Journal of
INDUSTRIAL
TECHNOLOGY

Volume 17, Number 1 - November 2000 to January 2001

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KEYWORD SEARCH

Computer Science
Curriculum
Higher Education
Research

Reviewed Article

The Official Electronic Publication of the National Association of Industrial Technology • www.nait.org

Computer Management Information Systems and Computer Production Skills Needed by Industrial Technology Graduates as Perceived by Universities and Companies

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Introduction

Major changes in technology as a result of computerization have impacted how children and adults are educated and trained. Employers in today's workplace are seeking the technological competencies and skills related to communication advocated in a national report from the Secretary's Commission on Achieving Necessary Skills (1991). The secretary's report identified resources, interpersonal skills, information, systems, and technology as necessary for solid job performance. It is essential that industrial technology (IT) educators look at the quality of the curricula and the computer usage of undergraduate students in addressing ways of acquiring, gathering, disseminating information, and accessing technology to meet their respective specialty.

Nearly 70% of technology companies cite a lack of skills for workers as a barrier to growth (Frezzo 1999). Technical institutes, community colleges, and other post-secondary institutions are expected to train and educate students for careers in technical areas. These careers often require mastery of both academic and vocational skills. Graduates in the 21st century must possess skills that deal with an ever-evolving workplace (Selingo 1999). Further, Lauber (1997) suggested that the education of students has shifted from the acquisition and retention of facts to the processing of information and applications of skills inherent from changing technology in business.

One of the most valuable lessons an employee can learn is the importance of continuously developing skills beyond those required for the performance of a specific job (Zargari, Devier, & Schumm 1999). It is not merely the hardware or software available in a classroom or corporation, but rather what teachers, students, and managers do with these computing tools that will determine competency enhancement (Proctor & Burnett 1996). A collective partnership must be developed to address the differences between what companies need and what colleges and universities are teaching. It is imperative that industrial technology programs respond and help students graduate and enter industry competent, because the future will belong to those people who are rich in communication and technological experiences.

Purpose of the Study

The purpose of this study was to examine the differences in perception between university faculty and personnel in employing companies on the importance of competencies related to computer management information systems and computer production skills for recent IT graduates.

Research Questions

The researcher formulated two research questions:

1. Is there a difference between the responses of university professors in IT programs and personnel in companies regarding computer management information system skills of graduates?
2. Is there a difference between the responses of university professors in IT programs and personnel in companies regarding computer production skills of graduates?

Significance of the Study

It is widely believed that IT is essentially an applied science field that emphasizes a "hands-on" approach (Meier & Walker 1995). As the usage of computers in universities and companies rise to new levels, it is imperative that the IT graduates possess computer-related application skills to function effectively and efficiently in multiple disciplines. A significant contribution of this study will be to aid post-secondary institutions to develop curricula that embrace emerging issues and trends dealing with technologies.

Limitations of the Study

The study was limited to faculty in IT programs and companies in North Carolina.

Terminology

The following definitions are provided for the purpose of clarity:

Management Information System Skills - the ability to use computer-based systems in the specific functional areas of information acquisition, storage retrieval, analysis, interpretation, and presentation for tracking an organization's performance by using software applications (i.e., databases, spreadsheets, and communications) in making decisions to solve problems.

Production Skills - the ability to use computer-based systems that change the form, time, and/or place utility of goods and materials to communicate a message.

Methodology

There were two target populations for this study: companies that hired IT graduates and universities that offered IT programs in North Carolina. Responses were received from 77 of 94 (82%) of the university faculty members and 69 of 85 (81%) of the companies' personnel or human resource directors.

Table 1 describes the IT program areas where faculty members are teaching. The most respondents came from manufacturing (27.3%), graphic arts & communication design (22.1%) was second, and other (16.9%) was third.

Respondents from companies were asked to describe their positions as personnel director, human resource director, information director, or other. Table 2 shows the distribution of titles by company respondents.

The survey instrument contained a Likert-type scale to measure the perceived *importance* of what competencies IT graduates needed to have and is listed as follows:

Importance

Extremely Unimportant = 1
Unimportant =2
Undecided = 3
Important = 4
Extremely Important = 5

Content and face validity were established by using a panel of experts consisting of four university faculty members and three people from industry, who reviewed the instrument. The internal consistency was tested by using Cronbach Alpha of the Statistical Analysis System (SAS) (1998). The Cronbach Alpha values for university faculty were .97 and .96 for personnel in companies. These values reflect a very strong correlation. For all analyses, the Alpha level was set at .05.

Discussion of Findings

The researcher used the scale in Table 3 to evaluate the mean relative importance scores. This scale was selected based on the survey instrument and the means were calculated and evaluated for statistically significant differences using the SAS package.

