

# ORGANIZATIONAL AND END-USER INFORMATION SYSTEMS JOB MARKET: AN ANALYSIS OF JOB TYPES AND SKILL REQUIREMENTS

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*The ever-changing information systems/information technology (IS/IT) environment and job market have generated a great deal of interest in IT skill requirements and career opportunities. Previous studies indicated an increasingly diverse IT job market and identified fast growth IT careers, including those with an end-user focus. The purpose of this study was to determine the specific types of organizational and end-user information systems (OEIS) jobs that are in demand. A comprehensive job classification scheme containing five main job categories (end-user support, business analyst, training, Web and interface design, and technical writing) and 24 subcategories emerged from an analysis of 484 end-user related job advertisements. Besides job types, this study included an analysis of primary work responsibilities, skill and work experience requirements, and characteristics of hiring companies. The research confirmed the availability of a variety of job opportunities for organizational and end-user computing professionals and highlighted the importance of an internship and/or other real-world experience to increase IT graduates' marketability.*

## INTRODUCTION

Rapid advancements in information and communication technologies (ICTs) have resulted in organizations' greater reliance on ICTs. Along with changes in technologies and their applications, demands and expectations for information systems/technology (IS/IT) professionals have evolved also. In the past two decades, knowledge and skill requirements and career opportunities for IT students have been a subject of interest among IS/IT educators. Since the 1980s, there have been a number of research studies on this subject. Studies on highly sought-after knowledge and skills and career opportunities for future IT professionals indicated a growing diversity in the IT job market (Lee, Trauth, & Farwell, 1995; Maier, Greer, & Clark, 2002; Noll & Wilkins, 2002; Trauth, Farwell, & Lee, 1993). Findings from these studies concluded that the traditional, generic IT curriculum was no longer adequate in meeting organizations' needs. Furthermore, as off-the-shelf information systems are becoming more prevalent, and many IT jobs that require little

user/client interactions are moving overseas (Mann, 2004), along with exponential growth in the amount of information in organizations, IT services that support organizational strategies and focus on meeting end users' information needs are becoming more important (Lee et al., 1995; Noll & Wilkins, 2002; Trauth et al., 1993).

While the importance of organizational and end-user computing is recognized among IT educators and organizations, the specific requirements of the hiring organizations for IT professionals in this area are not clear, given the diversity of organizational and end-user computing related knowledge domains. Furthermore, while there have been numerous studies on IT job market and skill requirements,

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few research studies focused specifically on non-programming, organizational and end-user information systems knowledge and skills. As summarized in the following section, many of the existing IT jobs and skills surveys either had a very narrowly defined end-user support category, relegating it to a peripheral role, or focused solely on the traditional IT areas such as programming and systems analysis and excluded organizational and end-user computing all together.

The purpose of this study is to gain a better understanding of the current market demands for organizational and end-user information systems (OEIS) professionals through a content analysis of job advertisements. In order to get a broad perspective on the availability and types of OEIS jobs in the United States, job advertisements posted by firms across the U.S. were used as the study's data source. Findings from this study can then be used as a basis for future studies such as surveys and interviews of IS recruiters and IT managers to obtain more in-depth information on various types of OEIS jobs. In addition to analyzing and categorizing demands using the job responsibilities and knowledge and skill requirements specified in these advertisements, characteristics of the hiring organizations (industry and geographic region) were examined also. This study purports to answer these questions:

1. What types of jobs are available for non-programming IT professionals?
2. What are the job responsibilities?
3. What are the knowledge and skill requirements?
4. What are the required work experience levels?
5. What are the characteristics of hiring companies (industry and geographic location)?

As the research questions suggest, this study focuses not just on the skill requirements but also on the types of organizational and end-user computing jobs that are in demand. One of the study outcomes, a comprehensive job classification scheme, can be used as a framework for future studies in this area. Another

contribution of this study is to offer IS/IT educators a means to validate the currency of their curriculum and its alignment with market demands. Furthermore, profiles and characteristics of recruiting organizations can be a valuable information source for IS educators when they offer career advice to their students. The following section is a summary of existing studies on IT job demands and skill requirements. It is followed by the research method and findings of this study.

## **IT JOB DEMANDS AND SKILL REQUIREMENTS STUDIES**

A review of IT job demands and skill requirements studies published in key IT academic journals was conducted. These journals included Information Technology, Learning, and Performance Journal, Journal of Computer Information Systems, Journal of Information Systems Education, Journal of Information Technology Education, Journal of Management Information Systems, and MIS Quarterly. Based on the source of data collected, these studies can be divided into three categories: (1) inputs from employers and recruiters, (2) surveys of faculty and students/recent graduates, and (3) analyses of job advertisements. Summarized below are key findings from all three categories. The inclusion of studies that used various data sources in this literature review provided a comprehensive overview of IT job demands and skill requirements studies.

### *INDUSTRY SURVEYS*

Studies in the first category included input from IS managers, IT executives, end-user managers, and recruiters. These studies identified several job categories and used various analysis frameworks. For example, some studies did not differentiate among different IS job functions and examined the IS job market as a whole, while others categorized IS knowledge and skills based on individual IS job functions.

