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ABSTRACT

In order to identify the information systems (IS) backgrounds and skills most in demand among employers in the Southeastern United States, the classified ads appearing in the region's major cities during the summer of 1997 were content analyzed. This paper reports the major findings of this investigation and their curriculum implications. It also outlines potential follow-up investigations for this and other newspaper want ad content analysis studies. There are several notable curriculum implications of these findings. First, the results suggest that it is important for IS curricula to emphasize both "hard" and "soft" IS skills. The results also suggest that it is important for IS program graduates to be well-grounded in systems development processes and that the traditional systems development life cycle continues to serve as useful framework for helping students understand the tradeoffs associated with different platforms, applications, programming languages, and data access alternatives. Another important implication of the broad range of technical skills mentioned in the newspaper job listing analyzed is that it is important for students graduating from IS programs to be prepared to develop new technical skills and competencies on an ongoing basis. Eleven tables illustrate results. (Author/AEF)

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THE INFORMATION SYSTEMS INDUSTRY: WHAT ABILITIES DOES IT WANT FROM ITS NEW HIRES? A LOOK AT THE SOUTHEASTERN U.S.

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In order to identify the IS backgrounds and skills most in demand among employers in the Southeastern US, the classified ads appearing in the region's major cities during the summer of 1997 were content analyzed. This paper reports the major findings of this investigation and their curriculum implications. It also outlines potential follow-up investigations for this and other newspaper want ad content analysis studies.

INTRODUCTION

Conscientious faculty in colleges/schools/departments of business administration are always attempting to remain current in their fields. In addition, they want the students enrolled in their degree programs to be prepared to succeed in careers within their chosen disciplines. To be prepared, the students must be offered a curriculum that is broad, meets accreditation standards, is current, and provides courses and internship experiences which give them the background required by employers and graduate programs. The pace of change in this highly dynamic disciplines such as information systems presents faculty with the ongoing challenge of maintaining a curriculum that meets these criteria.

The primary purposes of this investigation were to determine the educational/practical background(s) that Southeastern US employers

of undergraduate alumni of Information Systems program are requesting and to gather both timely and relevant information to assist in the revision of an Information Systems Curriculum. The motivation for the study was two-fold: (1) the desire to offer (maintain) a curriculum which satisfies the criteria stated earlier and (2) the need/opportunity to convert an existing quarter-based curriculum to a semester basis.

The authors decided to adopt an approach employed in earlier works that scanned the classified advertisements for entry level information systems positions. For example, Jacobson and Armstrong (1996)—the winners of the Best Paper Award at the 1996 IAIM Conference—used this approach in their analysis of the job market in the Middle Atlantic States. Several similar efforts aimed at gleaning high-demand IS skills by content analyzing newspaper ads include Athey and Plotnicki (1992), Arnett and Litecky (1994), Prabhakar, Litecky, and

Arnett (1995), Todd, McKeen, and Gallupe (1995), and McLean and Schneberger (1997). In this investigation, a methodology similar to that employed by Jacobson and Armstrong (1996) was applied to states in the southeastern United States.

METHODOLOGY

The current investigation focuses on the educational/practical background(s) that potential employers of undergraduate alumni of Information Systems degree programs are listing as requirements for new hires in their classified ads in southeastern U.S. newspapers in the following southeastern states: Alabama, Florida, Georgia, North Carolina, and South Carolina.

This investigation is the first in a planned sequence of multiple empirical studies aimed at identifying trends in the demand for both "hard and soft" IS skills among employers in the Southeastern US. A future investigation will attempt to replicate the findings of this investigation through the content analysis of on-line want ads (both for newspapers and independent listing services). Other investigations will involve comparing the IS skill trends observed by IS "headhunter" firms and alumni of an IS program to those obtained in this investigation, and contacting employers placing want ads in print and on-line media to determine the extent to which new hires actually satisfy the requirements stated in their ads.

In order to develop a grid of skills/competencies for use in the actual data collection phase of this investigation, classified advertisements for IS jobs listed in the Sunday editions of the *Savannah Morning News* and the *Charlotte Observer* during the Spring of 1997 were collected. The IS skills and backgrounds listed in these ads were used to develop a "first cut" classification scheme for ads appearing in future editions of these and other newspapers. The first cut version of the grid was subsequently refined and expanded after testing its applicability to a Sunday edition of the *Atlanta Constitution* during May of 1997. The resulting grid, implemented as a Lotus Excel spreadsheet, was used to analyze the content of want ads for IS positions appearing in the Sunday editions of the major newspapers published in Atlanta, GA, Birmingham, AL, Charlotte, NC, Columbia, SC, Jacksonville, FL, and Tampa, FL. It consisted of nearly two-

hundred distinct criteria grouped into numerous categories including general job skills, IS skills, IS certifications, educational backgrounds, programming languages, operating systems, hardware platforms, networking technologies, application packages, database technologies and development tools.

