A Blended Approach to the Accounting Information Systems Course

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Ever-changing technological developments affect decisions within business and accounting programs as to where and how to incorporate technology. This paper focuses on the Accounting Information Systems (AIS) course and the challenges faced in designing a meaningful curriculum. Fundamentally, a key decision is whether to focus on conceptual issues in the AIS field or to concentrate on technology tools students might encounter early in their careers. The solution presented here blends the principles with hands-on practice using current and emerging technologies.

Keywords: accounting information systems, AIS course design, data analytics, emerging technologies, accounting, Excel, QuickBooks

INTRODUCTION

The ubiquitous presence and usage of technology throughout the business sector means that business programs, including the accounting discipline, must incorporate technology into their courses. Within accounting, students need to develop technological skills to work in their chosen field, whether they choose public accounting or other avenues such as managerial accounting, internal audit, or corporate accounting. Consistent with this reality, Accounting Information Systems (AIS) has become an accepted and even necessary course in the accounting curriculum. Consideration of the AIS course, however, leads to several questions and challenges. This paper explores the dynamics that surround AIS and introduces one model of how the AIS course has been structured. The model, as presented, focuses on a practical approach to the relevant knowledge and skills, but one that remains grounded in the concepts and theories that surround the field.

A literature review explores the issues that feed into the AIS course development. The review begins by highlighting the importance of technology and the resulting calls to incorporate technology in the accounting curricula. Continual and rapid technological changes, though, add numerous challenges to be addressed in terms of faculty qualifications, course curricula, and pedagogy. Further, course content is affected by employer expectations, the continual rise of new technologies, and differing viewpoints on core topics and the knowledge and skills to be developed. Layered on top of these issues are basic questions regarding where technology should be addressed in the accounting program and whether to isolate technology in an AIS course or integrate the tools throughout the curriculum.

The detail presented on the AIS course curriculum and pedagogy offers one solution to the issues and challenges that exist. Although the focus is specific to AIS, the examples can provide insights for the broader context of addressing technology in additional courses, such as in accounting, finance, and others. Efficacy results, via course evaluations, are also presented to demonstrate the success of this model.

LITERATURE REVIEW

The continual advancement of technology drives the rapid pace of evolution in the business environment and the accounting profession (AACSB, 2018; Pathways Commission, 2015). Technological developments have been described as "extreme" (Coyne, Coyne, & Walker, 2016, p. 162), and that description continues to ring true as current technologies expand in functionality and new technologies emerge. Current trends include the advent of cloud computing as well as the existence of, and access to, Big Data. These changes significantly impact accounting education in numerous ways. As a result, accrediting bodies, task forces, researchers, and employers all call on accounting programs and educators to improve the technology-related knowledge and skills of accounting students (AACSB,2018; Coyne, Coyne, & Walker, 2016; Lawson, et al., 2014; Pathways Commission, 2015; Pincus, Stout, Sorenson, Stocks, & Lawson, 2017). The AIS course stands at the center of these dynamics.

Accounting programs continue to respond to the forces of change; however, the dizzying pace of change creates numerous challenges for those programs (Aleqab, Nurunnabi, & Adel, 2015; Clark, Clark, Gambill, & Brooks, 2017; Coyne, Coyne, & Walker, 2016; Daigle, Hayes, & Hughes II, 2007; Krahel & Vasarhelyi, 2014; Pincus, Stout, Sorenson, Stocks, & Lawson, 2017). Unfortunately, many programs change and adapt at a slow pace (Kearns, 2014; Spraakman, O'Grady, Askarany, & Akroyd, 2015), despite pressures from accrediting bodies (Krahel & Vasarhelyi, 2014). The challenges faced and the slow response can be explained by several factors, which will be broken down further. An underlying issue is the determination of where technology will be delivered within the accounting curriculum. Wherever it falls, another issue to be considered relates to the faculty who must teach the ever-changing technologies. A further dimension: What technologies should be covered? Numerous studies have explored this question, but the result has been a wide range of responses through the years. Similar disparities exist regarding the ideal core content for an AIS course and beyond that, the knowledge and skills students should develop in AIS. Decisions must be made as to whether to focus on conceptual matters, engage in training with the technological tools, or to craft a course that blends the theory with the practice.