Cappel (2001) surveyed IS managers and professionals in various industries to identify technical and non-technical skills and personal

qualities (e.g., communications and taking initiatives) they believed to be important for entry-level IS employees, and what they perceived to be the expected versus the actual performance of these entry-level IS employees. While Cappel's study focused on skill deficiencies of all entry-level IS employees, Zhao (2002) separated IT professionals from computer end users, and studied what human resources (HR) and IT executives believed to be important computing knowledge and skills for these two groups of personnel. Knowledge and skills areas included in this study were hardware and software; telecommunication, the Internet, and groupware; programming languages; and functional specific applications. In another study, Nelson (1991) examined educational deficiencies of IS and business end-user personnel from a broader organizational perspective including general IS knowledge, technical skills, IS product knowledge, knowledge of the organization, knowledge of the organizational unit, and interpersonal communication and project management skills. In a recent survey of IS/IT recruiters to determine knowledge and skills deemed important for entry-level IS professionals, Fang, Lee and Koh (2005) found interpersonal skills (e.g., teamwork, communication) and personal traits (e.g., critical thinking, personal motivation) were regarded as more important than IS skills and organizational knowledge.

Also in this category of IS job and skill surveys from industry sources are the following studies that further divided job functions beyond the two categories of IS versus business end users. Cheney and Lyons (1980) surveyed and interviewed IS managers to understand the importance of a list of 26 IS skills for three broad job categories: data center managers, systems development staff, and operations staff (operators and data entry clerks). In another survey of IS managers, projections of demands for IS jobs were studied. Leitheiser (1992) studied the demands for application and systems programmers and analysts, as well as demands in five specialized IS job categories over a ten-year period from 1990 to 2000. The five technical specialists included: database specialists, data communication specialists, end-user support

specialists, MIS planners, and artificial intelligence (AI) specialists.

Similar to Leitheiser, Lee et al. (1995) studied critical IS skills and knowledge requirements and IS staffing patterns based on input from focus meetings with IS managers, user managers, and IS consultants. They analyzed staffing needs for the following five IS job functions and knowledge areas: programmers, technical specialists (hardware/software, operating systems, communications, database management systems, and networks), business and systems analysts (business applications, planning, analysis, design, and implementation), end-user support (help desk, information center, and data retrieval), and data entry operators. The study participants predicted increases in demands for business and systems analysts, end-user support and technical specialists, and they anticipated declines in demands for programmers and data entry operators. The findings indicated "some clear patterns in IS staffing and activity trends that point to the shift in emphasis from a traditional, central IS organization toward a more decentralized, end-user focused business orientation" (1995, p. 313). The findings suggested IS practitioners must be more responsive to user demands to maintain positive and productive relationships with end users.

#### *FACULTY AND STUDENT SURVEYS*

In the second category of IS skill requirements research, opinions of IS faculty, students and graduates were studied. In a survey of alumni of an information systems technologies program, Davis (2003) found that the primary job foci of recent graduates included: (1) technical/end-user support, (2) systems analysis and design, (3) networking and systems administration, (4) computer programming, (5) information management, and (6) web design and development. The first three job categories made up over 50 percent of the responses.

To determine knowledge and skills important for IS students and to identify any gaps in the curriculum, Tang, Lee, and Koh (2000) asked a group of IS educators to assess the importance of four categories of knowledge and skills. In

addition, the IS educators rated the extent of the knowledge and skills achieved by the students as compared to the level required by the department. The four categories of knowledge and skills were: (1) IS technology knowledge and skills; (2) organization and society knowledge and skills; (3) interpersonal knowledge and skills; and (4) personal traits (e.g., critical and creative thinking abilities, personal motivation, and ability to work independently). Based on their responses, the IS educators rated their students to be deficient in 3 out of 10 IS technology knowledge areas; 8 out of 17 organization/societal skills; 2 out of 4 interpersonal skills; and all 3 personal traits.

While IS students were perceived by their professors to be deficient in several areas of knowledge and skills, they seemed to have a fairly accurate understanding of the knowledge and skills areas important to their future success in the industry. Weber, McIntyre, and Schmidt (2001) compared IS students and IS industry's perceptions of the importance of several skills. The findings showed that, in general, IS students' ratings of skill importance were similar to those rated by the industry (e.g., communication skills, object-oriented languages, 32-bit OS). In another study, Medlin, Dave, and Vannoy (2001) surveyed students to understand their views on the importance of technical versus non-technical skills for a successful IT career. Four categories of skills were included in this study: technical, organizational, creative thinking, and analytical skills. Overall, students rated communication skills the highest, followed by analytical skills, technical skills, and organizational skills. The study results showed that the students and the practitioners' views were similar, which indicated the message that IS professionals needed more than technical skills to be successful had gotten through to the students.

#### *JOB ADVERTISEMENT STUDIES*

The third category of research on IS market demands and IS skill requirements was based on data from job advertisements in major newspapers, online job portals, and corporate web sites.

To study the evolution of IS job skills from the early 1980s to the late 1990s, Todd, McKeen, and Gallupe (1995) analyzed the number of technical, business and systems phrases in 1,234 job advertisements from four major newspapers. Three types of IS jobs were included: programmers, systems analysts, and IS managers. The results showed that while the programmers' job requirements had changed very little over the 20 year period and the IS managers' job category remained relatively stable, the systems analysts category showed the greatest change.

