ISSN: 1545-679X

Information Systems Education Journal

Volume 2, Number 21 http://isedj.org/2/21/ April 7, 2004

In this issue:

Matching Employer Needs With IS Curriculum: An Exploratory Study

Thomas N. Janicki
Univ North Carolina at Wilmington
Wilmington, NC 28403

Douglas Kline
Univ North Carolina at Wilmington
Wilmington, NC 28403

J. Art Gowan
Univ North Carolina at Wilmington
Wilmington, NC 28403

Robert Konopaske
Univ North Carolina at Wilmington
Wilmington, NC 28403

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Recommended Citation: Janicki, Kline, Gowan, and Konopaske (2004). Matching Employer Needs With IS Curriculum: An Exploratory Study. *Information Systems Education Journal, 2* (21). http://isedj.org/2/21/. ISSN: 1545-679X. (Abstract appears in *The Proceedings of ISECON 2003:* §2223. ISSN: 1542-7382.)

This issue is on the Internet at **http://isedj.org/2/21/**

The **Information Systems Education Journal** (ISEDJ) is a peer-reviewed academic journal published by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals (AITP, Chicago, Illinois). • ISSN: 1545-679X. • First issue: 8 Sep 2003. • Title: Information Systems Education Journal. Variants: IS Education Journal; ISEDJ. • Physical format: online. • Publishing frequency: irregular; as each article is approved, it is published immediately and constitutes a complete separate issue of the current volume. • Single issue price: free. • Subscription address: subscribe@isedj.org. • Subscription price: free. • Electronic access: http://isedj.org/ • Contact person: Don Colton (editor@isedj.org)

The Information Systems Education Conference (ISECON) solicits and presents each year papers on topics of interest to IS Educators. Peer-reviewed papers are submitted to this journal.

EDSIG activities include the publication of ISEDJ, the organization and execution of the annual ISECON conference held each fall, the publication of the Journal of Information Systems Education (JISE), and the designation and honoring of an IS Educator of the Year. • The Foundation for Information Technology Education has been the key sponsor of ISECON over the years. • The Association for Information Technology Professionals (AITP) provides the corporate umbrella under which EDSIG operates.

Matching Employer Needs With IS Curriculum: An Exploratory Study

Thomas N. Janicki
janickit@uncw.edu
Douglas Kline
klined@uncw.edu
J. Art Gowan
gowanj@uncw.edu
Robert Konopaske
konopasker@uncw.edu
University of North Carolina at Wilmington
Cameron School of Business
Wilmington, NC 28403

Abstract

Educators in the fields of Information Systems (IS) and Information Technology (IT) encounter a continuing challenge to insure that their courses and curriculum stay up to date with the technological changes in the field as well as being relevant to the business community. This paper summarizes the results of an employer survey conducted in one state university's service area. It is similar to other employer surveys in querying job-hiring expectations, but unique in that it queries the detailed job skills required for specific occupations. Survey results indicated that programmers and network specialists had the highest anticipated hiring in the 2003-2004 period. By drilling down to the detailed job requirements for the above positions it was found that a high degree of systems analysis and database knowledge was fundamental for these positions. The survey results may be used to help IS departments plan their curriculum to meet employer needs.

Keywords: ACM curriculum, IS curriculum, IS education, IT employment, IT skills

1. INTRODUCTION

A challenge for any computer information systems' faculty member is to stay relevant and up to date with the evolving technologies demanded by employers. Lee, Koh, Yen and Tang (2002) note that in a dynamically changing industry (Information Technology) information systems' academics have a hard time coping with this rapid change in their course content. Many higher education universities follow the IS 2002 Model Curriculum as recommended by the Association for Computing Machinery (ACM), the Association for Information Systems (AIS) and the Association of Information Technology Professionals (AITP). This model curriculum provides suggestions for course content for graduate and undergraduate IS courses. However a limitation of the IS model is that it also has difficulty in staying abreast of technological changes. The model was updated in 2002 and prior to that in 1997.

Many schools that are accredited by the AACSB (Association to Advance Collegiate Schools of Business) have restrictions placed on the number of courses required within the business school and often results in restrictions on the number of courses required in a major, like information systems. While AACSB has made some adjustments in the

new guidelines (April 2003) to provide some flexibility and relief, it is only available to those who can prove the need based upon their mission. IS content in major courses must be designed efficiently in order to effectively cover the growing knowledge and skill set within limited course offerings.

With the recent contraction in the IT industry, IS programs have two challenges that they must address. First, IS enrollment has dropped as the lure of high salaries in the IS industry has faded. Second, the IT job market is tight, requiring new graduates to do more to compete with seasoned professionals. It behooves IS programs to take an objective look at how curriculum matches market needs. Better understanding of the market should improve placement, and thus draw more students into the programs.

Technology is rapidly changing and it is important (Lee et al., 2002, Woratscheck and Lenox, 2002, Scott, Alger, Pequeño, and Sessions. 2002) that IS curriculum is relevant to employer needs. There are several problem areas for developers of IS programs that need to evolve as technology and industry needs change. These problem areas are:

- How to balance the common body of knowledge for graduates of business schools versus technology skills desired;
- How to balance training and certification desires of students with in depth knowledge of a topic area;
- How to incorporate more and more recent advances in technology into the same number of courses;
- How to meet employer needs for entry-level and above entry-level employees in the IT profession; and
- How to determine what knowledge should be included in basic Information Systems courses?