Three primary options exist for determining where to address technology in the accounting curriculum. A recent paper by Dzuranin, Jones, and Olvera (2018) provides a thorough review of the options based on a faculty survey. One approach would be to concentrate training on data analytics, as they describe the topic, using a focused approach. This would entail establishing a stand-alone course (or courses), such as AIS, and developing the competencies within that context. Benefits include the separate development of accounting competencies before introducing data analytics and avoiding the necessity of having multiple faculty members tasked with adding a technology skillset. Weighing against this approach are the demands of squeezing another course into the accounting curriculum and the risk of a siloed effect for accounting training, the latter being a specific concern of The Pathways Commission (2012). The authors identify a second approach consisting of the integration of data analytics into existing accounting courses. In addition to not requiring a supplemental course, an integrative process allows students to apply the data analytic tools as a natural complement to their accounting instruction. However, adding new data analytics within existing accounting courses would mean current, and important, content would need to be removed. Also, spreading technology across several courses adds new demands on many, if not all, faculty. A final approach, supported by the faculty survey, consists of a hybrid approach whereby existing accounting courses emphasize a data analytics mindset while a stand-alone course provides intensive development of the data analytics skillset. An educational framework for accounting curricula, developed by the Task Force of the Institute of Management Accountants and the American Accounting Association (Lawson, et al., 2014), stressed the integration of competencies across the curriculum. The Task Force identified technology as one of the foundational competencies for business school graduates and emphasized the importance of using technology in support of all accounting competencies. With a focus on competencies rather than courses, the Task Force did not address the consideration of a stand-alone AIS course. An editorial on the role and future of AIS, written by Krahel and Vasarhelyi (2014), identified a stand-alone AIS course as the likely approach for AIS instruction. The authors identified the limitation stated above, which is the content demand on existing accounting

courses, as one driven by the requirements of the CPA exam. In summary, support can be found for a stand-alone AIS course, although more desirable would be a certain degree of integration with other accounting coursework.

One difficulty regarding technology instruction relates to the skillsets and interests of faculty. Faculty are prone to teach according to their strengths (Lunsford, 2001), whether that be topical coverage, pedagogical approach, or technology skills. The backgrounds of faculty members, many of whom did not "grow up" with technology, will influence the course content (Bain, Blankley, & Smith, 2002) as they are more inclined to focus on the tools that are familiar to them. Some faculty are simply uncomfortable with technology (Chen, Damtew, Banatte, & Mapp, 2009) or unqualified to teach AIS (Kearns, 2010). Even when faculty members display a willingness to take on an AIS course, they might be reluctant to break away from a lecture-style format and embrace the active learning that is a desirable approach to teaching technology tools (Riley & Ward, 2017). For these reasons and more, the pool of qualified AIS professors remains limited (Krahel & Vasarhelyi, 2014).

Several challenges make the task of developing AIS course content difficult. Unlike other accounting courses, AIS does not have a standard curriculum, due in part to a lack of authoritative guidance (Bain, Blankley, & Smith, 2002). The dynamic nature of AIS makes it hard for faculty to select content (Fordham, 2005) and determine pedagogy (Daigle, Hayes, & Hughes II, 2007). Yet, standardization could stifle the innovation and change prevalent with technology (Krahel & Vasarhelyi, 2014). The constant change and unstructured nature of technology-related problems can result in ambiguity within AIS (Lunsford, 2001). Students are likely to enter an AIS course with a background of structured problem solving in other accounting courses, and faculty also carry in their experiences of teaching based on a structured approach. As technology changes the nature of the accounting profession, researchers have identified a knowledge and skills gap between industry requirements and accounting curricula and AIS textbooks (Coyne, Coyne, & Walker, 2016; Pincus, Stout, Sorenson, Stocks, & Lawson, 2017; Spraakman, O'Grady, Askarany, & Akroyd, 2015; Woolridge & Parks, 2016). Faculty must continually work to close that gap in order to maintain relevance of the AIS course.

