right from your phone.

Even more intimidating, there is the possibility that soon computers will be able to take over entry level accounting jobs. Right now, entering the market are scanners that can not only create searchable pdf documents and sort the pdfs into files (Plustek), but also scanning software that can take over data entry. Optical Character Recognition (OCR) is a new technology that “allows software to interpret machine printed text on scanned images” (scanstore.com). Invoice Processing Software uses this OCR technology to “automatically identify the common data elements in an invoice, such as vendor, date, amount, invoice number, line item data, etc.” (scanstore.com). At first, these scanners will need operators to verify that the data fields are extracting data from the right locations on the invoices, but the more advanced models will be able to learn from prior programming and not have any problems. This will exponentially increase the speed at which invoices are entered into the computer system, while

simultaneously degrading the data entry job to a task of feeding paper into a scanner and eventual elimination of designated data entry personnel within companies.

This will cause a vast re-arrangement of accounting as the new entry level position will now be higher up in the company than before and will now involve more analysis. Therefore, students entering the accounting field will need to be proficient at analysis, critical thinking, and decision making.



Problematically, the public perception of accounting is that accounting is very black and white with no in-betweens. Students think accounting and they think debits and credits, assets and liabilities, rigid rules and right versus wrong. However, this is not the case; the reality and the future of accounting involve shades of gray, accounting judgements, and the ability to make good decisions. The Vision Model of Accounting (shown above), created by the Pathways Vision Committee of the American Accounting Association illustrates this difference (Wilson & Wilson, pg. 3).

Challengingly, students get drawn into accounting with the perception that accounting is black and white, “safe”, and “predetermined”. This perception draws candidates that may not be the best

critical thinkers or problem solvers. Nevertheless these students will not get far in accounting and will not make the high pay grades by being data entry monkeys. In fact, these data entry jobs will soon be extinct and then all the opportunities that will remain will be where analysis and decision making occurs. The only way to make money will be to look at the gray areas and make judgements.

Thus necessary accounting knowledge and skills will expand. While the basics of accounting will always be necessary to know, going forward this background knowledge will be used to analyze the data rather than to input the data into the system. Knowledge will be used as a basis for creating forecasts, predictions, and deciding what directions to take the company. While greater analytical skills are needed for this, there will also be an increased need for technological knowledge as the systems continue to get more complex and integrated.

## Conclusion

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Technology will always continue to progress. The only way to be successful in a society that has become so dependent on technology is to grow and adapt with the changing times. Accounting was recorded manually for thousands of years, and yet within the last hundred years, the profession has seen more changes than in those thousands of years. The development of accounting information systems has sped up the process and is transitioning from manual labor to completely automated processes. The future of accounting will most likely see the elimination of data entry within the next couple of decades and then the face of accounting will not be bookkeeping but rather analysis, forecasting, and consultation.

Students entering the field need to be prepared for this change. The perception of accounting cannot be just black and white, debits and credits. Rather, accounting students need to come out of college with that foundational knowledge and the perception that they will be making decisions not about where to put the debits and credits, but about what those debits and credits mean for the company. Accounting is changing, and it is time for the teaching techniques to change too. AIS should be stressed as an important foundational concept in accounting programs, whether that means adding a class or adding a major. Technology is important in today's society, and it should be treated as such.

# Appendices

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## STATEMENT OF INFORMED CONSENT

The purpose of this research project is to examine the effects of changing Accounting Information Systems on user interaction. The areas that will be studied are attitudes toward change, prior knowledge of Accounting Information Systems, and personal experience driven responses. This research project is also being conducted in order for me to complete my Honor's Undergraduate Senior Thesis in the Business Department at the College at Brockport, SUNY.

In order to participate in this study, your informed consent is required. You are being asked to make a decision whether or not to participate in the project. If you want to participate in the project, and agree with the statements below, your completion of the survey signifies your consent. You may change your mind at any time and leave the study without penalty, even after the study has begun.

I understand that:

1. My participation is voluntary and I have the right to refuse to answer any questions.
2. My confidentiality is protected. My name will not be written on the survey. There will be no way to connect me to my written survey. If any publication results from this research, I would not be identified by name.
3. There will be no anticipated personal risks or benefits because of my participation in this project.
4. My participation involves reading a written survey of about 30 questions and answering those questions in writing, via selection of a multiple choice answer, or via Likert scale. It is estimated that it will take less than 15 minutes to complete the survey.
5. Approximately 150 people will take part in this study. The results will be used for the completion of an honor's undergraduate senior thesis by the primary researcher.
6. This project has been approved by The College at Brockport's Institutional Review Board. Approval of this project only signifies that the procedures adequately protect the rights and welfare of the participants. Please note that absolute confidentiality cannot be guaranteed due to the limited protections of Internet access.

I am 18 years of age or older. I have read and understand the above statements. All my questions about my participation in this study have been answered to my satisfaction. I agree to participate in the study realizing I may withdraw without penalty at any time during the survey process. Finishing the survey indicates my consent to participate.

