Debunking the Myth of a Desperate Software Labor Shortage

Testimony to the U.S. House Judiciary Committee
Subcommittee on Immigration

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Contents

1 Executive Summary and Frequently Asked Questions

Due to an extensive public relations campaign orchestrated by an industry trade organization, the Information Technology Association of America (ITAA), a rash of newspaper articles have been appearing since early 1997, claiming desperate labor shortages in the information-technology field. Frantic employers complain that they cannot fill many open positions for computer programmers. [1]

Yet readers of the articles proclaiming a shortage would be perplexed if they also knew that Microsoft only hires 2% of its applicants for software positions, and that this rate is typical in the industry. **Software employers, large or small, across the nation, concede that they receive huge numbers of re'sume's but reject most of them without even an interview.** One does not have to be a "techie" to see the contradiction here. A 2% hiring rate might be unremarkable in other fields, but not in one in which there is supposed to be a "desperate" labor shortage. If employers were that desperate, they would certainly not be hiring just a minuscule fraction of their job applicants.

The hidden agenda of the ITAA public relations campaign which began in 1997 turned out to be to leverage Congress to increase the yearly quota of H-1B work visas, under which employers were importing tens of thousands of programmers to the U.S. each year. The campaign succeeded, with President Clinton signing the increase into law in October 1998. Yet in 1999 the industry started calling for even further increases in the visa quota, which it attained in October 2000.

1.1 Summary: Frequently Asked Questions (FAQs)

I am frequently asked questions relating to various industry lobbyist claims. Following is a list of such questions and my answers. The reader is urged, though, not to simply read such a coarse summary, but instead read this document in its entirety, as this is a highly complex subject which cannot be reduced to "sound bites." The answer to each FAQ includes links/page numbers to the detailed analyses within the document proper. Citations for all statistics and quotes given in this Frequently Asked Questions section are available in the body of this paper.

1.1.1 List of FAQs About the H-1B Program

Question: Are the H-1Bs paid the fair "prevailing wage," as claimed by the industry? Page (mouse click here) 9.

Question: The industry says that it will need H-1B visas temporarily, until more programmers can be trained. Is this true? Page (mouse click here) 16.

Question: The industry claims that if it cannot bring H-1B workers to the U.S., it will be forced to move software operations to where the workers are overseas. Is this true? Page (mouse click here) 20.

Question: Why are the H-1Bs de facto indentured servants? Page (mouse click here) 19.

Question: How has the high-tech slowdown of 2001 affected H-1B usage? Page (mouse click here) 22.

Question: Rather than H-1Bs being a source of cheap labor, the industry claims that legal fees make the H-1Bs actually more expensive than American workers. Is that true? Page (mouse click here) 19.

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[1] Our focus on computer programmers here is explained in the section "Reason for the Focus on Software."

Question: The industry lobbyists say the alleged high-tech labor shortage is due to the failure of our K-12 educational system to develop math skills for engineering careers. Is that true? Page (mouse click here) 22.

Question: Are large numbers of university computer science majors foreign students? Page (mouse click here) 17.

Question: What about at the PhD level? Are they largely foreign students? Page (mouse click here) 17.

Question: The industry lobbyists claim that the H-1Bs tend to be "the best and the brightest" from around the world. Is this true? Page (mouse click here) 18.

Question: What about the industry lobbyists' citing of the Asian-born entrepreneurs in Silicon Valley? Page (mouse click here) 18.

Question: The employers claim to hire the H-1Bs because they have work experience in specific software skills. How is it that the H-1Bs possess skills the Americans don't? Page (mouse click here) 14.

Question: The industry claims that each job held by an H-1B generates several new jobs for Americans. Is this true? Page (mouse click here) 18.

Question: Lobbyists for the large U.S. firms concede that there is abuse of H-1Bs, but that this is mainly among the "body shops" owned or run by Indo-Americans. Is this true? Page (mouse click here) 19.

Question: Since the industry says that the H-1Bs are so important to them, has it lobbied Congress to expedite the greencard process? Page (mouse click here) 20.

Question: The industry says H-1Bs comprise only a small percentage of their workers. If that is true, why is there such a controversy? Page (mouse click here) 20.

