Journal of Information Technology Education: Research

An Official Publication of the Informing Science Institute
InformingScience.org

JITEResearch.org

Volume 18, 2019

A SURVEY OF CIS ALUMNI TO ASSESS CURRICULUM: FINDINGS, IMPLICATIONS, AND FUTURE DIRECTIONS

Robert C. Mahaney* Eastern Kentucky University, Richmond, Kentucky, USA bob.mahaney@eku.edu

James H. Fisher Eastern Kentucky University, Richmond, Kentucky, USA jim.fisher@eku.edu

* Corresponding author

ABSTRACT

Aim/Purpose: At a public, higher education program in information technology, faculty are frequently asked to evaluate their curricula concerning: course content, the matriculation experience, where and in what capacity graduates are employed, and future academic initiatives developed to keep pace with changes in technology. The problem is determining the best process or mechanism to accumulate the responses.

Background: The increased importance of STEM programs (science, technology, engineering, and mathematics), reduced state support, and the need for greater accountability are driving academic technology programs to justify their existence. This paper explores one process for evaluating a Computer Information Systems (CIS) program in a state-supported university in the Midwest USA, through an email survey designed for graduates to capture their unique perspective as 'customers'.

Methodology: An email survey was developed, field tested, and sent to 550 email addresses obtained from university alumni affairs. Results were accumulated in a Qualtrics program and analyzed for research purposes.

Contribution: The contribution of this research is outlining one program's experience gleaning information on the employment of graduates, assessing the CIS and business core curriculum, and collecting suggestions for future academic courses and experiences through the utilization of an email survey. This is a valuable source of curriculum feedback that is often overlooked by programs that want to enhance their academic offerings.

Findings: Among the findings are the following: the CIS program is and has been a viable and relevant information technology program that prepares graduates for

Accepting Editor Donna Jean Satterlee | Received: September 13, 2019 | Revised: November 11, 2019 | Accepted: November 24, 2019.

Cite as: Mahaney, R. C. & Fisher, J. H. (2019). A survey of CIS alumni to assess curriculum: Findings, implications, and future directions. *Journal of Information Technology Education: Research, 18,* 571-587. https://doi.org/10.28945/4464

meaningful careers in this field; the business core curriculum of accounting, finance and business communication is essential to the career success of CIS graduates; graduates of the CIS program are prepared to assume managerial roles throughout their careers; and Cooperative (Co-op) education is an extremely valuable experience and should be required in the CIS curriculum.

Recommendations for Practitioners: Graduates of an academic program are an excellent source of evaluation material. A well-constructed email survey can gather relevant data on employment and employability, the curriculum, the college experience, and other academic program information. This type of survey is an easy, inexpensive, and expedient means for gathering this information.

Recommendation for Researchers: The current study surveyed CIS graduates to assess the appropriateness of the curriculum. Future researchers should seek input from IT managers and HR managers who will be hiring CIS graduates in the near future to find their perspectives on the CIS curriculum.

Future Research: Further research needs to investigate the link between alumni surveys and accreditation. There is also a need to improve and refine survey instruments, increase survey response rates, incorporate survey responses into program marketing initiatives, and define a process for incorporating these results into the development/creation of academic courses.

Keywords: CIS curriculum development, IT careers, email surveys, Cooperative education, STEM, curriculum assessment

INTRODUCTION

Continued decreases in state financial support for public higher education have forced academic departments to continuously evaluate academic program offerings and suspend or eliminate those programs that are under-performing or are no longer relevant (Andriole, 2006). This process requires educators to answer a number of questions (Benson & Boyd, 2018) including "What should CIS programs be teaching (Leonard, Jones, & Lang, 2019; Topi, 2019; Yew, 2008)?" "What experiences should be included in the curriculum?" and "For a CIS program, are graduates gainfully employed and thriving in the information technology (IT) field?"

The researchers developed an email questionnaire (Shannon, Johnson, Searcy, & Lott, 2002; Wilkerson, 2012) for graduates of a CIS program in a regional state-supported university with a current enrollment of 16,000 students. First and foremost, we wanted feedback on the CIS curriculum. The questionnaire included an assessment of the most valuable courses, the least valuable courses, and recommendations on which courses were missing and should be added. The researchers also wanted to know who participated in Cooperative Education and/or Internships and the value of these experiences in their individual career development (Lee, 2012). Further, this study strives to determine whether Cooperative Education should be required for all CIS students. Survey results and analysis are included later in this paper.