Table 4 lists the survey question number, description, university mean, company mean, standard deviation, t-values, and mean difference for Questions #12 through #39 (computer management information systems) and Questions #40 through #60 (computer production applications). According to university respondents, Question #26 (sending and receiving e-mail) was the competency with the highest mean score of 4.59 (ranking as extremely important), while question #12 (history, development, and trends of computer

Table 1. List of Respondents in IT Program Areas

Program Area	Frequency	Percent
Manufacturing	21	27.3
Graphic Arts & Communication Design	17	22.1
Other (technology education, occupational safety & health, vocational education)	13	16.9
Electronics	12	15.6
Construction	10	13.0
Industrial Distribution	4	5.2
Total	77	100.0

Table 2. Position Titles of Company Respondents

Position	Frequency	Percent
Personnel Director	26	38
Information Director	21	30
Human Resource Director	15	22
Other (accountant, site supervisor, manager, teaching leader)	7	10
Total	69	100

Table 3. Description of Mean Values

Mean Range	Mean Description Scale
4.51 and greater	Extremely important
3.51 to 4.50	Important
2.51 to 3.50	Undecided
1.51 to 2.50	Unimportant
1.00 to 1.50	Extremely unimportant

Table 4. Responses to Computer Management Information Systems and Computer Production Skills Needed as Perceived by College Professors and Companies

Category & Question	University Mean	Standard Deviation	Company Mean	Standard Deviation	Mean Difference	t-value	Probability
Skill #1. General Computing Knowledge							
12. History, development, and trends of computer systems	3.37	.95	2.57	1.14	.80	*4.5585	.0010
13. Loading, interacting, and executing software packages	4.41	.66	4.33	.76	.08	.6959	.4870
Skill #2. Understanding Word Processing							
14. Formatting and correspondence reports	4.41	.77	4.65	.48	-.24	*-2.2045	.0291
15. Mail merging for letters	3.70	1.27	4.39	.71	-.69	*-3.9919	.0001
16. Inserting graphics into documents	4.48	.74	4.48	.68	0	.0193	.9846
Skill #3. Understanding Spreadsheets							
17. Entering data, formulas, and calculations	4.20	.99	4.39	.60	-.19	-1.3690	.1734
18. Copying, linking, and merging	4.16	.80	4.33	.63	-.17	-1.3822	.1691
19. Reporting results	4.25	.86	4.36	.64	.11	-.8197	.4138
Skill #4. Understanding Databases							
20. Designing and editing	4.02	1.10	4.24	.71	-.22	-1.4492	.1497
21. Querying and determining relationships	3.94	1.11	4.21	.76	-.27	-1.7209	.0876
22. Creating reports	4.22	1.01	4.29	.72	-.07	-.4776	.6337
Skill #5. Understanding Basic Programming Languages							
23. Coding programs	3.53	.97	2.20	1.21	1.33	*7.2403	.0001
24. Editing programs	3.57	.94	2.17	1.18	1.4	*7.8287	.0001
25. Managing programs	3.61	.92	2.15	1.18	1.46	*8.2027	.0001
Skill #6. Understanding e-mail							
26. Sending and receiving e-mail	4.59	.73	4.59	.49	0	.0313	.9751
27. Sending attachments and files using e-mail	4.55	.73	4.57	.52	-.02	-.2027	.8397
28. Using listservs and mailing lists in e-mail	4.45	.78	4.42	.62	.03	.2920	.7707
Skill #7. Understanding Web Page Design							
29. Creating web pages	4.05	.90	3.60	1.07	.44	*2.6839	.0082
30. Formatting web pages	4.02	.90	3.59	1.06	.43	*2.6316	.0095
31. Using hyperlinks in web pages	3.97	.95	3.56	1.06	.41	*2.4425	.0159
32. Adding multimedia elements to web pages	4.00	.92	3.57	1.07	.43	*2.5238	.0128
33. Managing a web server	3.76	.94	3.56	1.07	.20	1.1926	.2351
Skill #8. Understanding Charting							
34. Transferring data to a charting application	3.72	.88	3.91	.85	-.19	-1.2920	.1984
35. Formatting charts	3.72	.87	3.94	.82	-.22	-1.5363	.1267
36. Exporting charts to other software	3.77	.87	3.95	.81	-.18	-1.2747	.2045

continued on next page

Table 4. Responses to Computer Management Information Systems and Computer Production Skills Needed as Perceived by College Professors and Companies (continued)

