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AUTHOR Case, Thomas L.

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ABSTRACT

Universities and educationally-oriented researchers have turned to survey research, advisory boards, and content analyzing newspaper want ads to provide guidance in keeping their curricula and IS/IT (Information Systems/Information Technology) course contents up-to-date. While such approaches can provide insight into the range of skills that employers are looking for, they may stop short of identifying emerging skills and/or the especially "hot" skills for which organizations are willing to pay a premium. This investigation was undertaken to determine whether the content analysis of IS/IT training ads in newspapers and online venues is superior to the content analysis of newspaper want ads in identifying high-demand and/or emerging IS/IT skills. The findings suggest that content analyzing training ads can provide IS educators with greater insight into high-demand IS/IT skills than can be observed in newspaper want ads. The findings also suggest the contents of IS/IT want ads are superior to training ads in their attention to "soft" skills (e.g., interpersonal, problem-solving, analytic, communication, project management) and enduring concepts that serve as cornerstones for lifelong learning. Universities are typically better positioned than training firms to help students develop the "soft" skills; training firms may be better positioned than universities to help trainees develop particular technical skills and competencies. (MES)

# USING TRAINING ADS TO IDENTIFY HIGH-DEMAND IS/IT JOB SKILLS AND COMPETENCIES



**Thomas L. Case**
***Georgia Southern University***



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*IS educators and administrators are continually challenged to offer a curriculum that appropriately balances employer needs, accreditation requirements, and university realities including budget and staffing constraints. An important aspect of addressing this challenge involves staying abreast of the evolution of high-demand IS/IT skills. Numerous universities and educationally-oriented researchers have turned to survey research, advisory boards, and content analyzing newspaper want ads to provide guidance in keeping their curricula and IS course contents up-to-date. While such approaches can provide insight into the range of skills that employers are looking for, including the relative demand for particular skills, they may stop short of identifying emerging skills and/or the especially "hot" skills that organizations are willing to pay a premium for. The current investigation was undertaken to determine whether the content analysis of IS/IT training ads in newspapers and on-line is superior to the content analysis of newspaper ads in identifying high/demand and/or emerging IS/IT skills. The findings suggest that content analyzing training ads can provide IS educators with greater insight into high-demand IS/IT skills than can be observed in newspaper want ads. The findings also suggest the contents of IS/IT want ads are superior to training ads in their attention to "soft" skills and enduring concepts that serve as cornerstones for lifelong learning. Universities are typically better positioned than training firms to help students develop the "soft" skills; training firms may be better positioned than universities to help trainees develop particular technical skills and competencies.*

## INTRODUCTION

Ensuring that IS program graduates possess skills and abilities sought by employers is an important issue among conscientious IS educators. IS educators (both faculty and program administrators) are continually challenged to craft curricula that satisfy a variety of criteria including:

- meeting accreditation standards
- up-to-date content
- sufficient breadth to ensure a foundation for lifelong learning
- courses, skill development and internship experiences that provide students with the background required by employers
- curriculum (and course) content that prepare students for graduate programs.

Simply identifying curricular content that satisfies labor market needs can be a daunting task in an age when the shelf-lives of technical skills are becoming shorter and shorter.

IS educators have utilized a variety of approaches to stay abreast of IS/IT skills demanded by employers. Numerous investigators have utilized questionnaires to identify industry needs including surveys of companies who have hired program graduates, surveys of potential employers of program graduates, and surveys of program alumni. Other researchers have content analyzed newspaper want ads in order to identify the relative demand for specific skills and abilities among employers. Studies that have analyzed newspaper ads include Arnett and Litecky (1994), Athey and Plotnicki (1992), Case, Price, and Rogers (1997), Jacobson and Armstrong (1996), McLean and Schneberger (1997), Prabhakar, Litecky, and Arnett (1995), and Todd, McKeen, and Gallupe (1995).

A common purpose of most of these investigations has been to determine the IS/IT skills, and educational/practical background(s) sought by employers. Most were undertaken to gather curriculum-relevant information that could be used to select of programming languages, software tools, and other information technologies that could serve the dual purpose of

illustrating (enduring) course concepts and providing skills that would help graduates get jobs.