In another comprehensive, longitudinal study, Maier et al. (2002) analyzed changes in the MIS job market over two decades, from the late 1970s to the late 1990s. Over 16,000 job advertisements from five major metropolitan newspapers were included in the analysis. The study focused on four broad knowledge and skill categories: (1) networking and operating systems; (2) programming language and software development; (3) the Internet; and (4) personal characteristics. Among 80 plus skills identified through the study, end-user training and support (under personal characteristics) were added to the list for the first time in the late 1990s, and they ranked 11 on a list of 45 skills. The authors concluded that the job trends clearly indicated a growing diversity in the IS job market and a challenge for IT educators and managers in preparing and recruiting IT professionals for the ever-changing IT environment.

In addition to job advertisements in major newspapers, online job postings have been an important data source for job demands and skill requirements studies. Liu, Liu, Koong, and Lu (2003) analyzed 300 IT job advertisements posted on Monster and Hot Jobs. The analysis focused on five areas of technical skills: programming languages, Web development, database management system (DBMS), networking, and operating systems knowledge and skills. Besides online job portals, corporate Web sites were another data source. Lee (2005) analyzed 902 job advertisements for systems analysts posted on the Web sites of 230 Fortune 500 organizations from 2001 to 2003. Lee adapted skill categories and coding schemes

developed by Todd et al., (1995), and the study findings indicated technical skills, business knowledge and interpersonal skills were equally emphasized for systems analysts.

The above review of IS job demands and skill requirements studies identified a variety of job categories and a lack of consistency in knowledge and skill classification frameworks. From studying skill requirements for IS jobs as a whole (e.g., all entry-level IS employees) to understanding job demands for a variety of IS functions from the perspectives of those in the IS industry and in academia, to analyzing the content of job advertisements, most of these studies focused on traditional IS job functions (e.g., systems developers, analysts, and IS managers). End-user related skills and job demands were either omitted all together or mentioned in only a few of these studies (e.g., Lee et al., 1995; Leitheiser, 1992; Trauth et al., 1993). In the few instances where they were included, they were narrowly defined in some cases, and in other cases, classified under “personal characteristics,” “interpersonal skills” or “additional qualifications.”

As Lee et al. (1995) noted, a generic, one-size-fits-all IS curriculum can no longer meet the educational needs of all future IS professionals. Given the diverse IS career opportunities and evolving market demand, different model curricula have been proposed (Cappel, 2001). One such curriculum to meet the organizational needs for supporting end-user computing in organizations is the 2004 Organizational and End-user Information Systems (OEIS) Curriculum Model prepared by the Organizational Systems Research Association. The first version of the OEIS curriculum was published in 1986, and it was updated in 1996 and again in 2004 (Daniels & Feather-Gannon, 2003; Hunt & Perreault, 1999). The 2004 OEIS Curriculum focuses on the end-user computing aspect of IS functions and contains seven core courses and six elective courses. Included in the OEIS Curriculum are detailed course descriptions, expected learning outcomes, and resources for IS/IT programs that wish to diversify their curricula by offering an option for IS students seeking a non-programming

IT concentration (Daniels & Feather-Gannon, 2003; Hunt & Perreault, 1999; OSRA, 2004).

This study focused on the demands for organizational and end-user computing professionals by analyzing job advertisements for IT professionals. To determine which job advertisements should be included in the analysis, the learning objectives and knowledge and skills listed in the OEIS Curriculum Model were used to guide the inclusion and exclusion decisions. Detailed descriptions of the research method are provided below.

## STUDY METHOD

Using the Organizational and End-user Information System Curriculum Model as a framework, organizational and end-user computing related job announcements posted on Monster were sampled and their content analyzed. The online job portal, Monster, was selected because it was the biggest and one of the most popular career Web sites (Doyle, 2004; Taylor, 2004). Among the top three online job portals—Monster, CareerBuilder and HotJobs—Monster had 52 million resumes, whereas CareerBuilder had 14 million. Furthermore, both Monster and CareerBuilder touted over 9 million unique visitors in a year, and HotJobs had 4.7 million unique visitors in the same period (Doyle, 2004; Kharif, 2005). For this study, snapshots of the job market were taken over a three-month period in fall 2004. On Mondays after the first full week of the months of August, September, and October in 2004, job advertisements on Monster were searched and retrieved using a delimiting search term “end user.” To ensure the effectiveness of this search term, other search terms suggested by Monster—such as end-user support, assistant systems administrator, computer services specialist, help desk technician, help desk/PC support, desktop administrator, help desk agent, and PC analyst—were used, and the results were compared to the simple search term “end user.” The results showed that the generic term “end user” was more inclusive and therefore was adopted.

Since a generic and more inclusive search term was used, non end-user computing related

job postings—such as sales manager, buyer, account executive, “work from home” job advertisements—were retrieved, and they were eliminated from the results. In addition, job advertisements for systems developer and programmer were excluded because these positions required significant programming knowledge and skills, and computer programming is not a focus area of the OEIS Curriculum (OSRA, 2004). The remaining job postings, a total of 484 job advertisements, were then printed and the content of the advertisements carefully analyzed. To answer the first research question, (i.e., What types of jobs are available for non-programming IT professionals?), the first task was to categorize the job advertisements.