LITERATURE REVIEW

Since the Great Recession of 2008, state appropriations have been declining for many state universities. At Eastern Kentucky University, in Richmond, Kentucky, USA, the state appropriation has decreased by $21.5 million or 26% in ten years (from $82.8M in 2008 to $61.3M in 2018) (Benson & Boyd, 2018). While state support decreased, inflation increased by 1.46% a year for this same period. According to the Bureau of Labor Statistics consumer price index (2018a), prices in 2018 are 15.7% higher than prices in 2008 (BLS-CPI). This situation has forced annual increases in tuition and great-

er scrutiny of all academic programs. In fact, Kentucky's Council on Post-secondary Education (CPE) has initiated a process of performance-based funding that measures degree production and progress, and course completion. It has become a financial reality that academic programs and universities must produce performance metrics on a continuous basis. To do this effectively, there is the need to have meaningful data on graduates and their preparation for careers (Noll & Wilkins, 2002).

IT Industry Evolution

Development of an IT curriculum is an evolutionary process that seeks to identify industry trends and competencies and then build courses of study that prepare students to thrive in that industry (Veltri, Webb, Matveev, Alexei., & Zapatero, 2011). In an effort to develop a structure for analyzing the survey responses, this study considered major milestone events in the computer industry over the last half-century. The 1960s ushered in the era of the mainframe computer. The origins of the mainframe trace back to Grace Hopper in 1945 with the development of the general-purpose programming language COBOL (Isaacson, 2014). Also around this time, physicist John Mauchly proposed an all-electronic calculating machine known as ENIAC (Electronic Numerical Integrator and Computer). This was an early prototype of what later became the mainframe computer. But it was not until the release of the IBM System 360 in 1964 and the IBM System 370 in 1970, that mainframe computing became widely accepted and an industry standard (Isaacson, 2014). The authors identified this period from 1972 to 1983 as the **Mainframe/COBOL Programming** era in the current study.

As the impact of computers grew in importance and computer processors became smaller, faster, and cheaper, the industry saw the release of personal use micro-computers. In 1975, the Apple 1 was developed by Wozniak and Jobs (Isaacson, 2011). The TRS-80 soon followed in 1977. Around this same time, the Apple 2 hit the market. Then came the founding of the Microsoft Company by Gates and Allen. In 1982, the IBM PC was introduced and the following year Microsoft changed everything with the release of the Windows operating environment (Rosenblatt, 1983), and ushered in a new era. The authors labeled the period from 1984 to 1992 as the **PCs and Client-Server** era.

The IT industry took a new direction with the development of World Wide Web hyperlinks by Tim Berners-Lee and the commercialization of the Internet in the early 1990s (Berners-Lee & Fischetti, 1999). This development was quickly followed by three notable events: the first graphical web browser Mosaic, AOL offering access to the Internet, and the creation of Google Search in 1998 (Friedman, 2007). Coinciding with these advancements was the widespread industry push to head off the uncertainty of the year 2000 date issue, along with investor euphoria over technology stocks and nearly any startup that had a "dot com" designation. The combination of these IT historical events created disruption and fundamental changes in the field. This period from 1993 to 2000, the authors labeled the **WWW/Y2K/Dot-Com Bubble** era.

The last two eras identified by the authors denoted two significant periods of the IT field and the economy in general. The first of these, 2001-2007, **Dot-Com Collapse**, describes the general failure of technology stocks and the collapse of many IT start-ups and Telecom organizations (Friedman, 2007). This was followed by the period of the **Great Recession and Recovery**, 2008-2015. CIS graduates who entered the job market during these two periods had vastly different career experiences as compared to previous graduates. The eras are listed in Table 1 below.

CIS History

The Computer Information Systems (CIS) degree at Eastern Kentucky University has its roots in 1965 as an Associate's degree in Data Processing (DP). The first mention of DP courses was in 1964 with the creation of two courses: BUS 361 – Unit Data Processing; and BUS 362 – Electronic Data Processing (EDP). In 1966, a broader systems perspective was added with the introduction of BUS 262 – Systems Analysis. Computer programming in COBOL, Fortran, and Easycoder (a Honeywell product similar to IBM's Autocoder) were added in 1967, as well as a course in flowcharting. The

degree grew into a major with the Bachelor of Science (BS) in EDP in 1969 and became a Bachelor of Business Administration degree (BBA) in 1971. In 1982 the program name was changed to a BBA in Computer Information Systems (CIS), to reflect both industry terminology and the systems perspective of the degree. Currently, the CIS program is an AACSB International and SACS accredited academic major leading to a Bachelor of Business Administration (BBA) degree (Albin & Otto, 1987; Attaway, et al., 2011).