What, then, should faculty do about the AIS curriculum, and where should they look for guidance? A standard approach to any accounting course is to look at available textbooks. Bain, Blankley, and Smith (2002) reviewed a dozen AIS textbooks for topical content; however, they cautioned that the publication cycle for textbooks can contribute to the lag in the development of technology skills and that inclusion in a textbook does not ensure coverage in the classroom. Coyne, Coyne, and Walker (2016) also expressed reservations tied to potential limitations of textbook usage. Given the skills gap discussed above, an obvious source of guidance would be to look at employer needs and communicate with professionals in the field (Cory & Pruske, 2012; Dillon & Kruck, 2008; Kearns, 2014). Several surveys of professionals, for example, have explored desired workplace skills (Kearns, 2014; Lee, Kerler, & Ivancevich, 2018; Spraakman, O'Grady, Askarany, & Akroyd, 2015). Other studies have sought to identify core topics for AIS. Topics commonly cited include internal controls, transaction cycles, systems design and analysis, and database management (Badua & Watkins, 2011; Bain, Blankley, & Smith, 2002; Daigle, Hayes, & Hughes II, 2007; Dillon & Kruck, 2008). The determination of topics becomes an "endeavor …that entails a consideration of many factors" (Badua & Watkins, 2011, p. 98).

Faculty might improve the AIS course design by framing the topics with a conceptual perspective. Such an approach would be consistent with the IMA-AAA Task Force that stressed competencies rather than courses for accounting programs (Lawson, et al., 2014) and their follow-up paper that stressed competency integration (Lawson, Blocher, Brewer, Morris, Stocks, Sorenson, Stout, Sundem, & Wouters, 2015). The literature often emphasizes competencies, consisting of a blend of knowledge and skills (Chen, Damtew, Banatte, & Mapp, 2009; Fordham, 2005; Kearns, 2010; Kearns, 2014; Krahel & Vasarhelyi, 2014; Pincus, Stout, Sorenson, Stocks, & Lawson, 2017). Identifying specific skills can be difficult as the technology landscape continues to change, new content emerges, and topics evolve (Clark, Clark, Gambill, & Brooks, 2017). Fordham (2005), having gathering responses from the marketplace, described alumni responses to AIS concepts "as being analogous to a methodology for thinking and reasoning" (p. 119) and inspiring "mental models of relationships" (p. 120). In that vein, Krahel and

Vasarhelyi (2014) concluded their assessment of AIS by emphasizing the "need to begin the process of educating a generation of continuous learners with an attitude of adaptability and an appetite for change" (p. 14). The authors advocated an emphasis on concepts over tools. Conceptually, the focus would be placed on models such as critical thinking, data analysis, and an understanding of how systems function. The various technology topics and tools become the means for developing the knowledge and skills that sustain accounting professionals throughout their careers.

An article by Coyne, Coyne, and Walker (2016) challenged the prevalent AIS models and explored a new model for AIS instruction that establishes a baseline of core competencies for consideration. The authors identify four competencies: the drivers of the information system, the function of the system, the elements of the system, and how the system is protected. They state that current courses highlight the first competency through consideration of standard business processes, particularly regarding the general ledger, and the last competency through examination of internal controls related to audit issues such as asset misappropriation. The proposed model deemphasizes the first component and focuses instead on the latter competencies. An emphasis on the function of the system refers to the information system life cycle of data collection, especially Big Data, processing, and analysis. Elements of the information system include hardware, software, storage, and services. The authors recommend hands-on practice with technologies while also stressing the integration of the elements. Working with technology tools aligns the AIS course with other accounting courses that "combine principles with practice" (p. 163). The revised approach to the final competency, system protection, would emphasize information security and data integrity. Addressing these competencies adds value for students through the breadth of coverage. Students desiring more depth in an area could pursue additional coursework in other disciplines such as computer science or management information systems.

COURSE DESIGN

An AIS course was first offered at my university in the fall term, 2011. The impetus behind the course was the continuing growth in technology and a recognition that accounting students needed exposure to AIS, both for their accounting careers and as preparation for CPA exam coverage. I had the most business experience of the accounting faculty at our small, private university, so I was asked to develop and teach the course. I did not bring a great deal of technology background from my thirty two years of business experience to the course – I had started my career in a tax/systems group at Price Waterhouse (working in those years via punch cards and time-share computers), spent a brief period at a small business, moved to a larger corporation to work as an internal auditor and financial analyst, and then settled into what has now been three decades in higher education with most of the years spent as a university Controller and adjunct faculty before transitioning to a full-time accounting faculty position. My technology skills were situational specific and consisted primarily of working with the university's operating system and utilizing basic features of Excel spreadsheets.

