

Information Systems Industry

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Information Systems Education and Industry Requirements in the United States: Implications for Computer Vendors

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Business Implications

- The decentralization of computing in large corporations in the United States has led to an evolution in the mix of skills required of information systems (IS) staff. Potential exists for vendors to obtain a new source of profitable revenue by supplying large users with educational services, training IS staff in the new skills organizations will require during the remainder of the 1990s.
- Vendors of small systems, application programming tools, and networking equipment and software are best positioned to take advantage of this revenue opportunity.
- Fewer business graduates are taking IS staff positions, in part because of instabilities in the IS career ladder created by the current mismatch between skills taught in the classroom and those required on the job. Vendors will need to increase their efforts to attract the best students.
- Vendors wishing to expand and upgrade the pool of available job applicants can offer financial aid to promising students in return for employment contracts.

Shifting Skill Requirements

The evolution of information systems (IS) architecture from a centralized to a distributed model has brought about a change in the mix of skills and knowledge required of IS professionals. Although educators and industry managers are aware of this shift, a discrepancy exists between the desired skill set and both academic programs and industry hiring practices.

As computing in large corporations has become more decentralized, with more computing power available on the desktop relative to the computing center, fewer specialized personnel are needed in the corporate IS center and more general expertise is required at the departmental level. End users with highly differentiated and individualistic business goals have ever greater and more sophisticated computing resources available right at their fingertips. Thus, not only has the demand for skilled personnel at the departmental level increased dramatically in recent years, but the types of skills these personnel must possess have also changed.

More than ever before, systems staff in large companies need to grasp the business problems of departmental managers, and these managers value more highly IS personnel whose skills reflect an

Such an employee should be able to assess various tools and select the combination that will be most effective in a specific business environment. Growth paths along the continuum of IS career tracks will progressively diverge from the center-which is occupied by programmers and analysts who develop software and perform IS tasks for functional areas of the company (e.g., accounting)-to the end points of technical specialists and business managers (Figure 1).

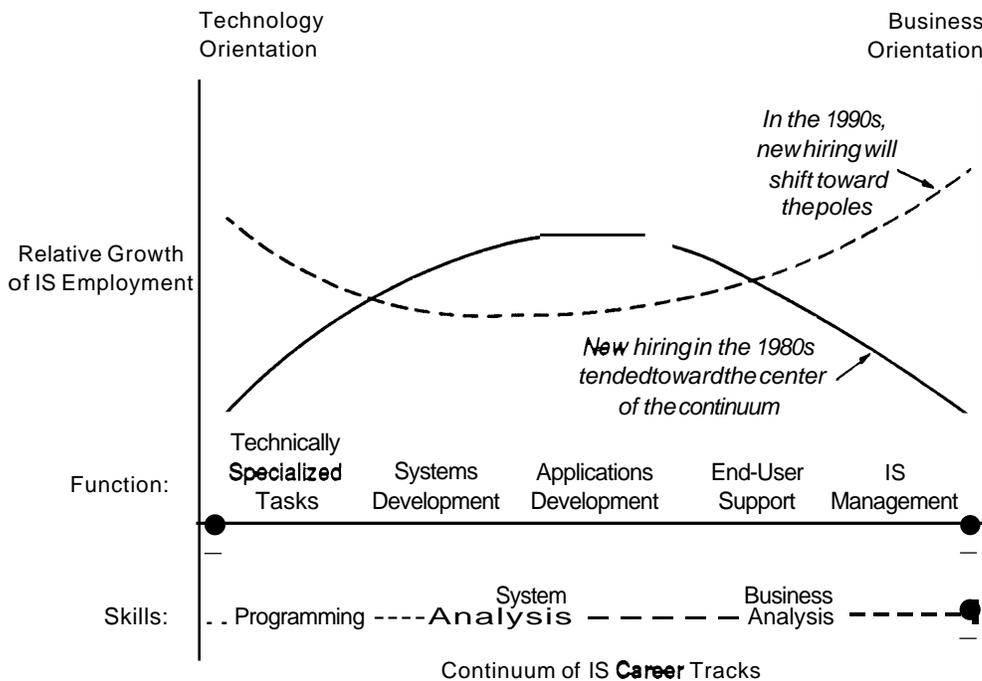
The Changing Role of IS in Corporations

Until recently, the IS department in a large corporation was expected to possess most of the skills requisite to solve the myriad problems facing a centralized facility that served the company on a broad range of fronts. Now, however, the rapid pace of technological change renders maintenance of a corporate staff that possesses current systems knowledge virtually impossible. IS professionals simply cannot keep up with the vast and swift meta-

morphosis in the universe of available hardware and software. Thus, even the most technically skilled personnel must turn to hardware vendors or consultants for solutions to highly technical problems.

