

COMPUTER TECHNOLOGIES USED IN BUSINESS AND
SKILLS REQUIRED IN THE WORKPLACE

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Online Proceedings for Refereed Presentation
Given at OSRA Conference in St. Louis, Missouri

February 22, 2002

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Introduction

The one constant in the field of information systems and technologies is change. Educators are constantly striving to stay up with these changes to enhance curriculum with new software, hardware, procedures, and systems used in business and industry. At the same time it is essential to emphasize the importance of non-technical “people” skills and teach students how to think, work as a team member, communicate with their fellow workers, and demonstrate strong personal characteristics.

Providing students with the necessary skills and knowledge required in the workplace of today provides a great challenge for educators. First, it is essential to identify the skills required as well as the technologies currently utilized. Next, it is important to learn and develop the new skills or knowledge, and then to include them in the curriculum as needed.

Review of Literature

In the field of information systems many of the same skills from the years before continue to be important, but there are always new ones appearing. According to Jerry Willenbring, manager of California Technology Staffing, “The rapid pace of innovation means there is always a shortage of people with the latest skills” (Lewis, 2001, p. 69).

In a study looking at the technology skills IT managers said they would train for or hire for the year 2001, the largest percent of managers indicated Windows NT/2000 for operating systems, Microsoft Exchange for groupware software, Oracle and Microsoft SQL Server for DBMS skills, and XML and Java in the category of web development skills. In the area of networking, the largest percent of managers indicated the most wanted skill was TCP/IP; it was Windows NT Server for LANs; and for internetworking skills, it was routing and gigabit Ethernet (“Most wanted skills for 2001,” 2000). According to Radcliff (2001), the following skills are still in demand despite the slow economy (last quarter of 2001): Java, C++, C, HTML, Visual Basic, Java, Active Server Pages, Oracle Developer 1000, Visual Studio, Microsoft Access, SQL Server, Oracle, DB2, Microsoft Exchange, Windows NT/2000, Linux, and other Unix. Networking skills still in demand include TCP/IP, routing, Ethernet switching, and 10BaseT switching; system software and support skills include Web server administration, project management, Internet application development, security, and help desk (Radcliff, 2001).

The staff at Computerworld contacted several national recruiters and staffing firms for their observations and predictions in an attempt to find out which jobs would be the hottest in 2001, by number of new hires, not by salary. According to Bernstein (2001), the 10 hottest jobs identified by the staff for 2001 were: (1) web developer, (2) database administrator, (3) security analyst, (4) Unix administrator, (5) E-commerce application developer, (6) C+ Object-Oriented/Visual Basic Developer, (7) Java programmer, (8)

network engineer, (9) PC technical support, and (10) quality assurance tester. Even with all the layoffs at dotcoms, “competition for information technologists has never been greater” (Lewis, 2001, p. 69). According to consulting firm Hewitt Associates LLC in Lincolnshire, Illinois, even though the economy may be cool, some jobs are still hot. IT professionals with skills that are in short supply and high demand, are still getting pay and perks comparable to those in past years” (“In Demand: IT Stars Require Premium Pay,” 2001). The Hewitt study, which included 42,000 employees, also reported that the specialties commanding the highest pay are deploying enterprise applications from PeopleSoft Inc. and SAP AG. Other job skills on the hot list are object engineering, data warehousing, data visualization, and Microsoft’s Exchange collaboration and messaging (“In Demand: IT Stars Require Premium Pay,” 2001). According to another survey, conducted in December of 2001, which surveyed 260 IT professionals knowledgeable about their company’s IT staffing plans, the areas they indicated as the top five highest priorities for hiring in 2002 were application development, network administration, security, database management, and web services (Pfenning, 2002).

