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# Introduction to Research on IT Skill Issues

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## Introduction

IT skills are the subject of many endeavors. Students are acquiring them, instructors are teaching them, organizations are procuring, utilizing, and developing them in their employees, and the global information infrastructure is totally dependent on people with IT skills. Because skill portfolios have elasticity and respond to changes in the economic, technical, and cultural environment, they are also studied. Researchers want to learn the patterns of such change – the impact of IT skills on careers, employment, and economic activities at various levels.

Research on this phenomenon falls into four domains: (1) classification/categorization of skills, (2) career orientation/path, (3) portfolio of skills required and/or desired, (4) skill acquisitions and transfers (see Table 1). Some studies cover more than one domain. Within each domain, this paper identifies some research questions.

## Major Research Areas

**Classification/categorization of skills.** We casually use such terms as “network system analyst,” “C++ programmer” and “Oracle database administrator.” The classification of IT skills is not necessarily straightforward. For example, skills can be attributed to organizational function, managerial position, industry, hardware/software platform or application, and system development life cycle. Thus, there are potentially a number of skill types. Rada (1999) notes that the efforts are underway by several nations to “standardize” IT skills. Yet, we still need to know what is the fundamental IT skill set, its elements, and its pattern of change.

The profiles of IS job descriptions on newspaper classified ads did not change much during 1970 through 1990 (Todd et al. 1995). Nonetheless, a recent US government report note that the content of these classified ads is changing. It states that “[m]ore employers want computer specialist to be knowledgeable about the industry their business is in, in addition to being technically skilled” (Department of Labor 1999, p. 64).

Finally, industry studies on skills include Computerworld’s Annual Skills Survey (e.g., Fryer, 1999; Goff, 2000) and Microsoft’s Skills 2000 (e.g., Microsoft, 1998, 1999).

**Career orientation/path.** In this domain, the focus is on the career orientation and career path of IT professionals. What are the career orientations of IT professionals? How does career orientation and the IT skills portfolio affect the career path? Kaiser (1983) summarized possible career paths of early IS personnel as: programmer → analyst → project manager → manager (in either technical support, operations or applications development) → MIS director → executive. However, her four-year long empirical study revealed that such “formal” career paths were often not followed. Moreover, it saw an early trend where IS personnel move into the non-IS, user areas as their careers evolve. An interesting question is if and how major IT trends such as end-user computing (EUC) in the late 1980s and e-commerce today influence career paths and orientations.

Using a survey, Igbaria et al. (1991) find that the career orientations of MIS employees are predominantly technical and managerial. They also note that higher job satisfaction and low turn over rates depend on the match between career orientations to job settings. As the following section points out, researchers started recognizing the increasing importance of “soft” skills (e.g., understanding end-users’ operational needs, communicating effectively with end-users) for IS professionals with the penetration of EUC. Interestingly, as far as classified ads are concerned, the emphasis on technical aspect of IS jobs has instead increased (Todd et al., 1995). This seems to indicate that firms require IT professionals more technical skills while assuming that IT professionals are equally capable of understanding business and management.

Crepeau et al. (1992) noted the complexity of career decision making. Their survey showed that, in addition to technical and managerial career orientations, IS workers do consider a variety of factors including stability and identity for their career decisions.

In the late 1980s, the term chief information officer (CIO) was coined. The title of CIO signified that the role of IT had become critical in firms’ strategy and operations. Stephens et al. (1992) reported characteristics of successful CIOs drawn from five case studies. Their findings suggest that, rather than being an IS functional head, a successful CIO acts as an executive who actively participates in strategy planning and coordinate between IS group, functional units and the firm’s external entities. Applegate and Elam (1992) examined the differences

between newly hired vs. veteran CIOs in terms of their background, working hour usage and reporting relationships. They found that new CIOs were just as likely to come from outside the organization as inside the organization, and they were more powerful than veteran CIOs in their ability to understand business strategy and to communicate well with top management. Similarly, Grover et al. (1993) note the importance of leadership and entrepreneurial abilities for CIOs to succeed in their position.