METHODOLOGY

SURVEY DEVELOPMENT

The CIS program became a BBA degree in 1971, with roots dating back to the 1960s. It has over 1,000 graduates, providing a significant source for feedback. This study sought to answer the following questions: "What should a CIS program be teaching?" "What experiences should be included in the curriculum?" and "Are the graduates successfully employed in the IT field?" The authors developed a survey instrument to answer these questions (Dillman, 2000). The survey questions grew out of the researchers' curiosity about four areas: employment, professional development, educational experience, and Cooperative education. The actual instrument (see Appendix A) included sections on employment demographics, including titles and compensation. It also asked graduates to reflect on the most useful CIS and non-CIS courses they completed and asked them to comment on what courses should be added to the curriculum. Graduates were asked to reflect on their experiences with Cooperative education, graduate school plans, and the value of professional certifications.

The authors refined the survey questions and conducted a pilot test survey with eleven graduates. The results of the pilot led to minor changes to the survey instructions. The full survey was sent via email to 668 addresses received from the Alumni Affairs office. The survey was distributed in October, with reminders sent in late October and in November. Alumni were informed that their responses would be kept confidential and that only anonymous findings would be reported. The response period was closed three weeks after the reminders were sent. One hundred eighteen email messages were returned as undeliverable. Consequently 550 graduates received the invitation to complete the survey.

One hundred forty-two alumni initially started the survey, and of these, 113 actually completed the full survey. An analysis of the IP addresses discovered three duplicate replies, which were eliminated. Thus, the analysis yielded 110 usable responses, which is a response rate of 20% (110/550) (Babbie, 1990).

DATA ANALYSIS

SURVEY RESPONSES

The earliest graduating class represented in the survey results is 1972. There were five responses from the graduating class of 2015, which was the last class that was included in the survey. Some of the largest graduating classes were in the mid-1980s and the response distribution was consistent with this. The highest number of responses (seven) came from each of the graduating years of 1984, 1986, and 1987. Appendix B shows the responses by year, grouped by technology eras. Table 1 reflects the number of responses from graduates by the technology eras indicated previously.

Table 1 – Responses by Technology Era

Graduation Year	Technology Era	# of Responses
1972-1983	Mainframes/COBOL Programming	20
1984-1992	PCs and Client-Server	35
1993-2000	WWW/Y2K/Dot-Com Bubble	19
2001-2007	Dot-Com Collapse	15
2008-2015	Great Recession and Recovery	21
	Total Responses	**110**

DEMOGRAPHICS

Ninety-four percent of respondents indicated they are employed full time (103 out of 109), while one is a part-time employee and three are working as a contractor/consultant. Two respondents indicated an employment status of other, and one left this answer blank.

Researchers asked respondents to identify the industry segment of their current employer. These responses are summarized in Table 2. This data verified for researchers that graduates with the CIS degree were employable across a wide spectrum of industries (Davis, 2003). The presence of two nearby universities and two nearby hospitals might account for this distribution.

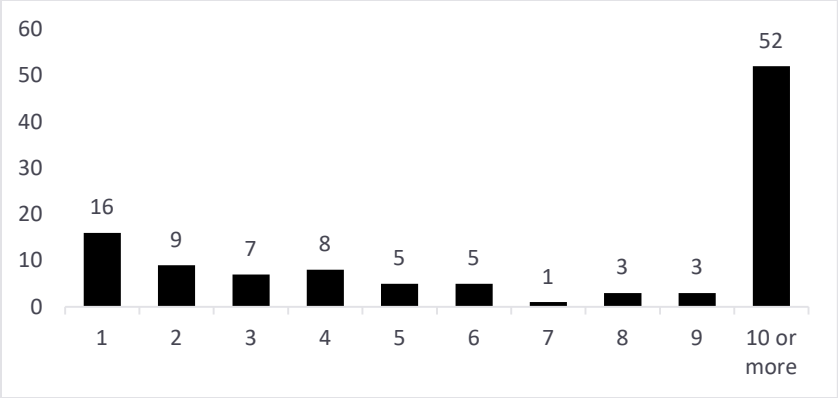
Table 2 – Industry Distribution

Industry	No. of Responses	%
IT Services	18	16.5%
Healthcare	17	15.6%
Education	14	12.8%
Manufacturing	12	11.0%
Government	10	9.2%
Financial Services	8	7.3%
Insurance	7	6.4%
Banking	3	2.8%
Telecom	2	1.8%
Consulting	1	0.9%
Hospitality / Food Services	1	0.9%
Retailing	1	0.9%
Other	15	13.8%

Graduates were asked whether they telecommute for their job. Perhaps surprisingly, 66 responded 'No'. Of the 44 who indicated they telecommute, only eight reported that they are away from the office 100% of the time. Twenty-four reported they work remotely less than a third of the time, with 17 indicating 10% - 20% of their work could be considered telecommuting.