The instinct, when developing a new course, was to find a textbook and build a syllabus and assessment around it. The first two years of the course followed the selected textbook's sequence, which was heavily focused on internal controls, transaction processing, and accounting systems and cycles. However, this approach resulted in a fair amount of redundancy with auditing and other accounting courses. Internal controls, for example, are a key element of audit preparation. Another recognition was that students were not being exposed to, or working with, technology tools. Those tools would offer the benefit of demonstrating the concepts through a more active learning environment and developing skills students might need upon entering the work force.

The use of a textbook was dropped in the third iteration of the course. Instead, a continuing focus on technology tools began. In fall, 2013, the primary emphasis was placed on Excel and QuickBooks Desktop, the former using an Excel training book that had been presented in a session at a state accounting educators conference. An introduction to XBRL and a robust Excel project were added in 2014. Microsoft Access first appeared in 2015. In 2016, QuickBooks (QB) training was expanded with QB Online and a QB project. Tableau first appeared in 2017, and exposure to "big data" via large datasets

came along in 2018. Several emerging technologies arrived in 2019 as well as more deliberate connections between the concepts and the tools. The current course blends hands-on practice with current and emerging technologies with key underlying concepts. My university is a smaller private institution, and a single AIS course is offered with counts averaging around twenty students.

I have made Excel training a core element of my AIS course. Several surveys of professionals have reiterated the importance of spreadsheet/Excel applications (Kearns, 2014; Lee, Kerler, & Ivancevich, 2018; Spraakman, O'Grady, Askarany, & Akroyd, 2015). The only "textbook" support within the course is an excellent, inexpensive, hands-on Excel training book. The book contains over 200, two-page lessons with step-by-step guidance and uses spreadsheets provided along with the book organized into twelve sessions, or topics. Excel coverage includes basic features such as sorts, filters, and pivot tables, but also provides introduction to systems concepts such as system security (for Excel workbooks) and data validation (for cells within workbooks). Anecdotally, many accounting graduates mention their continued reference back to the book as they begin their careers. The 2019 version of the book has expanded coverage of tools such as Get & Transform, for the extract, transform, and load (ETL) function, and Power Pivot, for data modeling. These tools facilitate the connections between technologies. For example, usage of ETL calls for an understanding of data types. Recognizing data types (such as numeric, text, and date formats) becomes important when working with other tools such as Access and Tableau. Practice with data modeling introduces students to relational databases, which is foundational knowledge for Access, enterprise resource planning (ERP) systems, and the world of business intelligence.

AIS-related research rarely addresses coverage of QuickBooks, but I consider exposure to QuickBooks to be another crucial element for AIS students for three reasons. First, students who enter public accounting might transition at some point to a smaller firm where client work consists of accounting support for QuickBooks users. In that case, familiarity with QuickBooks will be a necessity. Second, the likelihood exists that students will not be exposed to QuickBooks in other accounting courses. QuickBooks would be an ideal practice tool in the introductory financial accounting course, but issues previously identified might arise, such as a curriculum already filled to capacity and faculty not skilled with the technology. Third, QuickBooks happens to be an excellent tool for demonstrating the traditional core AIS concepts. Consider: In setting up QuickBooks, students encounter several internal control issues such as segregation of duties via user access, monitoring by the administrator or accountant, use of documentation such as sales and purchase orders, and accrual accounting issues surrounding the "soft" year-end close. Also, the heart of QuickBooks training consists of entering transactions, which gives students practice with the transaction cycles. The structure of both QuickBooks Desktop and QB Online highlights the different cycles as well. Accounting majors can be surprisingly weak in their ability to think about the flow of the accounting process and to connect journal entries to ledgers ("why do you have a negative asset?") and to financial statements ("why do you not show interest expense when you have a note payable?"). A final concept reinforced by QuickBooks is the nature of systems, whether that be system design or system analysis. System design, such as the Preferences in QuickBooks Desktop, will be a new experience for most students. Many of the problems students encounter in QuickBooks result from system design issues. Systems analysis, consisting of trouble-shooting problems that occur or maximizing the use of system features, will also be an area unfamiliar to many students and an opportunity to think broadly about the system's application. QuickBooks coverage in my course includes both QuickBooks Desktop and QB Online. Most new users adopt QB Online, however, approximate half of the marketplace still uses QuickBooks Desktop. The textbook market offers a few well-regarded training books, but I have instead developed my own series of transactions to demonstrate the breadth of features. For QuickBooks Desktop, I incorporate inventory to reinforce the key usage of Items, while for QB Online, I use a service company and incorporate more accrual accounting concepts.