The 1997 study conducted by Case, Price, and Rogers is illustrative of the general approach that is used in the investigations that have content analyzed newspaper ads. Classified ads for IS jobs listed in the Sunday editions of the *Savannah Morning News,* the *Charlotte Observer,* and the *Atlanta Constitution* collected during the Spring of 1997 were used to develop a grid of IS/IT skills/competencies. The grid, implemented as an Excel spreadsheet, consisted of approximately two-hundred distinct skills/competencies grouped into umbrella 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 grid was subsequently used to analyze the content of more than 700 IS want ads that appeared in the major newspapers published in Atlanta, GA, Birmingham, AL, Charlotte, NC, Columbia, SC, Jacksonville, FL, Miami, FL, and Tampa, FL. on the first Sunday in June, July, and August, 1997.

A subset of the findings of the Case, Price, and Rogers (1997) investigation that is especially relevant to the current investigation are summarized in Tables 1 - 4. It is important to emphasize that Tables 1-4 represent a subset of a broader range of IS/IT skills summarized by the researchers. For example, these researchers also provide data addressing the relative demand for a variety of "soft" skills (interpersonal, communication, problem-solving, project management, etc.), particular educational backgrounds, and experience with particular hardware platforms. The findings summarized in Tables 1 - 4 have been extracted to illustrate the nature of the outcomes of most newspaper want ad studies and their potential shortcomings.

Table 1 suggests that Windows NT is in high demand among employers. Demand for UNIX experience and Windows also seems to be fairly strong among the employers whose newspaper ads were included in this investigation's sample. Unfortunately, these results are clouded by the fact that the demand for Windows NT is the collective demand for Windows NT Advanced Server as well as the client (desktop) operating system, Windows NT Workstation. Similarly, in Table 1,Windows 3.x (whose utilization is rapidly fading) is not cleanly broken out from Windows 95. Hence, while these results provide a general sense of the OS skills/competencies that employers in the Southeastern U.S. are looking for, their focus could be sharper. More importantly, the results do not clearly indicate whether any of these skills/competencies are in high demand, i.e., those for which employers would offer higher salaries.

**TABLE 1**
**OPERATING SYSTEMS IDENTIFIED IN IS WANT ADS**

| Operating System | Percent |
|---|---|
| Windows NT | 28.06 |
| UNIX | 23.93 |
| Windows 3.x or 95 | 20.77 |
| OS/400 | 16.78 |
| Novell NetWare | 12.65 |

The most commonly listed programming languages found in the sample of want ads analyzed by Case, Price, and Rogers (1997) are summarized in Table 2. These results could be interpreted in several ways. For example, they might indicate that COBOL is being widely used among firms in the Southeast US to develop new applications. They may also indicate a need to hire COBOL programmers to address Y2K problems, or that maintenance programmers are needed to maintain a sizable presence legacy systems coded in COBOL. In short, the reported data do not help IS educators pinpoint if the demand for COBOL programming experience among employers is driven by the need for new applications, Y2K problems, or a need for maintenance programmers. The results are also silent on the question of whether firms are willing to pay a premium for experienced COBOL programmers. These shortcomings limit the curricular value of the reported data.

Other limitations can be observed in Table 2. For example, C and RPG were mentioned more frequently in this sample of newspaper ads than Java and HTML. Does this imply that experienced C and RPG programmers command higher salaries than Java programmers and website developers? Should IS educators be building 21st century curricula around C and RPG rather than Java? Once again, the relative frequencies reported in this investigation may mask the skills/competencies that are truly in demand among employers.

Table 3 summarizes the most frequently mentioned application software mentioned in the ads analyzed in this particular study. This table suggests that experience with

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. Notably absent from Table 3 is experience with packages such as Baan, Peoplesoft and SAP. While Case et al. mention that SAP experience was specified in slightly more than two percent of their sample of want ads, trade periodicals consistently note that demand for SAP-experienced outstrips the supply. As a result, IS professionals with SAP proficiency often command high starting salaries.

Table 4 illustrates that Oracle was the most commonly mentioned database application mentioned in the sample of want ads collected by Case et al. (1997). SQL was the most commonly mentioned database application language; Access was the most commonly mentioned microcomputer-oriented database system. Few would argue with the importance of Oracle, SQL, and Access in today's computing environments, but again, the picture is far from clear for IS educators to derive a great deal of value from the findings. For example, how much experience with Oracle and/or SQL should students have? Is it sufficient to have students write SQL queries on an Oracle database, or should they be provided with in-depth experience with Designer 2000 or Developer 2000? What will set them apart in the job market? How much experience is needed to make students truly attractive to employers?