Responses to the number of years with their current employment were bi-modal: 47.7% (52 graduates) have been working for the same employer for 10 or more years, while 36.7% (40 graduates) were with their organizations four years or less, as shown in Figure 1.

Figure 1 – Years with Current Employer



Researchers asked the alumni to indicate their current salary in one of eight ranges, beginning at $20K and ending with $110K or higher. Three respondents indicated their current salary was in the range of $20K-$29K. The lowest salary range had the fewest respondents. Five indicated a current salary in the $30K-$39K range; seven in the $40K-$49K range; eight in the $50K-$59K range; and fourteen in the $60K-$69K range. Nineteen respondents indicated their current salary is in the $70K-$89K range; twenty-four have a salary in excess of $90K; another thirty earn more than $110K annually. Thus, 49% were earning $90K or more. The Median Annual Wage for all occupations according to the Bureau of Labor Statistics (2018b), Occupational Employment Statistics for May 2017 was $37,690 (BLS-OES). Nearly 93% of the CIS graduates are earning in excess of the median annual wage. These results are reflected in Table 3.

Table 3 – Current Salary

Current Salary Range	Number of Respondents	Percent
$20K-$29K	3	2.7%
$30K-$39K	5	4.5%
$40K-$49K	7	6.4%
$50K-$59K	8	7.3%
$60K-$69K	14	12.7%
$70K-$89K	19	17.3%
$90K-$109K	24	21.8%
$110K +	30	27.3%

It is not surprising that most alumni work for large organizations. The overwhelmingly skewed response was somewhat surprising. Three people are working in an organization with nine or fewer employees. Another seven are working for companies with 10 to 49 total employees. Twelve respondents work in an organization with 50 to 100 employees. Ten work in mid-sized organizations with 20 to 499 employees and 7 work in organizations with 500 to 999 employees. Thus, sixty-two percent of respondents work in organizations with 1,000 employees or more.

The subjects were asked to indicate the total size of the IT function, in terms of total people working in IT. Again, the responses were skewed toward larger IT departments, with 26% of the graduates working in an organization with fewer than 10 IT professions and 54% working in organizations with 100 or more IT professionals. The remaining 20% had IT departments of 10 to 74 employees.

CURRICULUM

Perhaps the most valuable results from the alumni survey were the responses concerning the curriculum. Three specific questions were asked: "What was the most useful course in the major?" "What was the most useful non-major course?" and "What courses should be added?"

In general, the feedback was positive with the vast majority of responses identifying the actual courses by title and even course number. The respondents even took the time to explain how the course helped them in their career. A number of the alumni identified professors by name, and for the most part, these comments were positive. To provide some context for the quotations, the researchers included the title and graduation year of the alumni.

Graduates from the **Mainframe/COBOL Programming** era listed COBOL 42% of the time, and 21% listed programming languages as their most useful courses. Several examples of the feedback are:

- "Believe it or not - Cobol. I'm still using Cobol over 30+ years after graduation. As a mainframe developer Cobol is still the number one language use in many applications." (IT Specialist, 1980)
- "COBOL Programming course and my internship-student programmer (converting JCL from Honeywell to IBM)." (Application Analyst III, 1982)
- "Programming in multiple languages. In my day I took 7 programming languages/classes. It developed my critical thinking ability and set the stage to quickly learn new languages of the day." (IT Manager II, 1982)
- "COBOL programming – I was a computer programmer for 10 years. Fortran, Assembler were also helpful." (HR Rep, 1979)
- "Systems Analysis and COBOL." (Contracts Manager, 2004)

In the **PCs and Client-Server** era, of the 35 responses, six indicated programming languages and six responded COBOL. An additional four each said database management and systems analysis and design.

Indicative of the responses were these:

- "Back in the early 1980s was COBOL and Micro computing using the TRS80. I used both of those skills early on in my career. I also took a management class, a 400 level course, where we ran a company and to make decisions and presentations. Really prepared me for a technical start that evolved into leadership roles." (Manager Test Engineering, 1984)
- "Programming classes that required unusual programming assignments (i.e., Placing 8 queens on a chess board so no other queens could be captured or Pascal's triangle or Fibonacci sequence) they taught me to think outside the box." (Global Solutions Architect, 1986)
- "Decision Support Systems" (Application Analyst II, 1988)

- "The programming languages and database design courses." (Senior Programmer/Analyst, 1989)

Graduates from 1993-2000 (i.e., **WWW/Y2K/Dot-Com** era) listed databases most often (58%). Another three responses indicated programing.