The technical skills needed by professionals in the field of information systems seem to change even faster than ever before as various surveys compare the skills required from one quarter of one year to another. Although different surveys use different populations and have different slants on the basic questions asked, they seem to find similar results in regard to the skills needed by individuals in the profession. And even though many skills may slightly change their positions (of rank) in the list, the main software programs, languages, and protocols continue to appear along with new ones added each year. The non-technical skills may not receive as much emphasis, but when asked, most professionals indicate these are the ones that really make the difference as to whether a person progresses up the career ladder. According to Arnold Brown, chairman of Weiner, Edrich, Brown, Inc. in New York, “Non-IT skills will distinguish the most sought-after IT people. What you have to know to make you stand out from the crowd is people skills—how to motivate people, resolve disputes, and communicate” (Anthes, 2000, p. 57). With the changes in the marketplace that occurred since the September 11 terrorist attacks, there are less jobs available for IT professionals; however, most of the same skills are still in demand. Jon Ricker, president and CIO of Limited Technology Services, “urges IT workers to build up so-called soft business skills now to enhance their future marketability by accepting assignments that involve communication and consulting skills” (Hamblen, 2002, pp. 31).

Research Procedures

A national research study was conducted in an attempt to examine information technology trends and systems used in business and industry. A survey was developed based on a review of the literature for the study. It was designed to gather information on the status of trends and systems used in business and in assisting in the continual curriculum revision process. The survey was reviewed by a panel of experts, and changes were made based on their comments. A pilot test was conducted in which individuals in the field were asked to complete the survey and provide feedback. Minor revisions were made from the input provided from these individuals.

The desired population was the members of the Association of Information Technology Professionals (AITP), so the Board of Directors of AITP was contacted in the

spring of 2000. They explained that they did not release the membership list, but that if the study was approved by them, they would place the labels on the envelopes and complete the mailing. The research project was in fact approved by the ATIP board, and in May, surveys were mailed to 620 randomly selected members. Since the AITP staff took care of placing the labels on the envelopes containing the letters and surveys, they agreed to only one mailing; therefore, a follow-up mailing was not possible. One hundred and ten surveys were returned to the researchers, and the results were tabulated on the 103 completed surveys.

Research Questions

Answers were sought to the following research questions.

1. What types of software are used in business and industry?
2. What types of networks, digital network services, and information security tools are used in business and industry?
3. What are the technical and non-technical skills required in the workplace for individuals in the field of information systems?
4. Are there dependencies between the importance of technical and non-technical skills as required in the workplace based on the level of education, years of experience, or age of the professional?

Findings

Demographics

The largest number of respondents indicated their job titles were information systems managers/administrators (23%); the next three largest groups were chief information officers (14%), information systems analysts (14%), and programmers/programmer analysts (10%). With regard to age, the largest number fell in the age range of 46 to 55 (42%), and the age range above (over 55) and below (36 to 45) each had 26%. The majority of the respondents were male (70%). When asked how many years of experience they had in their profession, the largest number indicated they had 21 to 30 years of experience (43%); 10% indicated they had 1 to 10 years and 21% had 31 to 40 years of experience. The largest number of respondents had a bachelor's degree (41%) and 21% had a master's degree.

Research Question No.1 – Software and Programming Languages Used by Companies

What types of software are used in business and industry?

The respondents were provided a list of different types of (1) operating system software, (2) office suite software, (3) groupware software, (4) web authoring/design software, and (5) computer languages. They were asked to mark all that were used by individuals in their company.

The operating systems used by the majority of the companies were Windows 95 or 98 (90%) and Windows NT (85%). All operating systems listed on the survey are shown in Table 1.

Table 1 - Types of Operating Systems Software

Operating Systems	No.	Percent
Windows 95 or 98	93	90
Windows NT	88	85
Unix	52	51
Novell Netware	49	48
Windows 2000	24	23
VMS	18	18
Mac OS	17	17
Linux	16	16
OS/2	12	12
Other	24	23

Microsoft Office Suite was the office suite used by the majority of respondents (93%). The next two most popular suites were Corel Office Suite (16%) and Lotus Smart Suite (14%). In the category of workgroup computing, Microsoft was again the company that manufactured the most used software program. Microsoft Outlook/Exchange was used by a majority (65%) of the companies. However, Lotus Notes (28%), Netscape Communicator (25%), and Novell Groupwise (22%), were also used by several of the respondents.