**TABLE 2**
**PROGRAMMING LANGUAGES SPECIFIED IN IS WANT ADS**

| Programming Language | Percent |
|---|---|
| COBOL | 35.76 |
| Visual Basic | 25.31 |
| C++ | 25.17 |
| C | 16.78 |
| RPG | 13.20 |
| JAVA | 7.57 |
| HTML | 6.19 |

**TABLE 3**
**APPLICATION SOFTWARE MENTIONED IN IS WANT ADS**

| Application Software | Percent |
|---|---|
| CICS | 17.06 |
| Lotus Notes | 8.67 |
| Word (Microsoft) | 7.70 |
| Excel (Microsoft) | 7.43 |

**TABLE 4**
**DATABASE TECHNOLOGIES MENTIONED IN IS WANT ADS**

| Database Technology | Percent |
|---|---|
| Oracle | 19.39 |
| SQL | 17.74 |
| DB2 | 13.76 |
| Access (Microsoft) | 13.62 |
| Sybase | 7.70 |
| FoxPro | 6.46 |
| IMS | 5.91 |

The weaknesses encountered in the data reported by Case, Price, and Rogers (1997) are endemic to most investigations that have summarized the contents of newspaper ads. While such studies may provide an overview of the range of IS/IT skills being sought by employers at a particular point in time (and sometimes in a limited geographic area), the examples mentioned above suggest that newspaper ads may present a limited view of the IS job market. In particular, investigations that content analyze newspaper want ads may fail to capture the importance and market value of emerging competencies and/or the skills/competencies that organizations are willing to pay a premium for.

The rare mention of known high-demand skills (such as experience with SAP, Peoplesoft, Baan, or Cisco internetworking technologies) in newspaper ads may be due to a collective perception among organizations that newspapers may be poor media for attracting individuals who possess cutting-edge or niche talents. Firms may utilize other media (including headhunters, IS trade

publications, and on-line job listings) for recruiting/attracting individuals with high-demand niche expertise.

All of this suggests that newspaper ad investigations may have limited value to IS educators, especially those IS educators that are seeking to identify programming languages, operating systems, application software, and information technologies that can be used to illustrate course concepts and that are also in high-demand among employers.

Are there other/better sources than newspaper ads for identifying emerging and/or high-demand skills? Possibly so. Content analyzing the want ads that appear in major trade publications such as *Computerworld* may provide better insight than content analyzing newspaper ads. IS educators might also be better served by contacting headhunters that specialize in recruiting/placing IS/IT professionals. They are often aware of "what's hot and what's not" as well as the types of skills that organizations are paying big bucks (and high placement commissions) for. A third potentially useful approach may be to focus on the IS/IT training programs available in major IS/IT employment hubs. Such programs are typically developed in response to recognized employer needs for particular types of skills; the training firms are often reacting to supply-demand imbalances in the IS/IT labor market and have recognized the opportunity to capitalize on these imbalances. Often, trainers are able to draw trainees directly from employers who are desperate for particular IS/IT skills. They are also able to attract IS/IT professionals who recognize the supply/demand imbalances and hope to leverage the training to secure higher salaries and/or positions in firms who need employees with such training.

This third approach is the focus of the current investigation. Two studies were performed to assess the relative value of this approach for identifying high-demand IS skills/competencies. The first analyzed the content of ads for IS/IT training programs appearing in a Sunday edition of a newspaper in a major IS/IT employment hub: Atlanta, Georgia. The second study analyzed the content of on-line IS/IT training ads for the Atlanta job market found on the web on the same Sunday.

## METHODOLOGY: NEWSPAPER TRAINING AD STUDY

The primary purpose of this investigation was to assess the correspondence between the types of training offered by IS/IT training firms and the patterns of industry needs observed in a 1997 study that content analyzed IS/IT want ads in major city newspapers in the Southeastern U.S. (Case, Price, and Rogers, 1997). In order to do this, the content of 28 IS/IT training ads appearing the Sunday, April 26, 1998 edition of the *Atlanta Constitution.* These 28 ads represented the total set of IS/IT training ads appearing in this newspaper on this particular Sunday.