Category & Question	University Mean	Standard Deviation	Company Mean	Standard Deviation	Mean Difference	t-value	Probability
Skill #9. Understanding Scheduling Software							
37. Scheduling elements and creating a schedule	3.83	.89	3.58	1.05	-.05	-.3256	.7453
38. Editing a schedule	3.81	.88	3.86	1.04	-.05	-.3193	.7500
39. Outputting schedules in various forms	3.81	.88	3.79	1.10	.02	.1262	.8997
Skill #10. Understanding Computer Production Applications in Electronics							
40. Computer-Aided Design (CAD) for electronics	4.09	.99	3.85	1.15	.24	1.3182	.1897
41. Circuit simulation for electronics	4.18	.88	3.86	1.17	.32	1.7981	.0746
42. Circuit layout programs	4.11	.93	3.68	1.18	.43	*2.4545	.0154
Skill #11. Understanding Computer Production Applications in Construction							
43. Computer-Aided Design (CAD) for construction	4.10	.80	3.76	1.11	.34	*2.0679	.0408
44. Simulation software	3.94	.86	3.71	1.08	.23	1.4580	.1473
45. Cost estimating	4.07	.87	3.76	1.07	.31	1.9025	.0593
Skill #12. Understanding Computer Production Applications in Manufacturing							
46. Computer-Aided Design (CAD) for manufacturing	4.35	.87	3.88	1.24	.47	*2.5992	.0105
47. Simulation software	4.20	.91	4.01	1.15	.19	1.1141	.2673
48. Programmable logic control	4.19	.95	4.00	1.18	.19	1.0874	.2789
49. Computer integrated manufacturing	4.23	.90	3.91	1.26	.32	1.7421	.0840
50. Robotics	4.18	.92	3.91	1.28	.27	1.4378	.1530
51. Computer numerical control	4.25	.92	3.92	1.27	.33	1.7845	.0768
52. Automatic Identification (AutoID)	3.98	1.03	3.92	1.28	.06	.3057	.7603
Skill #13. Understanding Computer Production Applications in Industrial Distribution							
53. Automatic Identification (AutoID)	3.70	.97	3.28	1.22	.42	*2.2278	.0276
54. Routing (mapping) software	3.63	.96	3.30	1.20	.33	1.8292	.0697
Skill #14. Understanding Computer Production Applications in Graphic Arts & Communication Design							
55. Graphic design programs	4.18	.94	3.86	1.01	.32	*2.0048	.0469
56. Page layout	4.18	.95	3.85	1.03	.33	*1.9764	.0491
57. Imposition	4.07	1.03	3.76	1.08	.31	1.7583	.0809
58. Video editing	4.02	1.01	3.82	1.02	.20	1.1810	.2396
59. Audio editing	4.02	1.01	3.79	1.02	.23	1.3561	.1772
60. Multimedia	4.14	.96	3.85	1.01	.29	1.7546	.0815

N = 77 for universities. N = 69 for companies. * = $p < .05$

systems) had the lowest mean score of 3.37 (ranking as undecided).

According to company respondents, Question #14 (formatting and correspondence reports) was the competency considered the most important with the highest mean score of 4.65 (extremely important). Question #25 (managing programs) was the competency considered to be the least important with a mean score of 2.15 (unimportant). It was one of three questions considered unimportant by the company respondents. The other two that were considered unimportant were Question #24 (editing programs) with a mean of 2.17 and Question #23 (coding programs) with a mean of 2.20.

Conclusions

The following conclusions are based on the findings of this study:

The study revealed that sixteen of the 49 computer skill competencies were significantly different between university and company respondents. The university respondents rated 14 computer skill competencies significantly higher than did the company respondents. A positive t-value indicated that the universities' mean was significantly higher than was the company's mean, while a negative t-value indicated that the company's mean was significantly higher than the universities' mean. This may be because faculty members introduced these skills to IT graduates first, while companies expanded upon previous instruction.

Computer management information systems and computer production skills are identified in the literature as both needed and required for the workplace in the 21st century. Industrial technology graduates need to possess competencies in today's competitive industrial environment that keeps them abreast of emerging technologies and business practices to aid in their preparation and delivery of programs that utilize computer application skills. To respond to the educational needs of businesses, IT programs must continue to develop working relationships and strategic educational partnerships that incorporate training and development of computer-related skills.

Implications

Several implications of this study has relevance to industrial technology educators and companies that hire IT graduates: strategic working relationships between universities and companies on changing and emerging technologies, and periodic surveys that measure which competencies are most beneficial for entry-level employment is essential. University professors in industrial technology programs must perceive that computer production skills have advantages over computer management information system skills. They will then put forth the effort needed to confront the complexities that graduates face in adapting to instructional procedures in the workplace that capitalize on computer application skills.

References

Frezzo, Dennis (1999). On Teaching and Learning. [WWW document]. URL http://cisco.netacad.net.

Lauber, G. (1997). Preparing students for a changing future: How one New York school district restructured its educational focus with technology. T.H.E. Journal: Technological Horizons in Education, 24(8), 63-65.

Meier, R.L., & Walker, H.F. (1995). Enhancing U.S. competitiveness: Barriers and promising opportunities for industrial technologists. Journal of Technology Studies, 21(2), 15-19.

Proctor, R.M. & Burnett, P.C. (1996). Computer attitude and classroom computers. Computers in the Schools, 12(3), 33-41.

Secretary's Commission on Achieving Necessary Skills. (1991). What work requires of schools: SCANS report for American 2000. Washington, DC: US Department of Labor.

Selingo, J. (1999). Technical Colleges at a Crossroad. The Chroncile of Higher Education. (A28-A30).

Statistical Analysis System [Computer software]. (1998). Cary, NC: SAS Institute.

Zargari, Ahmad., Devier, David., & Schumm, Gregory. (1999). Preparation of Industrial Technology Associate Degree Programs for the 21st Century: Earning Accreditation by the National Association of Industrial Technology. Selected Papers: 32nd Annual Conference, Panama City Beach, Florida.