AIS Education: Incorporating Trends In Technology Into The Curriculum

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Abstract

The purpose of this study is to provide evidence on various approaches used in the AIS course by examining the broad systems context in which faculty teach AIS. Course approach is analyzed based on general course philosophy (transaction cycle, blended, or business process), use of software, topical coverage, and inclusion of emerging issues in technology. The results of the study are based on a survey of AIS faculty in attendance at the 2001 AIS Educators' Conference. The findings indicate that the majority of participants use a blended approach to AIS as evidenced by their self-reported course philosophy, use of accounting software, and coverage of various systems topics. The results also indicate show that a large proportion of the faculty include emerging topics (as identified by popular practitioner-based sources) in their course design.

Introduction

$\mathcal{T}$ he concepts and structures of accounting information systems (AIS) have changed dramatically in the past few years. A strong technological skill set is critical for accounting professionals and this skill set needs to be constantly updated and refreshed (Albrecht and Sack 2000). Educating accounting students in AIS and structuring coursework in an effort to include the right balance of technology, theory, and application is an ongoing challenge for the AIS educator. As the mix of technology, theory, and application changes significantly each year, many AIS educators are continuously concerned about whether or not the courses they teach meet acceptable standards or if they are reasonably current. The purpose of this research is to help AIS educators address this issue by providing evidence about the overall systems philosophy used by their peers and to identify what emerging technology topics they include in their courses.

In this study, we examine the broad systems context in which faculty teach technology, as well as the specific technology topics taught within this context. This is accomplished through a survey of 50 educators from across the country in attendance at the 2001 AIS Educators' Conference. Other studies have examined the general topical coverage of the AIS course (Groomer and Murthy 1996, Macur 1998, Theuri and Gunn 1998). This study differs in its currency, in its attempt to identify broad systems philosophies and its examination of specific technologies rather than general topics.

The remainder of the paper is organized as follows. Accounting, technology and emerging trends faced by accounting professionals are the topic of the first section. This section initially addresses the overall approach to systems taken by organizations, examining the importance of technological advancement, information integration and movements toward enterprise-wide systems. Then, the influence of these changes on the role of accountants as information professionals is discussed. Next, challenges

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for AIS education in light of these trends are examined. Specifically, three broad systems approaches to AIS curriculum, which mirror the broad approaches to systems in organizations, are defined. The results of the AIS educator survey are then presented, examining both the broad approach to AIS education taken by faculty and the specific technologies they incorporate in their classes. Finally, conclusions and recommendations for further research are outlined.

Accounting, Technology and Emerging Trends

The information age has brought with it significant changes in the technologies available to organizations. These new options, in turn, have significantly influenced the broad approaches that organizations take toward information systems and the role of information in business strategy. New approaches involve movement toward information integration and enterprise-wide systems. These approaches result in significant changes in the accountant's role as information professional, as discussed below.

Information Integration and the Move Towards Enterprise-wide Systems

Information systems in general have undergone a significant transformation in the past few decades (El Sawy 2001; Mauldin and Ruchala 1999; Johnson 1992). Organizations have moved from using isolated systems that gather narrow subsets of information for specific purposes toward enterprise-wide systems that integrate wide varieties of information into a centralized database that can serve many needs, some of which may not even be envisioned at the time the database is built (El Sawy 2001). Organizations that implement enterprise-wide systems lose a "functional" focus in terms of their information systems (Brady, Monk and Wagner 2001; Lobaugh and Deshmukh 2000). More specifically, the organization moves away from separate information systems for the various functional areas of the business such as accounting and finance, marketing and sales, production and materials management and human resources. As the organization moves away from functional information systems, the enterprise-wide system is built around the primary processes that occur within the organization (Brady, Monk, and Wagner 2001). The trend towards enterprise-wide systems has traditionally been in large organizations; however, software solutions for smaller and mid-size organizations are now being designed in an enterprise fashion (Eshelman, Juras and Taylor 2001)