- "App development and general IT Project methodology." (Vice President of Sales – East Region, 2000)
- "All of my database classes and anything related to SQL programming. The combination allowed me to combine those skills into a successful career." (Senior Activity Analyst, 1999)
- "Networking, Database" (Manager, Sales Engineering, 1998)
- "Systems Analysis. Database analysis" (Principal Systems Analyst, 1997)

In the **Dot-Com Collapse** era, Programming, Systems Analysis and Design, and Database Management were mentioned by a majority of the graduates. Also, Cooperative education was commonly listed as a useful course.

- "Networking and programming. I have used some from the database course" (IT Systems Administrator, 2007)
- "Programming languages" (Tech and Careers Middle School Teacher, 2003)
- "Systems Analysis & Design, MIS, Database Administration." (Sr. Application Coordinator – Inpatient Orders, 2003)
- "Systems analysis and design, database administration, coop" (Sr. Application Coordinator, 2003)
- "Visual Studio VB.net, SQL, Java, networking" (Supervisor Quality Assurance/IT Platform Services, 2007)

The **Great Recession and Recovery** era graduates gave some of the most detailed responses to this question. They mentioned major courses by course number and title, and even commented on the instructor and the personal value of the courses. Eleven indicated Project Management, a relatively new course requirement, as being useful. Examples of responses include:

- "Definitely the most useful course was the very first cyber security course that Dr. Mahaney taught... It was my first exposure to [information security] and, of course had been directly related to my IT career for the last 6 years." (Senior Security Consultant, 2009)
- "Most of the useful classes I attended were, unfortunately, outside of the CIS specific classes. Managerial Reports, Finance, Project management. These were all really great classes that helped round out my experience, but also included some very real world challenges. The task of having to interview two business executives for CCT300w was one of the most challenging and rewarding experiences I can remember, really enjoyed it." (ERP Administrator, 2013)
- "Project Management and Practice: Very Important Class for any IT student. Students should be encouraged to take the PMI's CAPM Exam (No Project Management Experience Required) while taking this course." (IT Pharmacy Support Analyst, 2013)
- "Database Management, Business Programming, Advanced Networks and Telecommunications, Project Management, Web Programming, Intro to Computer Information Systems" (SQL Server DBA, 2013)
- "Database, Project management, Graduate CIS" (2008)

- "Programming in Visual Basic. Was taught well and gave a good introduction to programming." (Service Desk Technician, 2015)

Next, the graduates were asked to identify their most useful non-CIS courses. Consistent with previous research (Burns, Gao, Sherman, & Klein, 2018; Zhang, 2012), the vast majority of responses were courses in the business core: Management (15), Accounting (14), and Business Communication (13). Finance, Marketing, and Business Law were also mentioned frequently. In fact, the responses were surprisingly similar for each era. The responses underscore the importance of the Business Core in the CIS curriculum. A sample of responses **across all eras** include:

- "Business Law, Economics and Real Estate" (HR Rep, 1979)
- "I have since earned my MBA so the Finance and Economics courses are very valuable." (IT Manager II, 1982)
- "Any course on organizational change/management. Business writing, Intro to legal, Statistics" (IS Project Director – Compliance and Standards, 1990)
- "Communications. Anything that enhanced my writing and speaking skills. All courses that focus on critical thinking." (Principal Systems Analyst, 1997)
- "The accounting courses, business English and my management courses that included project work and presentations." (Senior Activity Analyst, 1999)
- "Management courses are always beneficial as current IT roles are generally a mix of both technical and non-technical aspects." (Senior Security Consultant, 2009)
- "All accounting courses. Economics (Micro and Macro)" (Staff Accountant, 2013)
- "Accounting, Business Communication" (Network Operations Center Technician, 2015)
- "Principles of Economics I & II, Business Finance I, Operations Management, Principles of Management" (IT Service Desk Analyst, 2015)

This feedback underscores a strength of the CIS program that is missing in a computer science program. These IT professionals found Management, Accounting, Economics, and Business Communications were useful courses and valuable to their careers.

The subjects were asked to consider what courses were not available when they were in school, and should be added to the curriculum. Students from the **Mainframes/COBOL Programming** era often identified technology topics that did not exist in the 1970s. Responses included:

- "As an HR Rep and dealing with hiring employees, they need to be instructed more on business ethics, including behavior and appearance." (HR Rep, 1979)
- "DB2, Sequel Server, Oracle" (D. B. A., 1978)
- "IT Security" (Director, Workforce Services, 1972)
- "Project management" (IT Manager II, 1982)

Responses from graduates in the **PCs and Client-Server** era included:

- "IT Service management theory and frameworks" and "Data analytics/Data Science" (IS Project Director – Compliance and Standards, 1990)
- "I think programming for MDM solutions would be valuable, computer security, network operations, hacking classes would all be valuable." (Solutions Engineer, 1987)