**Portfolio of skills required and/or desired.** Past studies looked at the nature of skill sets required for IS staff. Because conflict between systems developer and users often hinders successful IS implementation, Kaiser and Srinivasan (1982) examined differences between systems designers and system users. They found significant differences in their attitude towards staff competency, development methodology and IS potential while few differences were found in analyst-user communication and user needs focus. A study on skill requirement issues (Grabski et al., 1987) investigated how skills differ among internal auditors, EDP auditors and systems analysts. It found no significant differences in their evaluation skills of internal controls. Other studies that looked at skill sets for particular IS work include Ferratt et al. (1993) on supervising skills, Mykytyn et al. (1994) on knowledge acquisition skills and traits of knowledge engineers as well as Nelson and Joshi (1995) on project skills.

EUC brought more interactions between IT professionals and end-users. Thus, it is not surprising that studies note the increasing importance of non-technical skills. Similar to the study by Kaiser and Srinivasan (1982), Green (1989) focuses on the sources of conflict between systems analysts and users. His survey finds that analysts recognize the importance of behavioral skills for successful IS development. Indeed, analysts do so more than their IS users. Another study indicates that IS personnel need more organizational knowledge as well as general IS knowledge than what they have now (Nelson, 1991). Similarly, Longnecker et al. (1996) note the importance of business acumen and customer orientation for IS professionals. Prager (1998) details the factors in the changing world that impact IT professionals including job security, necessity to understand non-technical issues, speed of market change, downsized organizations, and outsourcing.

The era of e-commerce requires that firms respond more quickly to market changes. Thus, one interesting research question is whether and how IT professionals need more market knowledge as opposed to organizational knowledge.

**Skill acquisitions and transfers.** On one hand, the US government reported that the demand for IT professionals would substantially exceed the supply (Office of Technology Policy, 1987, 1988). On the other hand, IS

professionals have a variety of educational and professional backgrounds, and they often do not have no formal, computer-related academic training (Khan & Kukalis, 1990). This gives an interesting research question as to whether IT worker shortages will really occur, or IT skill acquisitions – be they IT education at schools, on-the-job training at firms or IT outsourcing – will supply enough IT professionals for firms' needs.

Concerning the preparation of IT workers, Trauth et al. (1993) report that there is a gap between what industries need and what IS academic programs teach. Using focus groups, they first note two trends: (1) industry demands IS professionals with knowledge and skills in technology, management and interpersonal skills, and (2) there is more diversity in IS career paths as the IS function disperses. They argue that many traditional IS programs at universities do not meet these new needs sufficiently.

Compeau and Higgins (1995) and Simon et al. (1996) worked on IT skill training. The former compared behavior-modeling training (i.e., following how others perform tasks or interacting with a computer system) to traditional lecture based training. Its lab experiment finds that the effectiveness of both training methods differs for word processing and spreadsheet software. The latter also looked at the difference between behavior modeling and lecture based training methods. The study reports that behavior modeling gives higher knowledge retention and user satisfaction, although that may not denote trainee success.

Finally, Slaughter and Ang (1995) note that, compared to firms in Singapore, US firms tend to rely more on outsourcing for meeting immediate IS skill needs than on retooling IS skills internally. The impact of outsourcing on IT skill acquisition at various levels is a new concern for research.

## Research Groups

One research group particularly focusing on IT skill issues is Special Interest Group on Computer Personnel Research (SIGCPR) of Association for Computing Machinery (ACM) ([www.acm.org/sigcpr](http://www.acm.org/sigcpr)). In addition, as e-commerce penetrates in most industries, some governments actively involve in the study on the matters of IT workforce. Such efforts are seen in, for example, Office of Technology Policy ([www.ta.doc.gov/OTPolicy](http://www.ta.doc.gov/OTPolicy)) in US Department of Commerce ([www.doc.gov](http://www.doc.gov)), and National Skills Standard Board (NSSB) ([www.nssb.org](http://www.nssb.org)).

Although there are a number of associations in the world that study IT workers and/or their skill related matters, such associations in North America include Information Technology Association of America (ITAA) ([www.ita.org](http://www.ita.org)), The Association of Information Technology Professionals (AITP) ([www.aitp.org](http://www.aitp.org)), and The Software Human Resource Council (SHRC) of Canada ([www.shrc.ca](http://www.shrc.ca)).

