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INFORMATION TECHNOLOGY

Assessment of the Department of Commerce's Report on Workforce Demand and Supply

GAO

United States
General Accounting Office
Washington, D.C. 20548

**Health, Education, and
Human Services Division**

B-278899

March 20, 1998

The Honorable John D. Dingell
Ranking Minority Member
Committee on Commerce
House of Representatives

The Honorable George E. Brown, Jr.
Ranking Minority Member
Committee on Science
House of Representatives

Subject: <u>Information Technology: Assessment of the Department of
Commerce's Report on Workforce Demand and Supply</u>

Industry reports and various newspaper and magazine articles predict that
severe shortages of information technology (IT) workers could have a
crippling effect on the growth of the economy. In conjunction with
cosponsoring a convocation on the supply of IT workers, the U.S.
Department of Commerce prepared a report to explore the possibility of a
shortage of IT workers in the United States. As requested, we are providing
information on Commerce's analysis of the IT labor market presented in its
September 29, 1997, report, <u>America's New Deficit: The Shortage of
Information Technology Workers</u>.[1] Specifically, you asked us to assess
Commerce's analysis of IT worker supply and demand, and the basis for its
conclusion that a shortage of IT workers exists in the United States.

In conducting our work, we reviewed Commerce's report and interviewed
officials at the Departments of Commerce and Labor. To assess
Commerce's analysis of IT worker supply and demand and to evaluate the
basis for its conclusion that there is a shortage of IT workers, we compared
the data presented in the report with other available data from sources
such as the Bureau of Labor Statistics (BLS), the National Science
Foundation, and the Information Technology Association of America
(ITAA). As agreed with your offices, we did not perform any independent
analysis to determine whether a shortage of IT workers exists in the United
States. Rather, we limited our work to analyzing the methodology used by
the Department of Commerce in reaching its conclusion. We performed
our work from December 1997 to February 1998 in accordance with
generally accepted government auditing standards.

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[1]Washington, D.C.: Department of Commerce, Office of Technology Policy.

In summary, Commerce's report has serious analytical and methodological weaknesses that undermine the credibility of its conclusion that a shortage of IT workers exists. However, the lack of support presented in this one report should not necessarily lead to a conclusion that there is no shortage. Instead, as the Commerce report states, additional information and data are needed to more accurately characterize the IT labor market now and in the future.

The report appears to appropriately establish that the demand for IT workers is expected to grow, but it does not adequately describe the likely supply of IT workers. Although Commerce reported that only 24,553 U.S. students earned bachelor's degrees in computer and information sciences in 1994, Commerce also stated that BLS projects increasing job growth—an annual average of 95,000 new computer programmers, systems analysts and computer scientists and engineers will be required to satisfy the increasing demand for IT workers between 1994 and 2005. Pointing to the disparity between these two numbers and referring to evidence from other sources, Commerce concludes in the report's title and introduction that there is a shortage of IT workers. Commerce did not, however, consider other likely sources of workers, such as college graduates with degrees in other areas. As a result, rather than supporting its conclusion that a shortage of IT workers exists, the data and analysis support the report's observation that more needs to be known about the supply and demand for IT workers.

Background

ITAA, a trade association, issued a report entitled Help Wanted: The IT Workforce Gap at the Dawn of a New Century in February 1997 that focused on issues relating to the IT labor market.[2] Responding to this report, the National Economic Council and the Departments of Commerce, Education, and Labor began to discuss the workforce requirements of the IT sector; subsequently, federal officials agreed to cosponsor a convocation on the IT worker issue. The convocation, cosponsored by the Departments of Commerce and Education, the University of California at Berkeley, and ITAA, was designed to bring together leaders from industry, academia, and government to develop new educational strategies and forge partnerships that would increase the quantity and quality of the American IT workforce. Federal officials noted that the convocation would support the administration's goals for lifelong learning.

[2]Arlington, VA.: ITAA.

Commerce's Office of Technology Policy was assigned the lead federal role in working with ITAA on the IT worker issue. The Office of Technology Policy's mission is to work with the private sector to develop and advocate national policies that maximize technology's contribution to U.S. economic growth, the creation of high-wage jobs, and improvements in Americans' quality of life. In preparation for the January 12-13, 1998, convocation, the Department of Commerce issued its report, America's New Deficit: The Shortage of Information Technology Workers, examining the potential for shortages of IT workers.