This is an exploratory study that was designed to address some of these issues as they relate to the continuing improvement of an undergraduate program in information systems and the development of a proposed graduate program. The primary objective was to identify and profile IS positions anticipated in the near future by regional employers. In addition, we obtained feedback from those employers about those positions in order to identify different combinations of knowledge and skill sets expected for the successful candidate at both entry and advanced levels. This information is to be used to help guide IS faculty in the design and development of pertinent curriculum. These objectives address the last two "problem areas" identified above in detail.

Surveys of employers' technological needs are commonly performed to support the curriculum development process. However this survey is different in three different manners. First it attempts to "drill–down" to understand the employer needs for an occupation. For example, it is helpful to identify the mix of knowledge and skills are needed for database professionals, not just that a database course is necessary in the curriculum. Secondly, this survey was built from an employer perspective (of job skills needed) versus many surveys that are built from the academic side (what courses should be delivered). Thirdly, the survey queried not only entry-level positions (undergraduate degrees) but also two to three levels above entry positions to represent needs for graduate programs.

2. LITERATURE REVIEW

There are numerous research efforts in the area of matching employer needs to curriculum. Lee et al. (2002) surveyed IS practitioners and IS academicians and made the following conclusion: IS academician's understanding of the required knowledge and skills for the IT profession is not in line with the demands of industry. Specifically they noted that IS practitioners rated interpersonal, team, and communication skills higher than the technical knowledge and skill sets. They also noted that practitioners rated software tool skills as less important than the academicians. In general academics saw technical skills more valuable for IS graduates, while business professionals saw a need for more "managerial skills."

An interesting observation of Lee et al. (2002) is that the traditional career path for IS professionals (from programmer, to analyst to project manager, to IS manager) is being replaced by many diverse career paths

as one can not be a technical expert in all areas of IS operations.

Woratscheck and Lenox (2002) also reported that non-technical skills were if not more important than technical skills. In addition their survey of 30 plus employers noted that knowledge of the systems development life cycle remains a key component of IS graduate knowledge with less emphasis on programming languages. Investigating the certification needs of employers, their study reported that professional certifications were not important for entry-level positions. Cappel (2002) did a similar study of employer needs and also found the ability to utilize the systems development life cycle to be a key skill desired by employers.

The findings of Lee et al. (1995) also support the need for a well rounded IS graduate. They identified in their survey of business professionals a need for skills in technology, business operations, management and interpersonal skills. In addition they noted that lower level IS jobs (primarily programming) were disappearing to overseas markets and IS graduates need to have skills in multiple areas beyond technology. The 2002 IS model curriculum stresses the need for IS professionals to have a broad business and real world perspective, as well as strong analytical and interpersonal communication skills.

Scott et al. (2002) recently completed a similar study where they contrasted employer expectation with student skills. Their overall conclusion was that there were significant gaps in the knowledge expected by employers in the following areas: database, CASE modeling tools, and programming. Bentley, Lowry, and Sandy (1999) found a need for institutions to stress problem-based learning approaches in their courses.

To build on the results of previous research, we built our survey to provide a more detailed examination of the job skills and knowledge needed for indicated current or anticipated "hot" jobs for both undergraduate and graduate degree students. We sought to answer four key questions: a) what are the technologies currently in use and projected to be in use in the near future by corporations?; b) what entry and above entry jobs will have the highest new hiring in the near future?; c) what is the common set of business skills required by employers of IS graduates?; and, d) what are the IS skills required for specific jobs as well as what IS skills are needed by all graduates?

3. METHODOLOGY

The development of the survey instrument was in three phases as shown in Figure 1. In phase one, 20 professionals from various IT professions and responsibilities (members of a corporate advisory board), met with faculty to develop topic areas of importance to IT professionals when hiring entry-level or above entry-level professionals. This group provided the following inputs: common job titles, data about the job skills desired for each occupation, the common body of business knowledge desired for by IT professionals, and an overview of the current and future technologies utilized by their organization.

