The Student-Professor Research Relationship: Examining IS Employer Skills Expectations

Gerald F. Braun
Debbie Tesch
Ryan Skeldon
Department of Information Systems, Xavier University
Cincinnati, OH 45207, USA

Abstract

The Jack and Mary Kay Downing Scholar program at Xavier University funds undergraduate research designed to pair undergraduate scholars with faculty for work on a scholarly project developed over the course of three semesters. This paper describes the current process in a scholar program designed to complete a literature investigation, and to develop, implement, and analyze a survey designed to measure (1) entry-level IS/IT skill expectations of knowledge/skill area requirements as described in the literature and (2) employers' satisfaction with knowledge/skills possessed by recent hires.

Keywords: IS skill expectations, IS employers' satisfaction, IS survey, undergraduate IT research

1. INTRODUCTION

Each year, five undergraduates from the Williams College of Business are chosen to participate in a research scholarship program designed to match student and faculty research interests. Faculty must be full-time tenured or tenure-track personnel and submit an application indicating their interest in the goals of the Teacher/Scholar/Mentor Program and interest in working closely with undergraduate students. A scholarly agenda must indicate a specific project, appropriate for inclusion of an undergraduate student. The project should be of sufficient scope to teach the student about the scholarship process and of sufficient duration to engage the student's interest. Once a project has been defined, each student participant is matched with one or more faculty members who initiated the project.

Beginning in the second semester of their junior year, a Downing scholar spends eight to ten hours per week for three consecutive semesters working on a research project with one or more interested faculty members. Students compete for scholarships based on their academic record, work experience, community service, and the appropriate student faculty match of research interests.

As faculty members of the IS Department, two authors of this paper submitted a research proposal to survey IS managers in the business community with regard to expected skills required of IS majors as they enter the job market after graduation. The project would span three semesters as follows:

- Spring 2004 – literature review, survey development, and survey distribution.
- Fall 2004 – student paper presentation, literature review revision, data collection and analysis
- Spring 2005 – extended literature review and journal submission of results.

The faculty members were matched with an Accounting major with some prior interest in Information Systems. Since the primary

focus of the program is on research methodology, an IS background was not required.

Effectively teaching research processes and methodologies at the undergraduate level involves a significant effort by library personnel and faculty, as well as the student. This "information literacy" has been defined by the American Library Association (ALA) "as the ability to recognize when information is needed and the ability to locate, to evaluate, and to use effectively the needed information." (Thompson, 2003) Today's typical undergraduate student is quite adept at searching the Web, but not as proficient at narrowing the scope of their topic rather than searching the entire Internet, and recognizing useful information when they find it. (Block, 2001)

Recognizing the need to improve faculty involvement in the information literacy process, the Downing award was initiated to allow select students with extended research aspirations to pursue a much more comprehensive study of the research process. This paper will describe the initial efforts, completed in the spring 2004 semester, involved in one student/faculty relationship.

2. BACKGROUND

The skills needed to be successful in the field of Information Systems are constantly changing. Similarly, these evolving skills must be incorporated into the Information systems curricula at schools of higher education. Periodic assessment of skills requirements is essential if business schools are to match their curricula with skills that are necessary in the field.

Recent research indicates that the requisite skill base of the IS professional is expanding. Along with technical skills, managerial, business, and interpersonal skills have become increasingly cited as mandatory for these employees (Byrd, 2001). Not only must the professional possess invaluable technical skills, but they must also blend that with their deep understanding of the business structure.

Researchers have also expressed concern about the "gap" between expected levels of skills and observed levels of skills once a person has been hired. Cappel (2001) asked IS managers and professionals to rate the "expected level of performance for various IS-related job skills versus the "actual" level of skills observed in entry-level IS employees. His research showed that while the business and interpersonal skills are important, the development of programming skills remains an essential component to IS education. However, the gaps between "expected" and "actual" performance tended to be greatest for non-technical skills. The top-rated skill identified among all technical and non-technical skills was the ability to learn. Another clear message from the findings of this study is that there is no substitute for job experience.