The content analysis consisted of tallying the frequency that specific types of training were mentioned across the training ads published in the newspaper. The frequencies were converted to relative frequencies so that they could be compared to the relative frequencies (percentages) reported in the 1997 newspaper ad study.

The advertised IS/IT training programs were placed in the following categories (Operating Systems, Programming Languages, Applications, Database Technologies, Certifications, and Special Training). The results of this content analysis are summarized in the following tables and paragraphs.

## RESULTS: NEWSPAPER TRAINING AD STUDY

Table 5 summarizes the types and relative frequency of operating system and network operating system training (distinct from that available through certification programs) mentioned in the 28 training ads. UNIX training is clearly the leader with Windows NT (the desktop version) being the second most frequently offered training program in the Atlanta area. Windows 95, NetWare 4.11, and Windows NT Server training were the only other types of operating systems training mentioned in the ads.

Table 6 summarizes the relative frequency of training in specific programming languages appearing in the training ads. Visual Basic training is the most widely available programming language training available from the training firms placing ads in this newspaper. C and C++ training are second in availability; HTML training is third with Java not far behind. SQL training was the only other programming language specified in these ads.

Table 7 summarizes the major application (development) software mentioned in the training ads. Powerbuilder is clearly the most popular type of application development tool training that is available among these training firms in the Atlanta area. Training in SAP R/3, Peoplesoft, and AutoCAD is also available. Two ads appearing in the newspaper offered training programs for Internet Explorer and Netscape. One ad offered training programs covering a wide range of word processing (Word, WordPerfect,

Word Pro), spreadsheet (Lotus 1-2-3, Excel, Quattro Pro), and presentation graphics (Freelance Graphics, Powerpoint, Corel Presentations). Single ads for Eudora (e-mail) training, and Microsoft Outlook also appeared in the newspaper on this particular Sunday.

Table 8 summarizes the database-oriented training offered in the training ads. Needless to say, it is all Oracle or a specialized form of Oracle.

Table 9 summarizes the types of certification training programs offered by training firms in the Atlanta metropolitan area. Clearly training for Microsoft's MCSE certification is the most widely available; it is, in fact, the most frequently mentioned type of IS/IT training found in the ads. A+ certification training is second in availability, with CNE certification training third. As is apparent from Table 9, a variety of other certification training programs are also available in the Atlanta area including Microsoft Certified Office User, Cisco's CCIE, and Certified Help Desk Professional.

A variety of special training programs were also mentioned in the training ads appearing in this particular edition of the *Atlanta Constitution*. Included in this category is webmaster training, Internet Server training, Microsoft Exchange training. Other special training was available in web-page design, web-page publishing, TCP/IP, and NDS (Novell's directory services).

**TABLE 5**
**OPERATING SYSTEMS IDENTIFIED IN IS/IT TRAINING ADS**

| Operating System | Percent |
|---|---|
| UNIX | 21.43 |
| Windows NT Workstation | 14.29 |
| Windows 95 | 7.14 |
| Novell NetWare | 7.14 |
| Windows NT Server | 3.57 |

**TABLE 6**
**PROGRAMMING LANGUAGES SPECIFIED IN TRAINING ADS**

| Programming Language | Percent |
|---|---|
| Visual Basic | 25.00 |
| C | 17.86 |
| C++ | 17.86 |
| HTML | 14.29 |
| Java | 10.71 |
| SQL | 3.57 |

**TABLE 7**
**APPLICATION SOFTWARE MENTIONED IN TRAINING ADS**

| Application Software | Percent |
|---|---|
| Powerbuilder | 14.29 |
| SAP R/3 | 3.57 |
| Peoplesoft | 3.57 |
| AutoCAD | 3.57 |

**TABLE 8**
**DATABASE TECHNOLOGIES MENTIONED IN TRAINING ADS**

| Database Technology | Percent |
|---|---|
| Oracle | 17.86 |
| Oracle DBA | 10.71 |
| Designer 2000 | 7.14 |
| Developer 2000 | 7.14 |
| Oracle Financials | 3.57 |