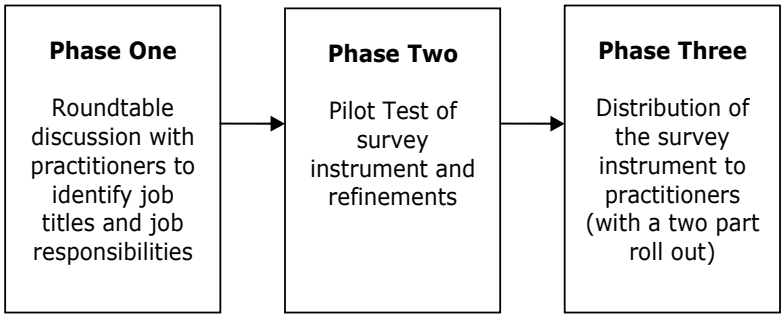
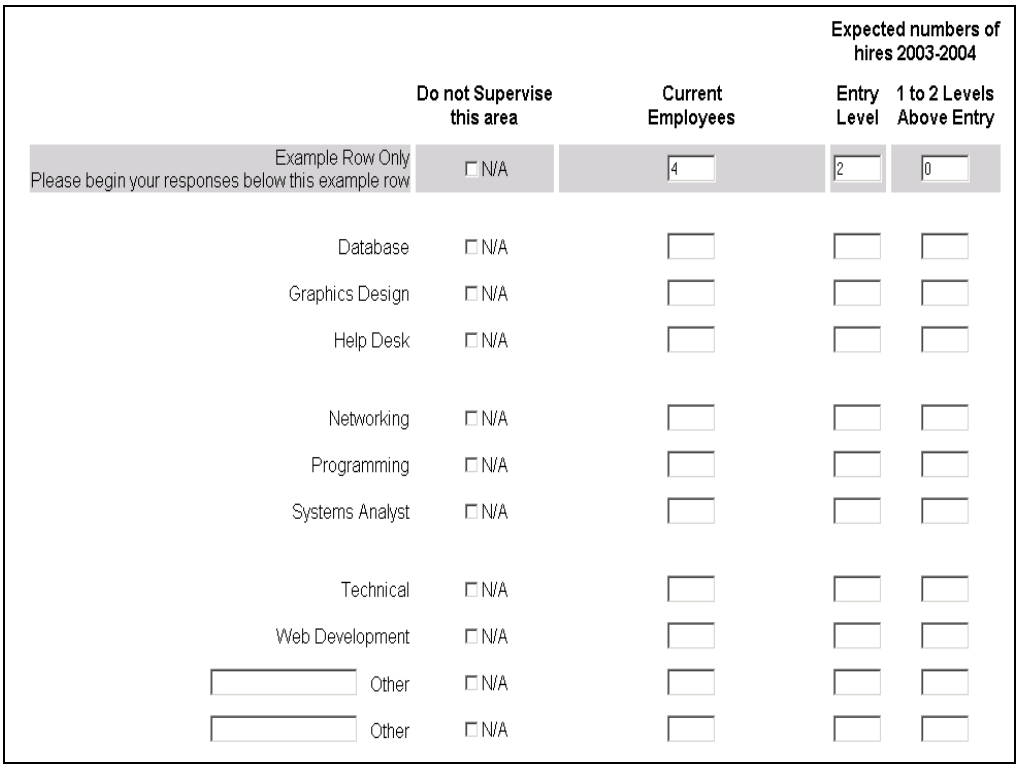


Figure 1**:** Survey Development Stages



	Do not Supervise this area	Current Employees	Expected numbers of hires 2003-2004 Entry Level	1 to 2 Levels Above Entry
Example Row Only Please begin your responses below this example row	☐ N/A	4	2	0
Database	☐ N/A			
Graphics Design	☐ N/A			
Help Desk	☐ N/A			
Networking	☐ N/A			
Programming	☐ N/A			
Systems Analyst	☐ N/A			
Technical	☐ N/A			
Web Development	☐ N/A			
Other	☐ N/A			
Other	☐ N/A			

Figure 2: Anticipated Hiring Needs by Job Title (Survey - Part A)

Part A of the survey was mailed to 225 professionals in the university's service area. The survey's mailing list was developed based on the following criteria:

a. all firms from a list of the top 100 employers in the university's service area (within a 150 mile radius of the university)

b. all firms listed in the Chamber of Commerce for the home city of the university with 10 or more employees

c. members of the Information Systems department's advisory board

The survey instructions asked that the survey instrument be completed by individuals who either supervise IT employees or hire IT employees. Respondents were given the option to complete the two-page survey via hard copy or via a web form. 74 individuals responded to Part A of the survey (75% via the web form and 25% via postal mail). Part A concerned itself with demographics of the respondent as well as their anticipated hiring needs

In Part A respondents were asked if we could send them an additional survey (Part B) querying their technologies and job skills needs. 50 of the 74 respondents indicated we may send them an additional survey. Each of these respondents was emailed a URL and password to complete Part B.

Part B surveyed the following items:

- What technologies are utilized by your organization currently or anticipated for the future (see Appendix A)?

- Based on their hiring expectations by position as shown in Figure 2 (Part A of the survey, the respondents were asked the common body of business skills desired for that position as well as the common body of technology skills required for that position. Appendix B details the common core of business knowledge surveyed, while Appendices C and D provide a sample

survey, and by job title, where the survey 'drilled-down' for additional data. Responses were captured for both entry-level employees as well as two to three levels above entry, potentially a masters degree graduate

The survey instrument "drilled-down" for specific responsibilities for a particular job or occupation. For example, for a new hire as a programmer, if it was indicated that database knowledge was important, the amount of knowledge of the following topics was indicated: SQL, query by example, specific database packages, data modeling, data modeling tools, data warehousing, data cleansing and database administration.

4. Results

As reported the survey (Part A) was mailed to 225 IT managers or individuals who hire IT professionals with 74 responses. Out of these 74 responses 50 indicated they would be willing to complete Part B. 24 individuals actually completed Part B.

This is a response rate of 33% for Part A of the survey, and 10.7% for Part B of the survey. Of those who indicated they would be willing to complete part B of the survey 48% actually responded.

Tables 1 to 4 report the overall demographics of the individuals who completed Part A of the survey. Tables 1 and 2 detail the demographics about the person who responded to the survey. Respondents were instructed to check all functional areas that applied to their position. Note that most of the respondents were involved in Information Systems or Operations, although all functional areas are represented to some degree indicating that many functional areas have responsibilities to manage or hire IS professionals. The mean number of subordinates for the respondents was 9.0. The average number of years in their position was 7.2. Tables 3 and 4 give information about the respondents' companies. We can see that medium and large corporations were prevalent in the survey.

Technology Needs

As technologies evolve and are replaced with newer emerging technologies, it is important to understand which of these technologies are currently important to IT professionals and are projected to be important in the future. These survey results could be useful in determining which technologies to include in a skills course and overall curriculum.