- "Since technology changes rapidly I feel the program should always be reviewing market technology trends and base curriculum needs and changes according to the technologies in demand." (Systems Analyst Advisory, 1989)
- "More classes focused on database design and performance." (Global Solutions Architect, 1986)

Graduates from **WWW/Y2K/Dot-Com** era stated:

- "An overview of networking, analysis of data - drawing conclusions from large datasets, Project Management." (Sr Manager, PMI, 1998)
- "The CIS degree is a balanced degree that allows for several career paths to be taken - Development, System Admin, Business Analysts, and Sales." (Manager, Sales Engineering, 1998)
- "More in depth relationship with big data." (Senior Data Scientist, 1997)
- "Another class that I think would be very useful is a class teaching about Negotiation and Influence. These classes will help students use the technical skill that they learn and ability to defend their argument and influence their ideas and thoughts." (Software Engineer 2, 2000)

There were several responses from graduates in the **Dot-Com Collapse** era. These included:

- "Co-op (internship) should be REQUIRED for all students." (2003)
- "I would like to see more hands on where it would be used in the real world. Like networking, get some patch panels, network cables, routers and switches. They don't have to be Cisco, I like Ubiquiti gear and set up a network in the class. I like hands on and I would have loved to do something like that during my time [in school]." (IT Systems Administrator, 2007)
- "They might be already added but IT security type courses." (Sr. Application Coordinator, 2003)

Students in the **Great Recession and Recovery** era stated:

- "A compilation course that combines the web, business programming, database management, and IS Analysis & Design into a single and simple web application built around C# MVC [Model View Controller] or something equivalent. All the parts are already being taught." (Software Engineer, 2010)
- "A few more IT certification courses. Some of the one's that have stuck around the longest like CCNA, Network+, A+, etc." (Solution Architect, 2014)
- "Also I think partnering with the Accounting department to teach a class on IT Auditing would be a good idea. I feel CIS students are uniquely qualified for these positions and there is an extreme need for good talent in that area." (Network Operations Center Technician, 2015)
- "CIS needs to involve more hands on projects when it comes to IT." (Service Desk Technician, 2015)
- "I firmly believe that a server infrastructure course should be added to the curriculum. This is a wide topic, but I believe this course, or courses, should focus on server virtualization (VMWare or Hyper-V), Windows Server (Active Directory, Group Policy, IIS, File Share Management/Security, etc.), and SQL Server." (IT Administrator, 2012)

Cooperative Education or Internship

The Cooperative Education and Internship program at EKU is one of the largest in the state of Kentucky. It is well-regarded by the administration and the faculty. The internship experiences are an

important aspect of the college experience for students. Almost 44% percent of the CIS graduate respondents have participated in a Co-op or internship experience. In the current curriculum, Cooperative education is an elective course in the CIS major; up to three credit hours can be used to fulfill a major course requirement.

The researchers wanted to know if the curriculum should require Cooperative education in the CIS major. An important finding is that even though only 43.6% participated in these experiences, 67% responded 'Yes' when asked if Co-op should be a required course in the major. Nineteen percent of graduates responded 'No' or 'Not Sure'. This is a strong endorsement by CIS graduates to make Cooperative education a required experience.

DISCUSSION AND RESULTS

SURVEY RESPONSES

The survey achieved an impressive 20% response rate, even though the researchers did not offer any incentives to the subjects. There were over 90 unique job titles, with many of our alumni in managerial, ownership, CEO, and other leadership roles. This confirmed the fact that the CIS program is unique in that it is both a business degree and a technology degree. As researchers, we are confident that the CIS program in fact does prepare students for a wide variety of meaningful careers in information technology.

Based on the number of responses at the higher salary level, there needed to be more salary levels to be able to further refine this response. Also, the question on starting salaries needed to be restated to eliminate confusion. This question was interpreted by some as the start salary in their current position and interpreted by others as the start salary when they first entered the field. In our opinion, these survey problems did not affect the overall quality of the data received and the researchers were satisfied with the survey response rate and the volume of usable data.

As the researchers investigated the STEM designated programs, we learned that the CIS program was considered by Kentucky CPE as a science, technology, engineering, and mathematics (STEM) academic program. The survey results concerning employment demographics confirmed this designation.

DEMOGRAPHICS

The instrument collected demographic data regarding employment but did not ask for age, gender, race, or country of origin. Therefore, no analysis on these dimensions was possible. Future researchers may wish to gather gender and race demographics for more detailed analysis. Graduation year can be used as a surrogate for age, as most students at this university are traditional-aged students. However, graduation year is not a perfect substitute for age. Furthermore, future researchers may also wish to collect data on prior or current military service. Responses from veterans may differ from other graduates. Of course, asking for these demographic data may reduce survey participation. Some people may be reluctant to indicate gender or race on a survey.