In contrast to Excel and QuickBooks, each of which encompass several class sessions, I spend just a few sessions each on other tools. My intent is to ensure students gain a basic level of familiarity with the tools and thereby can express a degree of confidence. In other words, students are better served when they can speak to their awareness of the tools and how to use them rather than having to admit to a lack of

knowledge. Further, in moving from topic to topic, students see trends emerge, such as the importance of data types, the capacity to create calculated fields or measures, and the ability to download data or reports for purposes of communication. Overall, the emphasis is on a breadth of coverage consistent with the model of Coyne, Coyne, and Walker (2016).

Universities normally cover certain technologies, such as Excel and Access, in an introductory computer science course. Not all students will have taken such a course, however. As a result, the skill level for students might span quite a range. To address this lack of consistency, I ask students who are more experienced to help their classmates. Coverage of Access in AIS exposes students to the concept of relational databases and sets them up for the Excel Get & Transform feature where file imports might come from Access. Access also has unique design elements through its mix of tables, queries, forms, reports, and use of calculated fields. In creating forms, students again encounter data validation, and in generating reports, students can sharpen communication skills.

Students are typically unaware of XBRL (eXtensible Business Reporting Language), a tool for digital financial reporting. Coverage of XBRL consists of exploring the electronic filings of Form 10-K reports at the Security and Exchange Commission (SEC) website (https://www.sec.gov/). Students learn about the SEC's classification system and the process for accessing and creating downloads of companies' annual reports into Excel. Additionally, I spend time on the terminology of XBRL, such as the use of namespaces and taxonomies. XBRL, as with QuickBooks, is a topic that could, and ideally should, appear in other accounting or finance courses (Lawson, et al., 2014), but often does not. With an annual report downloaded into Excel, students can refamiliarize themselves with financial analysis options such as the horizontal and vertical analyses and ratio analyses.

Coverage of Tableau provides students with an interesting contrast to their traditional focus on purely numeric data such as spreadsheets. Through Tableau, students can see a new world of possibilities for analysis and communication. As with many of the other tools, I believe the best approach is to guide students into the software, using videos as guides, and focus on active learning. Tableau broadens Excel's concepts of rows and columns to the fuller use of dimensions and measures. I also have students explore the fascinating Tableau Public website (https://public.tableau.com/s/) and share examples from the website on a classroom discussion board.

Other topics I touch upon include flowcharting, data flow diagrams (DFD), and REA (Resource Entity Agent) modeling. We compare the nature of flowcharting, which documents responsibilities and decisions, with DFD, which document the flow of data. A few excellent examples I have found show the usefulness of DFDs. REA modeling represents an intriguing conceptual model, introduced by William McCarthy (1982; 2003), that links together concepts of relational databases, data modeling, use of primary keys, and normalization. These concepts are now part of Excel's more advanced tools as well as the basis for Access. Exploring REA allows an even deeper dive into the roots of relational modeling through the work of E.F. Codd (1970), who receives several mentions in the Excel training book. Note, however, that the model of Coyne, Coyne, and Walker (2016) suggests prioritizing entity-relationship models rather than REA modeling. Students can experiment with developing these diagrams through several tools that are available on the market.