## Conclusion

The paper briefly overviewed the research on IT skill issues. Based on the review, future research topics include:

- What are “fundamentals” of IT skills and/or skill sets?
- Whether and how have career paths of IT professionals changed with the advent of Internet commerce?
- What do the new skill sets that Internet commerce mandates demand of IT professionals?
- Whether and how have IT skill acquisitions and transfers changed with the advent of Internet commerce?

## Endnotes

1. This article does not distinguish between IT skills and IS skills. Rather it regards IT skills as the skills used in firms to develop, implement, utilize and maintain IT related hardware and software.

## References

Applegate, L. M., and Elam, J. J. “New Information System Leaders: A Changing Role in a Changing World,” *MIS Quarterly* (16:4), 1992, pp. 469-490.

Compeau, D. R., and Higgins, C. A. “Application of social cognitive theory to training for computer skills,” *Information Systems Research* (6:2), 1995, pp. 118-143.

Crepeau, R. G., Crook, C. W., Goslar, M. D., and McMurtrey, M. E. “Career anchors of information systems personnel,” *Journal of Management Information Systems* (9:2), 1992, pp. 145-160.

Department of Labor. *futurework: Trends and Challenges for Work in the 21st Century*, 1999, p. 64, [www.dol.gov/dol/asp/public/futurework](http://www.dol.gov/dol/asp/public/futurework), (Current May 6, 2000).

Ferratt, T. W., Short, L. E., and Agarwal, R. “Measuring the information system supervisor’s work-unit environment and demonstrated skill at supervising,” *Journal of Management Information Systems* (9:4), 1993, pp. 121-144.

Fryer, B. “Computerworld’s 6th Annual skills survey -- Wanted: Experienced Anybody,” *Computerworld Business Careers*, Nov. 15, 1999, [www.computerworld.com/car/index.html](http://www.computerworld.com/car/index.html), (Current May 6, 2000).

Goff, L. “The E-lusive Staff: Computerworld’s 4th Annual Hiring Forecast,” *Computerworld Business Careers*, Jan. 3, 2000, [www.computerworld.com/car/index.html](http://www.computerworld.com/car/index.html), (Current May 6, 2000).

Grabski, S. V., Reneau, J. H., and West, S. G. “A Comparison of Judgement, Skills, and Prompting Effects Between Auditors and Systems Analysts,” *MIS Quarterly* (11:2), 1987, pp. 151-161.

Green, G. I. “Perceived Importance of Systems Analysts’ Job Skills, Roles, and Non-Salary Incentives,” *MIS Quarterly* (13:2), 1989, pp. 115-133.

Grover, V., Jeong, S., Kettinger, W. J., and Lee, C. C. “The Chief Information Officer,” *Journal of Management Information Systems* (10:2), 1993, pp. 107-130.

Igbaria, M., Greenhaus, J. H., and Parasuraman, S. “Career Orientations of MIS Employees: An Empirical Analysis,” *MIS Quarterly* (15:2), 1991, pp. 151-169.

Kaiser, K. M. “DP Career Paths,” *Datamation* (29:12), 1983, pp. 178-188.

Kaiser, K., and Srinivasan, A. “User-Analyst Differences: An Empirical Investigation of Attitudes Related to Systems Development,” *Academy of Management Journal* (25:3), 1982, pp. 630-646.

Khan, M. B., and Kukalis, S. “MIS Professionals: Education and Performance,” *Information & Management* (19:4), 1990, pp. 249-255.

Longenecker, C. O., Simonetti, J. L., and Mulias, M. “Survival skills for the IS professional,” *Information Systems Management* (13:2), 1996, pp. 26-31.

Microsoft, “Summary of findings from IT Skills Study – Final Draft,” January 1998, [www.microsoft.com/uk/train\\_cert/skills\\_research.htm](http://www.microsoft.com/uk/train_cert/skills_research.htm), (Current May 6, 2000).

Microsoft, “A wide variety of roles,” 1999, [www.microsoft.com/uk/skills2000/about\\_it/jobs.htm](http://www.microsoft.com/uk/skills2000/about_it/jobs.htm), (Current May 6, 2000).

Mykytyn, P. P. Jr., Mykytyn, K., and Raja, M. K. “Knowledge acquisition skills and traits: A self-assessment of knowledge engineers,” *Information & Management* (26:2), 1994, pp. 95-104.