The coding heuristics and procedures used to tally the IS skills mentioned in the newspaper want ads generally replicated the procedures employed by Jacobson and Armstrong (1996). That is,

...the study was limited to ads for business-oriented IS positions placed by organizations for their own work force and to ads placed by consulting firms who hire individuals to work for them. If the advertisement was for a specific number of positions with a particular set of skills, the need for those skills was tallied for that number. However, when the number of positions to be filled was not indicated, the skill was tallied only once (p. 45).

The classification procedures that were utilized enabled the researchers to compare the demand for IS positions across both cities and dates. It also enabled us to identify some general patterns in the demand for specific IS skills that is capable of providing guidance in IS curriculum revision decisions. Some of our major findings are reported in the following section.

RESULTS

As may be observed in Table 1, a total of 727 IS want ads appeared in the major newspapers from the target Southeastern US cities on the first Sunday in June, July, and August, 1997. These were content analyzed using the refined version of the previously mentioned skills grid that had been developed.

Consistent with its size and its reputation of being one of the key IT/IS centers in the southeastern US, more job listings appeared in the *Atlanta Constitution* than in any of the other newspapers. As Table 1 shows, the second highest number of IS want ads appeared in the *Charlotte Observer*, and nearly one hundred ads were found in the Birmingham, AL and Tampa, FL newspapers. Table 1 also indicates that more IS

TABLE 1

NUMBER OF ADS FOR EACH PAPER BY MONTH

	Atlanta	Birmingham	Charlotte	Jacksonville	Miami	Columbia	Tampa	TOTALS
June 1, 1997	63	31	38	25	25	18	39	239
July 6, 1997	51	25	26	25	19	16	19	181
August 3, 1997	90	43	51	26	31	27	39	307
TOTALS	204	99	115	76	75	61	97	727

want ads were published on the first Sunday of August, 1997 than for the first Sundays in either June or July 1997.

As may be observed in Table 2, the most frequently mentioned general job skills mentioned in the want ads of the major newspapers in the Southeastern U.S. during the summer of 1997 include project management and coordination, interpersonal/communication skills, problem solving and analytic skills, and general job skills. Written, oral, and presentation skills were each mentioned in less than five percent of the IS wants ads examined in this study.

TABLE 2

PERCENTAGE OF ADS

	June	July	August	TOTALS
Coordination/Project Management	16.18	15.69	22.06	15.13
Interpersonal Skills	9.80	12.25	24.02	12.93
Problem Solving & Analytical	9.31	8.33	13.73	8.80
General job skills	6.37	7.35	15.20	8.12

INCLUDING GENERAL JOB SKILLS

As Table 3 indicates, the most commonly listed IS skills address the entire systems development life cycle including design/development skills, hardware/software implementation skills, and operation and management skills. Other information skills including Year 2000 compliance skills/experience, and database administration skills were mentioned in only a very small

percentage of the IS want ads that we examined.

TABLE 3

PERCENTAGE OF ADS INCLUDING INFORMATION SYSTEMS SKILLS

	June	July	August	TOTALS
Design/Development	19.61	15.20	26.96	17.33
Hardware/Software Implementation	7.84	13.73	19.12	11.42
Operation & Maintenance	6.37	13.24	13.24	9.22

Table 4 illustrates that a bachelor's degree was the most common education requirement listed in the newspaper ads for IS positions. Associates degrees, masters degrees, and doctoral degrees were rarely mentioned in the ads included in this sample. Professional certifications such as Novell's CNE and Microsoft's MSCE were rarely mentioned in the IS want ads that we collected and analyzed. Table 5 shows that one to five years of work experience were most commonly listed.

TABLE 4

DIPLOMA/DEGREE

	June	July	August	TOTALS
Bachelors Degree	30.39	23.53	47.06	28.34

TABLE 5
YEARS EXPERIENCE

	June	July	August	TOTALS
3-5 years	25.49	21.57	40.69	24.62
1-2 years	34.80	16.67	32.84	23.66

As is indicated in Table 6, specific hardware platforms were mentioned in many of the job listings. However, jobs focusing on microcomputer and client/server computing platforms were mentioned in more ads than jobs involving midrange and mainframe systems.