TABLE 9
CERTIFICATIONS MENTIONED IN IS/IT TRAINING ADS

| Certification | Percent |
|---|---|
| MCSE | 42.85 |
| A+ | 21.43 |
| CNE | 17.86 |
| MSOU | 10.71 |
| MCPS + Internet | 7.14 |
| Help Desk | 7.14 |
| Cisco CCIE | 7.14 |
| MCSD | 3.57 |
| MCPS | 3.57 |
| Bay Networks | 3.57 |
| Lotus Notes | 3.57 |
| CNA | 3.57 |

## DISCUSSION: NEWSPAPER TRAINING AD STUDY

As noted in the Introduction, the newspaper ads have been content analyzed by a number of investigators to gauge the demand for specific skills and abilities being sought by employers. Few investigators have actually attempted to verify their results through follow-up studies although most have recognized the importance of doing so. Todd, McKeen, and Gallupe's (1995) longitudinal study arguably does the best job of attempting to verify results across time, but their results are viewed by many IS educators as too general to provide specific guidance for curriculum modifications that respond to local or regional employer needs.

Training ads in the *Atlanta Constitution* were deliberately selected for this investigation because Atlanta was identified by Case, Price, and Rogers (1997) as being the major IS/IT job market in the Southeast; this was corroborated by the fact that the largest percentage of major city newspaper ads analyzed in their investigation came from this newspaper.

This content analysis of training ads provides tends to verify some of Case et al.'s findings, but tends to cast doubt on the curriculum-oriented value of many of the findings that they report. Similarity/verification is strongest in the area of operating systems. When Tables 1 and 5 are juxtaposed, it is clear seems clear that UNIX is one of the most important platforms in the Southeastern US, at least in Atlanta. Windows NT is also important. While their order reverses between the two studies, they are first and second in both. Windows, at least Windows 95, is third in both studies and the relative importance of NetWare is consistent across the two investigations. However, the importance of OS/400 (see Table 1) is not substantiated in the training ads, at least to the extent that no Atlanta area trainers were using the newspaper to advertise the availability of courses or training programs for this OS.

Additional verification of Case et al's findings seems to be found in the area of database technologies. As noted in Table 4, Oracle was the most commonly mentioned database in this particular newspaper ad study. When Atlanta area training ads are content analyzed (see Table 8), Oracle is the *only* type of database training being advertised. While this provides strong corroboration for Case et al's findings regarding this particular database, it raises doubt about the relative importance of the other database technologies found in their sample of newspaper ads.

Only partial verification of Case et al's findings regarding programming languages is provided by this content analysis of training ads. While the results of this study tend to confirm the marketability of Visual Basic, C, C++, Java, and HTML, there is no evidence that COBOL (Case et al's most frequently mentioned language) or RPG are perceived as having market value by the training firms in the Atlanta area. Neither COBOL nor RPG training is mentioned in this sample of training ads.

The percentage of training ads specifying the availability of Powerbuilder training (14.29%) is approximately the same as that found in Case et al's sample of newspaper ads (12.38%). While CICS was frequently mentioned in the newspaper ads, it escaped mention in the training ads. Experience with end-user products such, as Word and Excel, was mentioned more frequently in the newspaper want ads than in the training ads. As noted previously, only one training firm advertised in this edition of the newspaper that it offered training in end-user products.

The most striking difference between the results of this investigation and those reported by Case, Price, and Rogers (1997) was found for professional certifications. While Case et al. report that professional certifications such as Microsoft's MCSE and Novell's CNE "were rarely mentioned in the ads" ( p. 148), they were liberally mentioned in this sample of training ads. MCSE training appears to be one of the most available types of IS/IT training in the Atlanta area. This finding is consistent with recent articles in trade publications (such as *Computerworld*) claiming that MCSE certification can mean a $7000 to $10,000 salary jump for individuals that obtain it. CNE certification also typically translates into a salary increase, but not as much as MCSE.

Table 9 suggests that a variety of other certifications also possess market value. Training programs for several Microsoft certifications (including MSOU, and MCPS + Internet) suggest that such certifications may be in sufficient demand in the Atlanta area for training firms to perceive it worth their while to offer training courses in these areas. Becoming a Certified Help Desk Professional and obtaining Cisco's CCIE also appears to have some value in the Atlanta IS/IT labor market. None of these certifications are even mentioned by Case et al. The findings of this investigation suggest that there must be some market value for these certifications in spite of their rare mention newspaper ads.