Functional Area	# of Respondents
Accounting	6
Corporate Administration	7
Corporate Management	11
Finance	5
Information Systems	34
Marketing	9
Operations	16
Research	4
Other	2

Table 1: Respondent Demographics - Functional Area of Responsibility

Mean Number of Subordinates	9.0
Average Number of Years in Position	7.2

Table 2: Respondent Demographics

Number of Employees	Count of Companies
< 11	3
11-20	4
21-100	9
101-500	15
> 500	16

Table 3: Respondent Demographics: Company Size

Type of Organization	Count of Companies
Corporation	37
Government	3
Non-Profit	2
Partner / Sole Prop	5
Education	0

Table 4: Respondent Demographics: Type of Organization

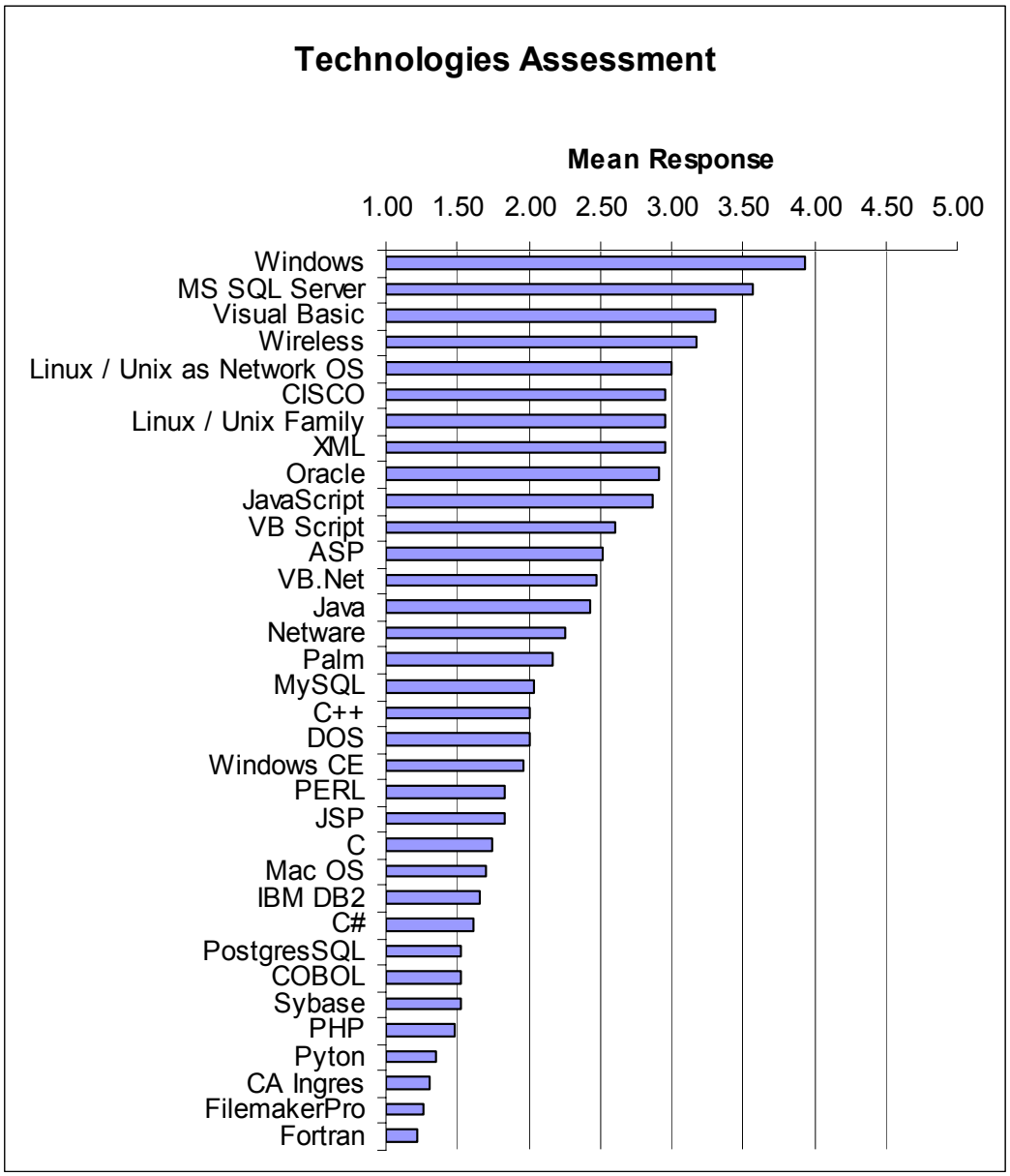


Figure 3: Assessment of organization's view of technology
Scale: 5=More Important in the Future to 1=Less Important in the Future

Figure 3 reports the summary of the technologies business organizations currently use or anticipate using in the future. Technologies that were relevant to a majority of responders were: Windows, MS SQL Server, Visual Basic, Wireless technologies, Linux/Unix family, CISCO telecommunication skills, and XML and .NET technologies. At the bottom of future relevance were Fortran, FileMaker Pro, and CA Ingres.