Liu, et al. (2003) focused on the technical skills necessary for entry-level IS professionals. Examination of Monster.com and HotJobs.com technical skill requirements over a 10-week period revealed a greater demand for contemporary programming language and Web-development skills and less demand for traditional programming skills.

There is some agreement among IS professionals concerning the nature of pressure to keep up with the amount of change in the field. Lee, et al. (1995) identified four types of pressure: changing technologies, changing business environment, changing role of IS, and pressure to change curriculum. According to Lee, very few professions in human history have advanced as rapidly as computing technology has in the last several decades. As the business environment becomes more and more competitive, IS professionals are now also forced to go beyond their technical skills by implementing their skills in cost-effective ways to solve business problems. They suggest that IS managers act as internal consultants, emphasizing the relationship between IS and users.

Hingorani and Sankar (1995) acquired student and industry perceptions of twenty skills required of new MIS hires in the Information Systems industry. Results of a comparison of perceptions indicate that the student and the industry rankings differ. Students perceived problem solving as the number one skill of an IS professional, while

the industry ranked it at six. Likewise, the industry ranked system analysis and design as the most important skill, while the students ranked it at number six. The broad skill of business communication and interpersonal relations was given a number two ranking by both the students and the industry.

3. METHODOLOGY

A recently extracted body of literature had been compiled and summarized by article prior to the initiation of this project. (see Appendix A). Using this literature search as a foundation, the Downing student was initially guided in the process of extracting a requisite skill set for inclusion in a survey of Midwest employers.

Skills extracted from the literature were organized by skill category and distributed to the IS department's advisory board for initial examination and comment. Using this list along with input from the board, an online survey tool was created.

Zoomerang (Zoomerang.com) from MarketTools, Inc., an ASP based online survey generation tool was used to generate the survey. The Downing scholar was initially introduced to the tool and asked to generate a practice instrument demonstrating his understanding of how to use the tool. A significant amount of time was spent generating practice questions, and then entering and extracting data to verify the use and value of the tool. Once satisfied that the tool was viable for our purposes and that the Downing student was prepared to create the instrument, the student began creation of a survey instrument designed in two sections. The primary section of the survey asks managers to respond to skills in four separate categories: 1) personal, such as oral and written communication; 2) interpersonal, such as leadership and teamwork; 3) technical, including specific, and general programming database, Web development, etc.; and 4) general business knowledge, such as accounting and finance. The second section asks for personal data to be used for data analysis.

Entry-level IS skill questions by category are presented in pairs in section one. For the first item in the skill pair, respondents were asked, based on their most recent hiring experience, to respond to each item or statement according to their expected level of expertise for an entry-level position in their organization. A Likert scale was used to capture this information as follows:

- 1 = Skill is not expected of entry-level people in our organization.
- 2 = Limited skill expected in this area
- 3 = Introductory skill base expected
- 4 = Reasonable skill expertise demonstrated
- 5 = Significant skill expertise demonstrated for entry-level employees

For the second item in the skill pair and again based on their most recent hiring experience, respondents were asked to indicate the actual level of expertise observed of the entry-level employee in their organization. The actual skill level was indicated on a Likert scale according to the following criteria:

- 1 = No actual expertise observed
- 2 = Limited expertise observed
- 3 = Introductory expertise observed
- 4 = Reasonable actual expertise observed
- 5 = Significant actual expertise observed

Post cards detailing the purpose of the survey along with a URL address were used to solicit responses. Because the URL address of the survey is unacceptably long and cryptic, a greetings Web page was created and stored on a local faculty server with a link to the Zoomerang survey. A domain name was registered to point to the greetings page, thereby simplifying the keying of the URL address in order to take the survey.