Whether or not an organization moves towards an enterprise-wide system, there are significant changes in practice regarding the types of information and the use of information, primarily due to technological changes. As technological capabilities increase, the availability of information also increases and decision-makers have the option of using information in a much broader context. Managers must be able to incorporate a wide variety of financial and non-financial information in support of both strategic and operational decisions. Given the type of information systems structure needed to support an enterprise-wide system, it can be difficult to determine if a "stand-alone" AIS exists or if it is fully incorporated into an enterprise-wide system. Figure 1 illustrates an information system spectrum with the two extremes being a 'stand-alone" AIS and an enterprise-wide system. Most organizations are not likely positioned at the extreme ends of the spectrum, but rather somewhere in-between. It is up to the accounting professional to determine where an organization fits on the spectrum and how a transgression may occur towards an enterprise-wide system.

As enterprise-wide systems become more prevalent, more and more organizations will find themselves moving along this spectrum over time. Accounting professionals will be instrumental in guiding the information system and continually refining it to meet the needs of its users.

Figure 1

| Stand-Alone Accounting Information System | ⟶ | Enterprise-Wide Information System |
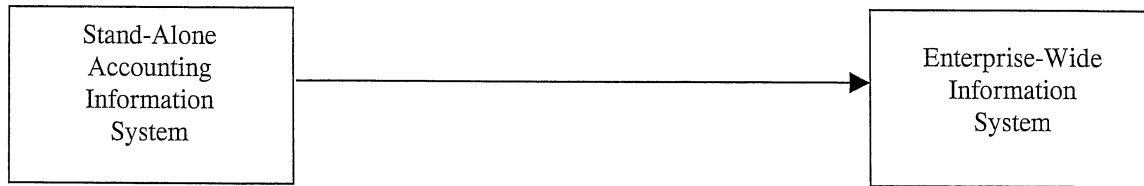
The role of accountants as information professionals

The CPA Vision Project describes the impact of technology as the single largest force facing CPAs [i]. In response to these challenges, the AICPAs Top Ten Technologies Task force develops a yearly list of the top technologies for accountants[ii]. Accountants in both public and private practice are faced with challenges and opportunities in areas affected by or created by increased reliance upon technology. Information systems are a key intangible asset and are critical in the foundation of all organizational strategies (Kaplan and Norton 2001). Accounting professionals have the opportunity to play a key role in determining how technology can be leveraged to create systems that will produce information that is essential to maintaining or creating a competitive advantage for an organization (Read, Ross, Dunleavy, Schulman and Bramante 2001; Barsky and Jablonsky 2000; Johnson 1992; Porter 1985). Consequently, accountants must have core values that allow them to stay informed about technology and also have adaptable skill sets that allow them to keep up with changes in technology. The CPA Vision Project also recognizes that, to successfully fulfill this role, accountants must understand how the information provided by them is tied to the strategies defined by an organization.

In terms of managing accounting information systems, accounting professionals have traditionally been concerned with the organization, control, and processing of financial information. These tasks are still critical to systems management; however, the focus of the accountant has moved to a broader perspective that requires a critical understanding of all business processes and practices, not just those affected by financial matters. Key technological areas the accounting professional must focus on are in a constant state of evolution. Following are examples of activities related to information systems that accountants are increasingly concerned with:

1)   Improving or replacing legacy systems.
2)   Integrating new and existing systems.
3)   Using technology to better serve the users of information.
4)   Producing better information to aid decision-makers.
5)   Determining the appropriate investments in technology.
6)   Determining how information systems support overall strategic objectives.
7)   Analyzing how information systems support an organization's value chain.

In order to effectively accomplish these activities, accounting professionals must be educated in the following areas: business process analysis, systems design, systems integration, systems installation, systems diagnostics, business process controls, knowledge management, systems integrity, and systems security. Knowledge of these areas of expertise will provide the foundation to help accountants deal with constant changes in technological issues[iii].