Question: How was the industry able to get Congress to pass the H-1B increase in 1998, given that a Harris Poll had shown that 82% of Americans opposed the increase? Page (mouse click here) 21.

Question: Does this discussion really boil down to whether one should protect the natives? Page (mouse click here) 21.

Question: The industry lobbyists say that only a tiny percentage of H-1B visas lead to complaints about underpayment of wages. Page (mouse click here) 18.

Question: Why not just have an open-borders policy, at least for high-tech workers? What would be the harm of issuing instant green cards to anyone with experience as a programmer or engineer? Page (mouse click here) 23.

1.1.2 List of FAQs About the Claims of a High-Tech Labor Shortage

Question: How can we evaluate all these conflicting claims about whether a high-tech labor shortage exists or does not exist? Page (mouse click here) 8.

Question: In all this "high-tech labor shortage" talk, what kinds of workers are we discussing? Page (mouse click here) 10.

Question: Is there a "desperate" shortage of programmers? Page (mouse click here) 10.

Question: Don't low unemployment rates among programmers indicate a labor shortage? Page (mouse click here) 11.

Question: True, the fact that industry employers hire only about 2% of their programming applicants in spite of an alleged programmer "shortage" does sound strange. But could the low hiring rates simply reflect a situation in which the same applicants are applying to many employers? If for example an applicant sends re'sume's to 12 firms, that might make the overall applicant pool look 12 times its actual size. Page (mouse click here) 11.

Question: Why are the employers being so picky in their hiring? Page (mouse click here) 11.

Question: Are U.S. universities producing enough computer science graduates to meet industry's needs? Page (mouse click here) 16.

Question: Industry employers say they have to hire only programmers with specific software skills, because they have urgent needs to finish a product quickly. Is this true? Page (mouse click here) 13.

Question: The industry lobbyists point to large sums of money they spend recruiting programmers. Doesn't that show that there is a shortage? Page (mouse click here) 13.

Question: The industry lobbyists cite astronomical sums of money the industry claims to spend on training. What about this? Page (mouse click here) 13.

Question: Industry employers say that the reason they reject all programming applicants who lack specific software skills, is that they receive such a huge volume of re'sume's. They don't have time to interview everyone, and thus need to use some filter to winnow down the the pile of re'sume's. Isn't that reasonable? Page (mouse click here) 13.

Question: If employers really would be better off hiring on the basis of general programming talent rather than on specific skills, won't market competition solve that problem? Won't the employers with better hiring policies naturally rise to the top of the market? Page (mouse click here) 15.

1.1.3 List of FAQs About Difficulties Faced by Older Tech Workers

Question: How widespread is age discrimination in this field? Page (mouse click here) 12.

Question: Some older programmers do quite well in the field. So if an older programmer is having trouble finding programming work, isn't it his/her own fault for not keeping up with changes in the technology? Page (mouse click here) 14.

Question: Since the issue of specific programming skills is central, is the solution to increase government or private training programs? Page (mouse click here) 14.

Question: But training does seem to be working. Press accounts in the year 2000 have reported that the training programs funded by the H-1B fees are resulting in actual hires. Page (mouse click here) 15.

Question: The industry dismisses concerns about older programmers by claiming that those programmers' experience is in COBOL, a language popular in the 1960s and 1970s but radically different from the languages used today. Is this true? Page (mouse click here) 14.

1.1.4 Answers to the FAQs

Question: How can we evaluate all these conflicting claims about whether a high-tech labor shortage exists or does not exist?

Perform this simple five-minute experiment:

Just call any firm which hires programmers — a large firm, a small one, new, old, any location — and talk to the HR Department. Ask them if it is true that they reject the vast majority of their programming applicants without even an interview. After they confirm this, ask them why they do this, and they will say that the vast majority of the applicants don't have some new software skill set the employer wants, even though the applicants have years of programming experience.

Here is what you will have learned from this experiment:

- The industry lobbyists are incorrect when they claim a lack of "bodies," i.e. a lack of people with programming experience. What they really mean (some insincerely, some sincerely) is a lack of programmers with work experience in a specific software skill, say the Java programming language.