Note that the survey asked for the importance of a technology in their company, not their opinion of its importance in the overall IT industry. Therefore, a company that mainly used Java / open source platforms might say that Windows was not relevant. One important conclusion from this is that all the technologies were at least somewhat relevant to someone. Furthermore, a score of nearly 4.0 for Windows does not mean that Windows is highly relevant to all companies, but it certainly indicates that many

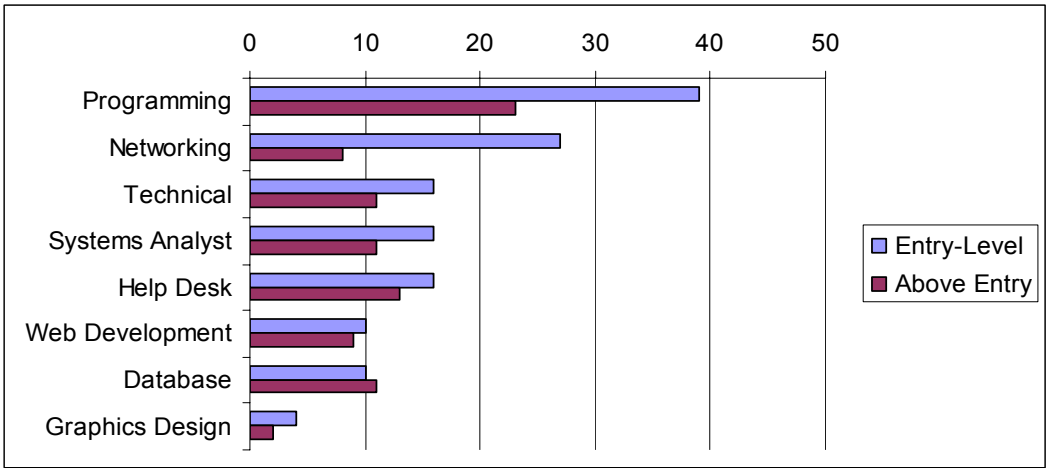


Figure 4: Number of new hires for 2003-2004 (aggregate of 24 responses)

companies view it as highly relevant to their company.

Hiring Expectations

To assist students' preparation for the job market, another section of the survey concerned future hiring expectations by position. Figure 4 summarized hiring expectations for the 2003-2004 period. It reports that programmers, and networking specialists, have the highest demand in the next two years for our service area. Upper level hiring was defined as two to three levels above entry-level employment.

Common Body of Business Knowledge

Previous employer surveys have stressed the importance of interpersonal and general business skills. Similar results were found in this survey. IT professionals indicate that entry-level hires should have fundamental skills in information systems as well as operations management. Entry-level hires should have cursory knowledge of management, accounting, economics and finance. In addition entry-level hires should have the fundamentals of the office suite of products (word processing, spreadsheets and databases). Tables 5 (entry-level) and 6 (above entry-level) report the desired level of business knowledge for IS hires.

When asked about above entry-level hires, employers expected a higher level of all common body of business knowledge as well as a higher degree of office productivity software. Knowledge expectations were highest for basic information systems, management, statistics and project management Contrasting Tables 5 and 6 provides insight into the additional skills expected from master level graduates.

Knowledge desired by occupation

Tables 7 and 8 detail the skills desired by employers for the two highest expected occupations for new hires, programmers and network specialists. As would be expected, the highest skill desired for programmers would be programming expertise. However, employers expect that programmers should also possess systems analysis and design knowledge, delivery and compliance knowledge, and database skills. For network specialist, employers desired additional knowledge of computer architecture, security, systems analysis and database.

Knowledge important for all IT professionals

Table 9 is the aggregate of IS skills desired across all job functions. Although hiring in database administration is not at the top of anticipated new hires, employers indicated that, across all IT jobs, new hires should possess fundamental knowledge of databases, followed by programming skills and system design knowledge. This table may be useful when determining course content for IS majors.

Common Body of Knowledge	Data-base	Graphic Design	Help Desk	Net-working	Pro-graming	System Analyst	Tech-nical	Mean
Accounting	1.8	2.0	1.9	2.1	2.1	2.6	1.7	1.9
Business Law	1.4	2.0	1.4	1.8	1.7	1.9	1.7	1.6
Economics	1.4	2.0	1.9	1.8	1.5	1.9	1.7	1.6
Finance	1.7	2.0	1.4	1.9	2.0	2.4	1.3	1.7
Info Systems	**3.1**	**3.0**	**3.0**	**3.2**	**3.4**	**3.6**	**3.0**	**2.9**
Management	**2.2**	**2.7**	**2.0**	**2.4**	**2.1**	**2.9**	**2.7**	**2.2**
Marketing	1.7	3.0	1.9	1.8	1.8	1.7	2.3	1.9
Operations	**2.0**	**2.3**	**2.6**	**2.5**	**2.5**	**2.9**	**3.0**	**2.3**
Statistics	2.0	2.0	1.9	2.3	2.4	2.4	2.3	2.0
MS Access	**2.9**	**2.7**	**3.0**	**3.0**	**2.7**	**3.0**	**3.0**	**2.9**
MS Excel	**3.4**	**2.7**	**3.3**	**3.2**	**2.5**	**3.3**	**3.0**	**2.8**
MS Front Page	1.7	2.0	2.1	2.6	1.8	2.0	1.7	1.9
MS PowerPoint	**2.7**	**2.7**	**3.1**	**2.9**	**2.2**	**3.0**	**3.0**	**2.6**
MS Project	1.8	2.0	2.6	2.7	2.1	3.1	2.3	2.2
MS Word	**3.3**	**2.7**	**3.3**	**3.2**	**2.5**	**3.1**	**3.0**	**2.8**

Table 5: Common Body of Knowledge versus occupation for **entry-level** hires
Scale: 5=In-depth; 4= Working; 3 = Fundamental; 2 = Cursory; 1 = No Knowledge