Finally, I committed in the most recent iteration of the AIS course to reserving a few class sessions for emerging technologies. The four I selected were Python programming, Power BI, Alteryx, and Robotic Process Automation (RPA). All four had been highlighted in one or more sessions of the 2019 annual meeting of the American Accounting Association. A 2008 survey of employers by Dillon and Kruck found programming languages to be of relatively low importance, but more recently, researchers have spoken in favor of an understanding of programming languages such as Python (Richins, Stapleton, Stratopoulos, & Wong, 2017), which can assist in developing a data analytics mindset (Zhan, Her, Hu, & Du, 2018). The IMA Competency Framework also highlights programming languages such as Python, labelling it as an advanced skill (IMA, 2019). Students wanting to develop more advanced skills can consider taking courses outside the accounting discipline (Lee, Kerler, & Ivancevich, 2018). Exposure to Power BI provides students the opportunity to see more advanced interaction with Excel. Gaining a taste of this powerful tool also allows students to compare the visualizations with Tableau. Students can access

Alteryx and RPA through free trials provided by vendors. The key concept I highlight with these tools is their ability to structure recurring tasks. Alteryx, which has similarities to Power BI as a tool for ETL and can be linked to Tableau for back-end visualizations, accommodates structuring data workflows. RPA, consistent with its somewhat futuristic name, lets users automate recurring processes. All these technologies can be introduced through short videos.

The last AIS course component I address is the material covered on the CPA exam. The range of tools described above offers little support for the material addressed in the Information Technology portion of the CPA exam's BEC section. I spend one or two class sessions reviewing the technical content as covered on the CPA exam, and the final exam for the AIS course is a multiple-choice simulation of the CPA exam content. The points for the final exam represent a small part of the overall course points.

The basis for course assessment consists of a dozen or more applications of the various technologies. These assignments are uploaded into Canvas, our university's learning management system. Within Excel, students use class time to complete many of the lessons from the training book and then complete separate assignments that I have developed. Starting at around the midway point in the course, I also begin to assign a handful of larger projects to expose students to Big Data. The projects use datasets consisting of tens or hundreds of thousands of lines of data, which differs from their usual practice of working on Excel files containing less than one hundred records. The projects are focused on Excel and Tableau, and most of them include analysis and communication. Datasets can be obtained from faculty (for example, see Tietz, Cainas, & Miller-Nobles, 2019) or public data sites. Sites that have relevance for my mid-west students include the City of Chicago's Data Portal (https://data.cityofchicago.org/) and the State of Indiana's Management Performance Hub (https://www.in.gov/mph/). The assignments and projects are supplemented with a few discussion boards and the final exam. The assessment mix differs from most traditional accounting courses, which rely more heavily on traditional testing, but reflects the hands-on nature of the AIS course.

SUMMARY

The rapid pace of technology changes has significantly affected the business world. The advancement in technologies also affects accounting programs as they prepare students for their careers. Decisions must be made regarding when, where, and how to expose students to the array of technology tools. Focusing technology coverage within an upper division AIS course represents one solution, although a hybrid approach that integrates technology throughout the accounting curriculum might be a more effective approach. In either case, existing challenges must be addressed.

The dynamic nature of technological developments creates the risk the AIS course might lag in addressing the knowledge and skills that accounting students will need. That requires extra effort by faculty to keep the course current and relevant. However, one of the challenges with AIS is finding faculty with the background or training to lead the course. Even with the proper skillset, faculty still must determine whether to approach the course from a conceptual basis or to focus on training with specific technology tools.

The AIS course elements I have presented blend the key concepts of AIS with the practical technology tools students are likely to encounter. Through an active learning process using tools such as Excel, QuickBooks, Tableau, large datasets, and other current and emerging technologies, students develop skills and confidence in the use of technology for the start of their careers and build a technology mindset to support long-term success (Lawson, et al., 2014). The course has been well received by students. On course evaluations, students have responded to the question "This course challenged me to think critically," with a mean score for all years of 3.26 out of 4.00 and an annual range from 3.1 to 3.4. In response to the question "I am to relate what I have learned to situations outside of class," the mean score for all years has been 3.36 and an annual range from 3.0 to 3.6. Of note, the highest mean (3.4) on the critical thinking question occurred this past year, and the highest score (3.6) on the application of skills outside of class occurred in each of the past two years. An interpretation of these scores could be that continued improvements, such as the ongoing addition of innovative technologies and Big Data

projects as well as the more deliberate blending of concepts with the tools, has been effective. The nature of the AIS discipline, however, means that curriculum adjustments will need to continue as each course offering occurs.

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