CURRICULUM

The survey results provide a valuable insight into the curriculum of previous years which will encourage future program assessment. These findings will permit faculty to structure a CIS program that remains relevant well into the future. These two questions can be addressed: "What should we be teaching in CIS?" and "What other supporting courses should we offer?"

Based on the feedback from these graduates, the CIS program should add a second programming course. Currently, students complete one business programming course in Visual C#. These results indicate students should have the opportunity to complete an advanced programming course. Also,

the survey results indicated the curriculum needs to offer an advanced database course. The curriculum currently offers a broad coverage of topics in the IT field. These findings, similar to those of Clark, Clark, Gambill, & Brooks (2017), suggest a need to allow students to gain depth in one or more IT topics, such as programming or database management. Three suggestions for new courses have already been added to the curriculum. IT project management is now a required course in the CIS program. Consistent with the research findings of Yang & Wen (2017), cybersecurity and data mining are now offered as electives.

Graduates indicated a need for more hands-on experience while in school. This can be accomplished through internships, and by adding more lab assignments to the current courses.

Cooperative Education and Internships

Over 40% of the survey respondents indicated they participated in a Co-op or Internship experience. However, 67% indicated that Co-op should be required for CIS majors. Placement data from the Co-op program indicates that a large percentage of those students with a Co-op experience receive a full-time offer with that employer or with a subsequent organization because of their experience. Researchers believe there is now enough evidence to modify the curriculum and require a Co-op experience for CIS students.

Implications for Research and Future Directions

The current study surveyed CIS graduates to assess the value of the curriculum. Future researchers should seek input from IT managers and HR managers who will be hiring CIS graduates in the near future to find their perspectives on CIS curriculum. Future researchers might also conduct a comparative study using 50+ years of university course catalogues and alumni responses concerning the curriculum they completed. The required courses tend to change gradually. But elective courses seem to change more frequently. Such a study would provide an additional way to assess the curriculum, and determine if current industry needs are being met. Additionally, the five technology eras could be further researched to validate or refine them. Finally, researchers who are interested in on-line surveys should invest the majority of their time establishing clear objectives, developing relevant and concise questions, testing and retesting each question, and refining response mechanisms; all before the survey is sent.

The researchers believe that a periodic assessment of curriculum and the employability of students would be a valuable process to undertake every three to five years. Areas like cyber security, data analytics, privacy, and regulatory compliance are all potential areas of future research.

Conclusion

This study sought to answer the following questions: "What should a CIS program be teaching?" "What experiences should be included in the curriculum?" and "Are the graduates working in the IT field?" Using an email survey sent to 550 graduates of the CIS program, and with a 20% response rate, the study found the following:

1. The CIS program is and has been a viable and relevant information technology program that prepares graduates for meaningful careers in the information technology field.
2. The Business Core curriculum is essential to the careers of CIS graduates. Accounting, Finance, and Business Communication courses are important to career success.
3. Graduates of the CIS program are prepared to assume managerial roles throughout their careers.
4. Cooperative education is an extremely valuable experience and should be required in the CIS curriculum.

5. The alumni recommended adding an advanced database course and a second programming course.

The CIS BBA degree is a strong academic program that not only prepares graduates for entry-level IT positions, but also for managerial roles in organizations (Karanja & Zaveri, 2012). CIS graduates strongly endorsed the curriculum, indicating that many of the courses were instrumental in their individual career success. The business core courses, including Accounting, Management, and Business Communication, were mentioned frequently as valuable to preparing the graduates for their careers. In fact, respondents reported over 90 unique titles, with 2/3 in five varied industries: IT Services, Healthcare, Education, Manufacturing, and Government. Many of these were in leadership capacities.

Compensation for graduates is well above that of most undergraduate majors. In addition, students who completed the program are being promoted to managerial roles within their organizations. CIS graduates from this program have longevity in their organizations. Forty-eight percent have been with the same employer for 10 years or more. Two-thirds of the CIS Alumni indicated that Cooperative education is an extremely valuable experience and that it should be required in the CIS curriculum. Many of the CIS graduates have been promoted to positions in management, making full use of what they learned in the Business Core. This is a unique strength of the CIS program compared to other technology majors a student might pursue.

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APPENDIX A – CIS ALUMNI SURVEY QUESTIONS

-- Your Eastern Experience --

Did you graduate from EKU? (Yes | No)
If yes, in what year did you graduate? (Range 1970 : 2016)
What was your degree and major?