Noticeably absent from any of the newspaper training ads are courses designed to enhance "soft" skills (interpersonal, problem-solving, analytic, communication, project management, etc.). Also absent are general IS skills such as systems development, operations, and maintenance. Both soft skills and general IS skills were frequently mentioned in the newspaper want ads analyzed by Case, Price, and Rogers (1997).

The training ads analyzed in this investigation are decidedly focused on technical skill development/ enhancement. This pattern may also indicate a general bias among the training firms toward teaching easier-to-teach technical skills. The findings may indicate that training firms do not perceive a market for soft and general IS skill development courses. Since newspaper ad investigations consistently suggest that employers often seek new hires who possess a combination of technical and soft-side skills, the lack of attention to soft skills demonstrated by training firms may represent a skill-development niche that can be exploited by IS educators at colleges and universities.

## METHODOLOGY: ON-LINE TRAINING ADS STUDY

In order to assess the generalizability of the previously discussed content analysis of newspaper training ads, a sample of training ads found on-line on the same day in the same major IS/IT employment hub was content analyzed. In this investigation, on-line training ads listed on the Technical Training page of a popular Atlanta IS/IT website (www.atlanta.computerjobs.com) on Sunday, April 26, 1998, were content analyzed.

The webpage summarizing the on-line training ads (n=44) was printed out. To facilitate comparison, the same categories as the ones developed for newspaper training ads were utilized. As was done for the newspaper training ads, the particular types of training courses falling into each of these categories were tallied and converted to relative frequencies (percentages). The major results of this investigation are summarized in Tables 10 through 13.

## RESULTS: ON-LINE TRAINING ADS STUDY

A wider variety of training courses/programs were listed on-line than in the newspaper training ads. The convenience of web-publishing and the higher costs associated with placing ads in newspapers may account for the greater variety found on-line.

Greater emphasis on end-user training programs was found on-line than in the newspaper training ads. While training ads in the newspaper could be characterized as quite squarely focused on developing core IS/IT technical skills, the on-line ads offered a mixture of training encompassing both core IS/IT technical skills and end-user skills. In addition, unlike the newspaper training ads, the training programs advertised on-line mentioned courses focusing on "soft" skills and general IS job skills. Project management training was most common; it was mentioned in just over 10% of the ads. General courses on topics such as computer basics, software development, website creation, and networking fundamentals were also listed on-line but not in the newspaper ads.

Many of the training programs mentioned in on-line ads were less specific than those in the newspaper ads offering training. For example, some on-line advertisers offered training in "operating systems, spreadsheets, Macintosh, databases, word processing, and all major office suites". Others offered "Lotus authorized training", "Oracle

products training" and "Microsoft networking". Many of these ads invited readers to visit their websites for more specific information. Because a primary of this investigation was to assess the generalizability of the results the newspaper training ad study, the non-specific on-line training ads were ignored (not classified) in this investigation.

Table 10 summarizes the major operating systems training mentioned in the on-line ads at this Atlanta website. The relative frequencies are quite consistent with those summarized in Table 5 for the training ads printed in the newspaper. UNIX and Windows NT are the platforms for which training is most widely available.

**TABLE 10**
**OPERATING SYSTEMS SPECIFIED IN ON-LINE TRAINING ADS**

| Operating System | Percent |
|---|---|
| UNIX | 25.00 |
| Windows NT Workstation | 15.91 |
| Windows 95 | 11.36 |
| NT Server | 9.09 |

Table 11 summarizes the programming languages that are mentioned most frequently in the on-line training ads. When compared to Table 6, it is quite clear that there is a great deal of consistency among print and on-line ads for programming language training. Visual Basic training is among the most widely available types of training mentioned in both media. C++ training is also frequently advertised in both forums. Java training was observed to be advertised more frequently on-line than in the newspaper ads; SQL shows a similar pattern. Perl was mentioned in 6.8% of this sample of on-line training ads as was ActiveX. In general, web-oriented languages were specified more frequently in the on-line training ads than in newspaper training ads.

Other important types of training found in this analysis of on-line training ads are summarized in Table 13. Lotus Notes training was mentioned more frequently on-line than in newspaper training ads while Powerbuilder was advertised less frequently on-line. Both Access and Delphi training were only advertised on-line; they were not mentioned in newspaper training ads in Atlanta on this particular Sunday. Pagemaker was also only specified on-line.