As mentioned, most of the existing IS knowledge and skill requirements studies focused on traditional IS skills in which organizational and end-user computing skills were either excluded or very narrowly defined. Furthermore, most of these studies employed vastly different skill categories in their analyses. With no existing analysis framework for organizational and end-user IS jobs, the constant comparison method (Glaser & Strauss, 1967) was used to analyze and categorize the job advertisements.

While the researchers screened all job advertisements and decided which job advertisements should be included based on the learning objectives contained in OSRA’s 2004 OEIS Curriculum, two graduate assistants (second-year MBA students) were trained to record pertinent information from each job posting into a template provided by the researchers. Information gleaned from each job advertisement included title of the position, knowledge and skill requirements (including certification), primary and secondary job responsibilities, work experience requirements, and the hiring company’s name and location. The researchers closely supervised the graduate assistants’ recording of job advertisement information.

Once all job advertisements were recorded, the analysis and categorizing process began. The researchers reviewed the first job advertisement in detail and proceeded to reviewing the second job advertisement. The second job advertisement

was compared to the first one. Similarities (e.g., both jobs required knowledge of computer and network hardware and software; and the primary responsibilities of both positions were end-user support) and differences (e.g., one job required a higher level of network troubleshooting knowledge than the other) between the two were noted. Besides knowledge and skill requirements and job responsibilities, work experience requirements of both job advertisements were analyzed and compared to detect patterns and relationships between responsibilities and work experience requirements. This comparison process continued until broad categories—such as end-user support, business analyst, and training—began to emerge. Job advertisements were then assigned under appropriate categories by adding a job category code to each job advertisement. Also in the comparison process, the researchers wrote down rules for classifying job advertisements for each job category to ensure (1) the job categories were mutually exclusive, and (2) the consistency in categorizing the job advertisements. For example, when the primary responsibility of a job was to support various computing needs of users, it should be classified under “end user support” category, even when the job has a minor training role.

As the comparison and sorting continued, subcategories under each job category began to emerge, given the variety of jobs under each broad category. For example, the “business analyst” category was further divided into “business analyst–quality assurance” and “business analyst–management” because some business analyst positions had significant responsibilities in certain areas such as quality assurance and project management instead of a typical business analyst role. Another example was the “end-user support–network administration” subcategory; it was split from the “end-user support–network and systems administration” subcategory because the former concentrated only on high-level network design and administration tasks; whereas, the latter focused on day-to-day system and network administration and maintenance. Classification rules were also developed for each subcategory to ensure the consistency in sorting and that the

subcategories did not overlap. The process of classifying continued until all job advertisements were sorted based on the classification rules. The researchers believed that the job categories and their respective subcategories provided a useful and detailed analysis framework for OEIS jobs. The entire job classification scheme and other findings are presented below.

**STUDY RESULTS**

From the analysis of the primary work responsibilities, job titles, specific technology, business, and other knowledge and skill requirements of all 484 job advertisements, five broad job categories and 24 subcategories emerged. The five job categories were end-user support staff, business analyst, trainer, Web and interface designer, and technical writer. As shown in Table 1, the end-user support staff and the business analyst were the two major categories. At 46 percent, the end-user support category accounted for close to half of the 484 job advertisements; whereas, 37 percent of job

advertisements fell under the business analyst category.

*JOBS CATEGORIES AND SUBCATEGORIES*

Of all 24 subcategories, the end-user support generalists, the business analysts, and the end-user support-network and systems administrators were the three jobs in the highest demand at 19, 17 and 15 percent respectively. As shown in Table 1, 90 out of the 484 job advertisements sampled were in the end-user support generalist subcategory. The job with the second highest demand was the business analyst, followed by the network and systems administrator.

Other top ten jobs were business analyst-system analysts, end-user support-managers, business analyst-managers, business analyst-quality assurance, technical writers, human computer interface designers, and systems implementation trainers. A summary of the primary job responsibilities of each of these subcategories is provided in Appendix A.

<b>Job Categories</b>	<b>N</b>	<b>%</b>	<b>Job Categories</b>	<b>N</b>	<b>%</b>
<b>End-User Support</b>	<b>219</b>	<b>45.2%</b>	<b>Training</b>	<b>33</b>	<b>6.8%</b>
End-User Support-Generalist	90	18.6%	Training-Implementation	12	2.5%
End-User Support-Network and Systems Administrator	72	14.9%	Training-Sales	10	2.1%
End-User Support-Manager	24	5.0%	Training-Technical	8	1.7%
End-User Support-Customer Service	9	1.9%	Training-Instructional Development	2	0.4%
End-User Support-Network Administrator	9	1.9%	Training-Management	1	0.2%
End-User Support-Consultant	8	1.7%	<b>Web &amp; Interface Design</b>	<b>29</b>	<b>6.0%</b>
End-User Support-Generalist-Manager	7	1.4%	Human Computer Interface	16	3.3%
<b>Business Analyst</b>	<b>180</b>	<b>37.2%</b>	Web Design	11	2.3%
Business Analyst	82	16.9%	Graphic Design	2	0.4%
Business Analyst-Systems Analyst	36	7.4%	<b>Technical Writing</b>	<b>23</b>	<b>4.8%</b>
Business Analyst-Manager	22	4.5%	Technical Writer	18	3.7%
Business Analyst-Quality Assurance	15	3.1%	Technical Writing-Business Analyst	5	1.0%
Business Analyst-Consultant	10	2.1%			
Business Analyst-Technical Support	10	2.1%			
Chief Information Technology Officer	5	1.0%			
			<b>Grand Total</b>	<b>484</b>	<b>100.0%</b>