The challenges facing the accounting profession as organizations move toward strategic use of technology, information integration and enterprise-wide systems are not easy ones. Fortunately, in ana-

lyzing the problem, it is perhaps easier to shed light on some of the difficulties faced by AIS educators as well as the changes they might make to keep pace with the skills needed by new accounting graduates. The following section describes challenges in AIS education in light of the emerging trends and issues faced by practitioners.

Challenges in AIS Education

From an accounting perspective, prior to the focus on information integration and the move towards enterprise-wide systems, it was simpler to identify the components and purpose of the AIS course. For the most part, AIS courses discussed the revenue, expenditure and conversion cycles, and focused on the documents and controls necessary to capture and ensure the integrity of the information needed to prepare general-purpose financial statements. As accounting information becomes more affected by information integration and enterprise-wide systems, the approach of the AIS course becomes more of a challenge.

Systems Approaches Used in AIS

In order to investigate the broad context in which AIS faculty teach their courses, we defined three systems approaches frequently used in AIS classrooms. The approaches are classified as 1) the transaction cycle approach, 2) the business process approach, and 3) a blended approach. In this section, the primary features of each approach are discussed. It is important to note that overlap is inherent in all three approaches.

Transaction Cycle Approach

In the transaction cycle approach, the focus of the course relies heavily on the accounting cycle, accounting equation and the processing of financial information. More specifically, the focus is on recording economic events and how the events flow through the accounting system. Under this approach, events that do not have a direct affect on an asset, liability, equity, revenue, expense, gain, or loss are not typically managed by the AIS. Events are entered into the AIS once they are measurable as "recordable events" [iv] and can be captured in the accounting system via the entry of a debit and credit. Mechanically, the AIS is driven largely by the chart of accounts, general ledger, subsidiary ledgers, and special journals. Typical examples of output for this approach are the income statement, balance sheet, statement of cash flow, aging reports, trial balances, and general ledger. The information in this approach can be processed in either a real-time, online, or batch environment (or combinations thereof), but the output is frequently generated in monthly, quarterly, or annual reporting cycles.

Business Process Approach

We define the business process approach to AIS education as a move away from the transaction cycle approach and an emphasis on illustrating how information can be captured from all functional areas of an organization, not just accounting. One of the key factors in distinguishing this approach from the transaction cycle approach is that it recognizes the importance of non-financial information as well as financial information. The focus is not on the point when an economic event has occurred, but rather when an event has occurred that a user of the information system wants to know about. In other words, there is potentially a lot of information that is useful long before an economic event occurs that a user of information may need for decision-making purposes. This concept is consistent with the "events accounting" concept described by Sorter (1969) and Johnson (1970) and further defined by McCarthy and Dunn (1997). The REA (resources, events and agents) accounting model (McCarthy 1982) extends the events accounting concept. Dunn and McCarthy (1997) compare and contrast the concepts of "events account-

ing", "database accounting" and "REA accounting". The REA approach includes the dimensions of the database accounting approach and the events accounting approach, but it is more inclusive. McCarthy (1982) describes the REA framework as a starting point for enterprise-wide database design. The business process approach to the AIS curriculum is consistent with the use of the REA model as a core element.

Blended Approach

The transaction cycle and the business process approach to AIS education represent in some sense "opposite ends of a spectrum", just as pure accounting information systems and enterprise-wide systems are in the professional realm; therefore, a blended approach to curriculum may be more practical and realistic in terms of what is used in practice today. The blended approach may include all the elements of the transaction cycle approach and some of the characteristics of the business process approach. This may be accomplished by incorporating concepts about non-financial information and more emphasis on internal reporting rather than external reporting.   Using this approach, the system is not as focused just on external events, rather, the focus is on both internal and external activities.

Regardless of the approach used, the AIS educator is faced with significant challenges in many areas, but especially the following: 1) providing access to technology in the classroom 2) maintaining currency on technology trends, and 3) gaining access to instructional materials on emerging issues. The results discussed in the following section provide some insights into how AIS educators are working with these challenges.

