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SIMILARITIES BETWEEN BCIS AND OTHER BUSINESS STUDENTS' RATINGS OF TECHNICAL SKILL IMPORTANCE

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Abstract

Three hundred and two (302) business students were administered a survey designed to evaluate the importance that BCIS majors and other business majors placed on certain technical and interpersonal skills desired for IT hires. Student results were compared to industry desires from a previous study. Results indicated substantial agreement between BCIS majors and industry ratings. Results also indicated substantial correspondence between ratings of importance of certain technical skills by BCIS students and other business majors.

I. Introduction

At the beginning of the 21st century, businesses are faced with an explosion of global competition and innovation. At the forefront of this explosion has been the ability of businesses to obtain, manipulate, and make decisions based on the enormous amounts of information produced by their own operations and data from the competitive environment. A necessary condition for successful competition, in this environment where businesses have woven information technology into their basic business processes, has been businesses ability to hire qualified and skilled Information Technology (IT) employees, as well as management and other workers possessing IT skills (Lu, Chung & Wang, 1998-1999; Magnet, 1994; Laudon & Laudon, 1998).

The demand for IT graduates continues to grow. Economists predict that by 2010 the majority of American workers will be knowledge workers, or those who make their living working with information (Maitland, 1999). A consequence of this increase in business use of technology and the shift toward knowledge work in American industry is that all prospective workers need a certain level of computer and technical skills. As business attempts to hire and train college graduates with what they consider to be pertinent technical skills, universities struggle to determine the appropriateness of their curricula from a technical skills perspective. Schools of business have determined that all business students, no matter if they are IT focused or not, need to

have proficiency in computer and information technology. An attempt to link the skills needed by industry to college curriculums has resulted in research whose outcome was to make curriculum changes that more closely match industry needs (Massetti, Abraham and Goeller, 1995-1996; Couger, Davis, Dologite, Feinstein, Gorgone, Jenkins, Kasper, Little, Longenecker and Valacich, 1995).

Many studies have examined technical skills needed by industry (Athey and Wickham, 1995-1996; Hingorani and Sankar, 1995; Jiang, 1994; Jiang, Udeh, and Hayajneh, 1994; Lee, 1995; Lu, Chung and Wang, 1998-1999; Nelson, 1991; Trauth, Farwell and Lee, 1993; Young, 1996; Young and Lee, 1997; Zhao, 1997). For example, Young (1996) surveyed businesses that were known for hiring IT graduates, targeting companies that were more likely to hire graduates from a school of business IT program than from a computer science program. The Young study established a baseline of skills that business believed important for new IT professionals hired from schools of business.

Other studies have examined student awareness of skills needed by industry (Romero, Costley and Chinen, 1999; Jones and Berry, 1995). Research of this type is used by universities in their curriculum modification process. Many business curriculum committees have also developed business advisory groups in an effort to build stronger ties with the needs of business and what has been taught in the classroom.

In summary, business is requiring increased technical and computer skills from all business graduates at the same time that business schools are recognizing the necessity of a higher level of technical knowledge for all graduates. Given these two factors, it might be expected that there would be some degree of convergence between technical and non-technical business school majors on their evaluation of the importance of certain technical skills in their future jobs. The purpose of this study was to evaluate the degree of similarity with which Business Computer Information Systems (BCIS) majors and non-BCIS business majors perceive IT skills needed by industry.

II. The Study

Prior studies had emphasized the importance of certain technical and interpersonal skills from the perspective of the IS/IT industry hiring IS/IT graduates (Trauth, Farwell, & Lee, 1993; Young, 1996; Young & Lee, 1997). The focus of this study was on business student perceptions of the importance of certain technical and interpersonal skills in their future jobs. The study's purpose was to evaluate potential convergence between BCIS majors and non-BCIS business majors' ratings of the importance of technical skills in their future jobs. The sections below address the survey, subjects and analysis procedures.

1. SURVEY

As part of a larger study, a questionnaire was administered containing 27 skills identified by Young (1996) in his study of the relative importance of technical and interpersonal skills to industry. The survey used a 3-point Likert scale (1 = Not Important, 2 = Somewhat Important, 3 = Very Important) following Young's procedure, and contained additional demographic items including major, grade point average, and work experience. The surveys were administered in-class, and students were assured of the confidentiality of their responses. Students were asked to circle the answer that most closely described how important each skill was for an entry-level position in their major.

