

# Identifying Employer Needs from Accounting Information Systems Programs

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## ABSTRACT

As the need for new hires with accounting and information technology knowledge increases, a new major in accounting information systems (AIS) has emerged. This new AIS degree is a hybrid of accounting concepts and common business subjects combined with key information technology issues. Employers were presented with 56 core content areas found in the curriculum for the AIS major and asked to rate the importance of each. We present the results of the survey along with company demographics. Conclusions are then drawn to determine if the employers are hiring new employees with the necessary knowledge and skills needed to fill these employment trends.

**Keywords:** AIS major, Accounting Information Systems major, Employer needs

## 1. INTRODUCTION

The emergence of undergraduate Accounting Information Systems (AIS) programs is the result of universities heeding the recommendations of leading professional accounting societies and recognizing employment trends. For example, as of 2002, the American Institute of Certified Public Accountants (AICPA) recommends that computer and information technology concepts be part of the knowledge, skills, and abilities of accounting professionals (AICPA 2002), and the Institute of Management Accountants (IMA) identifies computer systems and operations as one of four work activities that are predicted to consume more of an accountants time (Russell, Siegel, and Kulesza, 1999, 38). See figure 1 for the evolution of AIS (Arnold and Sutton, 2002).

As colleges and universities add the AIS concentration, track, or major it offers an opportunity for students to go beyond elementary exposure to accounting information systems. Furthermore, the required additional credit hours for Certified Public Accountants (CPAs) required by the AICPA for the CPA licensure exam gives colleges and universities more credit hours in which to include AIS content in their curriculum (Ainsworth 2001).

In an AIS program, students should have the opportunity to blend the most important accounting concepts with the most important information systems concepts (Chayeb and Best, 2005; Dillon and Kruck, 2005; Dillon and Kruck, 2004; Dillon and Kruck, 2001). Chayeb and Best studied core accounting information systems curricula across

universities in Australia and found that a lack of consistent topics may be as a result of lack of guidance (2005). The faculty that create and teach AIS programs should design the curriculum to meet the needs of the accounting and informa-

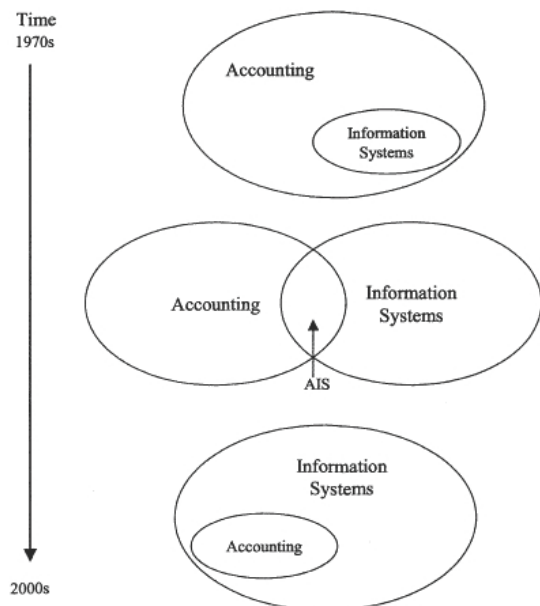


Figure 1: Evolution of AIS (Arnold and Sutton, 2002)

tion systems employer community and to achieve the best blend of accounting and information systems content. Our research provided employers the opportunity to identify their needs from existing AIS curriculums and to provide.

**2. METHODOLOGY**

We conducted a study that allowed AIS employers to identify their needs when compared against the current content of undergraduate AIS programs. In addition, we sought to better understand the types of companies that employ AIS program graduates. Specifically we would like to answer the following questions:

1. What demographic characteristics best describe the companies that hire and employ AIS graduates?
2. What content found in the current AIS curriculum do these employers rank as most important?
3. Are there different priorities for different types of AIS employers?

The intent of this study is to analyze undergraduate AIS programs from the perspective of the employer community that hires AIS graduates.