Demand for IT Workers

In its report, Commerce presented BLS projections that between 1994 and 2005 the United States would require slightly over 1 million additional IT workers. BLS projections, based on surveys conducted for the Occupational Employment Statistics program and on the Current Population Survey, estimate future occupational needs resulting from expected national growth and separations from employment over time. Although there is no single, universally accepted definition of the occupations that should be designated as IT occupations, Commerce based its analysis of demand on job growth projections for the three IT occupations used by BLS—computer programmers, systems analysts, and computer scientists and engineers.[3]

BLS projections for new IT workers over the 11 years from 1994 to 2005 include IT workers to fill newly created jobs (820,000) in the three occupational categories and to replace workers (227,000) who are leaving these fields as a result of retirement, change of profession, or other reasons. The report noted that, according to BLS, of the three IT occupations, the greatest job growth is predicted for systems analysts (92 percent). (See table 1.) The number of computer engineers and scientists is expected to grow by 90 percent, while the number of computer programmer positions is expected to grow at a much slower rate (12 percent). The projected job growth for all occupations between 1994 and 2005 is 14 percent. Since the report was issued, Commerce has issued an update with revised BLS projections showing an even stronger growth. Between 1996 and 2006, there will be over 1.3 million projected job

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[3]BLS descriptions of these occupations are as follows: (1) computer programmers write and maintain the detailed instructions, called "programs" or "software," that list in logical order the steps that computers must execute to perform their functions; (2) systems analysts use their knowledge and skills in a problem solving capacity, implementing the means for computer technology to meet the individual needs of an organization; (3) computer scientists generally design computers and conduct research to improve their design or use, and develop and adapt principles for applying computers to new uses; and (4) computer engineers work with the hardware and software aspects of systems design and development.

openings as a result of growth and net replacements; about 1.1 million of these job openings will be due to growth alone.

Table 1: BLS Projected Job Growth for Systems Analysts, Computer Engineers and Scientists, and Computer Programmers

| Occupation | Numbers of workers in thousands | | Percentage change |
	1994	2005 (projected)	
IT occupations	1,365	2,184	60
Systems analysts	483	928	92
Computer scientists and engineers	345	655	90
Computer programmers	537	601	12
All other occupations	125,649	142,524	13
Total, all occupations	127,014	144,708	14

Source: BLS.

Supply of IT Workers

Commerce identifies the supply of potential IT workers as the number of students graduating with bachelor's degrees in computer and information sciences. The report presents data from the Department of Education showing that 24,553 students earned bachelor's degrees in computer and information sciences in 1994, a decline of more than 40 percent from 1986. While the Commerce report highlights the supply of IT workers as those with bachelor's degrees in computer and information sciences, Commerce does note that IT workers may also acquire needed skills through other training paths—master's degrees, associate degrees, or special certification programs. Commerce's report also includes information from BLS that indicates, in the case of computer professionals, there is no universally accepted way to prepare for such a career but that employers almost always seek college graduates.

Commerce's analysis of the supply of IT workers, however, did not consider (1) the numerical data for degrees and certifications in computer and information sciences other than at the bachelor's level when they quantify the total available supply; (2) college graduates with degrees in other areas; and (3) workers who have been, or will be, retrained for these occupations. Regarding these other sources of workers, the report sometimes acknowledges their relevance to a definition of supply but does not include estimates of workers from those sources in its overall estimate of supply. For example, Commerce reported that in 1994, 15,187 degrees and awards were earned in computer and information science programs below the bachelor's level, but this number was not included in the supply

number for IT workers when Commerce compared the IT worker demand with the available supply.

Commerce also noted that, although employers almost always seek college graduates for computer professional positions, there is no universally accepted way to prepare for a career as a computer professional. According to the BLS Occupational Outlook Handbook, which defines qualifications for jobs and careers in terms of education and experience of IT workers with a bachelor's degree, some workers have a degree in computer science, mathematics, or information systems, while others have taken special courses in computer programming to supplement their study in other fields such as accounting or other business areas. According to the National Science Foundation, only about 25 percent of those employed in computer and information science jobs in 1993 actually had degrees in computer and information science.[4] Other workers in these fields had degrees in such areas as business, social sciences, mathematics, engineering, psychology, economics, and education. The Commerce report did not take this information into account in any way in estimating the future supply of IT workers. The report also stated that IT workers acquire needed skills through various training paths, but it provided no analysis of the extent to which companies are training and retraining workers.