2. SUBJECTS

This study divided business students into two groups, BCIS majors and non-BCIS majors, to gauge the degree to which the 27 technical and interpersonal skills were viewed as important by the two groups. Subjects were 302 undergraduate business students at a mid-sized public mid-western university. A questionnaire was administered and usable responses on the skill section were obtained from 162 Business Computer Information Systems (BCIS) majors and 140 other business majors from Accounting, Finance, Real Estate, Marketing, and Management. Table 1 gives descriptive data for the sample. One-way ANOVA failed to reveal significant differences between BCIS majors and other business majors in terms of gender, age, current grade point average, and work experience.

Table 1. Descriptive Data for Sample.

	Gender		Age			Work Experience	
	Male	Female	Mean	Std. Dev.	Range	Mean	Std. Dev.
BCIS Majors	109	53	23.3	2.79	19-38	2.72	3.15
Other Business Majors	82	58	22.8	3.48	20-42	2.41	3.78
All Business Majors	191	111	23.06	3.13	19-42	2.58	3.45

3. ANALYSIS STRATEGY

Initial analysis used three groupings: industry, BCIS majors and other business majors. Means and standard deviations for BCIS students and other business students on each item were calculated and used along with the results reported for industry by Young (1996) to calculate correlation coefficients in order to assess the overall similarity of scores between the three groups. ANOVA was then employed to test for differences in mean ratings of all skills between the three groups. A finding of significant overall differences led to the employment of pairwise t-tests to detect differences between specific pairs of groups. Finally, t-tests were used to detect differences between BCIS majors and other business majors on each skill that was rated.

III. RESULTS

Industry, BCIS majors' and other business majors' means and standard deviations for each skill are presented in Table 2. Skills in Table 2 are sorted from high to low by industry rating. For instance, industry rated Verbal Skills (mean = 2.811) as most important and Low Level Language Skill (mean = 1.226) as least important for new IT hires. BCIS majors and other business majors rated the importance of these skills for a new hire in their own major area.

Table 2. Ratings of Required Skills for New Employees

Technical and Interpersonal Skills	Industry		BCIS Majors		Other Business Majors	
	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.
Verbal Skills	2.811	0.456	2.883	0.322	2.901	0.335
Work in Cross-Functional Group	2.784	0.473	2.773	0.420	2.683	0.486
Written Communication Skills	2.778	0.478	2.589	0.530	2.690	0.505
High-Level Languages	2.595	0.543	2.374	0.599	1.683	0.737
System Development Methodologies	2.568	0.638	2.605	0.561	1.871	0.747
Object-Oriented Languages	2.514	0.500	2.601	0.539	1.831	0.772
Client-Server Development Tools	2.462	10.547	2.605	0.539	2.063	0.717
32-Bit Operating Systems	2.378	0.630	2.350	0.572	1.851	0.648
Object-Oriented Programming	2.361	0.630	2.601	0.562	1.859	0.758
Mainframe Query Languages	2.324	0.700	2.160	0.638	1.613	0.659
Mainframe Operating Systems	2.314	0.747	2.067	0.620	1.824	0.655

Networks (local and wide-area)	2.297	0.692	2.374	0.534	2.204	0.591
16-Bit Operating Systems	2.265	0.656	1.865	0.503	1.667	0.521
Unix Operating Systems	2.229	0.680	2.061	0.563	1.729	0.678
Network Software	2.114	0.747	2.466	0.580	2.289	0.604
Data File Structures	2.054	0.695	2.448	0.590	2.085	0.674
PC Database Tools	2.054	0.695	2.644	0.541	2.451	0.605
CASE Software	2.000	0.707	2.172	0.615	1.829	0.642
Project Managemnt Tools	1.972	0.645	2.466	0.611	2.257	0.708
PC Spreadsheet Tools	1.946	0.769	2.528	0.570	2.535	0.574
Telecommunications	1.919	0.632	2.399	0.594	2.394	0.552
Workgroup Software	1.714	0.613	2.399	0.562	2.128	0.593
Expert System Languages	1.556	0.598	2.025	0.628	1.620	0.679
Multimedia Computing	1.500	0.553	2.331	0.619	2.387	0.604
Desktop Publishing	1.405	0.543	2.117	0.632	2.340	0.691
Apple/Mac Operating System	1.324	0.674	1.617	0.622	1.732	0.689
Low-Level Languages	1.226	0.489	1.88	0.663	1.645	0.604

Table 3 presents correlation coefficients between the three groups on all items.

Ratings of skills between industry and BCIS majors are strongly correlated ($r = .650$, $p<.001$) indicating substantial correspondence between the two groups. This result was expected, given that both groups are looking at skills for the same set of jobs. Likewise, ratings of skills between BCIS majors and other business majors are strongly correlated ($r = .675$, $p<.001$). Roughly 45.6% of the variance in one group's responses could be explained by the other group's responses. The correlation between industry and other business majors, however, fails to reach significance.