- The industry lobbyists are incorrect when they claim the school system needs to produce more programmers. The technology changes extremely rapidly, so it will always be the case that the vast majority of programmers do not possess the newest software skills — no matter how many programmers the schools produce. Producing more programmers would just give employers more people to reject. (Note that it will not work for a older programmer to take a class in a new skill; the employers insist on actual work experience in the skill.)

- Thus the industry lobbyists are incorrect when they claim that they only want a temporary increase in the quota for foreign programmers on H-1B work visas, while the educational system works to produce more programmers.

Question: Are the H-1Bs paid the fair "prevailing wage," as claimed by the industry?

The industry lobbyists form a lone voice on this issue. There is a broad consensus that the H-1Bs are indeed exploited in terms of wages and working conditions. This was found in

- the study at UCLA, which found that the immigrant engineers were paid 33% less than comparable Americans

- the study at Cornell University, which found underpayment of H-1B programmers and engineers by 20-30%

- my study at UC Davis, finding that immigrant programmers and electrical engineers were paid 15-20% less than comparable Americans

- the report by the Immigration and Naturalization Service, which found that the computer-related H-1Bs were paid a median of $53,000 per year, far below the national median of $66,000 for this field

- the audit done by the Department of Labor, finding that 19% of the H-1Bs were not even paid the salaries promised by the employers on the visa application forms

- the report by the National Research Council, which found that "H-1B workers requiring lower levels of IT skill received lower wages, less senior job titles, smaller signing bonuses, and smaller pay and compensation increases than would be typical for the work they did"

- articles in respected, pro-business publications such as *Forbes Magazine* ("Indian programmers working in the U.S. on temporary H-1B visas typically earn 25% to 30% less than their naturalized colleagues") and the *Wall Street Journal* ("recruiting foreign talent is cheaper than hiring Americans"

- statements by the H-1Bs themselves, who have formed the national organization ISN (www.isn.org) with a goal of persuading Congress to reform the program

One need not even use data sets to see the problem. Most H-1Bs are *de facto* indentured servants, unable to switch jobs. Thus they cannot leave for a higher-paying job elsewhere, nor can they negotiate higher wages with their present employers by threatening to leave. So, they have lesser opportunities than do normal workers who are free to move about in the market. **Thus it is indisputable, from basic economic principles, that on average they are making less money than they would if they had their freedom.**

See Section 9.2.5.

Question: In all this "high-tech labor shortage" talk, what kinds of workers are we discussing?

Though usually not mentioned by the lobbyists, the discussion is about computer programmers. (Note that this includes not only those with Programmer titles, but also those with titles like Software Engineer and System Analyst.) The reason the discussion is about only programmers that the H-1B work visa holders in the high-tech field work almost exclusively as programmers, not in all the other information technology (IT) jobs such as marketing, customer support, software testing and so on. And note that this is not about engineers either — among the H-1B workers, computer science graduates outnumber the electrical engineering graduates 15-to-1.

See Section 3.

Question: Is there a "desperate" shortage of programmers?

The only ones claiming a shortage are the industry and their allies. Consider:

- No study, other than those done by the industry, has confirmed the industry's claim of a shortage.

- The study sponsored by the industry lobbying group ITAA was sharply criticized by the General Accounting Office, Congress' research arm.

- Studies by highly pro-business groups such as the National Research Council, the Department of Commerce, the Computing Research Association, etc. have all found that they could not confirm the shortage claim. The same is true for studies performed at the Urban Institute and UC Berkeley.

- Employers only hire about 2% of their software applicants, and they admit that they reject the vast majority of their applicants without even an interview. If employers were so desperate, they could not afford to be so picky.

- Both government and private data show that average wage increases for programmers have been mild, 7 or 8%, and again contradict the claims of huge shortages. The industry's own study estimated that the claimed 'shortage' is only driving up salaries by 3%. If employers were desperate, they would be willing to pay much higher wage premiums.

  And though figures like 7 or 8% are a few percentage points above inflation, they are still very mild. **If employers were desperate to hire, as they claim, they would certainly be willing to pay a premium of more than 7%.** Wages in almost all professions have been going up at least this much. Surveyors and dieticians saw their salaries increase far more than programmers in 1997, beating inflation by 20% and 17%, respectively.