Common body of knowledge	Data-base	Graphics Design	Help Desk	Network-ing	Program ming	Systems Analyst	Techni-cal	Mean
Accounting	2.7	2.7	2.3	3.0	2.5	3.4	1.7	2.4
Business Law	1.8	2.7	1.9	2.7	1.9	2.6	1.7	2.0
Economics	1.9	2.7	2.0	2.6	1.9	2.6	1.7	2.0
Finance	2.2	2.7	2.0	2.7	2.7	3.1	1.7	2.3
Info Systems	**4.2**	**3.7**	**3.7**	**4.2**	**4.2**	**4.4**	**4.0**	**3.9**
Management	**3.3**	**3.3**	**3.0**	**3.6**	**3.1**	**3.7**	**3.3**	**3.1**
Marketing	2.1	4.3	2.3	2.8	2.3	2.7	2.7	2.5
Operations	**2.8**	**3.3**	**3.4**	**3.6**	**3.4**	**3.9**	**3.7**	**3.1**
Statistics	**2.4**	**2.7**	**2.3**	**3.3**	**3.1**	**3.3**	**3.3**	**2.7**
MS Access	**3.7**	**3.0**	**3.9**	**4.1**	**3.9**	**3.4**	**3.7**	**3.3**
MS Excel	**4.0**	**3.3**	**4.1**	**4.1**	**3.4**	**4.0**	**3.7**	**3.5**
MS Front Page	1.9	2.3	3.0	3.3	2.6	2.1	1.7	2.2
MS PowerPoint	**3.4**	**3.0**	**4.0**	**4.0**	**3.1**	**3.6**	**3.7**	**3.2**
MS Project	**2.8**	**2.3**	**3.1**	**3.7**	**3.0**	**4.0**	**2.7**	**2.8**
MS Word	**3.9**	**3.3**	**4.1**	**4.0**	**3.4**	**4.0**	**3.7**	**3.4**

Table 6: Common Body of Knowledge for **above entry-level** new hires
Scale: 5=In-depth; 4= Working; 3 = Fundamental; 2 = Cursory; 1 = No Knowledge

Knowledge areas desired for Programmers	Entry Level	Above Entry-Level
Programming	2.8	3.6
Systems Analysis	2.7	3.8
Systems Design	2.6	3.5
Release Delivery Compliance Management	2.5	3.2
Relational Database	2.4	2.9
Rapid Application Development	2.3	2.7
Systems Implementation Methodologies	2.0	2.8
Computer Architecture	1.7	2.1
Security	1.7	1.9
IS Management	1.6	2.1
Web Development	1.3	1.5
Networking Communications	1.1	1.3

Table 7: Skills desired for programmers
Scale: 5=In-depth; 4= Working; 3 = Fundamental; 2 = Cursory; 1 = No Knowledge

Knowledge areas desired for Network Specialists	Entry Level	Above Entry-Level
Networking Communications	3.0	4.2
Computer Architecture	2.4	3.4
Security	2.2	3.2
Systems Design	1.9	2.8
Relational Database	1.9	2.6
Systems Analysis	1.8	2.9
IS Management	1.6	2.3
Release Delivery Compliance Management	1.6	1.8
Programming	1.6	1.9
Systems Implementation Methodologies	1.5	2.1
Rapid Application Development	1.5	1.7

Table 8: Skills desired for network specialists
Scale: 5=In-depth; 4= Working; 3 = Fundamental; 2 = Cursory; 1 = No Knowledge

5. CONCLUSIONS

The moderate sample size prohibits making broad conclusions; thus, the results here should be considered exploratory in nature. However several interesting results may be considered when developing or updating an information systems major. Specifically in the technology arena for this university's service area, employers were desirous of graduates with Windows, SQL Server, VB (and VB.Net/ASP.Net) and Linux/Unix knowledge.

The respondents indicated that graduates at both an entry and above entry-level should possess fundamental knowledge of information systems as well as management (motivation, team building) and operations topics. Cursory knowledge of accounting, finance, marketing and economics was expected of all graduates. At above entry-level, project management and statistics as well as proficiency in personal productivity software were relevant. Another important consideration for the curriculum developer is to drill-down to the individual job skills indicated by occupation.

The highest level of new hires is anticipated in programming, network specialist, technical experts and system analysts. For above entry-level hiring, programmers, technical experts and system analysts have the best job prospects.