We initially identified AIS programs through reading the accounting literature, searching college and university listing websites, and making inquiries to several accounting and information systems listservs. We then narrowed our list by limiting the AIS programs to those found at universities

accredited by the Association to Advance Collegiate Schools of Business (AACSB). Universities and colleges were then eliminated if they did not list undergraduate AIS programs in their college or university catalog as a specialty, major, track, concentration, or emphasis.

Since the intent was to analyze the content of AIS programs and compare it to industry needs, we did not include programs that recommend accounting students to pursue a double major in an information systems related major, such as computer information systems, management information systems or computer science. A double major would require a student to complete two curricula. We wanted to compare the needs of the AIS field to the curricula of programs where the faculty instituted a curriculum review process to identify the needs of one major, the AIS program.

Thirteen AIS programs were identified in late 2003. We obtained a syllabus from each of the courses in these thirteen AIS programs. We entered the content of each syllabus into a database. Using content analysis, we combined similar topics until we arrive at the 56 core content areas listed in Table 1. For example, a course titled "Database Management" may have a unit on data modeling with Entity Relationship Diagrams. A similar unit of instruction may be found in a course titled "Accounting Information Systems." For this reason there may be overlapping content (e.g., data modeling, database design, and database normalization). Further detail of how the AIS programs were identified and

<ol style="list-style-type: none"> <li>1. accounting cycle</li> <li>2. activity based costing</li> <li>3. algorithms and data structures</li> <li>4. audit concepts, planning and reporting, sampling, testing</li> <li>5. auditing - computerized AIS/EDP</li> <li>6. auditing standards and ethics</li> <li>7. capital budgeting</li> <li>8. CASE tools</li> <li>9. cost accounting</li> <li>10. data modeling (e.g. ERD)</li> <li>11. data warehouses</li> <li>12. database - design and implementation</li> <li>13. database - normalization</li> <li>14. depreciation</li> <li>15. disaster recovery &amp; contingency planning</li> <li>16. documentation skills (e.g. work papers)</li> <li>17. electronic commerce</li> <li>18. employee benefit plans</li> <li>19. ERP systems (e.g. SAP, PeopleSoft)</li> <li>20. financial statements and reporting</li> <li>21. GAAP</li> <li>22. input and output design</li> <li>23. intangible assets</li> <li>24. inventory management</li> <li>25. investments/financing (e.g. present value)</li> <li>26. IS/IT requirements gathering techniques</li> <li>27. job order costing</li> <li>28. lease accounting</li> </ol>	<ol style="list-style-type: none"> <li>29. legal liability</li> <li>30. local area networks</li> <li>31. network security</li> <li>32. object-oriented analysis and design</li> <li>33. operating systems (e.g. Unix, Windows)</li> <li>34. partnership accounting</li> <li>35. trust &amp; pension accounting</li> <li>36. process modeling (e.g. data flow diagrams)</li> <li>37. professional services and responsibilities</li> <li>38. computer program design and development</li> <li>39. programming language</li> <li>40. project management skills</li> <li>41. request for proposals</li> <li>42. revenue cycle</li> <li>43. short &amp; long-term debt</li> <li>44. software purchase decisions</li> <li>45. spreadsheets</li> <li>46. SQL</li> <li>47. system design &amp; development</li> <li>48. system maintenance</li> <li>49. systems implementation, testing</li> <li>50. tax – codes, concepts, research</li> <li>51. tax – corporate, estate, fiduciary, partnership</li> <li>52. tax – individual</li> <li>53. total quality management</li> <li>54. transaction analysis and controls</li> <li>55. unified modeling language (e.g. use case diagram, sequence diagram, class diagram)</li> <li>56. web page development</li> </ol>
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**Table 1: AIS Core Objective Content Areas**

analyzed is in an earlier publication (Dillon and Kruck, 2004)

**3. THE EMPLOYER SURVEY**

The survey instrument was created by analyzing the curricula from all 13 of the AACSB accredited undergraduate AIS programs identified and dividing each course into core objective content areas. Fifty-six of these core objective content areas were then listed in alphabetical order on a three page survey so that the level of importance could be determined from each survey respondent.