Research Method and Results

AIS faculty surveyed were all participants in the AIS Educators' Conference, held in August 2001. Of 82 conference registrants, 50 completed the survey, which was also designed to provide information in planning future conferences. Table 1 presents demographic information for survey participants. Table 2 describes the classroom environment these faculty face, including class sizes, access to technology and use of accounting and other software.

Evaluating Subjects' General Approaches to AIS

A frequent quip at AIS meetings is that there are as many approaches to teaching AIS as there are faculty who teach AIS. Additionally, observation suggests that AIS faculty often use different words to refer to the same concepts. Consequently, three different methods for assessing subjects' general approaches to AIS were used. The first method was to simply ask subjects whether they used a business process approach, a transaction cycle approach or a combination of the two. One potential indicator of faculty member's approach may be their choices of software for illustrating concepts in the course. Use of low-end software that provides primarily traditional accounting functions might generally be indicative of a transaction cycle approach because the software does not contain many of the features that would make it easy to illustrate a business process approach. On the other end of the spectrum, while a high-end, ERP package could be used to illustrate transaction cycles, it seems unlikely that an individual would go through the considerable effort to implement this type of software simply to illustrate transaction cycles. Consequently, use of an ERP package is assumed to be indicative of a business process approach. A final indicator of an individual's approach might their choice of topics to cover in class. For example, the REA template for examining business events described by McCarthy is particularly useful for modeling business processes and their information needs (1982). Thus, we would expect that individuals placing weight on this topic are likely to be using a business process approach. On the other hand, subjects placing heavy emphasis on transaction cycles are most likely using a transaction cycles

approach. Obviously, coverage of these topics is not purely indicative of approach, however, it does give some idea of emphasis.

The data in Table 3 are consistent with subject use of a blended approach. As described in Table 3, Panel A, a large majority of subjects (65.2%) describe their own approach as a blended approach. The results in Panel B, which describe the highest level of software used by subjects, reveal an even distribution between low, middle and high-end/ERP systems among those who use accounting software in their classes. As indicated in Table 3, Panel B, of the 50 participants in the survey, 18% used no software in their course, 26% used low-end software, 34% used mid-market software and 22% used high-end packages. More detail on software use is provided in Table 2. Note that the percentages above indicate the *highest* level of software used by each faculty member. The statistics in Table 2 report total use of each type of software, where some faculty may use more than one package.

Panel C provides information on topic coverage. To assess relative coverage of various topics deemed to be representative of each approach, we asked subjects to rate the importance of individual topics using a 5-point scale where 1 indicated the topic was unimportant and 5 indicated the topic was important. Recognizing that most of the topics we presented were likely to be of some importance regardless of the approach taken by the faculty member, the analysis in Table 3, Panel C shows the portion of subjects answering above/below the median response for *all* questions on the specific item. This indicates whether subjects felt the topic was more or less important than other topics. The results suggest a blended approach, or possibly an approach with a slight emphasis on business processes. When comparing subjects importance ratings for individual topics when compared to the group's overall average importance rating for all topics (3.34), we find that a significantly larger percentage of subjects assign an above average importance rating for one business process topic (entity relationship diagrams) and one transaction cycle topic (transaction cycles). A significantly larger proportion of subjects assign a below average importance rating for three transaction cycle topics (special journals, review of debits and credits and manual practice set). The de-emphasis of these topics suggests that subjects are steering away from these very traditional topics toward topics more consistent with the business process approach, while still maintaining a foundation in key topics such as transaction cycles.