### *KNOWLEDGE AND SKILLS REQUIREMENTS*

The knowledge and skill requirements for each of the 24 job subcategories identified from this study varied considerably. Some of the positions required general knowledge in several areas and no supervisory skills (e.g., business analyst) while others required more specialized knowledge and skills in a single area (e.g., business analyst–quality assurance). The knowledge, skill, certification (if any), and other special requirements of these jobs are described below. A complete listing of the knowledge and skill requirements for these subcategories is available in Appendix B.

The requirements for jobs in the first category, end-user support, progressed from broad-based, basic skills to more advanced knowledge. End-user support generalists were required have PC and network hardware and software knowledge. In addition, effective communication skills and excellent customer service attitude were often emphasized in the job advertisements. The network and systems administrators were expected to know how to install, configure, maintain and troubleshoot LAN and WAN hardware and software. The network administrators must have networking knowledge and skills, and they must be trained in network security assessment. There were two management-level positions in this category. The end-user support managers were required to have project management skills. The generalist–managers must possess management skills, and they were required to have significant hands-on skills since they were required to perform some of the end-user support duties also.

Compared to other job postings in the same category, the job advertisements for business analyst had the greatest variability and the broadest set of skill requirements. The basic computer requirement for business analysts was knowledge of the Microsoft Office suite. Other frequently mentioned technical skills were DBMS, enterprise resource planning (ERP), enterprise reporting and business intelligence tools, and strong communication skills. The business analyst–systems analyst had requirements similar to those of a business analyst with the addition of

heavier emphases on DBMS and business intelligence tools. The business analyst–consultants required in-depth knowledge of and experience with ERP systems since many of them were ERP implementation consultants. Required knowledge and skill for business analyst–quality assurance specialists were testing and quality assurance (QA) methodologies, DBMS and software testing tools. Finally, business analyst–technical support specialists were required to be familiar with technical support tools, Microsoft Office, and DBMS. Of the two management subcategories under business analyst, the business analyst–manager had requirements similar to those of the business analyst. In addition, project planning, progress monitoring, and directing skills were heavily emphasized. The chief information technology officer was required to have at least five years of experience and a thorough understanding of computer programming, the networked environment, data warehousing, and data mining.

Training was the third largest job category, both in the numbers of job postings and subcategories. As one of the top ten jobs in this study, implementation trainers were required to have enterprise systems knowledge. The knowledge and skill requirements for technical trainers varied from standard desktop applications to proprietary software. The instructional developer was required to be familiar with software such as Adobe AfterEffects, Framemaker, and Final Cut Pro. The training manager was expected to have project management skills and be familiar with the latest instructional technologies.

The fourth job category was Web and interface design. The human-computer interaction (HCI) designers were responsible for designing user experience, and they were required to have experience with flowcharting tools and Web design and scripting knowledge. Graphic designers were required to be proficient in a variety Adobe and Macromedia products, and they were required to have creative abilities and artistic skills. The Web designer position required both graphic design and some Web development (mostly maintenance) skills. In addition, a Web designer was required to be able

to work with users (external clients or internal business users) to define and design Web content and function.

Technical writing was the last job category. Basic requirements of a technical writer included MS Office (expert level Microsoft Word), Adobe FrameMaker, Visio, and Macromedia products; some technical writing positions emphasized additional Web design skills for developing and managing technical content materials for the Web environment. The technical writing–business analyst position required the jobholder to have both the knowledge of a business analyst and the skills of a technical writer.

While entry-level positions for their undergraduate students were likely of the most interest to IS educators, it is important to know the career options and advancement paths for graduate level and non-traditional students. The following section presents an analysis of job experience requirements.

#### *PRIOR WORK EXPERIENCE REQUIREMENTS*

Prior work experience requirements in the job advertisements were grouped under three experience levels: (1) minimum experience–0 to 1 year; (2) some experience–2 to 5 years; and (3) experienced–more than 5 years. Based on these classifications, only 23% of the 484 job advertisements that required either no or very minimum work experience could be considered entry-level jobs. The majority, 62%, required two to five years of experience, and the remaining 15% fell under the experienced category.

Among the entry-level jobs, the types of positions in greatest demand were end-user support generalists (27%), business analysts (20%), network and systems administrators (19%), technical writers (7%), and systems implementation trainers (5%). IT graduates with two to five years of prior work experience were most likely to find jobs as end-user support generalists (20%), business analysts (16%), network and systems administrators (16%), business analyst–system analysts (9%), and HCI designers (5%). Interestingly, the top three jobs in both work experience levels were the same.