A poor initial response rate indicates the need for a follow-up. Due to organization limitations associated with the Zoomerang tool, the survey has been re-created as a paper-based survey. A complete copy of the survey may be found in the attached Appendix B.

4. RESULTS

After extensive testing and refining with input from other faculty and managers, the final survey was launched from Zoomerang. The final survey was posted the first week of June of 2004. Post cards were mailed at the same time to three thousand Information Systems Special Interest Group (ISSIG) and Information Technology Special Interest Group (ITSIG) members of the Project Management Institute (PMI®) from nine Midwest states. These states were chosen based on results from a prior alumni survey (Tesch, et al, 2001) which indicated that a large percentage of our graduates stay within the region for employment.

In addition, the Downing student submitted a brief literature review summarizing the available literature. This literature review will form the basis for initial discussions beginning in the fall semester.

5. DISCUSSION

The project at this point has been successful in meeting goals set for the initial term of the three semester program. The student participant has examined a comprehensive literature review on a very specific topic and has begun to use library resources to extract additional sources. He has also experienced the rigors of designing, testing, and distributing an online survey. While survey results are just now starting to come in, the experience itself has met with the primary objective of the Downing scholarship program.

The faculty participants have also gained from the experience. The obvious advantage of having a third person contribute to the research effort was offset to some extent by the time devoted to coaching and monitoring the student through the process. However, this process of working with the student is rewarding in itself and is consistent with the faculty goals of the award process as described by the program application process.

6. CONCLUSIONS

During the beginning of the semester, the student was a bit apprehensive about working on a research project with two faculty members from a different department, in a topic area where he had little long-term interest. Concerns diminished as he found that the tool he would be working with was not designed for programmers. As he became engaged in the research project and saw the various pieces pulling together, he became more comfortable and enthused about the project. Seeing the project move from a stack of articles to a completed and deliverable online survey was a meaningful accomplishment.

Balancing the demands of full-time school work, a part-time job, and the research project was the biggest challenge. Scheduling time for meetings and review sessions around the student and faculty obligations was not easy. Since the primary components were electronically based, much of this could be handled through online resources.

Overall, the project has progressed quite smoothly, and both the student and faculty look forward to completing the project over the next two semesters.

7. REFERENCES

Block, M. "Teaching Kids Indirectly," *Library Journal*, 126(11), Summer 2001, pp. 33-35.

Byrd, T.A. and Turner, D.E. "An Exploratory Analysis of the Value of the Skills of IT Personnel: Their Relationship to IS…", *Decision Sciences*, 32(1), Winter 2001, pp. 21-55.

Cappel, J.J. "Entry-Level IS Job Skills: A Survey of Employers", *Journal of Computer Information Systems*, 42(2), Winter 2001-2002, pp. 76-82.

Hingorani, K.K. and Sankar, C.S., "Entry Level MIS Jobs: Industry Expectations Versus Academic Preparation", *Journal of Computer Information Systems*, pp. 18-27.

Lee, Denis M.A., Trauth, Eileen M., & Farwell, Douglas, (1995). "Critical skills and knowledge requirements of IS professionals: a joint academic/industry

investigation", <u>*MIS Quarterly*</u>, 19(3), September, 313-340.

Liu, X., Kiu, L.C., Koong, K.S., Lu, J., "An Examination of Job Skills Posted on Internet Databases Implications for Information Systems Degree Programs", *Journal of Education for Business*, 78(4), Mar/Apr 2003, 191-196.

Pennanen, M. and Vakkari, Pertti. "Students' Conceptual Structure, Search Process, and Outcome while Preparing a Research Proposal: A Longitudinal Case Study,´*Journal of the American Society for Information Science and Technology*, 54(8), June 2003, pp. 759-770.