Technology Coverage by AIS Faculty

In addition to identifying the general systems approach taken by AIS faculty, we also sought to identify the importance of emerging technology topics. Topics for inclusion in our survey came largely from the AICPA's Top Ten Technologies list. In addition, the authors considered technologies mentioned in the AICPA vision project reports and also those that were topics of presentations at the AIS Educators' conference. The result was the list of emerging technology issues shown in Table 4. We asked participants to indicate whether they were currently covering the topic and, if not, whether they intended to cover the topic in the future. The results are also tabulated in Table 4. Topics have been organized into 5 categories:

1.   Information Integration and Enterprise-Wide Systems
2.   E-Business/Internet Related Issues
3.   Assurance Issues
4.   Security Issues
5.   Evaluation of Software Solutions

Looking at Table 4, the most consistently covered individual topics were database design and development, internal controls and information security followed shortly by enterprise resource planning systems, electronic business and financial reporting and electronic audit trails. General topics covered

most consistently appear to be assurance and security issues. Of the topics examined, those least likely to be covered were cross-functional process maps, web site development and integration of legacy systems with e-business initiatives. Those topics that were most frequently cited as a topic to be covered in the future were XBRL, XML and knowledge management. These last topics represent good opportunities for development to help meet the needs of AIS faculty.

Conclusions

The purpose of this research was to identify the overall systems philosophy or general approach taken by AIS faculty and the specific technology topics they teach in the classroom. Results suggest that the majority of faculty surveyed use a blend of a transaction cycle and business process approach. This is indicated by their self-reported philosophy, as well as by the accounting software the select to illustrate concepts in the classroom and the topics that they emphasize the most. A large proportion of faculty address the majority of emerging technology topics identified by the authors through a review of the AICPA's top ten technology list and other sources. The greatest degree of consistency is in coverage of assurance and security issues. Faculty plan to incorporate topics including knowledge management, XBRL and XML in their future courses. Hopefully this information gives AIS faculty a perspective on the approaches taken and technology taught by their colleagues. This knowledge can be useful in helping to develop courses, as well as a starting point for discussing the topics that should be taught in the AIS course.

Suggestions for Future Research

Further research on the use of business and accounting software solutions in the AIS course may provide additional insight into the various approaches and challenges faced by AIS faculty. An increased understanding of the relationship between approach and pedagogy as various types of technological issues are brought into the classroom may help AIS educators achieve an effective plan for weighing how much theory, application, and emerging technology is appropriate for their course. 📖

Table 1
Demographic Data for Survey Participants

	Frequency	Percent
Rank		
Professor	15	30.6
Associate Professor	11	22.4
Assistant Professors	17	34.7
Instructor	6	12.3
Total	50	
Number of AIS Courses		
One	29	58.0
Two	6	12.0
Three	5	10.0
More than three	10	20.0
Total	50	
When is the first AIS course taken?		
Sophomore	5	10.0
Junior	37	74.0
Senior	8	16.0
Total	50	
Number of Technology Courses other than AIS		
None	1	2.0
One	15	30.6
Two	21	42.9
Three	8	16.4
More than three	4	8.3
Total	49	
Length of Accounting Program		
2 years	2	4.0
4 years	23	46.0
5 years	26	50.0
Total	50	
Size of Program – Graduates per year		
0-50	15	30.0
50-75	11	22.0
75-100	12	24.0
100-150	7	14.0
More than 150	5	10.0
Total	50	

Table 2
Classroom Environment

	Frequency	Percent
AIS Class Size		
Less than 10	3	6.0
10-20	12	24.0
20-30	26	52.0
More than 30	9	18.0
Total	50	
Access to Technology		
AIS courses are taught in a classroom with computers	43	86.0
Students bring their own laptops to class	6	12.0
Accounting Software used in AIS Courses*		
No Accounting Software Used	9	18.0
Peachtree	13	26.0
Quickbooks	8	16.0
AccPac	6	12.0
Great Plains Dynamics	20	40.0
MAS 90	3	6.0
JD Edwards	3	6.0
Oracle	5	10.0
Peoplesoft	1	2.0
SAP	3	6.0
Use of Other Software		
Microsoft Excel	26	52.0
Microsoft Access	36	72.0

*Some individuals used more than one accounting software package, consequently, the percentages do not add to 100%.

