

Critique of:

The Supply of Information Technology Workers in the United States

The Computer Research Association (CRA) is a trade association whose membership is appointed by the Colleges, Universities and other member organizations. It is not an organization of individual members. Its main mission appears to be promotion of support for research in Computer areas. As such it would naturally have a propensity to enhance the supply of Computer researchers and to prevent any escalation of costs associated with high demand or inadequate supply of trained workers. Their report can in no way adequately represent the interests of members of the profession. In this critique of their report, it will be shown that they have obfuscated rather than enlightened. They have used discredited information and failed to use reliable available information.

p9 Executive Summary(Left column number is the page number in the CRA report)

p9 "The study group found that federal data are by far the most important and reliable."

Federal data such as the BLS-CPS has insufficient sample size for specialties of less than 500,000 population and possibly 1,000,000 depending on the period of aggregation. It classifies workers by what they do, not by job title or other criteria. For sufficiently large specialty groups, it is the most valuable of all available data.

The BLS industry surveys have little value because of a major change recently destroying the continuity.

All other surveys have biases, inadequate response rates, inadequate sample size or just plain errors making it impossible to extend the survey results to the universe.

The attempt to develop a new worker classification system has no relationship with the data sources available.

There is a plethora of courses, short courses, certificate programs and seminars but the major and most effective missing element is on-the-job training.

p10 "The study group determined that the data are inadequate to determine what mismatch there is, if any, between national supply and demand." After that statement, they then proceed to use discredited data characterizing it as the preponderance of evidence.

p10 "The preponderance of evidence suggests that there is a SHORTAGE of IT workers, or at least a tight labor market" Such a statement is out of place. If it were true, and it is not, it should be in the conclusions not up front where the possibility of a SHORTAGE is being studied. In fact, the only reliable data, BLS median wages are only moving at a long term rate similar to the average rate for all workers in the economy.

p11 CRA refers to the Computer Research association. "CRA and other professional societies participating in this study did not take a position on the H-1B increase when it was being debated in 1998." This is a misleading statement. No professional society representatives are listed as study group members on pages 153-154 but they would have

been willing to participate if asked IEEE-USA is a professional society and they in a footnote specifically cite IEEE-USA as actively opposing the H-1B increase.

p11 "A government organization cannot regulate supply and demand; it can only provide incentives." Dead wrong! It does it all the time. Federal and State governments establish minimum wages that remove large numbers of workers from employment while protecting others from exploitation. State Governments control the supply of Professional Engineers. State Governments control the budgets of State Universities that promote or discourages specialty enrollments. The NSF promotes excessive supplies of PhD's by research grants.

p13 "The mandate for this study was to provide an understanding of the issues surrounding the supply of and demand for IT workers" "As a study group, we do not have any particular standing within the government, industrial, or academic sectors from which to recommend actions." HOWEVER! Fifteen pages are devoted to making 37 recommendations.

p15 Chapter 1, Political Context

p15 What is This Report's Evaluation of Earlier Studies?

p15 The report identifies ITAA as a trade association representing 11,000 companies while in fact the ITAA has listed approximately 350 member companies and claims the balance as affiliates.

p15 The ITAA report is stated as "reporting a large SHORTAGE" while in fact, the report found a vacancy rate of 190,000 that they proceeded to call a SHORTAGE. Government, industry and universities have vacancies almost all of the time just due to the time lag between the creation of a requisition (vacancy) and the filling of the job. Historically there has been a 6 months lag between job advertising and the resulting employment change as determined by an advertising lineage index and the BLS employment data. With 2,100,000 employed engineers and a 7 year job tenure, there are 300,000 job changes a year so that at any time a normal 150,000 engineering job vacancies would exist. Job vacancies have nothing to do with a shortage. In the simple case of retirement, the potential vacancy is recognized well in advance and a requisition is created in anticipation of only actually filling the job near the retirement date. That requisition is classified by ITAA as a vacancy even though there will be no more workers employed when it is filled.

p15 "In 1998, ITAA published a second report based on a larger sample of companies which indicated a more SERIOUS SHORTAGE of workers" , thereby putting a value judgment on the ITAA-Virginia Tech survey.