The survey also contained three organizational demographic data questions concerning the industry classification, the estimated total revenue of the organization, and the estimated number of employees at all combined locations. A fourth question requested the job title of the person completing the survey. A final question was open-ended and simply requested if the respondent had any additional comments they would share with us. The employers in the study were located through the career development offices of two east coast universities that graduated AIS majors. Both universities provided AIS curricula data for the study.

Each survey was packaged with an introductory letter that explained the goals of the study and guaranteed anonymity. In early 2005 the survey was initially mailed to 128 employers that previously hired AIS majors. A second mailing was performed four weeks later to enhance response rates and all employers were contacted by e-mail.

**3.1 Demographic Characteristics of the Respondents**

Twenty surveys were returned with a response rate of 16 percent. A demographic profile of the participating organizations is presented in Tables 2, 3 and 4. The responding companies were widely distributed through a number of industry classifications. The largest responding industry groups were consulting services with 35 percent and public accounting with 25 percent (See Table 2). A number of industry groups were not represented in our sample. This may be due to the limited geographic location of the employers selected for the survey.

The estimated total revenue and estimated number of employees at all combined locations for the responding organizations were very diverse. The estimated reported total revenue ranged from less than \$50 million by 33 percent of respondents to over \$1 billion for 28 percent of the respondents (See Table 3). The number of employees for the responding companies included small businesses of less than 100 employees to very large organizations of 5,000 employees or more (See Table 4). From the findings presented in Tables 3 and 4, most employers that hire AIS graduates appear to be larger organizations that employ over 100 employees (about 70 percent report a workforce greater than 100) and report earnings greater than \$50 million (about 67 percent report earning ranging from \$51 million to over \$1 billion).

The job titles of those completing the survey were also very diverse. Five respondents or 29 percent of those responding were directly involved in the recruiting process on college campuses and had titles such as, campus

development manager, college recruiter, human resource director, and personnel manager. Five respondents reported generic names, for example, manager, supervisor and general manager. Four respondents or 24 percent of those responding, in a display of how influential the consulting profession is on the AIS field, provided titles that reflected the consulting profession; principle, partner, firm administrator, and managing partner. Two respondents were senior financial managers with the titles vice president of finance and finance director. And surprisingly, only one information systems professional responded, with the title senior information technology manager.

Industry Classification	Percent Responding
Consulting/Services	35 %
Public Accounting	25
Manufacturing	10
Wholesale and retail	5
Financial and legal	5
Construction	5
Computers and technology	5
Government (Federal, State, or Local)	5
Transportation	5
Utilities and communications	0
Publishing or news gathering	0
Consumer products	0
Petroleum	0
Aerospace	0

**Table 2: Respondent's Industry Classifications**

Estimated Total Revenue	Percent Responding
Less than \$50 million	33 %
\$51 to \$100 million	11
\$101 to \$300 million	6
\$301 to \$600 million	11
\$601 million \$1 billion	11
Over \$1 billion	28

**Table 3: Respondent's Estimated Total Revenue**

Number of Employees	Percent Responding
Less than 100	30 %
101 to 500	20
501 to 1,000	5
1,001 to 2,000	5
2,001 to 3,000	5
3,001 to 4,000	0
4,001 to 5,000	0
Over 5,000	35

**Table 4: Number Of Employees**

When provided with a general comments area, few of our respondents provide additional feedback on essential AIS content. Only 10 percent of the respondents provided feedback, most commenting that AIS graduates should also be proficient in verbal and written communication skills.