**TABLE 11**
**PROGRAMMING LANGUAGES SPECIFIED IN ON-LINE TRAINING ADS**

| Programming Language | Percent |
|---|---|
| Visual Basic | 20.45 |
| C++ | 20.45 |
| Java | 20.45 |
| C | 13.36 |
| HTML | 11.36 |
| SQL | 11.36 |

Table 12 summarizes the relative frequencies of certification training courses/programs advertised at this website. These percentages are generally consistent with those specified in the training ads in the newspaper (see Table 9); they tend to corroborate the perception created by the newspaper training ads that professional certifications are valued in the IS/IT job market. As noted previously, such findings seem to be at odds with the results of Case, Price, and Rogers (1997).

You may have noted that no attempt was made in this study to devise Tables comparable to Tables 7 and 8 for the analysis of newspaper training ads. This is because training programs for specific database technologies and application development tools were specified very infrequently in this sample of on-line ads. Although the newspaper training ads seem to confirm Case et al's finding that Oracle is the dominant database technology in the Southeastern US, the on-line training listings rarely reference Oracle or specific Oracle applications (e.g. Oracle Financials). The same pattern can be observed for the development tools summarized in Table 8. These were virtually non-existent in the on-line training ads—somewhat surprisingly, SAP was not mentioned at all.

TABLE 12
CERTIFICATIONS MENTIONED IN ON-LINE TRAINING ADS

| Certification | Percent |
|---|---|
| MCSE | 25.00 |
| A+ | 22.72 |
| CNE | 15.91 |
| CNA | 9.09 |
| MCPS + Internet | 6.82 |
| MCPS | 6.82 |
| MCSD | 4.55 |
| Help Desk | 4.55 |

TABLE 13
OTHER IS/IT TRAINING FREQUENTLY SPECIFIED IN ON-LINE TRAINING ADS

| Training type | Percent |
|---|---|
| Lotus Notes | 11.36 |
| Access | 11.36 |
| Delphi | 6.82 |
| SQL Server | 6.82 |
| Proxy Server | 6.82 |
| Pagemaker | 6.82 |
| Act! | 6.82 |
| Powerbuilder | 4.55 |

## GENERAL DISCUSSION

Like the content analysis of newspaper training ads, the analysis of on-line IS/IT training ads tends to support some of Case, Price, and Rogers (1997) findings and to cast doubt on others. Significant differences can be observed among the studies in the areas of programming languages and professional certifications. While Case et al found COBOL to be the most frequently mentioned language in their sample of IS/IT want ads in major cities in the Southeastern US, COBOL training is noticeably absent from both newspaper and on-line training ads. Also, although Case et al found professional certifications rarely mentioned in their sample of want ads, professional certification training is arguably the most widely advertised type of IS/IT training offered by training firms in the Atlanta area. Such inconsistencies may contribute to prolonged debates among IS educators about the place of COBOL in IS curricula and whether courses should be restructured to move students toward professional certifications.

The findings suggest that a wider array of IS/IT training may be advertised on-line than in newspapers, at least this seems to be the case in Atlanta. In general, training programs advertised in the newspaper are more consistently oriented toward core IS/IT skills/competencies than are those advertised on-line. Similar to newspaper training ads, on-line training ads generally have a strong technical flavor, however, the wider range of training and the inclusion of end-user and a few "soft" skills training programs slightly dulls the technical edge of on-line training ads. The wider range of training found on-line tends to make the results of the second study more consistent the results reported by Case et al.

The findings in these two analyzes of training ads tends to confirm the results of other studies focusing on the Georgia and Southeast U.S. For example, McLean and Schneberger (1997), report that UNIX experience is highly valued in the IS/IT job market in Georgia; Visual Basic, C and C++ are also reported by these researchers to be in high-demand among employers in Georgia. The findings of these two training ad investigations do not contradict McLean and Schneberger's claims.

The findings of these investigations suggest that HTML and Java appear to be growing in value. The newspaper training ad study seems to provide further evidence that Oracle experience is important among employers in the Atlanta area.

While not mentioned in the newspaper training ads, soft skills training programs were available from a few the training firms advertising on-line. Case, Price, and Rogers (1997) found them to be mentioned frequently in their sample of IS/IT want ads. McLean and Schneberger (1997) and Jacobson and Armstrong (1996) found in the same pattern in their analyses of IS/IT newspaper want ads. This consistency across the newspaper ad studies offers strong evidence that such skills are highly valued by many employers. Since training programs for such

skills seem to be overlooked by most training firms, soft skill development may represent a niche training area that college and universities can exploit.