While jobs in the first two work experience categories sought non-supervisory, individual contributors, many of the jobs in the third category (over five years) looked for candidates to fill managerial positions. Types of jobs in the highest demand for experienced hires were end-user support managers (21%), business analyst–managers (15%), senior business analysts (14%), chief IT officers (7%), and senior technical writers (7%). A complete listing of the job subcategories under each work-experience level is available in Appendix C.

#### *HIRING COMPANY PROFILES*

To understand the characteristics of the hiring companies (research question 5), the geographic region and industry affiliation of the companies were analyzed. Job advertisements in this study included companies from 42 states in all nine U.S. Census Bureau regions across the United States. Companies in the Pacific, South and Mid Atlantic regions (particularly those in California, Georgia, Virginia, New Jersey, and New York) offered the highest numbers of OEIS jobs as shown in Table 2. Other states that offered relatively high numbers of OEIS jobs were Illinois (in the East North Central region), Massachusetts (New England), and Texas (West South Central).

In addition to their geographic locations, another characteristic of the hiring companies analyzed in this study was their industry sectors. Categorized by the North American Industry

**Table 2. Hiring Companies by Region**

<b>Region</b>	<b>%</b>
Pacific	20.7%
South Atlantic	18.8%
Mid Atlantic	14.5%
East North Central	12.6%
New England	7.4%
West South Central	6.4%
Mountain	5.8%
West North Central	5.0%
East South Central	2.1%
Not Available	6.8%
<b>Total</b>	<b>100.0%</b>

Classification System (NAICS), many of the hiring companies were in the professional/technical services (particularly IT consulting, staffing and data processing services firms), financial services, manufacturing, health care (hospitals, medical care), and information (telecommunication, entertainment, publishing) sectors (see Table 3).

### DISCUSSION AND CONCLUSIONS

This study analyzed current market demands for organizational and end-user information systems professionals based on an analysis of 484 job advertisements from Monster, one of the most popular online job portals (Doyle, 2004; Kharif, 2005; Taylor, 2004). The comprehensive job type classification scheme derived from the analysis clearly indicated a variety of job opportunities were available for IT professionals. The five major job categories and 24 subcategories identified through this study validated the Organizational and End-user Information Systems (OEIS) Curriculum Model developed by the Organizational Systems Research Association. The OEIS Curriculum Model “is designed to prepare graduates for entry-level non-programming related positions in end-user information systems” (OSRA, 2004, p. 1). The seven required and six optional courses in the OEIS Curriculum Model included knowledge and skill foci that were consistent with the types of jobs identified through this study. The Organizational Systems Research Association should be commended for the exemplary curriculum and for their contributions to the rich repository of IS curricula to meet the growing divergence in IS careers (Lee et al., 1995; Maier et al., 2002; Trauth et al., 1993) since “no longer can one individual or a single curriculum be all things to all people” (Trauth et al., 1993, p. 300).

Among the five main job categories, the end-user support and business analyst positions accounted for over three-quarters of all job advertisements. This finding—high demand for

**Table 3. Hiring Company Industry**

NAICS	Sectors	%
54	Professional, Scientific, & Technical Services	48.3%
52	Finance & Insurance	14.3%
31-33	Manufacturing	9.7%
62	Health Care & Social Assistance	6.6%
51	Information	5.8%
44-45	Retail	3.1%
61	Education Services	2.1%
22	Utilities	1.7%
72	Accommodation & Food Services	1.2%
48-49	Transportation & Warehousing	0.6%
53	Real Estate & Rental/Leasing	0.4%
56	Administrative & Support	0.4%
81	Other Services	0.4%
23	Construction	0.2%
71	Arts, Entertainment, & Recreation	0.2%
	N/A	5.0%
<b>Total</b>		<b>100.0%</b>

business and systems analysts, end-user support, and other technical specialists—is consistent with previous study results (e.g., Davis, 2003; Lee et al., 1995; Leitheiser, 1992). In addition to end-user support and business analyst, there were tremendous job opportunities in training, Web and interface design, and technical writing. This finding should be encouraging for IT students who are interested in helping others learn, in combining technical skills and creative talents, or in enjoying the challenge of organizing and documenting important information, thus helping organizations manage their intellectual assets.

Consistent with prior IS skill requirement studies (Kittner & Papp, 2004; Lee, Yen, Havelka, & Koh, 2001; Leitheiser, 1992; Noll & Wilkins, 2002; Todd et al., 1995) findings in this study showed a mixture of technical and non-technical skills, and the emphasis varied by job categories and staff levels. Non-supervisory end-user support staff, business analysts, and Web and interface designers had more technical requirements, even though effective communication skills were emphasized in virtually all positions. Management positions required a good balance between a solid technical background and management proficiencies, leadership qualities and business knowledge.

While the diverse job opportunities should be good news to IS educators and students, the work experience requirement is a cause for concern. In this study, less than one-quarter of the job advertisements required either no or only one year of prior work experience while the majority of the jobs needed two to five years of experience. This finding echoes results in other studies; for example, Liu et al. (2003) found 84% of the job postings in their study required prior job experience. This requirement may explain why some IT graduates have difficulties finding employment immediately after graduation. The implication of this finding underlines the importance of real-world experience to increase students' marketability.