Commerce's Conclusion Regarding Shortage of IT Workers

The Commerce report cited four pieces of evidence that an inadequate supply of IT workers is emerging—rising salaries for IT workers, reports of unfilled vacancies for IT workers, offshore sourcing and recruiting, and the fact that the estimated supply of IT workers (based on students graduating with bachelor's degrees in computer and information sciences) is less than its estimate of the demand. However, the report fails to provide clear, complete, and compelling evidence for a shortage or a potential shortage of IT workers with the four sources of evidence presented. First, although some data show rising salaries for IT workers, other data indicate that those increases in earnings have been commensurate with the rising earnings of all professional specialty occupations. Second, the ITAA study gives some indication of a shortage of IT workers by providing information on unfilled IT jobs. However, in our view, ITAA's survey response rate of 14 percent is inadequate to form a basis for a nationwide estimate of unfilled IT jobs. Third, although the report cites instances of companies drawing upon talent pools outside the United States to meet their demands for workers, not enough information is provided about the magnitude of this phenomenon. Finally, while the report discusses various sources of

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[4]This information was cited in a January 1998 update report by the Commerce Department.

potential supply of IT workers, it used only the number of students earning bachelor's degrees in computer and information sciences when it compared the potential supply of workers with the magnitude of IT worker demand.

Commerce stated that upward movement in salaries is evidence of a short supply of IT workers and cited several surveys and newspaper articles illustrating salary increases. For example, the report cited a survey conducted by the Deloitte & Touche Consulting Group showing that salaries for computer network professionals rose an average of 7.4 percent from 1996 to 1997. The report also cited an annual survey by Computerworld, a weekly newspaper covering the computer industry and targeting IT workers and managers, showing that in 11 of 26 positions tracked, average salaries increased by more than 10 percent from 1996 to 1997. Increases in starting salaries were also reported in the Wall Street Journal and the Washington Post.

These wage increases, however, may not be conclusive evidence of a long-term limited supply of IT workers, but may be an indication of a current tightening of labor market conditions for IT workers. According to BLS data, increases have been less substantial when viewed over a longer period of time. For example, the percentage changes in weekly earnings for workers in computer occupations over the 1983 through 1997 period were comparable to or slightly lower, in the case of computer systems analysts and scientists, than the percentage changes for all professional specialty occupations. Thus, salary increases for these occupations have been consistent with the salary increases for other skilled occupational categories over time. What is uncertain is whether the recent trend toward higher rates of increase will continue.

Regarding unfilled jobs, Commerce cited the ITAA report,[5] which concluded that about 190,000 U.S. IT jobs were unfilled in 1996 because of a shortage of qualified workers, and that these shortages were likely to worsen. According to the ITAA survey, 82 percent of the IT companies responding expected to increase their IT staffing in the coming year, while more than half of the non-IT companies planned IT staff increases.

The Commerce report should have cautioned readers, however, that the ITAA survey has a major methodological weakness. While the ITAA study provides useful information on unfilled jobs among the firms responding to its survey, the findings cannot be generalized to the national level. ITAA

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[5]Feb. 1997.

surveyed a random sample of 2,000 large and midsize IT and non-IT companies about their IT labor needs and received a total of 271 responses—a response rate of about 14 percent. We consider a 14-percent response rate to be unacceptably low as a basis for any generalizations about the population being surveyed. In order to make sound generalizations, the effective response rate should usually be at least 75 percent[6] for each variable measured—a goal used by many practitioners.[7] Furthermore, ITAA's estimate of the number of unfilled IT jobs is based on reported vacancies, and adequate information about those vacancies is not provided, such as how long positions have been vacant, whether wages offered are sufficient to attract qualified applicants, and whether companies consider jobs filled by contractors as vacancies. These weaknesses tend to undermine the reliability of ITAA's survey findings.[8]

Commerce cited support for an emerging shortage in its observation that some companies are drawing upon talent pools outside the United States to meet their demands for IT workers. For example, the Commerce report stated that India has more than 200,000 programmers and, in conjunction with predominantly U.S. partners, has developed into one of the world's largest exporters of software; in 1996 and 1997, outsourced software development accounted for 41 percent of India's software exports. Commerce also cited a Business Week article, "Forget the Huddled Masses: Send Nerds," to illustrate that companies are searching for IT workers in foreign labor markets such as Russia, Eastern Europe, East Asia, and South Africa.