p15 "The legislation is temporary, lasting only three years,...". The report's statement minimizes a dislocation of a total of 345,000 US citizens that could have taken the jobs.

p16 "There is no hard evidence from any statistically valid study that refutes either the ITAA results or the presence of a worker shortage'. They fail to use their own presentation of BLS data in the report that shows unemployment of Computer Scientists and System Analysts at 1.1%, less than the 10 year average of their data at 1.88%

p16 “the unemployment rate for IT workers was only 1.3% in 1997, which is much lower than the 4 percent often considered by economists to represent “full employment”.” This is an apples and oranges comparison as anyone with only rudimentary understanding of unemployment rates knows. The general population unemployment rate is always higher than professional and technical specialists. Perhaps they would like to compare the IT unemployment to the urban teenagers that is even now in the high single numbers.

That is one of the few pieces of statistically valid data and it shows a SURPLUS of workers. (The unemployed are in fact a SURPLUS population.) Computer Programmers have a 1997 unemployment rate (a SURPLUS) of 1.6%. It is true that it is lower than the 10 year average of 2.39% but still represents approximately 11,000 SURPLUS programmers.

Another set of statistically valid evidence is ignored, the median weekly wages. That data is included in the report and shows that the Computer Science and System Analyst median wage increase was 3.0%, roughly in line with that of the general working population at 2.7%. It is true that the data for 1997 for Programmers showed an increase of 8.8% over 1996 median weekly wages but that seems to be a fluke because the Programmer pay increased only \$3.00 per week in 1998 (0.4%). The two year average is 4.6% that can hardly be classified as a blow out.

The report then proceeds to classify the BLS data as inferential. The unemployment data cannot be classified as other than direct evidence. The BLS unemployed population consists only of those without work for less than 4 months and actively looking for work. If there is any supply demand imbalance, it is on the side of a worker SURPLUS.

"In general these secondary indicators are also unable to distinguish between a shortage and a mere tightness in the labor market." This statement is countered absolutely by the SURPLUS called unemployed and inferentially by the economic relationship between real shortages and rapidly escalating salaries, a non existing condition in this case. .

p19 How Does Recent Legislation on H-1B Visas Affect any SHORTAGE?

The recent legislation has increased the competition for jobs by displacing US citizens from the employed to the unemployed part of the labor force, increasing in each quarter from below 1% to 2.2% for Computer Scientists and System Analysts in the first quarter of 1999. It is obvious that the Temporary Workers are employed since it is required that they return home when terminated thus requiring that the displaced must have been the native US workers. Need one say more?

p20 “The cost of the visa, which approaches \$15,000 when legal fees are included, limits the extent to which H-1B visas will be used to fill low-skill positions. Grossly inflated. The INS says that the total cost is less than \$1,000 and there are Internet Legal sources to confirm the low cost.

p25 Chapter 2, Information Technology Workers

p25 What is Information Technology?

p25 "In this discussion, Information Technology (IT) refers only to computer based systems." "We define 'computer-based systems' broadly." It is not clear that it includes Automotive emission control system and similar equipment but it should. Included should be all devices acquiring information, providing it to a processor and providing a controlled activity. Having provided a definition we are still nowhere since there is no useful data to define the level of activity

p28 "Only the three most popular IT-related disciplines-computer science, computer engineering and information systems will be considered here". Considering the goal of the book as established by its title to consider the supply of IT workers, these specialties are useless because none are reported exclusively in any BLS CPS data and thus cannot be validated as meaningful. Computer engineers are included in the Electrical, Electronic and Computer Engineer category. Computer scientists are part of the Computer Scientist and System Analyst category. Information systems have no comparable exclusive category in the BLS CPS data, the only meaningful data available.

p29 Who is an IT Worker?

A simple definition would be helpful and should be broken down into the developers and the users. The developers are any individuals doing the creation of the hardware and software, and the users are just those that utilize the hardware and/or the software.

p34 How Many IT Jobs Are There, and Where Are They Located?