Even as the IS department loses its status as the repository of deep systems knowledge, a concomitant rise is occurring in the need for personnel with basic business knowledge. The shift in requirements away from systems skills toward applications proficiency is driven in part by the fact that many of the smaller platforms used in departmental systems are equipped with highly developed operating systems that represent huge investments on the part of the vendors-investments that users cannot economically duplicate. In addition, these small platforms often possess a sophisticated set of programming tools that enable designers with limited systems skills to produce complex application programs. Thus, the need for technical programming knowledge has diminished while the

Figure 1
Shift In Functions and Skills of IS Personnel Added to Staff In the 1990s



Source: Eileen Trauth, Speech at Data Processing Management Association, student chapter, Springfield, Mass., 1989.

Facilitator of **Strategic** and **Operational** Goal.

IS personnel will no longer be able to function as merely technologists, but will have to help managers realize their business objectives. In order to fulfill this role, IS professionals will need to understand these objectives and be able to analyze the business problems involved and generate solutions for them. Such personnel might report to the IS department, but could very well work in the end-user department,

Integrator of Disparate System.

In the past, the proliferation of small system resources dispersed throughout the company led to isolated pockets of automation. Recently, these pockets have begun to be integrated into larger—even enterprisewide-information networks. The ability to integrate disparate systems will become an increasingly important skill.

Coordinator-Function. Liaison

Part of the ability to integrate systems necessarily involves an understanding of the workings at both ends. For example, when a sales-support system is integrated with an accounting system, the integrator must have a clear perception of both departments to effectively link the two without interfering with the operation of either.

Future Staffing Trends

Our data indicates that IS managers expect total IS staff levels to grow by approximately 4.4% during the next three years, while end-user managers estimate this rate to be closer to 10.8% and IS consultants project growth of 13.7%. This pattern suggests that most of the growth in IS function will come from outside the traditional areas. All three groups expect the ranks of programmers, who currently account for the largest proportion of human resources devoted to IS, to experience the slowest growth, while the number of business analysts and end-user support personnel will undergo the most rapid rise.

Technical Requirements

As we have stated, the importance of technical personnel varies with the size of the organization, with small firms stressing technical capabilities and large companies emphasizing business-analyst and end-user support functions (Table 2). Within the technical area, different groups value varied skills. IS managers and consultants rate COBOL knowledge as the most important now, but expect networking to become the primary skill in three years. End-user managers want today's IS staff to be proficient with microcomputer operating systems and would like to have staff who are skilled in relational databases in three years.

Given that both recent graduates and professors perceive that college curricula tend to place the most emphasis on systems skills more befitting the

Table 2
IS Staffing Trends In Small vs. Large IS Organizations

	1990		1993	
	Small	Large	Small	Large
Average size of IS staff	40	625	32	657
Programmers (%)	36	45	32	40
Technical specialists (%)	14	13	17	14
Business analysts/systems analysts (%)	14	14	16	17
End-user support consultants (%)	7	9	11	14
Other (e.g., machine operators, data entry clerks) (%)	30	20	23	15

Note: May not total to 100 because of rounding.

Source: Study for the Society for Information Management.

Dennis Lee, a professor who teaches courses in computer information systems at Suffolk University's School of Management, does research on the management of both computer-based technologies and technical professionals. He has presented seminars and given speeches to professional societies and published a variety of articles in his area of expertise. He is a former member of the technical staff at BeU Laboratories. He is the current chairman of the scholarship committee for the Boston chapter of the Society for Information Management and serves on the editorial boards of the Institute of Electrical and Electronic Engineers' Transactions on Engineering Management and the Journal of Engineering and Technology Management. Dr. Lee holds a B.S. from Columbia University and an M.S. from the Massachusetts Institute of Technology, both in mechanical engineering, and a Ph.D. from the Sloan School of Management.

Eileen Trauth, an associate professor who teaches courses in management information systems at Northeastern University's College of Business Administration, does research on the management of end-user computing, information resource management, information systems education, telecommunications policy, and the globalization of the information industry. She has published a number of articles and a book on information systems topics. Before joining the faculty at Northeastern, Dr. Trauth taught at the University of Pittsburgh, Bentley College, and Boston

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91-11-17

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