#### 4. IMPORTANT RANKINGS FROM THE RESPONDENTS

##### 4.1 Need for Accounting Fundamentals

The 56 core objective content areas were listed in alphabetical order followed by a two-inch line. The left anchor of the line was labeled “Not Important” and the right anchor was labeled “Very Important” (see Table 1 for the 56 core objective content areas). Respondents were requested to “Please mark the horizontal bar with an ‘X’ to indicate the level of importance for each topic in an accounting information systems curriculum.” The intersection of the “X” was measured from the left anchor establishing a ratio value for the distance. The distance identified the level of importance perceived for each core objective by each respondent. We decided to scale the response as a ratio measure so that absolute zero, or “no importance” was an available choice (Siegel and Castellan, 1988, p. 30).

The results of the perceived importance for each of the 56 content topics were averaged. The mean scores were then ranked and charted in Table 5. In 1997, Fordham, Bryant and Benke recommended that AIS programs be taught from an accounting perspective (1997). The results of our study show that employers that hire AIS graduates agree with this recommendation. As can be seen in Table 5, the eight AIS curriculum content topics that are rated the most important center clearly on the accounting issues of financial statements and the accounting cycle, auditing, documentation skills, generally accepted accounting practices and the use of a spreadsheet, a common accounting tool used to support financial analysis (Kruck, 2006).

##### 4.2 Mix of General Business, Accounting, and IT

When ranked by AIS employers, the next forty or so AIS curriculum topics are somewhat evenly divided between accounting, general business, and information system concepts. It is also clear that AIS employers place importance on the ability of the newly hired student to be able to understand general business operations and responsibilities. For example, curriculum issues such as professional services and responsibilities, and project management skills are both rated in the top 15 for importance. Other general management topics, including electronic commerce, legal liability and total quality management are ranked in the top 30. This result coincides with similar conclusions made by Wilder and Stocks, (2004) that the accounting profession is in a state of change and that accountants have broadened their scope to include strategic advising and quality assurance.

Basic accounting functions such as employee benefit plans, inventory management, intangible assets, short and long-term debt, activity-based costing, capital budgeting, and financial investment are also seen as important. However, tax concepts, including corporate tax, partnership accounting, individual tax returns, and trust and pension accounting are all ranked relatively low in importance for AIS graduates. From this analysis we can determine that employers do not expect the same accounting knowledge from new AIS hires as they do from new hires enrolled in traditional accounting programs.

##### 4.3 What IT Concepts are Important?

Employers of graduates from AIS programs also recognize the need for colleges and universities to provide curriculum coverage of organization-wide information technology issues. They rank enterprise resource planning (ERP) relatively high along with network issues and database design. Likewise, Wilder and Stocks (2004) also recently commented on the need for management accountants to understand ERP issues and McCarthy (2003) has encouraged relational database concepts since 1978. Network concepts, such as operating systems, network security, and disaster recovery and contingency planning are also highly ranked. Database design issues including modeling with entity relationship diagrams and normalization, and data warehousing are spread throughout the mid-rankings. Accessing data through SQL (structured query language) was the lowest ranked database curriculum topic.

Moreover, AIS employers recognize the need for properly designed systems. They ranked input and output design, requirements gathering techniques for information technology, and systems implementation and testing relatively high.

We were surprised by the content items that the AIS employers found least important. Clearly, the actual programming process is not considered important by AIS employers. Programming languages, computer programming, and algorithm development are ranked as some of the least important curriculum content issues, along with process modeling with data flow diagrams and accessing database through the use of SQL. It should be noted that one of the essential skills for straight Information Systems majors is the development of programming skills (Cappel, 2002; Janicki, Kline, Gowen, and Konopaske, 2004)). This leads to further justification of why we did not include double major programs in this study.

Two additional outcomes that were a surprise are the low ranking of web page development and the low ranking of all object-oriented topics, including object-oriented analysis and design and Unified Modeling Language (UML). Considering the relatively high ranking of electronic commerce we thought that web page development would have more importance. Further examination of Table 5 shows that AIS employers do not value programming skills (i.e., algorithms and data structure, programming languages, computer programming design and development), whether with a traditional programming language or a new web-enhance tool.