"Over the period 1988 to 1997, employment in the IT occupations (as they defined them) grew from 1,259,000 to 2,063,000..." They have used reliable BLS-CPS data to measure the technical jobs but that does not include the IT industry non-technical employment. It measures the "satisfied" demand. It also differentiates the relatively static demand for Programmers and the rapid growth of Computer Science and System Analyst employment.

No data is given as to where the jobs are. If they had done a thorough job, they would have at least investigated IT industry employment data from the State Departments of Employment Security to get geographical distributions of employment.

p37 What Skills Does an IT Worker Need to Be effective?

p37 "technical knowledge about information technology, business knowledge and experience. And organizational and communication skills". If these skills are needed then why is it that there is such demand for H-1B's from cultures markedly different from that of the US. Those from India and China have no opportunity to obtain business knowledge and experience or to have developed organizational and communication skills.

p39 Why is Information Technology Becoming So Prevalent in Our Society?

p40 "This means that information technology, which can be programmed to do practically anything, has become embedded in many kinds of organizational and physical systems." The real answer is that IT systems have encapsulated skilled activities in programs that can be operated by less skilled individuals and produce the results previously only available through the use of more skilled workers. Here they have slipped

in the strange and unsupportable statement "Any tightness in the labor market is likely to become a shortage in a few years'

p41 What Are the Characteristics of Information Technology That Affect IT Labor?

p41 "Information technology has a short life cycle." The short life cycle is true for a small portion of IT, but in application areas among users, change does not occur quickly and is not an excuse for requiring instant multiple skill sets.

p45 Chapter 3, Demand, Constraints and Consequences

p45 What Are the Dynamics of the Marketplace and the Dangers of Government Intervention in the IT Labor Market?

p45 "In fact, it is very difficult for government organizations to effectively control labor supply". The statement is absolutely false, the government through grants, loans, immigration quotas and research contracts with educational institutions generally produce large surpluses usually out of phase with demand. They act but they cannot forecast accurately and cannot react in a timely fashion.

p46 What Factors Limit the Ability of the Government, Industry, University System, and Professional Community to improve the match between Supply and Demand?

p47 "The high level of competition and the short product life and product development time make it difficult for companies to hire new employees who require a lengthy period of break in training before they become productive"

This is just an excuse for eliminating large number of mid career and older engineers that have a balanced life style consisting of a home life with a spouse and children that causes the individual to want to a normal 40 to 50hour week rather than 80 hours. Experienced engineers are able to hit the road running and do not have the narrow limitation suggested by employers. Most engineers give more than employers can reasonably expect for their 40 hours of pay.

p48 What Are the Costs of an IT Worker SHORTAGE?

There are 13 paragraphs about the dire effects of a shortage but there has never been a shortage in the post WWII US. There has always been a SURPLUS as readily shown by the existence of unemployed. But the unemployed are a small part of the SURPLUS that is at least 3 times what the unemployment level is. A still greater supply is available from those classified as out of the labor force with over 60's having over 59% so classified. Having a large SURPLUS pool to choose from may be in the interest of employers, but it is not in the interest of society to have the wasted human resources.

p49 What Are the International Considerations in Dealing with a National IT Worker SHORTAGE?

A policy of beggaring thy neighbors by cornering the world supply is a policy that in time will cause dissension among our friends and lack of support during crises. In the long run

it can cost the US more in terms of foreign aid. This policy is not favorable for the global common good.

More importantly, the excessive use of foreign workers has the side effect of exporting advanced technology. There are laws against exporting advanced technology of which advanced encryption technology is only one of many sanctioned technologies. It is legal to hire and use green card holders in contact with the prohibited technologies but it is illegal to use H-1B workers.

p53 Chapter 4, Worker SHORTAGE

p53 How Does One Determine Whether There is a Labor SHORTAGE?

There never has been in the post WWII US. We have always had a SURPLUS at over three times the unemployment level. What employers seem to want is a significantly greater SURPLUS to provide lots of competition for the available jobs to keep their labor costs down. Since 1965, each recession with its attendant high unemployment has seen a reduction in real wages.

p54 Is There a SHORTAGE of IT Workers?

There is no SHORTAGE, there is always a SURPLUS as measured in part by the unemployment level. The engineering unemployment level has never gone to zero indicating that there was no SURPLUS.