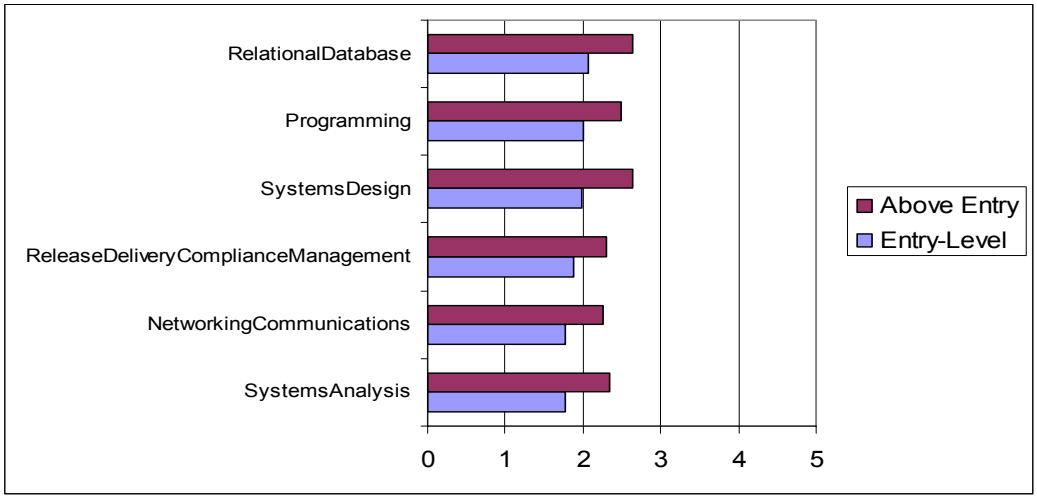


Table 9: Aggregate knowledge desired for all information systems majors
(Scale: 5=In-depth; 4= Working; 3 = Fundamental; 2 = Cursory; 1 = No Knowledge)

Finally, the survey indicates that regardless of the occupation, the employers expected a fundamental knowledge of many information systems areas such as database, systems analysis and design, networking and programming.

Our survey found some interesting results that differ from previous employer surveys. The Woratscheck and Lenox (2002) and Cappel (2002) studies found that the top skill set desired by employers was systems development life cycle knowledge, while our study found programming skills most desirable for new hires.

Another difference compared to previous surveys was that we investigated the common body of business knowledge desired by employers. Only the Lee et al. (1995) study had previously investigated the common body of business knowledge. However, their study did not include the detail and drill-down analysis of this exploratory study. Finally our survey attempted to define the different skill sets required for a new hire versus a hire two to three levels above new entry.

6. FUTURE RESEARCH

Future research includes expanding the survey to additional employers outside the university's service area. Our current survey results cannot necessarily be generalized beyond this university's geographic region. Furthermore, a larger sample would certainly give us a clearer view of the data, and allow us to make more powerful statements.

Another future goal is to have the existing survey respondents complete the survey in another eighteen months to see if any trends or changes have been observed. Such a longitudinal study would be helpful in tracking changes in the IT industry during this time when the rate of change appears to continue to increase.

We would also like to delve deeper into the skill-sets needed for particular jobs. For instance, our survey results indicate a curriculum designed to develop a successful programmer is not accomplished by simply adding more programming courses, but by blending a combination of courses that satisfies the skill-set required. More investigation on each job would help us create tracks in curriculum that closely match the required skill-sets.

Finally, we would like to report in the future how we adjusted our curriculum to better match the job market. This is a non-trivial exercise, since a market that demands programmers does not necessarily mean that relational database expertise is not in demand. Furthermore, it touches on the question of what role should higher education play in IS skills. Should we move towards specific products and certifications, because of their high perceived value on graduates' resumes? Or do we focus on fundamental skills that are not product-specific and let organizations train graduates in the products that they use?

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APPENDIX A

Sample portion of the survey instrument detailing the technologies utilized by practitioners

Please detail the level of importance to your organization for the following technologies:

Technology	Not Applicable	Less Important in the Future	Relevant	Highly Relevant	More Important in the Future
Platforms					
Windows	○	○	○	○	○
Linux / Unix Family	○	○	○	○	○
Mac OS	○	○	○	○	○
Palm	○	○	○	○	○
Windows CE	○	○	○	○	○
Network Operating Systems					
Linux / Unix	○	○	○	○	○
Windows	○	○	○	○	○
Netware	○	○	○	○	○
CISCO	○	○	○	○	○
Wireless	○	○	○	○	○
Technology	**Not Applicable**	**Less Important in the Future**	**Relevant**	**Highly Relevant**	**More Important in the Future**
Languages					
Java	○	○	○	○	○
C	○	○	○	○	○
C++	○	○	○	○	○
C#	○	○	○	○	○
Fortran	○	○	○	○	○

COBOL	○	○	○	○	○
Visual Basic	○	○	○	○	○
VB.Net	○	○	○	○	○
JavaScript	○	○	○	○	○
VB Script	○	○	○	○	○
PERL	○	○	○	○	○
PHP	○	○	○	○	○
Pyton	○	○	○	○	○
XML	○	○	○	○	○
DOS	○	○	○	○	○
ASP	○	○	○	○	○
JSP	○	○	○	○	○
Technology	Not Applicable	Less Important in the Future	Relevant	Highly Relevant	More Important in the Future
Databases					
IBM DB2	○	○	○	○	○
Oracle	○	○	○	○	○
Sybase	○	○	○	○	○
CA Ingres	○	○	○	○	○
MS SQL Server	○	○	○	○	○
MySQL	○	○	○	○	○
PostgresSQL	○	○	○	○	○
FilemakerPro	○	○	○	○	○

APPENDIX B

Survey instrument detailing the common body of business knowledge desired

Indicate the level of general business knowledge required for a Programmer

Entry Level Position						1 to 2 Levels Above Entry				
None	Cursory Knowledge	Fundamentals	Working Knowledge	In-depth Knowledge	**Topic**	None	Cursory Knowledge	Fundamentals	Working Knowledge	In-depth Knowledge
					Software Applications					
○	○	○	○	○	MS Word	○	○	○	○	○
○	○	○	○	○	MS Excel	○	○	○	○	○
○	○	○	○	○	MS PowerPoint	○	○	○	○	○
○	○	○	○	○	MS Access	○	○	○	○	○
○	○	○	○	○	MS Front Page	○	●	○	○	○
○	○	○	○	○	MS Project	○	○	○	○	○
Entry Level Position						**1 to 2 Levels Above Entry**				
None	Cursory Knowledge	Fundamentals	Working Knowledge	In-depth Knowledge	**Topic**	None	Cursory Knowledge	Fundamentals	Working Knowledge	In-depth Knowledge
					Business Core					
○	○	○	○	○	Accounting	○	○	○	○	○
○	○	○	○	○	Business Law	○	○	○	○	○
○	○	○	○	○	Economics	○	○	○	○	○
○	○	○	○	○	Finance	○	○	○	○	○
○	○	○	○	○	Information Systems	○	○	○	○	○
○	○	○	○	○	Management	○	○	○	○	○
○	○	○	○	○	Marketing	○	○	○	○	○
○	○	○	○	○	Operations	○	○	○	○	○
○	○	○	○	○	Statistics	○	○	○	○	○