However, the Commerce report stated that some professional engineering societies believe information regarding a short supply of IT workers in the United States is exaggerated and that it is not necessary to recruit foreign workers to fill IT jobs. Additional systematic information about the

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[6]GAO, Developing and Using Questionnaires (Oct. 1993).

[7]By effective response rate, we mean the percentage of people who return the questionnaire and answer the variable in question. Small to moderate differences between the respondent and nonrespondent populations will usually have little or no bias effect on the results. High or disproportionate nonresponse rates can threaten the credibility and generalizability of the findings. The reason some nonrespondents do not complete a survey may be related to important differences between them and the responding group; for example, respondents may be motivated to complete the questionnaire because they have particular experience with the survey issue.

[8]Since it published Help Wanted: The IT Workforce Gap at the Dawn of a New Century, ITAA has released preliminary findings from a second study on the shortage of IT workers. This report, Help Wanted: A Call for Collaborative Action for the New Millennium, was done in collaboration with Virginia Polytechnic Institute and State University and estimates 346,000 claimed vacancies for IT positions. This survey involved a random sampling of 1,500 IT and non-IT companies with 100 or more employees, and the response rate was 36 percent (of 1,493 telephone interviews, 532 were successfully completed).

magnitude of the phenomenon of companies meeting their demands for IT workers outside of the United States would be useful.

The report identified the decline in the number of computer science graduates as a factor contributing to an inadequate supply of IT workers. The introduction to the report stated that evidence suggests that job growth in information technology fields now exceeds the production of talent. Commerce reported that between 1994 and 2005, an annual average of 95,000 new systems analysts, computer scientists and engineers, and computer programmers will be required to satisfy the increasing demand for IT workers and that only 24,553 students earned bachelor's degrees in computer and information sciences in 1994. Because there is a disparity between these two numbers, Commerce concluded that it will be difficult to meet the demand for IT workers.

Commerce did not adequately explain why the decline in conferred bachelor's degrees in computer science would reflect a short supply of IT workers. As stated in the section on supply, IT workers come from a variety of educational backgrounds and have a variety of educational credentials such as master's degrees, associate degrees, or special certifications. In addition, Commerce reported on the decline from 1986, although that year represents a peak in the number of computer science degrees conferred, which had risen steadily from the 1970s but has remained relatively stable in the 1990s.

Commerce's conclusions about the IT workforce are inconsistently reported in separate segments of its report. First, the title of the report states that America's new deficit is a shortage of information technology workers. The introduction also states that there is substantial evidence that the United States is having trouble keeping up with the demand for new information technology workers. However, the report notes that current statistical frameworks and mechanisms for measuring labor supply do not allow for precise identification of IT worker shortages and, in its summary chapter, Commerce concludes that more information is needed to fully characterize the IT labor market. We agree with Commerce's conclusion that more information and data are needed about the current and future IT labor market.

Agency Comments and Our Evaluation

In commenting on a draft of this correspondence, the Department of Commerce's Acting Under Secretary for Technology said there were several inaccuracies that the Department believed should be corrected.

First, he said that we had inaccurately treated the report as if it was intended to be a definitive, exhaustive analysis of the labor market for IT workers. Instead, Commerce presented the study as an initial effort to explore a potential shortage of IT workers. Second, the Acting Under Secretary said that we inaccurately characterized the report's portrayal of the supply of new IT workers as consisting only of students graduating with bachelor's degrees in computer and information sciences—overlooking people with degrees and certifications in computer and information sciences other than at the bachelor's level and college graduates with degrees in other areas. Third, he said that the report included evidence indicating a tightening labor market for IT workers in addition to the four indicators cited in our correspondence. Commerce also took issue with our characterization of the report title (America's New Deficit: The Shortage of Information Technology Workers) and statements in the introduction as reflecting Commerce's conclusion that there is a shortage of IT workers. The Acting Under Secretary said that the report does not conclude that a shortage of IT workers exists. Instead, he said that the report's only conclusions were those contained in the chapter entitled "Summary and Further Action." Commerce's comments on our draft are included in their entirety in the enclosure.

We made no changes to this correspondence on the basis of Commerce's comments. Regarding Commerce's first point, our correspondence explains that the stated purpose of Commerce's report was to explore the possibility of a shortage of IT workers in the United States; we did not characterize the report as a definitive analysis of the labor market for IT workers.