## RECOMMENDATIONS

Besides providing an analysis framework for future OEIS job demand studies, the study findings offered useful insight for OEIS academic programs in the United States. First, coursework for preparing graduates for careers in end-user support and business analysis should be encouraged, given their strong demands in the job market. In addition, for OEIS programs looking to expand their course offerings and/or to leverage the repertoire of expertise of their faculty, courses related to training, Web and interface design, and technical writing will prepare graduates for niche areas in the IT job market. Second, the importance of effective communication skills was highlighted in this study. In addition to developing students' knowledge and skills in various specialized OEIS areas, it is imperative that the development of communication skills be an integral part of all OEIS courses. Third, OEIS programs should consider making internship and/or other experiential learning experience a requirement for graduation. Findings on work experience requirements from this study clearly indicate that hiring companies placed heavy emphasis on their new employees' real-world work experience. Besides internships, other outreach initiatives—such as developing close partnering relationships between academic programs and businesses and encouraging student participation in IT

professional organizations—should be implemented to increase students' exposure to the business world and opportunities to gain valuable networking experience.

The above recommendations echo guidelines specified in other IS/IT model curricula. For example, the IS 2002 Model Curriculum and Guidelines for Undergraduate Programs in Information Systems (Davis, Feinstein, Gorgone, Longenecker, & Valacich, 2001) identified three key requirements for IS professionals. The three requirements underlined the importance of developing broad business and real world perspective, strong analytical and critical thinking skills, and strong interpersonal communication and team skills. While the OEIS 2004 and IS 2002 curricula were different in the foci of their respective content areas, the importance of preparing graduates with well-rounded skill sets and real-world experience were emphasized in both curricula, as were confirmed in this study.

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<b>Appendix A. Primary Responsibilities of Each Job Subcategory</b>	
<b>Job Categories</b>	<b>Primary Responsibilities</b>
<b>End-user Support</b>	
Generalist	Perform a variety of desktop, operating systems, and network support tasks including software/hardware installation, maintenance, troubleshooting; resolve and document user calls; require strong communication skills; and some training responsibilities
Network and Systems Administrator	Provide client/server OS and network support; no PC and desktop application support
Manager	Perform management function; oversee support center operations, performance, and resource allocation
Customer Service	Perform some technical support responsibilities but mostly customer relationship/service and administrative tasks
Network Administrator	Carry out high-level networking responsibilities (e.g., network design and integration and network security), instead of routine maintenance, installation, and upgrade; job titles often include network analyst or engineer
Consultant	Support proprietary or single hardware/software system (Avaya, Brio, HP, SAP, etc.) for OEM, VAR, or client organizations
Generalist-Manager	Perform support center management responsibilities and end-user support tasks
<b>Business Analyst</b>	
Business Analyst	Perform business process analysis and requirements documentation; prepare reports (benchmarking, customer satisfaction, financial, etc.); facilitate meetings and gather user input/requirements; recommend business strategies and improvement solutions; some testing and training responsibilities
Systems Analyst	Design and create customized reports that ensure information accessibility; interact with end user to determine user needs and extract information from DBMS
Manager	Perform supervisory functions, often as program manager or IT project leader while still carrying out business analyst's tasks including direct contacts with end users
Quality Assurance	Develop and monitor user acceptance test strategies; design and run test scripts
Consultant	Work with business partners/clients; offer post-sale system support and handle client requests; responsibilities similar to business analyst but work as an external consultant
Technical Support	Perform equal share of analyst and support functions, instead of daily problem detection and resolution, focus more on pattern/trend analysis
Chief Information Technology Officer	Serve as the chief architect of the organization's technology infrastructure; translate business goals into technology strategies; oversee multiple functions (end-user support, business analysis, training, etc.)
<b>Training</b>	
Implementation	Provide end-user training and project support services on system implementation projects; some positions require training material development also
Sales	Develop and deliver product training; give pre-sale demos
Technical	Provide in-house or external training on various topics (proprietary or standard desktop applications)
Instructional Development	Design and develop instructor-led courses and/or online courseware
Management	Lead training operations and develop human resources development strategies
<b>Web &amp; Interface Design</b>	
Human Computer Interface	Conduct usability research, analyze user feedback, document user requirements; design software/Web site screen flow and interface; help formulate navigation and organizational structure
Web Design	Design Web functionality; maintain Web sites; work with developer to incorporate user requirements and feedback; run tests
Graphic Design	Responsible for designing high quality graphics for a variety of delivery media (print, e-mail, Web); develop online presentation and marketing material
<b>Technical Writing</b>	
Technical Writer	Create and update system documentation and end-user product manuals for both print and online environments
Business Analyst	Have technical writer job title but job responsibilities extend beyond end-user documentation to include performing business process analysis and preparing system design documents, functional specifications, and impact assessment documents