APPENDIX C

Survey instrument to determine the breath of IT knowledge desired for a particular job
Note: Survey starts the drill-down process of what is important for a position; Appendix D continues this process

You previously indicated you supervise the following occupation: **Help Desk**

Please check the general area(s) of knowledge required for this position (click all that apply)

- Computer Architecture ☐
- IS Management ☐
- Networking & Communications ☐
- Programming ☐
- Rapid Application Development ☐
- Relational Database ☐
- Security ☐
- Systems Analysis ☐
- Systems Design ☐
- Systems Implementation Methodologies ☐
- Systems Release / Delivery / Compliance ☐
- Web Development ☐
- Other ☐
- Other ☐

Appendix D

Example of "drill-down" skill sets desired for a profession,
Here a respondent indicated Database knowledge was required for a Help Desk Employee

Skills needed for: **Help Desk**

Indicate the level of knowledge required for the above position

Entry Level Position						1 to 2 Levels Above Entry				
None	Cursory Knowledge	Fundamentals	Working Knowledge	In-depth Knowledge	Topic	None	Cursory Knowledge	Fundamentals	Working Knowledge	In-depth Knowledge
					Relational Database					
○	○	○	○	○	SQL	○	○	○	○	○
○	○	○	○	○	Query by Example	○	○	○	○	○
○	○	○	○	○	Specific DB Packages	○	○	○	○	○
○	○	○	○	○	Data Modeling	○	○	○	○	○
○	○	○	○	○	Specific Data Modeling Tool	○	○	○	○	○
○	○	○	○	○	Data Warehousing	○	○	○	○	○
○	○	○	○	○	Data Cleansing	○	○	○	○	○
○	○	○	○	○	Data Integration	○	○	○	○	○
○	○	○	○	○	Database Administration	○	○	○	○	○
○	○	○	○	○	Other:	○	○	○	○	○

Entry Level Position						1 to 2 Levels Above Entry				
None	Cursory Knowledge	Fundamentals	Working Knowledge	In-depth Knowledge	Topic	None	Cursory Knowledge	Fundamentals	Working Knowledge	In-depth Knowledge
					Systems Release / Delivery / Compliance					
○	○	○	○	○	Release / Delivery / Compliance Management	○	○	○	○	○
○	○	○	○	○	Testing	○	○	○	○	○
○	○	○	○	○	Quality Control	○	○	○	○	○
○	○	○	○	○	Systems Integration	○	○	○	○	○
○	○	○	○	○	Migration Approaches	○	○	○	○	○
○	○	○	○	○	User Training	○	○	○	○	○
○	○	○	○	○	Documentation	○	○	○	○	○
○	○	○	○	○	Other:	○	○	○	○	○

Thomas Janicki is an Assistant Professor in the Information Systems Operations Management Department in the Cameron School of Business at the University of North Carolina at Wilmington. He received his Ph.D. from Kent State University in Ohio in Information Systems. His primary research area involves utilizing web-based technologies to enhance the traditional classroom-learning environment. He currently is the department's corporate advisory board coordinator which brings in over twenty five business professionals from the community into the department to assist in program development and increased opportunities for our students.

Douglas M. Kline is currently an Associate Professor of Information Systems in the Department of Information Systems and Operations Management at the University of North Carolina at Wilmington. His research interests include neural network theory, methodology, and applications, and information system design. His research has appeared in *Computers & Operations Research*, *OMEGA*, *IEEE Transactions on Systems, Man, and Cybernetics*, the *Journal of Business Strategies*, and others.

J. Art Gowan, Jr. is an Associate Professor of Information Systems in the Department of Information Systems and Operations Management at the University of North Carolina at Wilmington. He is CCNA certified and teaches data communications and networking. His research interests include systems security, implementation of large-scale systems, and project methodologies. He has papers published in *Communications of the ACM, IEEE IT Professional, Information & Management,* and *Computers in Industry,* among others.

Robert Konopaske is an Assistant Professor of Management at the Cameron School of Business, University of North Carolina at Wilmington. He earned his doctoral degree in management from the University of Houston. His teaching and research focuses on organizational behavior, international business and management, and human resource issues. In addition to writing two popular management textbooks and publishing refereed articles in such journals as the *Journal of Applied Psychology*, *Academy of Management Executive*, and *Journal of Business Research*, he serves as an ad hoc reviewer for the *International Journal of Human Resource Management*. He is currently a Senior Fellow for the Applied Management Sciences Institute and co-chair of the Professional Development Workshops of the Academy of Management's Human Resource Division. He has lived and worked overseas, speaks three languages, and has held management and marketing positions with a large nonprofit organization and two Fortune 500 multinational firms.