Regarding our characterization of the supply of IT workers, we acknowledged that the report contained other information on the supply of IT workers. Our point was that Commerce did not include this information when citing the imbalance between the demand and supply of IT workers. Instead, Commerce focused on the gap between the estimated annual demand for 95,000 new IT workers and the supply of 24,553 students earning bachelor's degrees in computer and information sciences, not including the 15,187 students who earned degrees and awards in computer and information sciences below the bachelor's degree in 1994.

Regarding the third point, our analysis considered all of the factors Commerce reported as evidence that a potential shortage of IT workers may be emerging in the report's chapter entitled "Is There an Adequate Supply of IT Workers?" While the report contained other information

indicating there was a tightening labor market for IT workers, that information was presented elsewhere in the report and only as anecdotal information reflecting the experiences of individual companies, not the industry as a whole.

Finally, we believe the report's title and the statements about the magnitude of the IT worker supply and demand imbalance contained in the report's introduction could reasonably be interpreted as reflecting a conclusion that there is an IT worker shortage.

We believe it is useful to now have Commerce's clarification that it does not believe its report demonstrated that a shortage of IT workers exists. As this correspondence states, the Commerce report appears to appropriately establish that the demand for IT workers is expected to grow, but it did not adequately describe the likely supply of IT workers. For that reason, we agreed with the Department's conclusion that more needs to be known about the demand and supply of IT workers.

As agreed with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this correspondence until 30 days from its issue date. At that time, we will send copies to the Chairmen of the Committee on Commerce and the Committee on Science. We will also make copies available to other interested parties upon request.

If you have any questions about this correspondence, please contact me at (202) 512-7014. Major contributors to this correspondence include Sigurd R. Nilsen, Assistant Director; Betty S. Clark, Evaluator-in-Charge; and Gene G. Kuehneman, Jr., Senior Economist.

Carlotta C. Joyner
Director, Education and
    Employment Issues

Enclosure

Comments From the Department of Commerce

UNITED STATES DEPARTMENT OF COMMERCE
The Under Secretary for Technology
Washington, D.C. 20230

MAR 17

Dr. Carlotta C. Joyner
Director
Education and Employment Issues
U.S. General Accounting Office
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Dear Dr. Joyner:

Thank you for the opportunity to review and comment on the General Accounting Office's (GAO) letter to Representatives John D. Dingell and George E. Brown, Jr. on the subject, "Information Technology: Assessment of the Department of Commerce's Report on Workforce Demand and Supply."

The GAO review of the Commerce Department's report, "America's New Deficit: The Shortage of Information Technology Workers," contains several inaccuracies, which we believe should be corrected.

The first, and most fundamental, inaccuracy is the treatment of our Fall 1997 report as a definitive, exhaustive analysis of the labor market for information technology (IT) workers. That was never the mission of our effort; we never set out such a goal for this report, and we have never presented the report as such. Nevertheless, this characterization serves as a foundation for many of GAO's criticisms. In fact, the cover letter—which was bound into the report—makes it clear that our study was an initial effort to explore the mounting reports of the U.S. private sector's difficulties in recruiting and retaining highly skilled IT workers. Our cover letter states:

> The Office of Technology Policy prepared this report to bring attention to the issue, and to encourage stakeholders to examine the potential for shortages that would undermine U.S. economic performance, and to take the steps necessary to ensure an adequate supply of these critical and highly trained workers.

This is further amplified in the report's Introduction which states:

Page 2   This paper is an initial effort to explore this complex and evolving challenge.... In exploring these issues, the paper recognizes that information technology is evolving rapidly, with resulting shifts in labor requirements. Accordingly, this paper is, at best, a snapshot of a rapidly changing phenomenon.

Further, when the report was released at a press conference on September 29, 1997, the Department of Commerce committed publicly to publish an update to the report based on our on-going analysis. We released that update, which highlights findings from our continuing study of the issue, in January 1998.

Second, the GAO letter states: "Commerce identifies the supply of potential IT workers as the number of students graduating with bachelor's degrees in computer and information sciences," and that Commerce's analysis of the supply of IT workers did not consider numerical data for degrees and certifications in computer and information sciences other than the bachelor's level or college graduates with degrees in other areas. These statements are inaccurate.

Page 2

Chapter III of the report, entitled "Is There An Adequate Supply of IT Workers?," provides this information. On pages 11-15, in addition to information on bachelor's degrees awarded in computer and information science, we include data on master's and Ph.D. degrees awarded in this field—both in the text and in Figure 6. We also cite the number of degrees and awards earned in computer and information sciences below the bachelor's level (15,187 in 1994).