When examining the type of web design software used, it was primarily Microsoft FrontPage (52%) and various HTML editors (44%). Other Web design tools used can be seen in Table 2.

Table 2 - Types of Web Authoring/Design Software

Web Design Software	No.	Percent
Microsoft FrontPage	53	52
HTML Editors	45	44
Cold Fusion/Cold Fusion Studio	14	14
XML	13	13
Macromedia Dreamweaver	10	10
Netscape Composer	9	9
Other	4	4
Do Not Use	12	12

The respondents were also asked to indicate the type of computer languages used for writing and editing programs. There were a wide variety of languages listed as shown in Table 3. The three languages used by the majority of the companies were visual basic (64%), COBOL (62%), and SQL (61%).

Table 3 - Types of Computer Languages

Languages	No.	Percent
Visual Basic	66	64
COBOL	64	62
SQL	63	61
Java	42	41
C/C ++	39	38
Java Script	34	33
VB Script	29	28
RPG	20	19
Perl	18	18
ActiveX	17	17
Other	15	15

Research Question No. 2 – Networks and Security Devices Used by Companies

What types of networks, digital network services, and information security tools are used in business and industry?

The types of networks used by the largest number of respondents were Ethernet 10BaseT (49%) and Fast Ethernet 100BaseT or 100BaseF (46%). Token ring (30%) and FDDI (17%) were used by several of the companies. Other networks used were Ethernet 10Base2 or 10Base5 (12%), 100VG AnyLAN (9%), Gigabit Ethernet (9%) and Apple Talk (7%).

The type of digital network service used by the largest number of respondents was T1 lines (64%). Frame relay (38%) and ISDN (34%) were services used by several of the companies as well. Table 4 shows the services employed by the companies.

Table 4 – Digital Network Services

Digital Service	No.	Percent
T1 Lines	66	64
Frame Relay	39	38
ISDN	35	34
DSL	19	18
T3 Lines	18	18
VPN	18	18
ATM	7	7
SONET	7	7

In regard to information security, the types of tools used by a majority of the respondents were login passwords (94%), anti-virus programs (91%), and firewalls (81%).

Other solutions were router filters (36%), encryption (35%), and secured socket layer protocol (28%). When asked what types of biometric devices they used, if any, no more than one company indicated it used each of the devices listed--retina/iris scans, thumbprints, palm scans, voice recognition, and signature recognition.

Table 5 – Information Security Tools

Security Tool	No.	Percent
Login Password	97	94
Antivirus Program	94	91
Firewalls	83	81
Router Filters	37	36
Encryption	36	35
Secured Socket Layer	29	28
Intrusion Detection	20	19
Digital Signatures	18	18
No Device Used	2	2
Other	1	1

Research Questions No. 3 – Technical and Non-Technical Skills Required

What are the technical and non-technical skills required in the workplace for individuals in the field of information systems?

The respondents were given a list of 10 general content/technical skill areas and 8 non-technical skill areas. They were asked to indicate their opinion regarding the importance of each area for a bachelor's degree in Information Systems Technologies as well as a position in the IT or IS field. These were calculated on a 5-point scale, and means were determined. The means of these 18 areas (technical and non-technical combined) and the standard deviations are provided in Table 6. The top six skills based on level of importance, as indicated by the members of the Association of Information Professionals, were all non-technical skills. These skills were thinking skills, teamwork, desire to learn, personal characteristics, personal attitude and motivation, and communication skills.

Table 6 - Technical and Non-Technical Skills

Content/Skill Area	Mean	Standard deviation
Thinking Skills	4.40	0.43
Teamwork	4.38	0.47
Desire to Learn	4.35	0.54
Personal Characteristics	4.33	0.51
Personal Attitude and Motivation	4.33	0.53
Communication Skills	4.29	0.54
Systems Analysis, Design, Implementation, and Maintenance	4.16	0.65
Basic Foundation and Analytical Skills	4.04	0.69
Programming Skills	3.90	0.77
Computer Software Skills	3.87	0.85
Database Design and Development	3.64	0.94
Information Systems and Technologies	3.63	0.91
Telecommunications/Networking	3.53	1.00
Supervisory Skills	3.51	0.76
Records and Information Management	3.26	0.91
Basic Business	3.19	1.10
Project Management	3.17	1.14
Computer Hardware Skills	2.89	1.00

Research Question No. 4 - Dependencies of Skill Importance Based Upon Personal Factors

Are there dependencies between the importance of technical and non-technical skills as required in the workplace based on the level of education, years of experience, or age of the professional?