-- Tell us about your job --

Where are you working? (Name of your company)
Location (city)?
What is your employment status? (Full-time | Part-time | Contractor / Consultant | Other)
What is your current job title?
How many years have you worked for your current company?
What is your company's industry segment? (Select from among 14 options)
Do you telecommute? (Yes | No)
If you do telecommute, what percentage of your work is completed away from the office?
What is your current salary (range)? (Ranges from $20,000 up to $110,000 or higher)
What was your starting salary (range)? (Ranges from $20,000 up to $110,000 or higher)
What is the size of your company? (total headcount) (Eight categories from '1-9' up to '1,000 or more')
What is the size of the IT function? (total headcount) (Ten categories from '1-4' up to '200 or more')

-- Reflections on Your EKU Experience --

What were the most useful CIS courses you had at EKU?
What were the most useful non-CIS courses you had?
While I believe all of our courses are important, perhaps you had a different experience. Were there any courses that you were required to take that were not valuable and perhaps should be dropped? If so, please explain.
Are there any courses that you believe should be added to the curriculum? If so, please elaborate.

-- Cooperative Education (Co-op) or Internship (major-related work assignment) --

Did you have a Co-op or Internship? (Yes | No)
If yes, where did you Co-op/work?
Currently, CIS 349 - Co-op is an elective, and is NOT required. Do you believe Co-op should be a required course for CIS majors? (Yes | Maybe | No | Not sure)

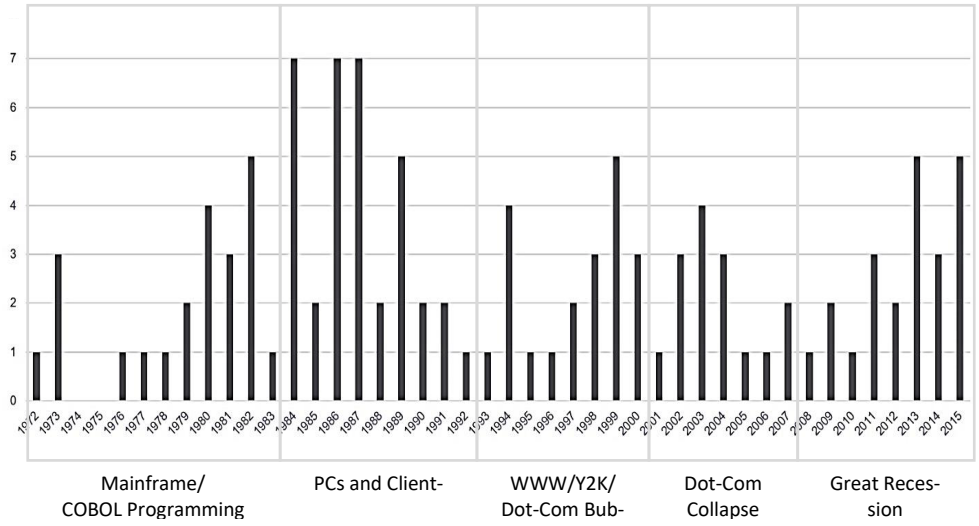
Please evaluate these experiences in transitioning from college to your first job:
Scale: (Very Helpful | Somewhat Helpful | Neutral | Somewhat Unhelpful | Not Helpful At All | Does Not Apply)

EKU Office of Career Services
Co-op or Internship Experience
College of Business and Technology Advising Office
CIS Student Club / AITP Student Club
Faculty Members
Your EKU Classmates

-- Continuing Education, Professional Development, and Certifications --

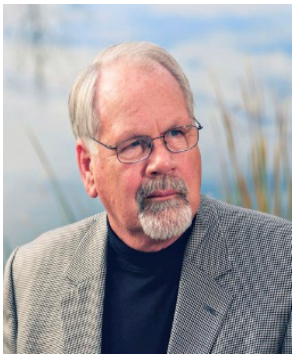
What career advice would you give to future students? (Please be detailed)
Have you attended graduate school? (Yes | No)
If yes, where did you attend and what degree did you pursue?
If not, do you have plans to attend graduate school in the future?
Please list the certifications you have earned.

APPENDIX B – RESPONSES BY GRADUATION YEAR



BIOGRAPHIES

Robert C. Mahaney is an associate professor of Computer Information Systems in the School of Business at Eastern Kentucky University. He received his Ph.D. from the University of Kentucky in 2000. His research interests include Managing Projects, Shirking, Motivation Theory, and Neural Networks. Dr. Mahaney teaches IT Project Management, Data Mining, Network Security, and C# Programming.



James H. Fisher has a Master of Business Administration degree from Xavier University, and a Bachelor of Science in Mathematics from the University of Cincinnati. He retired in 2013 as a Staff Emeritus Faculty Coordinator of Cooperative Education at Eastern Kentucky University, and his background includes experience in Career Services and Human Resources. He was President of the National Student Employment Association in 1995 and 1996, and was recognized as a Kentucky Colonel in 1996.