Tesch, D.B., Crable, E.A., & Braun, G.F, (2003-2004). "Evaluating IS Curriculum Issues Through an Ongoing Alumni Assessment Mechanism", <u>*Journal of Computer Information Systems*</u>, 44(2), Winter, 40-48

Thompson, C. "Information Illiterate or Lazy: How College Students se the Web for Research," *portal: Libraries and the Academy*, 3(2), April 2003, p. 259-268.

Appendix A
Literature Review of Employer IS Skill Requirements

1. Byrd, T.A. and Turner, D.E. "An Exploratory Analysis of the Value of the Skills of IT Personnel: Their Relationship to IS…", *Decision Sciences*, 32(1), Winter 2001, pp. 21-55.
2. Cappel, J.J. "Entry-Level IS Job Skills: A Survey of Employers", *Journal of Computer Information Systems*, 42(2), Winter 2001-2002, pp. 76-82.
3. Doke, E. R. and Williams, S.R., "Knowledge and Skill Requirements for Information Systems Professionals: An Exploratory Study", *Journal of Information Systems Education*, Spring 1999, pp. 10-18
4. Fox, T.L., Hindi, N., and Remington, W.S. "Students' Perceptions and Misconceptions of a Career in IS," *Journal of Computer Information Systems*, 42(1), Fall2001, pp. 83-39.
5. Medlin, B.D., Dave, D.S., Vannoy, S.A. "Students' Views of the Importance of Technical and Non-Technical Skills for Successful IT Professionals", *Journal of Computer Information Systems*, 42(1), Fall2001, pp. 65-69.
6. Ehie, Ike C., "Developing a Management Information Systems (MIS) Curriculum: Perspectives from MIS Practitioners", *Journal of Education for Business*, 77(1), Jan/Feb 2002, pp. 151-158.
7. Fougere, K.T., Macdonald, L.E., Sousa, K.J., "COBOL's Role in a College Curriculum – A Pilot Study", *Journal of Education for Business*, 78(3), Jan/Feb 2003, pp. 164-169.
8. Hayes, M. "Hot Job Skills for the Year Ahead", *Informationweek*, Jan 7 2002, http://www.informationweek.com/story/showArticle.jhtml?articleID=6508904
9. Hingorani, K.K. and Sankar, C.S., "Entry Level MIS Jobs: Industry Expectations Versus Academic Preparation", *Journal of Computer Information Systems*, Summer 1995, 35(4), pp. 18-27.
10. Lee, Denis M.A., Trauth, Eileen M., & Farwell, Douglas, (1995). "Critical skills and knowledge requirements of IS professionals: a joint academic/industry investigation", *MIS Quarterly*, 19(3), September, 313-340.
11. Lee, S., Koh, S., Yen, D., Tang, H., "Perceptions between IS academics and IS practitioners: an exploratory study", *Information & Management*, 40(1), October 2002, pp. 51-62.
12. Lightfoot, J.M., "Fads Versus Fundamentals: The Dilemma for Information Systems Curriculum Design", *Journal of Education for Business*, 75(1), Sept/Oct 1999, pp. 43-50.
13. Lidtke, D.K. and Stokes, G. "An information systems-centric curriculum, ISCC '99", *Journal of Systems & Software*, 12/30/99, 49(2/3), pp. 171-175.
14. Liu, X., Kiu, L.C., Koong, K.S., Lu, J., "An Examination of Job Skills Posted on Internet Databases Implications for Information Systems Degree Programs", *Journal of Education for Business*, 78(4), Mar/Apr 2003, 191-196.
15. Mykytyn Jr., Peter P., Mykytyn, Kathleen, & Raja, M.K., (1994). "Knowledge acquisition skills and traits: a self-assessment of knowledge engineers", *Information & Management*, 26, 95-104.
16. Nelson, R.R., "Educational Needs as Perceived by IS and End-User Personnel: A Survey of knowledge and Skill Requirements", *MIS Quarterly*, December 1991, vol 15, no 4, pp. 503-525.
17. Tang, H., Lee, S., Koh, S. "Educations Gaps as Perceived by IS Educators: A Survey of Knowledge and Skill Requirements", *Journal of Computer Information Systems*, Winter 2000/2001, 41(2), pp. 76-84.
18. Trauth, E.M., Farwell, D.W., Lee, D. "The IS Expectation Gap: Industry Expectations Versus Academic Preparation", *MIS Quarterly*, September 1993, pp. 293-307.
19. Weber, J.E., McIntyre, V.J., and Schmidt, M. "Explaining IS Student and IS Industry Differences in Perceptions of Skill Importance,", *Journal of Computer Information Systems*, 41(4), Summer 2001, pp. 79-83.
20. Yen, D.C., Lee, S., & Koh, S. "Critical knowledge/skill sets required by industries: an empirical analysis,", *Industrial Management & Data Systems*, 101(8/9), 2001, pp. 432-442.
21. "Part 1: IS/IT professionals: work, practice and skills", *Journal of Management Development*, 19(2), 2000, pp. 100-109.