- An analysis of growth in starting salaries for new college graduates during 1995-1999 found that wage growth for computer science graduates was below those of graduates of business administration, accounting and sales/marketing.

When the industry claims a shortage of programmers, what they mean is a shortage of cheap programmers. A September 28, 2000 article in the *Chicago Tribune* said it succinctly:

> "If you're willing to pay market rate, you can find people," said Pete Georgiadis, founder and CEO of eBlast Ventures, a company that funds and builds technology firms. "The issue is if you're budget-constrained, you can't get the people you want."

The fact that the industry cries of "shortage" were nothing more than a political ploy was illustrated by the fact that heavy layoffs in the industry began around January 2001, just two months after the industry lobby-ists were insisting to Congress that there was a "desperate" shortage (and nearly a year after the NASDAQ stock index started falling).

In the economic slowdown of 2001, employers became even pickier than before. Whereas before a job ad might require only Java, the same ad now was phrased something like "Requires Java and XML, in real estate applications, residential real estate preferred."

See Section 4.

Question: Don't low unemployment rates among programmers indicate a labor shortage?

Since people who cannot find programming work leave the field, unemployment statistics for programmers are meaningless.

For example, consider the recent age discrimination lawsuit filed against Siemens. An EEOC report on the suit found that in the firm's layoff action, the termination rate for those over 40 was 10 times higher than for those under 40. The plaintiffs in the case were now working in jobs such as truck driver. Clearly, they were "employed," but they counted in government statistics as an employed truck drivers, not unemployed programmers.

See Section 5.7.1.

Question: True, the fact that industry employers hire only about 2% of their programming applicants in spite of an alleged programmer "shortage" does sound strange. But could the low hiring rates simply reflect a situation in which the same applicants are applying to many employers? If for example an applicant sends re'sume's to 12 firms, that might make the overall applicant pool look 12 times its actual size.

It is not just the *hiring rates* which are low; the *interview rates* are also low. Employers admit that they reject the vast majority of their programming applicants without even interviewing them. The key significance of of this is that it shows that the the employers are actually not "desperate" to hire, contrary to their claim. Instead of being desperate to hire, they are actually very picky.

Question: Why are the employers being so picky in their hiring?

As noted earlier, most employers admit that they reject the vast majority of their applicants. Why are they so picky?

The employers answer that most of their applicants, even though they are experienced professional program-mers, do not have a very specific new software skill which the employer wants, say the Java programming language.

This skills issue is central, for both insincere and sincere employers:

- Insincere employers use the skills issue as a pretext for hiring cheap H-1B programmers and for not

11

hiring older programmers.

- Sincere employers genuinely believe they need to hire a programmer with specific skills, but they are misinformed, because any competent veteran programmer can become productive in a new programming language in a couple of weeks on the job.

So again, for both insincere and sincere employers, the skills issue is central. Employers say they do not have enough applicants for programming jobs, but in fact they have huge numbers of applicants; what they really mean is that they do not have many applicants who possess work experience in a given skill.

An *Information Week Online* article (March 30, 1998) summarized the situation with respect to both age and specific software skills:

> "Younger people with hot skills have the most options open to them," says Tom Morgan, a VP in the Chicago office of Pencom Systems, a national IT recruiting firm.

See Sections 5, 7 and 9.2.

Question: How widespread is age discrimination in this field?

Age discrimination is rampant in this field, starting even as young as 35. Though industry lobbyists like to dismiss this as being supported only by anecdotal evidence, the fact is that there is a plethora of hard data which show that older programmers and engineers do face major difficulties in finding programming and engineering jobs, such as:

- A study at American University found that on average it takes three more weeks for a laid-off programmer or engineer to find a job for each year of age.

- An *InformationWeek* survey of hiring managers found that only 2% of them would prefer to hire an applicant with more than 10 years of experience.

- A *Network World* survey of hiring managers found that the younger the manager, the less likely he/she would be to hire an older programmer.

- Twenty years after graduation from college, only 19% of computer science majors are still employed as programmers. This compares, for instance, to a figure of 57% of civil engineering majors who are still working as civil engineers 20 years after leaving school.