Chapter III also states that IT workers obtain their skills from training providers other than four-year-degree granting universities, including: two-year associate-degree-granting community colleges, vocational technical education programs, special university/community college one-year programs, private sector computer learning centers, in-house company training, computer-user groups, Internet forums, and company-sponsored help sites.

Other sources of supply are recognized on page 24, which provides examples of other educational backgrounds found among developers of computing technologies; on page 29, where reference is made to companies hiring graduates from noncomputer-related academic disciplines and providing training in computer skills; and on page 35, which states:

Page 35   For example, information is lacking on the supply of IT workers flowing from employer provided
            training and from academic programs other than computer and information sciences, both believed to be
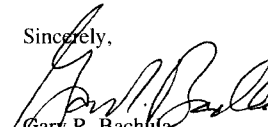   important training grounds for the U.S. IT work force.

Furthermore, data on the variety of educational backgrounds found among those already working in computer-related jobs are prominently featured in the January 1998 update of the report.

GAO's conclusion that we identified "the supply of potential IT workers as the number of students graduating with bachelor's degrees in computer and information sciences" appears to rest on a single statement in the report's introduction that says, "Only 24,553 U.S. students earned bachelor's degrees in computer and information sciences in 1994." In reaching that conclusion, GAO overlooked the sentence that immediately follows this statement, which acknowledges that many IT workers acquire the needed skills through other means:

Page 1   While many IT workers acquire the needed skills through less formal training paths, it is difficult to
            determine whether such training can be adequately expanded to meet the demand for IT skills.

GAO also apparently overlooked a similar statement in Chapter III:

Page 12   The significant decline in bachelor-level computer science degrees is, however, an imperfect indicator of
            declining labor supply, given that many IT workers acquire their skills through alternative education and
            training paths.

Third, GAO's letter states that the report cites only four sources of evidence to indicate a tightening labor market for IT workers: rising salaries for IT workers, reports of unfilled vacancies for IT workers, a decline in computer and information science degrees awarded, and offshore sourcing and recruiting. On the contrary, our report includes other evidence such as: discussions of companies' aggressive recruitment strategies, the offering of bonuses to employees who provide hiring leads, the offering of attractive signing bonuses, industry efforts to retrain staff, more extensive college recruiting, and early job offers to university students. Taken together, these industry practices are clear indications of a tight labor market for IT workers.

Page 3

GAO states that "...Commerce concludes in the report's title and introduction that there is a shortage of IT workers." These are not Commerce's conclusions. The report's conclusions are described in Chapter VII of the report, entitled "Summary and Further Actions." These include:

Page 35   The labor market for IT workers is expanding and shifting rapidly, driven by the unrelenting advancement and diffusion of information technology. New skills are constantly in demand, and IT occupations are evolving in new directions. As a result, employers are having difficulty obtaining the numbers of adequately trained IT workers they need...

As the Office of Technology Policy worked to develop this snapshot of a rapidly moving situation, we found the information and data inadequate to completely characterize the dynamics of the IT labor market. For example, information is lacking on the supply of IT workers flowing from employer provided training and from academic programs other than computer and information sciences, both believed to be important training grounds for the U.S. IT work force.

Page 36   Better information about where computer and information science graduates go, what kind of jobs they find, and what skills they need in those jobs would help educators do a better job of curriculum development and career counseling, and provide students with a roadmap for plotting their educational and career paths...

More data is needed on linkages between engineering, science and technology education and training, and work place needs. The National Science Foundation recently published a report, based on surveys of technical education in two year colleges, which begins to document linkages between their programs and local businesses. Such analysis could be extended to four-year degree granting universities.

Many IT workers currently obtain their skills through a rapidly emerging IT training industry that has developed largely outside the formal educational system. More data is needed on the structure of this IT training industry, how it responds to rapidly changing technology, what the costs are to obtain significant IT skills, and whether workers interested in obtaining such training are able to obtain the financial assistance through existing student aid programs.

Let me reiterate that this report was an initial attempt to stimulate discussion on an issue with potentially serious implications for U.S. competitiveness. It was never intended to be an exhaustive analysis of the IT labor market. To conclude, as the GAO review does, that "Commerce's report has serious analytical and methodological weaknesses that undermine the credibility of its conclusion that a shortage of IT workers exists" without considering the stated purpose and scope of the report—as well as the totality of the information contained in the report— is unwarranted.

Sincerely,

Gary R. Bachula
Acting

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Washington, D.C. 20548-0001

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Penalty for Private Use $300

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