The low ranking for UML and object-oriented curriculum topics is a major concern. All aspects of information technology are migrating toward object-orientation, and UML is the primary tool being used to analyze, design, and implement this technology migration. AIS professionals do not appear to be aware that object-oriented development techniques have moved into the mainstream and are now commonly accepted in the information systems world (Towell and Towell 2002). In contrast to AIS professionals, a similar survey concerning new hires in the information technology industry found that IT professionals ranked object-orientated programming lan-

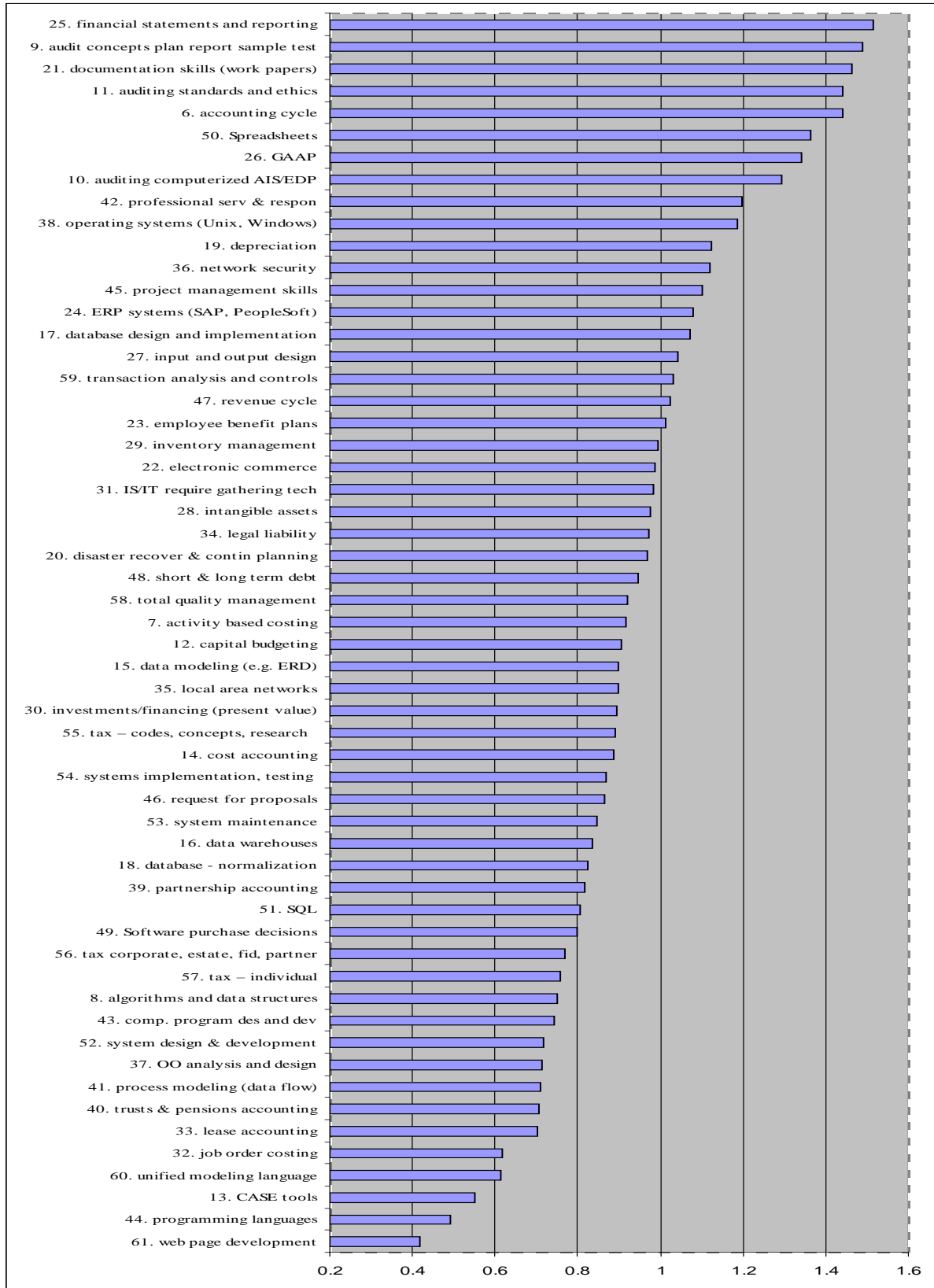


Table 5: Rank Order for Content Areas by Importance

<b>Consulting Firms Most Important – Tier 1</b>	<b>Public Accounting Firms Most Important – Tier 1</b>	<b>Non-Consulting And Non-Public Accounting Companies Most Important – Tier 1</b>
auditing concepts, plan and report, sample, test	auditing standards and ethics	spreadsheets
financial statements and reporting documentation skills (e.g. work papers)	auditing concepts, plan and report, sample, test	transaction analysis and controls
accounting cycle	financial statements and reporting	legal liability
auditing standards and ethics	documentation skills (e.g. work papers)	operating systems (e.g. Unix, Windows)
auditing - computerized AIS/EDP	GAAP	accounting cycle
depreciation	auditing - computerized AIS/EDP	network security
input and output design	spreadsheets	database - design and implementation
Spreadsheets	accounting cycle	inventory management
GAAP	employee benefit plans	professional services and responsibilities
	electronic commerce	project management skills
<b>Also Important – Tier 2</b>	<b>Also Important – Tier 2</b>	<b>Also Important – Tier 2</b>
database - design and implementation	depreciation	financial statements and reporting
professional services and responsibilities	project management skills	total quality management
revenue cycle	professional services and responsibilities	local area networks
data modeling (e.g. ERD)	operating systems (e.g. Unix, Windows)	auditing standards and ethics
ERP systems (e.g. SAP, PeopleSoft)	intangible assets	disaster recovery & contingency planning
network security	ERP systems (e.g. SAP, PeopleSoft)	documentation skills (e.g. work papers)