In the public discussion of recent years, surveys of job vacancies have been used to establish the presence of a shortage. Engineering now has a population of approximately 2.1 million. The job tenure for engineers has been about 7 years. On average, then 300,000 engineers change jobs each year. Research has shown that employment ad volume is correlated with employment changes and leads the employment changes by 6 months. In the period between starting advertising and the employment of the engineer, 6 months of vacancies exist. The 300,000 annual job changes result in an average of 150,000 job vacancies without any expansion in employment. Added to that is normal retirements for which the replacement process begins 6 months before the employee retirement. At 2.5% of the employment, 52,500 are replaced yearly and result in an average of 26,250 vacancies. These added together result in 176,250 continuing vacancies or 8.4% of the employment. If expansion of 50,000 per year is added resulting in a 25,000 vacancy level, the total is 201,250 but it has nothing to do with establishing a shortage. VACANCIES are not SHORTAGES, they are the normal experience for a mobile workforce. The whole house of cards built by the ITAA in converting VACANCIES INTO SHORTAGES falls when the reality of vacancies is understood.

p68 “There is no way to directly answer the question of whether there is a shortage of IT workers”

This statement is absolutely wrong. There is adequate BLS CPS data indicating a continuing surplus or workers a part of which are the unemployed. Looking further into the data, because of the strict definition of unemployment, the out of the labor force data

shows the large number of available technical workers that are simply unemployed more than four months and are no longer counted in the unemployment data.

p68 Where Are IT Worker SHORTAGES Occurring?

There are some locations where the SURPLUS is smaller than employers would like. The SURPLUS of available workers is smaller in expanding areas. The high demand in Silicon Valley can be filled by importing from other parts of the country paying appropriate wages to compensate for the extremely high housing costs.

p71 Chapter 5, Supply-The Degree Programs

p71 What Are the Sources of IT Workers?

There are over 13 million science and engineering graduates in our population with only a few million working in their science or engineering field. The NSF Science and Engineering Statistics (SESTAT) data has shown the wide variety of talented workers presently used by the IT industry Talented US High School, Community College, Bachelor Degree Graduates and Advance Degree Graduates in Science and Engineering should be the primary source of IT workers..

p73 How Have the Career Paths for IT Workers Changed Over Time?

As the Internet based expansion has developed, careers have become shorter. The danger point for career termination has now gone down to age 35 instead of 40 or 50 or 60. The new career lifetime is 12 years from graduation with a BS degree.

p75 What is the Role of High Schools in the Supply System?

The historic role of the High Schools has been preparation of the students for a science or engineering degree. Now there is immediate demand for HS graduates as programmers, web page designers and in system administration. There is nothing wrong with siphoning off HS graduates for a few years of well compensated technical work as long as they are not kept from returning to the advanced education system at a later time. Remember the WWII Veterans success with delayed educational opportunities. The informally trained hackers are an important talented resource if converted to legitimate employment.

p78 What Is the Role of Two Year College Programs in the Supply System?

For those HS graduates who have not had the opportunity to develop skills for the entry level IT jobs, the two year College Program is an appropriate way of entering the IT workforce.

p81 What is the Role of Four Year College Programs in the Supply System?

Got entry into the IT workforce at an advance level, the Four Year college program provides an appropriate preparation. At this level, the amount of educational commitment requires consideration of the potential length of career to rationalize the educational investment.

p88 What is the Role of Graduate Programs in the Supply System?

In the case of Masters degrees, the program provides advanced technical education for some specialties and for others business education to provide a background for management. For those looking for a doctorate for teaching or for advanced research, the program is one of slave labor for the thesis supervisor. The doctoral programs are supported with NSF grant funding with an aim of having more than enough output to prevent inflation of salaries. Pages 88 to 97 go on at length without getting at the game plan.

p99 Chapter 6, The Non-Degree Programs

There is a whole industry growing up around training grants to provide talent for the IT industry however, the industry does not want to hire anyone with training or retraining but without experience. The industry spends less than \$99 per year per employee on training and some of that is in sessions on benefit programs or indoctrination. There are many expressions indicating the fear of an individual quitting as soon as receiving training. The large segment of the IT industry expecting 80 hours of work leave little time for training after work and a disinterest in releasing individuals for scheduled classes. Industry does not want to pay for training, does not want it to interfere with work schedules and expects employees to do it on their own. The organizations belonging to the ITAA are fostering programs that are detrimental to the US population.