<b>Appendix B. Knowledge and Skill Requirements of Each Job Subcategory</b>	
<b>Job Categories</b>	<b>Knowledge and Skill Requirements</b>
<b>End-user Support</b>	
Generalist	PC and network operating system, networking protocol, hardware repair, familiarity with vendor warranty processing and support center operations (e.g., service level agreement and performance measurement), and help desk information systems (e.g., trouble ticket database); also emphasized: effective communication skills and excellent customer service attitude; common certification requirements: A+ and i-Net+, and MCSE
Network and Systems Administrator	LAN and WAN hardware and software knowledge (installation, configuration, maintenance, and troubleshooting) and telecommunication protocols; preferred certification: MCSE, CNE, and CompTIA
Manager	Budgeting, cost control, and project management; must be able to achieve performance goals; must demonstrate effective planning and communication skills and leadership qualities; some required hardware, software and networking knowledge, as well as industry experience
Customer Service	Basic desktop computer software knowledge and skills; effective communication and excellent customer service attitude
Network Administrator	Basic networking knowledge and skills (same as network and systems administrators), network security assessment, and telecommunication infrastructure design and support; common certification requirements: MCSE
Consultant	Knowledge of proprietary hardware/software system (Avaya, Brio, HP, SAP, etc.)
Generalist-Manager	Management skills and qualities similar to those of end-user support managers; must have hands-on technical knowledge and skills
<b>Business Analyst</b>	
Business Analyst	Microsoft Office suite, SQL Server and/or Oracle, SAP and/or PeopleSoft, Cognos, Actuate, Crystal, SAS, software development and testing process and tools (e.g., IBM Rational Robot); strong communication skills
Systems Analyst	Heavy emphases on DBMS and business intelligence and reporting tools (Business objects, Cognos, Crystal, Hyperion, Microsoft OLAP, and SAS); some positions required some Web programming knowledge and skills (ASP, Java, and PERL)
Manager	Technical skills (same as business analyst) and business knowledge, project planning, progress monitoring, and directing skills
Quality Assurance	Testing and QA methodologies, DBMS, and software testing tools
Consultant	In-depth knowledge of and experience with ERP systems (e.g., SAP and Siebel)
Technical Support	Technical support tools (LANDESK and ZENworks), Microsoft Office, and DBMS
Chief Information Technology Officer	Five years of experience (minimum), knowledge of programming, computer networks, data warehousing, and data mining; leadership qualities and communication skills
<b>Training</b>	
Implementation	Enterprise systems knowledge (SAP, Ariba, PeopleSoft, or Oracle), MS Office, and training experience
Sales	Knowledge of proprietary product and services, MS Office, and effective presentation skills
Technical	Knowledge of standard desktop applications and proprietary software applications, training experience
Instructional Development	Adobe AfterEffects, Framemaker, Final Cut Pro, MS Office, and training experience
Management	Project management skills and leadership qualities, familiar with the latest instructional and learning technologies, MS Office, and training experience
<b>Web &amp; Interface Design</b>	
Human Computer Interface	Experience with flowcharting tool (e.g., Visio) and Web design and scripting knowledge (HTML, CSS, DHTML, and JavaScript)
Web Design	Must have graphic design and Web development (mostly maintenance) skills including HTML, DHTML, CSS, JavaScript, Dreamweaver, Flash, Photoshop, Illustrator, and SQL
Graphic Design	Proficient in a variety Adobe (e.g., Photoshop, Illustrator, and InDesign) and Macromedia products (e.g., Flash and Dreamweaver)
<b>Technical Writing</b>	
Technical Writer	Software skills (Adobe FrameMaker, Visio, Captivate, Flash, Dreamweaver, and Epic Editor) and MS Office (in particular, expert level Microsoft Word proficiency); some also require Web design and development knowledge (HTML, DHTML, XML, CSS, XSL, Flash, Java, VBScript, and FrontPage)
Business Analyst	Must have knowledge and skills similar to those of a business analyst and technical writer

<b>Appendix C. Work Experience Requirement for Each Job Subcategory and Experience Level</b>			
<b>Job Category</b>	<b>0 – 1 year</b>	<b>2 – 5 years</b>	<b>&gt; 5 years</b>
<b>End-User Support</b>			
End-User Support-Generalist	31	59	0
End-User Support-Network and Systems Administrator	21	47	4
End-User Support-Manager	0	9	15
End-User Support-Customer Service	4	5	0
End-User Support-Network Administrator	0	5	4
End-User Support-Consultant	0	8	0
End-User Support-Generalist-Manager	0	5	2
<b>Business Analyst</b>			
Business Analyst	23	49	10
Business Analyst-Systems Analyst	4	28	4
Business Analyst-Manager	0	11	11
Business Analyst-Quality Assurance	2	10	3
Business Analyst-Consultant	2	5	3
Business Analyst-Technical Support	0	10	0
Chief Information Technology Officer	0	0	5
<b>Training</b>			
Training-Implementation	5	7	0
Training-Sales	4	5	1
Training-Technical	4	1	3
Training-Instructional Development	2	0	0
Training-Management	0	1	0
<b>Web &amp; Interface Design</b>			
Human Computer Interface	0	14	2
Web Design	0	10	1
Graphic Design	1	1	0
<b>Technical Writing</b>			
Technical Writer	8	5	5
Technical Writing-Business Analyst	2	3	0
<b>Total (Percentage)</b>	<b>113 (23%)</b>	<b>298 (62%)</b>	<b>73 (15%)</b>

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