If you have any questions you may contact:

Primary researcher	Faculty Advisor
Name: Elysia Tornow	Name: Pamela Neely
Email address: elysia.tornow@gmail.com	Email address: pneely@brockport.edu

## Student Survey

You have used accounting information systems (including, but not limited to QuickBooks, Peachtree/Sage 50, Excel, Access, Turbo Tax, ACL, IDEA, etc.) in one or more of your accounting classes. Please answer the following questions based on your experience with **technology in the classroom** (consider your use of technology in a work situation, such as an internship in the second set of questions).

1. On a scale from 1 to 5 (1 being strongly disagree, 5 being strongly agree) please rate the following statements, on how comfortable you are with technology learned in the classroom:

	1	2	3	4	5
Before I took classes at Brockport, I knew a lot about accounting information systems					
Before I took classes at any school (e.g. MCC), I knew a lot about accounting information systems					
I feel comfortable navigating a general ledger package (e.g. QuickBooks) that I learned about in class, as long as it was the same version that I used in class					
I feel comfortable with the idea of using a general ledger package (e.g. QuickBooks) even if I am asked to use a version that I have not seen before (e.g. a newer version of QuickBooks or other program that I have used previously)					
I feel comfortable with the idea of using a general ledger package that I have not specifically learned in class (such as XTuple Postbooks)					
I feel comfortable navigating a tax package (e.g. TurboTax that I learned about in class, as long as it was the same version that I used in class					
I feel comfortable with the idea of using a general ledger package (e.g. TurboTax) even if I am asked to use a version that I have not seen before (e.g. a newer version of TurboTax or other program that I have used previously)					
I feel comfortable with the idea of using a general ledger package that I have not specifically learned in class (such as Drake Software)					

I would be comfortable creating a spreadsheet from scratch if I was given the requirements (e.g. create an income statement or create a spreadsheet to calculate specific financial ratios)					
I feel comfortable with being asked to use ANY software in an accounting context, even if I have never seen it before. I know what learning resources are available and how to learn how to use new software.					

2. Now we would like to know your perceptions of how technology is changing the field of accounting.

	1	2	3	4	5
Learning technology in the classroom has made me a more valuable potential employee					
My ability to be adaptable to changing technology is going to be critical to my success in the accounting field					
Technology has changed the way I learn accounting					
Technology has changed the way I study accounting					
I believe that technology has transformed the way that accountants do business in the last 10 years					
I believe that there will be new technologies (e.g. cloud solutions, mobile apps) that I will need to become comfortable with as my career progresses					
As long as I am proficient at one technology (e.g. QuickBooks or TurboTax) I will have no problem finding and keeping a job.					
Once a business invests in a specific technology, they are very slow to change.					
The technology needs drives the business.					
The business needs drive the technology.					
I will be able to get complete training on any technology that a company that I am working for adopts.					
I will need to know everything about a specific technology before I can get a job					

3. Thank you for participating in this survey. Your input was greatly appreciated!  
Please feel free to leave any additional comments, thoughts, questions, or concerns.

## Professional Survey

1. **Please answer the following questions:**

- What is your age? (under 25, 25-34, 35-44, 45-54, 55-64, 65 and above)
- What is your gender? (Male, Female, Wishes to not disclose)
- How many years have you worked in the professional field?
- What type of company do you work for? (CPA Firm, Organization, Bank, Institution, Other)
- Where is your company located? (state/province & country)
- What is your job title?
- What is your main responsibility?
- In general do you like change? (Yes, No, Not sure)
- What is your view on technology? (Favorable, Unfavorable)
- How would you prefer to process accounting data? (Manually, Using a computer program)
- Why?

2. **Please answer the following to the best of your ability:**

**(Consider Accounting Information Systems as general ledger programs, spreadsheets, tax programs, ERP, etc.)**

- How many years have you worked with Accounting Information Systems?
- How many different Accounting Information Systems have you heard of?
- What are they?
- How many different Accounting Information Systems have you used?
- What are they?

3. **Please answer the following to the best of your ability:**

- How often does your company switch accounting programs?
- When was the most recent accounting program switch in your company?
- On average, how long does it take you to learn how to use a new program?
- Do you feel like you need more or less background knowledge to do the same job now versus when you started working? (more, less, not sure)
- Any comments about this last question or any of the above?

**4. Evaluate the following statements (yes, no, not sure)**

- In your opinion, do new programs make work easier?
- Do you feel that new programs increase your knowledge of underlying processes?
- Have new programs and information systems sped up work?
- Is this good?
- Do you feel that with new programs, knowledge of underlying processes is given up in exchange for speed?
- Are accounting programs used in a different way in your company now versus when you started working?

**5. If you answered yes to the last question in #4, please elaborate here. Also feel free to elaborate on any of the other questions.**

**6. Evaluate the following statements. (yes, no, not sure)**

- Have you witnessed any change in your field of business due to changing technology?
- Have you witnessed any change in your field of business due to changes in accounting programs (e.g. new features, new platforms, mobile apps, etc.)?
- Do you think that rules and industry standards are changing due to changing technology? For example are internal controls changing because of more computerized accounting?
- Have you experienced industry standards changing due to changes in technology?

**7. If you answered yes to any of the previous, please elaborate here.**

**8. Thank you for participating in this survey. Your input was greatly appreciated!**

Please feel free to leave any additional comments, thoughts, questions, or concerns.

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