Table 3
Approaches to AIS Education

	Frequency	Percent
Panel A: Self-Reported Approach		
Transaction Cycles	6	12.8
Blended	31	66.0
Business Process	10	21.2
Total	47	
Panel B: Approach Based on Highest Level of Accounting Software Used*		
No Accounting Software Used	9	18.0
Low-End	13	26.0
Mid-Range	17	34.0
High-End/ERP	11	22.0
Total	50	

*Where subjects used more than one accounting software package, they are classified based on only the *highest* level of software used.

Panel C: Approach Based on Importance of Topics Characteristic of Each Approach

	mean for question	% below mean[1]	% above mean[1]	Chi-Square P-Value[2]
Topics Indicative of Business Process Approach				
REA Models	3.35	58.00	42.00	-0.26
Entity Relationship Diagrams	3.80	36.00	64.00	**0.05**
Data Flow Diagrams	3.57	50.00	50.00	1.00
Systems Analysis	3.45	46.00	54.00	0.57
Systems Design	3.33	52.00	48.00	-0.78
Topics Indicative of Transaction Cycle Approach				
Transaction Cycles	4.18	24.00	76.00	**0.01**
Document Flowcharts	3.45	48.00	52.00	0.78
Special Journals	2.83	72.00	28.00	**-0.01**
Review of Debits and Credits	2.15	86.00	14.00	**-0.01**
Review of Accounting Cycles	3.73	44.00	56.00	0.40
Completion of a Manual Practice Set	2.55	74.00	26.00	**-0.01**
Completion of a Computer-Based Practice Set	3.09	40.00	60.00	0.16

[1]The percents of subjects above and below the mean represent the percentage of subjects who assigned an importance rating to the topic that is above or below the mean rating of 3.34 for all topics combined. As a result, this proportion indicates the number of subjects who thought this topic was more/less important than other topics.

[2]To quickly describe whether a larger percent of subjects rated the topic above or below the average importance, the p-values have a positive sign if a larger percentage of subjects gave above average ratings for the topic and a negative sign if a larger percentage of subjects gave a below average rating for the topic.

Table 4
Technology Coverage By AIS Faculty

Topic	Percent Who Currently Cover the Topic	Percent who Intend to Cover the Topic in the Future	Percent Who Do Not Intend to Cover the Topic
Information Integration and Enterprise-Wide Systems			
Business process redesign	85.4	2.1	12.5
Enterprise Resource Planning (ERP) Systems	89.6	2.1	8.3
Cross-functional process maps	36.2	17.0	46.8
Database design and development	97.9	0.0	2.1
Data warehousing	69.6	15.2	15.2
Knowledge management	52.1	22.9	25.0
E-Business/Internet Related Issues			
E-business (general introductory concepts)	83.3	6.3	10.4
Electronic business and financial reporting	89.6	4.2	6.3
Integration of legacy systems with e-business initiatives	50.0	10.4	39.6
Web site development	50.0	8.3	41.7
XBRL	62.5	27.1	10.4
XML	52.1	27.1	20.8
Assurance Issues			
Electronic audit trails	89.6	2.1	8.3
Internal controls	97.9	0.0	2.1
Online assurance	81.3	4.2	14.6
Security Issues			
Information security	95.8	2.1	2.1
Privacy of information	75.0	10.4	14.6
Disaster recovery	83.3	6.3	10.4
Evaluation of Software Solutions			
Software vendor selection	77.1	0.0	22.9
Application Service Providers (ASPs)	68.8	6.3	25.0

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[i] See www.cpavision.org for the full report of the CPA Vision Project.

[ii] For more information on the AICPA Top Ten Technology issues see www.aicpa.org.

[iii] For more information on the AICPA Top Ten Technology issues see www.aicpa.org.

[iv] An event may be considered to be recordable if it is an element, is measurable, and is relevant and reliable.