Table 3. Correlations between ratings of skills by Industry, BCIS Majors and Other Business Majors.

	Industry	BCIS Majors
BCIS Majors	.650***	
Other Business Majors	.232	.675***

*** $p<.001$

Analysis of variance results showed significant differences on the mean of all items between the three groups ($F_{2,78} = 3.845$, $p=.026$). Overall means for Industry, BCIS majors and other majors' ratings appear in Table 4. These results indicate differences in the overall importance of items between the three groups. Although the significant F-value indicates differences, additional analysis is required to show where these differences exist.

Table 4. Overall means of items rated by Industry, BCIS Majors, and Other Business Majors.

	Mean	Std. Dev.	N
Industry	2.12830	.44907	27
BCIS Majors	2.34826	.29865	27
Other Business Majors	2.08004	.37390	27

Pairwise t-tests for differences in means between the three groups in Table 4 were conducted and results appear in Table 5. Results show that the mean of all items for BCIS majors (mean = 2.348) was significantly different from both other business majors' scores (mean = 2.08) and industry scores (mean = 2.12). Industry and other business majors' scores were not significantly different. Thus, BCIS majors believed that, as a whole, the set of skills examined was more important than either industry or other business majors.

Table 5. T-values for Mean Differences Between Groups.

	T-value	DF	Mean Difference
Industry versus BCIS Majors	2.119*	52	.21996
Industry versus Other Majors	.429	52	.00486
BCIS Majors versus Other Majors	2.913**	52	.26822

*p<.05, **p<.01

Results of t-tests between BCIS majors and other business majors on specific items appear in Table 6. Items are sorted in descending importance according to industry ratings. With combined sample sizes of approximately 300 for BCIS majors and other business majors (and given reasonable pooled standard deviations), t-tests have the power to detect statistically significant but trivial differences in mean values for different skills. For example, mean skill importance in local and wide area networks differ by only .17 between BCIS majors and other business majors, yet this difference is significant at the p=.009 level. Obviously this magnitude of difference is significant, but is it might be argued that a difference of this magnitude is not very

important. If important differences are defined as achieved at a level somewhat greater than .17, it is instructive to compare the items that are not significantly different between BCIS and other business majors with those having larger, important statistical differences.

There was no significant difference between BCIS majors and other business majors on any of the non-technical skills examined…verbal skills, working in cross-functional groups, and written communication skills. These were all top-rated items for each group. Students also had non-significant differences on ratings of the importance of PC spreadsheet tools, telecommunications, multimedia computing and Apple/Mac operating systems. With the exception of Apple/Mac operating systems, all items were rated at or above the midpoint of ratings. Both groups rated the importance of Apple/Mac operating systems near the bottom of the scale and similarity on this item might have been affected by restriction of range. The other items, however, are items students are typically required to use in courses in their business curriculum.

Table 6. T-tests of differences on skill items between BCIS Majors and Other Business Majors.

Technical and Interpersonal Skills	t-value	df	Mean Difference
Verbal Skills	.486	303	.02
Work in Cross-Functional Group	1.741	303	.09
Written Communication Skills	1.696	303	.10
High-Level Languages	9.160**	303	.69
System Development Methodologies	9.871**	300	.73
Object-Oriented Languages	10.283**	303	.77
Client-Server Development Tools	7.438**	302	.54
32-Bit Operating Systems	7.219**	302	.50
Object-Oriented Programming	9.859**	303	.74
Mainframe Query Languages	7.460**	303	.55
Mainframe Operating Systems	3.305**	303	.24
Networks (local and wide-area)	2.641*	303	.17
16-Bit Operating Systems	3.386**	302	.20
Unix Operating Systems	4.631**	301	.33
Network Software	2.594*	303	.18
Data File Structures	5.045**	303	.36
PC Database Tools	2.926*	303	.19

CASE Software	4.735**	301	.34
Project Management Tools	2.748*	301	.21
PC Spreadsheet Tools	.115	303	.01
Telecommunications	.066	303	.00
Workgroup Software	4.081**	302	.27
Expert System Languages	5.356**	303	.40
Multimedia Computing	.804	303	.01
Desktop Publishing	2.962*	302	.22
Apple/Mac Operating System	1.526	302	.12
Low-Level Languages	3.223**	301	.24

*p<.01, **p<.001

Items with mean differences greater than .5, certainly an important significant difference given the scale anchors, included almost all the programming and query languages, system development methodologies, client-server development tools, and 32-bit operating systems. It seemed that BCIS majors and other business majors definitely disagreed on the importance of these skills for an entry-level job in their major area. Given the nature of these skills, disagreement here would be expected.