TABLE 6
HARDWARE PLATFORMS

	June	July	August	TOTALS
PC's	18.63	25.00	31.86	21.18
Client/Server	20.59	23.04	40.20	28.06
Midrange Systems	15.20	14.71	32.35	17.47
Mainframe Systems	11.27	10.29	13.73	9.90

Windows NT was the most frequently mentioned network operating system in the job ads, but UNIX, and Win95 or Windows 3.x were also mentioned quite frequently (see Table 7). Table 7 also illustrates that OS/400 was the most commonly mentioned operating system for midrange systems and that Novell NetWare was also mentioned in numerous ads.

TABLE 7
**PERCENTAGE OF ADS MENTIONING
(NETWORK) OPERATING SYSTEMS**

	June	July	August	TOTALS
Windows NT	36.76	23.04	40.20	28.06
UNIX	31.37	21.08	32.84	23.93
Windows 3.x or 95	22.06	17.16	34.80	20.77
OS/400	20.10	12.75	26.96	16.78
Novell NetWare x.x	8.82	11.76	24.51	12.65

The most commonly listed programming languages found in our content analysis of newspaper ads for IS positions are summarized in Table 8. COBOL was the most common programming language mentioned in the ads. It is possible that this reflects the growing pre-occupation with the Year 2000 problem; it may also reflect the existence of numerous legacy applications coded in COBOL in cities in the southeastern US. After COBOL, Visual Basic and C++ were the two most common programming language skills mentioned in the job ads. C and RPG were mentioned in numerous ads and Java and HTML were the most commonly mentioned languages for Internet and WWW applications.

Table 9 summarizes the most frequently mentioned application packages. As this table shows, IBM's Customer Information Control System (CICS) is still a marketable skill in major cities in the Southeastern U.S. Lotus Notes was the most frequently mentioned groupware product and Word and Excel were the two most commonly listed end-user applications mentioned in the job listings. As shown in Table 10, Powerbuilder was the most commonly mentioned client/server application development tool; no other application development tool of any type was specifically mentioned two percent or more of the ads in our sample.

TABLE 8
**PERCENT OF ADS MENTIONING
SPECIFIC PROGRAMMING LANGUAGES**

	June	July	August	TOTALS
COBOL	49.02	25.00	53.43	35.76
Visual Basic/VB	31.37	20.10	38.73	25.31
C++	35.78	19.12	34.80	25.17
C	27.94	13.73	18.14	16.78
RPG	16.67	10.29	20.10	13.20
JAVA	13.24	7.84	5.88	7.57
HTML	9.31	6.86	5.88	6.19

TABLE 9**PERCENTAGE OF ADS INCLUDING SPECIFIC APPLICATION SOFTWARE**

	June	July	August	TOTALS
CICS	25.98	12.25	22.55	17.06
Lotus Notes	16.18	6.37	8.33	8.67
Word (Microsoft)	8.82	6.86	11.76	7.70
Excel (Microsoft)	8.33	7.84	10.29	7.43

TABLE 10**PERCENTAGE OF ADS MENTIONING SPECIFIC DEVELOPMENT TOOLS**

	June	July	August	TOTALS
PowerBuilder	17.16	11.27	15.69	12.38

Table 11 shows that Oracle was the most commonly mentioned database application mentioned in want ads that we examined and that SQL was the most commonly mentioned database application language. DB2 appears to be the second most common database system in the Southeastern U.S. and our results suggest that Access is the most common microcomputer-oriented database system.

TABLE 11**PERCENTAGES OF ADS REFERRING TO SPECIFIC DATABASE SYSTEMS**

	June	July	August	TOTALS
Oracle	26.96	15.69	26.47	19.39
SQL	25.49	14.22	23.53	17.74
DB2	21.57	11.27	16.18	13.76
Access (Microsoft)	17.65	12.25	18.63	13.62
Sybase	9.31	7.35	10.78	7.70
FoxPro	7.84	4.41	10.78	6.46
IMS	10.29	3.43	7.35	5.91

DISCUSSION

When our results are compared to those obtained by Jacobson and Armstrong (1996) concerning the entry-level job market in the Middle Atlantic States, both similarities and points of departure can be noticed. Our findings for the types of general job skills and IS skills mentioned in the IS want ads are largely consistent with Jacobson and Armstrong's 1996 data. However, IS skills tended to be mentioned more frequently in Jacobson and Armstrong's Middle Atlantic cities.