Nelson, R. R. “Educational Needs as Perceived by IS and End-User Personnel: A Survey of Knowledge and Skill Requirements,” *MIS Quarterly* (15:4), 1991, pp. 502-525.

Nelson, A. C, and Joshi, K. "Application of a matrix approach to estimate project skill requirements," *Information & Management* (29:3), 1995, pp. 165-172.

Office of Technology Policy, *America's New Deficit: The Shortage of Information Technology Workers*, US Department of Commerce, 1987, [www.ta.doc.gov/OTPolicy/Reports.htm](http://www.ta.doc.gov/OTPolicy/Reports.htm), (Current May 6, 2000).

Office of Technology Policy, *Update - America's New Deficit*, US Department of Commerce, 1988, [www.ta.doc.gov/OTPolicy/Reports.htm](http://www.ta.doc.gov/OTPolicy/Reports.htm), (Current May 6, 2000).

Prager, K. P. "Organizational culture and the IT professional," *Information Systems Management* (16:2), 1999, pp. 12-17.

Rada, R. "IT skills standards," *Communications of the ACM* (42:4), 1999, pp. 21-26.

Simon, S. J, Grover, V., Teng, J. T. C., and Whitcomb, K. "The relationship of information system training methods and cognitive ability to end-user satisfaction, comprehension, and skill transfer: A longitudinal field study," *Information Systems Research* (7:4), 1996, pp. 466-490.

Slaughter, S., and Ang, S. "Information systems employment structures in the USA and Singapore: across-cultural comparison," *Information Technology & People* (8:2), 1995, pp. 17-36.

Stephens, C. S, Ledbetter, W. N., Mitra, A., and Ford, F. N. "Executive or functional manager? The nature of the CIO's job," *MIS Quarterly* (16:4), 1992, pp. 449-467.

Todd, P. A., McKeen, J. D., and Gallupe, R. B. "The evolution of IS job skills: A content analysis of IS job advertisements from 1970 to 1990," *MIS Quarterly* (19:1), 1995, pp. 1-27.

**Table 1. Selected Studies on IT Skill-Related Issues**

**Classification/categorization of skills**

*Authors*

Fryer (1999), Goff (2000)  
Microsoft (1998, 1999)  
Rada (1999)  
Todd et al. (1995)

*Focus*

Computerworld's Annual Skill Survey  
Microsoft's Skills 2000 (skill vision & study)  
Issues on the standardization of IT skills  
Description on news paper classified ads

**Career orientation/path**

*Authors*

Applegate & Elam (1992)  
Crepeau et al. (1992)  
Grover et al. (1992)  
Igbaria et al. (1991)  
Kaiser (1983)  
Stephens et al. (1992)  
Todd et al. (1995)

*Focus*

Veteral vs. newly hired CIOs  
Career decision making of individual IT workers  
Required characteristics for CIOs  
Career orientations of MIS employees  
Career paths of IS personnel  
Characteristics of successful CIOs  
Description on news paper classified ads

**Portfolio of skills required and/or desired**

*Authors*

Ferratt et al. (1993)  
Grabski et al. (1987)  
Green (1989)  
Kaiser & Srinivasan (1982)  
Longnecker et al. (1996)  
Mykytyn et al. (1994)  
  
Nelson & Joshi (1995)  
Prager (1998)

*Focus*

Supervising skills  
Skill differences between auditors and analysts  
System analysts and users  
Skill differences between IS designers and IS users  
Desired skills for IS personnel  
Knowledge acquisition skills and traits of  
knowledge engineers  
Required skills for IS personnel (empirical)  
Required skills for IS personnel

**Skill acquisitions and transfers**

*Authors*

Compeau & Higgins (1995)  
Khan & Kukalis (1990)  
  
Office of Technology Policy (1987, 1988)  
Simon et al. (1996)  
Slaughter & Ang (1995)  
Trauth et al. (1993)

*Focus*

Behavior modeling vs. lecture methods  
Educational background of MIS personnel and  
their performance  
Forecasts on IT professional supply & demand  
Behavior modeling vs. lecture methods  
IT skill outsourcing in the US and Singapore  
Industry needs vs. academic IS programs