Items with means that were significantly different but small in magnitude (<.3 for this example… recall that a difference in means of only .17 on the importance of local and wide area networks was significant at the .009 level) included certain items that non-technical employees might use (desktop publishing, workgroup software and project management tools), but also included items that would certainly be considered to be of a technical nature such as mainframe operating systems, local and wide-area networks and PC database tools. The items with mean differences between .3 and .5 included mostly technical items, such as Unix operating systems, data files structures, CASE software, and expert systems languages. These items tended to be at or below the midpoint of ratings for each group.

IV. DISCUSSION

As discussed earlier, business increasingly needs a technologically savvy workforce, and educational institutions are responding with curricula that are augmented with additional computer and information technology classes. Arguably, the increasing importance that business and institutions of higher education are placing on technical skills should be reflected by students' opinions of the importance of those skills for their future employment. This study took certain technological and interpersonal skills

that are desired for new IT hires and examined the degree to which non-IT business students felt these skills were also needed for new hires in their field.

Results of the study showed a strong relationship between rankings of skills between industry and BCIS majors, and between BCIS and other business majors. In general, BCIS and other business majors rank the importance or order of skills examined similarly. In terms of the overall importance of skills, BCIS majors thought that the entire set of skills examined was more important than other business majors did. The mean evaluation of skill importance for BCIS majors was 2.35 while for other business majors it was 2.08. This difference was significant at the $p<.01$ level, indicating that it was not likely that other business majors felt that all skills were as important as did BCIS majors.

Since differences in the overall mean of skills between BCIS and other business majors existed, individual t-tests were employed to "tease" out these differences. No significant differences existed between students on the interpersonal skills that industry had also indicated were of prime importance. Student recognition of the importance of these skills is a positive indicator. There were also no significant differences on computer and IT skills such as PC spreadsheet tools, telecommunications and multimedia computing. Increasingly students are called upon to use these computer and IT tools in their class-work, and both sets of students rated their importance highly, probably reflecting this heavy in-class usage.

The two groups had significant differences in regard to their ratings of the importance of programming and computer language skills, with BCIS students rating these more highly. This response was anticipated. Entry-level jobs for other business majors probably don't require programming or computer language skills, convergence between the two groups in these areas should not be expected.

It is important to examine those skills where mean differences between BCIS and other business majors are small, but the sample size gives the researcher the ability to detect significance. In reality these differences may be significant, but not important. An examination of those items where the mean difference between the two student groups is less than .3 shows two types of skills. A number of these are definitely computer skills, but they could reasonably be appropriate for entry-level hires in a variety of business disciplines. These include skills in desktop publishing, workgroup software and project management. Ten years ago, much of this software did not exist and most business majors would not have thought it necessary to have these skills. Recognition by other business majors of the importance of these skills is a positive response to the needs of industry. The second type of skills is highly technical, and these skills include mainframe operating systems, local and wide-area networks and PC database tools. The small differences in these evaluations represent an important

step by other business majors toward fulfilling business needs for technologically competent employees.

Items with mean differences greater than .3 tend to be more hard-core IT or computer science skills, and the larger difference in means between the two groups of business students seems a thoughtful recognition of that.

V. CONCLUSIONS

Overall, this study supports a finding that non-BCIS majors are recognizing the importance of many of the skills that industry expects of new IT hires. Although there are questions about the generalizability of the sample to all institutions of higher education, it is a positive sign that students in the sample generally rate the importance of skills similarly to industry ratings, as shown by the strong correlation between BCIS majors and industry on the technical and interpersonal skills. The important implication for students is that they are generally placing appropriate importance on most skills. In addition, there seems to be a stratification of the perceived importance of these skills to new non-BCIS hires that is both realistic and insightful. Non-BCIS majors are placing appropriate emphasis on technical skills they are likely to use, and less emphasis on technical skill they are less likely to use. One implication for higher education is that communication to students of the importance of skills has been relatively successful. This does not mean that higher education can assume that skill learning has or will occur, and evaluation of skill learning must still take place. Students may recognize the importance of skills without learning them (or having an opportunity to learn them). Continuing efforts to ascertain the importance of both new and recognized skills to industry must take place, along with efforts to communicate to students the importance of these skills and educate students in these skills. As certain skills assume greater importance, academia must revise the curriculum to reflect changes. Industry could also take a proactive role in the process of communicating skill importance. Note that skill importance to industry in this study was taken from an academic source. If industry is to obtain the skill set it wants from graduates, it must effectively communicate skill needs to academia.

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