The following five non degree programs are part of a growing training industry that ends up with generally frustrated workers. The trained workers do not meet the needs of Industry for experienced workers. The only way to get the trained workers into industry is to provide cooperative education. It works.

p101 What Non-Degree Programs Do the Traditional Colleges and Universities Offer?

p102 What Other Groups Supply Non-Degree Programs?

p103 What is the Role of Corporate Universities in Training and Educating IT Workers?

p106 What is the Role of Distance Learning in Educating the IT Workforce?

p109 Is Retraining Occurring, and if so, How Long Does It Take to Retrain for an It Job?

p111 Chapter 7, Women, Minorities and Older Workers

p111 How Do Women Relate to the Worker SHORTAGE?

The report lists 12 reasons why there are not more women in IT jobs (other than data entry) but the report misses the most important one of discrimination against women. The employer's perception is that women have other primary interests such as child care and childbearing. It is the employers concern in professional jobs but not a concern in data entry because the women are easily replaced even on a day to day basis. Women are over represented in data entry jobs and under represented in professional jobs.

p114 How Do Minorities Relate to the Worker SHORTAGE?

Minorities have the same problems as women. They are discouraged in taking the educational channels leading to work in the field because of the historical lack of

opportunity. They are unwilling to make the educational investment. Discrimination leads to lack of supply.

p115 How Do Older Workers Relate to the Worker SHORTAGE?

"It has been reported to us that less than 2% of programmers over 40 are unemployed, but we have been unable to track down the hard data to support this statement" It is almost ludicrous that the report ignores the SESTAT data that shows that of Computer and Math Scientists in the overall IT workforce age 50 to 59, 9.7% are not in the labor force. For those 60 and over, 59.3% are not in the labor force.

p117 Chapter 8, Seed-Corn Issues

Is the Strong Industrial Demand for IT Workers Harming the Educational System?

It is not a case of harming, but one of making them aware that their socialistic leanings are not compatible with strong industrial demand. The educators belief that they have a right to their allocation of workers is challenged by their workers switching to more lucrative jobs. The demand is helping to reallocate workers to jobs that are more valuable to society as expressed by higher salaries. The educators too don't want to do any training of replacements, education is their business.

p121 Chapter 9, Data Issues

p121 What Are the Sources of Data on IT Workers?

Degree data is a census and is useful. BLS CPS data is useful and timely within its sample size limitations. The BLS Occupation survey is now coming into its own with the completion of a full cycle. It however is an aggregation of three years of survey results and is not as timely as the BLS CPS data.

p124 What is the Limitation of Existing Data on the IT Workforce?

Existing BLS surveys have insufficient sample size to determine the unemployment status of any specialty with a population of at least several hundred thousand. Other sampling surveys almost invariably have selection biases and cannot be extrapolated to the universe.

p127 Recommendations

Here are 16 pages of recommendations they offer even though they stated early that it was not in their province to make recommendations.

Critique summary

The report is useless as a tool in making public policy decisions. The report purports to study the supply of and demand for information technology workers. "The study group determined that the data are inadequate to ascertain what mismatches there is, if any, between national supply and demand." Yet, in the next paragraph they state their

preconceived conclusion, “ The preponderance of evidence suggests that there is a shortage of IT workers or at least a tight labor market.” They ignore the most statistically valid data, the BLS Employment, Unemployment and Median Salary Data that do not show a shortage.. Throughout the report they repetitively use the word shortage as though it were proven fact.

The report makes no effort to determine why employers reject 95 to 98 percent of their applicants. The report excuses the young age distribution of the IT workers and makes no effort to determine why so many women, older and ethnic groups are absent from the workforce. The report excuses the lack of interest by industry and universities to provide entry and ongoing training in order to access a much larger supply of workers. The report equivocates and obfuscates rather than contributing to the understanding of the supply-demand problem. The report should be repudiated and withdrawn from circulation.

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