The percentage of ads mentioning operating systems and network operating in our sample tended to be higher than that reported by Jacobson and Armstrong. The demand for IS professionals with Windows NT experience is notably higher in our sample (by a factor of 3) and both OS/400 and NetWare were also mentioned more frequently in our sample of IS want ads. UNIX was identified slightly less often in our sample of ads.

Our findings for database systems is largely consistent with those obtained by Jacobson and Armstrong with Oracle being the clear leader in both regions of the country. However, in the southeastern US in the Summer of 1997, both DB2 and Access were mentioned more often, while Sybase was mentioned less often.

Like those for Jacobson and Armstrong, our findings indicate that Powerbuilder is the most frequently mentioned client/server application development tool. For application software, relative to Jacobson and Armstrong, the frequent mention of CICS experience is notable in our sample while SAP was mentioned less often in our sample of newspaper ads. Most of the rest of our findings for application software and development tools are consistent with those reported by Jacobson and Armstrong.

Comparing our results for Atlanta to McLean and Schneberger's (1997) analysis of 10,000 Georgia IS want ads indicates more similarities than differences. Like these researchers, our findings indicate that UNIX, C, C++, Visual C++, COBOL, DB2, Powerbuilder and AS/400 programming skills are in high demand in the Atlanta/Georgia IS job market as is Oracle, SQL, and Visual Basic. Our results for general job skills and IS skills is also largely consistent with those

reported by McLean and Schneberger. Unlike McLean and Schneberger, business skills (such as finance, operations, accounting, and sales) were more likely to be mentioned in our sample of ads.

Curriculum Implications

There are several notable curriculum implications of our findings. First, the results suggest that it is important for IS curricula to emphasize both "hard" and "soft" IS skills. While specific technical competencies may help the graduates of IS programs obtain jobs, our results strongly suggest that communication, interpersonal, and teamwork-oriented skills (such as project management/coordination) are valued by employers.

The results also suggest that it is important for IS program graduates to be well-grounded in systems development processes and that the traditional systems development life cycle continues to serve as useful framework for helping students understand the tradeoffs associated with different platforms, applications, programming languages, and data access alternatives. Skills mentioned in the ads in our sample run the full range of the systems development life cycle.

Another important implication of the broad range of technical skills mentioned in the newspaper job listing that we analyzed is it is important for students graduating from IS programs to be prepared to develop new technical skills and competencies on an ongoing basis. IS is a highly dynamic field and lifelong learning is essential for career success and professional growth and development. As such, it is important for IS faculty to instill a love of learning in their students as well as to provide the conceptual foundation on which such learning can occur.

Future Research

In order to assess the generalizability of our findings, several follow-up investigations are planned. First, now that a workable skills grid and content analysis approach has been developed, the authors intend to leverage the work invested in this study by attempting to replicate it on an annual basis. This will enable us to perform longitudinal assessments and to

identify shifts in the demand for specific skills and competencies among employers of IS program graduates in the southeastern US.

To assess the generalizability of our findings beyond newspaper ads, another follow-up study is planned that will involve the application of our final skills/competencies grid to WWW IS job listings for cities in the southeastern U.S. Numerous newspapers have on-line classified ads (including want ads). In addition, independent Web-based IS job listing services have been developed for several major cities. It should be noted that the job listings available through such services are distinct from on-line classified ads posted on the Web by newspapers. While the same job may be listed in both venues, there may be differences in both content and format. Assessing/identifying these distinctions and determining the degree to which the IS skill patterns in these forums mimic those in print media (newspaper want ads) should provide another appropriate test of the generalizability of the findings of this investigation.

The investigators also plan to utilize the results of this newspaper classified ad study to develop survey instruments for administration to at least three distinct samples: job placement ("headhunter") firms, employers of the graduates of our IS program, and alumni of our IS program. The pattern of results that we obtain from survey respondents along with the findings of our analyzes of newspaper ads and on-line job listings should, in combination, provide solid evidence of the types of IS skills/competencies that are in high demand among employers in the Southeastern U.S. Such information should enable IS program faculty in our region of the United States to develop curricula that balance student acquisition of high-demand skills/competencies with an educational foundation that is conducive to lifelong learning.

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