capital budgeting	partnership accounting	system maintenance
operating systems (e.g. Unix, Windows)	input and output design	request for proposals
IS/IT requirements gathering techniques	revenue cycle	ERP systems (e.g. SAP, PeopleSoft)
intangible assets	tax – individual	auditing concepts, plan and report, sample, test

**Table 6 Important Rank for Three Categories Of AIS Employers**

guages as the sixth most important and object-oriented systems development methodologies as the ninth most important out of twenty-seven possible content items (Weber, McIntyre, and Schmidt, 2001). UML is now a commonly accepted object oriented analysis and design documentation methodology and a failure to understand UML may limit AIS graduates in the audit process.

**5. PRIORITY DIFFERENCES FOR AIS EMPLOYERS**

A large segment of the AIS employers came from two distinct populations; consulting with 35 percent and public accounting with 25 percent. For this reason, we elected to divide our sample into three hiring categories; consulting, public accounting, and the remaining non-consulting and non-public accounting companies with 40 percent of the responding sample. Table 6 presents the top 20 most important curriculum topics for each of these three categories divided into two 10-curriculum topic tiers.

Clearly there is a significant difference between the curriculum topics rankings for those in the non-consulting and non-public accounting company category than those in both consulting and public accounting. Surprisingly, only two curriculum topics appear in the first tier for all three categories; the hands-on ability to use spreadsheets and an understanding of the accounting cycle.

The non-consulting and non-public accounting companies appear to want AIS majors to be better-rounded in accounting, IT, and general business skills than the consulting and public accounting. These companies emphasize a wide mixture of skills, with no direct focus. For example, the top 10 curriculum topics for the companies include almost equal mix of broad topics. This ranged from IT topics (operating systems, network security, and database design), to a focus on internal accounting concepts (transaction analysis and controls, accounting cycles, and inventory management) and included general business issues (legal liability, professional services, and project management).