Appendix B

CONFIDENTIAL SURVEY OF MIDWEST IS EMPLOYERS
XAVIER UNIVERSITY
DEPARTMENT OF MANAGEMENT INFORMATION SYSTEMS
(This survey will be delivered as a paper-based survey to employers in the Midwest including Ohio, Kentucky, Indiana, Michigan, Illinois, Minnesota, Iowa, Wisconsin. Postcards will be mailed requesting participation and indicating the website URL)

Section I: Entry-level IS skills are presented in this section in pairs. For the first item in the skill pair based on your most recent hiring experience, please respond to each item or statement according to your **expected level of expertise** for an entry-level position in your organization. For each item, specify your expected skill level according to the following criteria:
- 1 = Skill is not expected of entry-level people in our organization.
- 2 = Limited skill expected in this area
- 3 = Introductory skill base expected
- 4 = Reasonable skill expertise demonstrated
- 5 = Significant skill expertise demonstrated for entry-level employees

For the second item in the skill pair and again based on your most recent hiring experience, please respond to each item or statement according to the actual level of expertise observed of the entry-level employee in your organization. For each item, specify the actual skill level according to the following criteria:
- 1 = No actual expertise observed
- 2 = Limited expertise observed
- 3 = Introductory expertise observed
- 4 = Reasonable actual expertise observed
- 5 = Significant actual expertise observed

		Expected Level of Expertise					**Observed Level of Expertise**					*Does not apply, not available, not required*
		No expertise expected				*Significant expertise expected*	*No expertise observed*				*Significant expertise observed*	
	Personal Skills											
1	Oral Communication	1	2	3	4	5	1	2	3	4	5	( )
2	Written Communication	1	2	3	4	5	1	2	3	4	5	( )
3	Ability to Listen	1	2	3	4	5	1	2	3	4	5	( )
4	Conceptual Thinking	1	2	3	4	5	1	2	3	4	5	( )
5	Critical Thinking	1	2	3	4	5	1	2	3	4	5	( )
6	Creative Thinking	1	2	3	4	5	1	2	3	4	5	( )
7	Self Motivation	1	2	3	4	5	1	2	3	4	5	( )
8	Ethics	1	2	3	4	5	1	2	3	4	5	( )
9	Other Personal Skills: Please Specify											
	Interpersonal and Management Skills											
10	Leadership	1	2	3	4	5	1	2	3	4	5	( )
11	Teamwork	1	2	3	4	5	1	2	3	4	5	( )