When the respondents were asked to indicate the importance of each of the 18 skills for graduates of a four-year degree in information systems technologies, the overall F did not reveal any significant associations based on level of education, years of experience, or age of the respondents. In order to avoid making a Type 1 error, the researchers used the Bonferoni adjustment, which involves dividing the experiment-wise alpha rate by the number of contrasts made. The experiment-wise alpha of 0.05 was divided by 18 (skill areas) which gave a contrast-wise alpha of 0.003. The skills, F values, and probabilities can be seen in Table 7.

Table 7 – Dependencies of Skill Importance
Based Upon Education, Years of Experience, and Age

Content/Skill Area	Education		Years of Experience		Age	
	F Value	p	F Value	P	F Value	p
Basic Business	1.29	0.2780	0.96	0.4340	1.87	0.1405
Database Design/Development	2.81	0.0295	0.54	0.7091	1.79	0.1539
Information Systems and Technology	1.43	0.2301	0.40	0.8047	0.60	0.6153
Computer Hardware Skills	0.62	0.6464	1.80	0.1345	1.37	0.2583
Computer Software Skills	1.00	0.4131	.040	0.8073	1.13	0.3417
Programming Skills	0.36	0.8331	0.56	0.6931	0.72	0.5401
Project Management	2.60	0.0408	0.51	0.7275	0.20	0.8971
Records and Information Management	0.53	0.7115	0.99	0.4151	0.35	0.7865
Systems Analysis and Design	1.42	0.2341	1.08	0.3726	1.25	0.2951
Telecommunications/Networking	1.63	0.1725	1.37	0.2485	2.26	0.0862
Basic Foundation and Analytical Skills	3.07	0.0199	0.88	0.4781	0.10	0.9578
Communication Skills	2.77	0.0316	1.48	0.2138	0.11	0.9514
Desire to Learn	1.07	0.3736	0.33	0.8564	0.85	0.4723
Personal Attitude and Motivation	0.90	0.4651	0.77	0.5494	1.23	0.3033
Personal Characteristics	0.30	0.8779	0.82	0.5152	1.35	0.2623
Supervisory Skills	0.05	0.9946	0.61	0.6589	2.03	0.1150
Teamwork	1.36	0.2527	2.55	0.0437	1.12	0.3438
Thinking Skills	1.72	0.1525	0.42	0.7937	2.42	0.0707

Note. df = 4,96 (education); 4,96 (experience); 3, 93 (age); $p < 0.003$.

Discussion and Conclusions

The largest number who returned the survey was male, was 46 to 55 years of age, was an information systems manager/administrator, had 21 to 30 years of experience, and had a bachelor's degree. The most widely used operating system was Windows 95/98; the software suite was Microsoft Office; the groupware software was Microsoft Outlook/Exchange; and the web design software was Microsoft FrontPage. The types of computer languages used by the majority were visual basic, COBOL, and SQL.

Almost half of the respondents indicated they used Ethernet 10BaseT or Fast Ethernet 100BaseT or 100BaseF network architectures. Well over half of the companies had T1 lines and about one-third used frame relay or ISDN. The three main types of information security tools used were passwords, antivirus programs, and firewalls, which were all used by over three-quarters of the companies.

The non-technical skills of thinking, teamwork, and desire to learn received the highest means out of the 18 technical and non-technical skills listed. Once again, it still seems obvious that these "people" skills are considered of great importance for those in the profession of information systems and technologies. There were no dependencies on the importance of the skills based upon the professionals' level of education, years of experience, or age.

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