**Limitations of this Investigation**

It is important to note that this study focused on training IS/IT advertisements for a single Southeastern US city (Atlanta) in April of 1998. Case, Price, and Rogers (1997) cast a wider net by capturing data from most of the major cities and IS/IT employment hubs in the Southeastern US. If this study had attempted to analyze training ads from each of the cities included in Case et al's investigation, more similarities and fewer points of departure among the findings might have been observed. The fact that this study only captured data at one point in time (and at a time different from the Case et al study) is also a limitation. Differences observed across the studies findings may reflect the changing popularity of particular languages or technologies.

Another potential limitation may reside in its assumption that firms offering training programs are attuned to employer needs and the relative value of particular skills in the Atlanta IS/IT job market. While it seems reasonable to assume that trainers would not offer training for non-valuable skills/competencies, we should not lose sight of the fact that training ads are marketing tools for training firms. They are created to "sell" the importance of the skill in order to lure buyers (trainees) to take advantage of their services (training programs). Like other effective marketers, training firms have a vested interested in selling their product even if it isn't exactly what the market needs. Hence, there may be more reason to trust what employers say they need in the want ads that they personally place in newspapers than to trust the skills being "sold" by training firms.

**Curricular Implications**

When the results of Case, Price, and Rogers' (1997) newspaper want ads study are juxtaposed with those of the current investigation, no clear curriculum path is indicated for programming languages. COBOL remains a question mark as do the emerging web-oriented languages such as Java. Visual Basic and C++ seems to be pretty safe bets at this point in time in spite of some prognosticators who predict that these languages will be displaced by Java within three to five years. There is strong evidence across the studies that using UNIX to illustrate course concepts will also provide students with marketable skills.

Perhaps the most significant curricular implication of this investigation is the potential soft skill training niche that universities and colleges are positioned to exploit. Such institutions have traditionally been focused on helping students fine-tune their communication and interpersonal skills. Thus, they seem to be well-positioned to leverage their traditional strengths to provide students with valuable labor market skills (the soft skills) that training firms seem to be ignoring in favor of technical skill development.

It is common knowledge that the need for particular technical skills will continue to change in the years ahead and that their half-lives will continue to shorten. The soft skills that colleges and universities are well-positioned to cultivate among their students are likely to be much more enduring. Some of these soft skills will be the cornerstones of the foundation needed for lifelong learning.

To directly compete with IS/IT training firms, colleges and universities will have to find ways to incorporate high-demand technical skills/competency development within their curricula. Since such skills/competencies change often and rapidly, universities will have to be committed to ongoing (and potentially costly) faculty training and development in high-demand languages, application programs, operating systems, and IT technologies. Faculty members will have to have up-to-date skills/competencies if they are going to help their students develop the same. Ironically, in the near-term, such faculty training and development is likely to be provided by IS/IT training firms.

In Georgia, some universities and technical schools are restructuring their curricular to include training toward professional certifications (such as the MCSE) within their programs of study. Such restructuring is part of Georgia's ICAPP program which is designed to enable the University System of Georgia to satisfy more of the state's burgeoning demand for IS/IT employees with state-of-the art skills and competencies. This attempt to provide degree-seeking students with the types of technical training traditionally available from training firms seems to be one university system's attempt to compete more directly with training firms.

**Future Research**

An obvious follow-up to this investigation is to expand it to incorporate training program data from all the cities in the Southeastern US that were included in Case, Price, and Rogers (1997) If a similar pattern of findings was

found, there would be strong evidence that these findings reflect the general types of technical training available in the major IS/IT employment hubs in the Southeastern U.S.

Another approach would be to survey and/or interview headhunters and IS placement firms to assess their views of the skill sets that are most in demand among employers. Such an investigation would help to address the question of whether training firms are attuned to the real needs of the market. It would also provide another test of the extent to which newspaper want ads accurately reflect high-demand IS/IT skills. Other investigations might survey the graduates of IS programs concerning the types of training they have recently received and the types of training they want to pursue next. The consistency among newspaper and on-line IS/IT want ads should also be assessed.

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