The consulting and public accounting firms' priority hiring categories are unquestionably similar to each other. In the top 10 topics found in tier 1, they both contain eight of the same curriculum topics; all with an emphasis on the auditing process and financial reporting. But in the second tier, the consulting and public accounting employers differ. The public accounting employers place a continued importance on accounting concepts, such as depreciation, partnership accounting, and individual taxes. Those in the consulting category begin to place importance on a broad array of IT topics that include database design and data modeling with entity relationship diagrams, network



security, and gathering IT requirements.

In summary, the three different types of employers that hire AIS graduates place importance on dissimilar curriculum areas. Companies look for a broad range of skills that integrate accounting and IT abilities and concepts into wide-ranging business knowledge. Consulting and public accounting firms both place significance initially on auditing and financial reporting concepts, but then differ when consulting firms begin to emphasize general IT concepts and public accounting firms continue with accounting issues.

## 6. CONCLUSION

The evidence obtained from these employers about curriculum issues found within the comparatively new course offerings for AIS majors within accredited business schools will assist both businesses and curriculum developers. For this emerging new program offering, we found that accounting concepts and theories are still very important, however, IT concepts and theories are now gaining in importance.

In the past, as the curriculum in a new domain evolves, there is widespread difference in college and university offerings (Ainsworth 2001) but as the curriculum progresses it aligns more with what industry employers' desire. Outcomes from our study, when compared to previous research by Fordham and colleagues (1997) indicate that the core content requirements for AIS programs are evolving. However, there are also differing topics that should be emphasized in AIS programs depending on the local and regional needs, and the needs of the employer constituencies.

The AIS major will no doubt continue to evolve as faculty gain more experience and understanding with the IT content (Mounce, Mauldin, and Braun, 2004). Additionally, the AIS major will reflect dynamic technological changes, much as it has with issues involving e-commerce, database, and network design. Communication and dialogue between academicians and AIS professionals must be maintained to integrate these technological changes into the AIS curriculum (Aryan, Fellingham and Schroeder, 2003). In addition, academicians should also continue to explain to practitioners why specific content areas are important for students to develop conceptual understandings of the ever changing AIS content. Practitioners may not fully understand the conceptual foundations of newer content areas and may not recognize the importance the foundation concepts play. This will ensure that the topics included in AIS programs are closely aligned with the needs of the profession.

One final conclusion may also be a limitation to the study. Employers that completed the survey may not see an issue such as modeling with UML as a necessity for AIS graduates. These employers, realizing the need for object oriented modeling techniques, may have already sought out majors, such as graduates in information systems, to perform these tasks.

There are a number of limitations that may have affected the results of this study. Obviously there is a limited return rate and a small sample size, but after two mailings and contacts by email, data collection was closed. We also found that respondents to the survey may not have fully understood a number of the 56 core content areas. For example, the core

content concept of "operating systems" referred to the study and comparison of operating system functions found in Window and Unix. Non-technical respondents may have assumed that the content area was describing the use of Windows as a user.

## 7. IMPLICATIONS FOR FUTURE RESEARCH

As we continue our stream of research on the AIS major in the business school curriculum, it would be helpful to explore the reasons why some universities do not presently offer the AIS major and, if not now, do they plan to offer one in the near future. Perhaps some business schools lack the funds necessary to offer and staff the additional courses needed. Or, it could be the difficulty in finding the qualified faculty with the appropriate skills needed to teach the AIS courses. Within the AACSB guidelines, there are a limited number of hours available for courses in the major. Curriculum planners are perhaps struggling with the decision of which major courses or topics to eliminate in order to make room for AIS content. An additional reason for not offering the AIS major could be that AIS content is not an important need for graduates of accounting programs in some localities or regions.

## 8. ACKNOWLEDGEMENTS

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