		Expected Level of Expertise					Observed Level of Expertise					Does not apply, not available, not required
		No expertise expected				*Significant expertise expected*	*No expertise observed*				*Significant expertise observed*	
12	Project Management	1	2	3	4	5	1	2	3	4	5	( )
13	Systems Analysis and Design	1	2	3	4	5	1	2	3	4	5	( )
14	Other Interpersonal and Management Skills: Please specify											
	Technical Skills											
15	Object-oriented Programming (OOP) Technique	1	2	3	4	5	1	2	3	4	5	( )
16	Structured Programming Techniques	1	2	3	4	5	1	2	3	4	5	( )
17	OOP Language such as Java or C++	1	2	3	4	5	1	2	3	4	5	( )
18	Visual Basic or other Visually-based Programming Tools	1	2	3	4	5	1	2	3	4	5	( )
19	Web Site Development using HTML or a tool such as FrontPage or Dreamweaver	1	2	3	4	5	1	2	3	4	5	( )
20	Web Application Development with XML	1	2	3	4	5	1	2	3	4	5	( )
21	Scripting Tools such as JavaScript, PERL, or ASP	1	2	3	4	5	1	2	3	4	5	( )
22	Client-server based Database Tools such as Oracle or SQL Server	1	2	3	4	5	1	2	3	4	5	( )
23	Unix or Linux Operating System	1	2	3	4	5	1	2	3	4	5	( )
24	Mini or Mainframe Operating System	1	2	3	4	5	1	2	3	4	5	( )
25	ERP Tools such as SAP, Oracle, or PeopleSoft	1	2	3	4	5	1	2	3	4	5	( )
26	Telecommunications and Networking	1	2	3	4	5	1	2	3	4	5	( )
27	Network Security	1	2	3	4	5	1	2	3	4	5	( )
28	Data Warehousing	1	2	3	4	5	1	2	3	4	5	( )
29	Knowledge Management	1	2	3	4	5	1	2	3	4	5	( )
30	Systems Development Life Cycle	1	2	3	4	5	1	2	3	4	5	( )
31	Case Study Experience	1	2	3	4	5	1	2	3	4	5	( )
32	Co-Op Experience	1	2	3	4	5	1	2	3	4	5	( )
33	Other Technical Skills: Please specify											

		Expected Level of Expertise					Observed Level of Expertise					Does not apply, not available, not required
		No expertise expected				Significant expertise expected	No expertise observed				Significant expertise observed	
	General Business Knowledge											
34	Accounting	1	2	3	4	5	1	2	3	4	5	( )
35	Finance/Economics	1	2	3	4	5	1	2	3	4	5	( )
36	Operations Management	1	2	3	4	5	1	2	3	4	5	( )
37	Supply Chain Management	1	2	3	4	5	1	2	3	4	5	( )
38	Marketing	1	2	3	4	5	1	2	3	4	5	( )
39	International Relations	1	2	3	4	5	1	2	3	4	5	( )
40	Business Statistics	1	2	3	4	5	1	2	3	4	5	( )
41	Other Business Skills: Please Specify											

Section II. Please provide the following information about yourself and your organization.

1. Your gender: __ Male   __ Female

2. Your employer's state:
__ Iowa   __ Illinois   ___ Indiana   __ Kentucky   __Missouri   __ Ohio   __ Wisconsin
__ Other, Please Specify: _____

3. Which best describes your position:
__ IS Manager __ Project Leader   ___ IS Professional
__Other, Please Specify: _____

4. The industry type of your company:
__Service   __ Manufacturing   __ Education   __ Retail   __ Consulting
__ Other, Please Specify: _____

5. Years of professional IS experience:
__ < 5 years   __ 6 to 9 years   __ 10 to 14 years   __ 15 or more years

6. Number of full-time employees in your Information System Department:
__ <= 10   __ 11-50   __ 51-100   __ 101-500   __ >500

8. The average size of IS project teams in your organization:
__ <= 7 members   __ 8-15 members   ___16-25 members   __ 26 or more

8. The average IS project duration in your organization:
__ < 1 year   __ 1-2 years   __ 2-3 years   __ 3-5 years   __ 6 or more

9. Your PMP certification status:
__ Certified   __ Pursing certification   __ Intend to pursue certification
__ Not Certified