- Even a National Research Council committee, heavily biased in favor of industry, found that:

  - Older programmers are more likely to be laid off than the younger ones.
  - The length of time to become re-employed after a layoff is longer for older programmers than for younger ones.
  - Among laid-off programmers that get rehired, the older ones on average take a cut in pay, whereas the younger ones on average actually get a raise.

- Most employers define a Senior Programmer title to mean just three to five years of experience.

The employers use the skills issue as a pretext for shunning the older programmers, saying, "Sorry, we cannot hire you, since you do not have the new software skills."

Question: The industry lobbyists point to large sums of money they spend recruiting programmers. Doesn't that show that there is a shortage?

No. Again, this only reflects the fact that employers want to hire certain narrow categories of people, such as those with specific new software skills and younger and/or foreign programmers with lower salaries.

Question: The industry lobbyists cite astronomical sums of money the industry claims to spend on training. What about this?

Most of those sums for training are spent on secretaries and technicians, with much less being spent on programmers and engineers.

In fact, it is common for a firm to be laying off older workers while simultaneously hiring younger ones with newer skills. As one HR director of Dow Jones put it in 1998

> There's a real focus on skill sets needed right now. I recently attended a conference on retention where participants were simultaneously hiring and laying off-even in IT-all because of the need to get things involving new skill sets done fast. Training never came up as an alternative.

Computerworld reported in June 2000 that IBM, Hewlett-Packard, Ernst and Young and so on

> [are laying off programmers off while] hiring people with the right skills — not teaching old dogs new tricks.

Question: Industry employers say they have to hire only programmers with specific software skills, because they have urgent needs to finish a product quickly. Is this true?

By the industry's own admission, they often leave jobs open for months (an average of 3.7 months in Silicon Valley) until they find a programmer possessing the exact skills match they want. It is thus disingenuous for them to say they need someone who can "be productive immediately, tomorrow."

During the three or four months they wait for the perfect match, they could instead hire a generic programmer and let him/her learn the specific skills on the job, which any competent programmer can do within weeks. Refusing to hire a C-language programmer to write Java code is like a Ford dealer refusing to hire mechanics who have only Chevy experience, and even such luminaries as Microsoft's Bill Gates have criticized industry practice in this regard.

The best way to finish a project on time is to hire smart programmers, not programmers who have some particular skill set. Studies show that there is a 10-to-1 range in productivity among programmers.

Employers are shooting themselves in the foot with their current hiring policies, actually increasing their labor costs rather than reducing them, and increasing time-to-market for their products, rather than reducing it.

See Sections 5.9, 7 and 10.

Question: Industry employers say that the reason they reject all programming applicants who lack specific software skills, is that they receive such a huge volume of re'sume's. They don't have time to interview everyone, and thus need to use some filter to winnow down the the pile of re'sume's. Isn't that reasonable?

It's not reasonable to say on the one hand that they are "desperate" to hire, and on the other hand complain that they have so many applicants that they need ways to winnow down their pile of re'sume's. They have an embarrassment of riches, not a shortage.

Question: The employers claim to hire the H-1Bs because they have work experience in specific software skills. How is it that the H-1Bs possess skills the Americans don't?

Often the H-1Bs don't have the background they claim. An audit by a U.S. consulate in India found that fraud was quite common. Similarly, reports from American programmers who work with H-1Bs indicate that rather than having work experience in the given skill, many H-1Bs either have only had a quick course or are learning the skill on the job. Ironically, the latter is what I recommend that the employers have older American programmers do, but the difference is that the H-1Bs are much cheaper than the older Americans, so the employers do this with the H-1Bs but not with the older Americans.

See Section 9.8.

Question: Some older programmers do quite well in the field. So if an older programmer is having trouble finding programming work, isn't it his/her own fault for not keeping up with changes in the technology?

No. Employers are not willing to hire a veteran programmer who has taken a course in a new software skill. Employers insist on actual work experience in that skill.

If an older programmer is lucky enough that the present employer will allow him/her to work on a project which uses a new skill, then he/she can then stay alive in the field. Or, in some instances, if there is a very new programming language X which very few programmers know, a programmer who knows another language Y can try to find another employer who needs Y and is willing to let him/her learn X on the job. But there is only a narrow window of time in which this is possible.

See Section 5.9.

Question: The industry dismisses concerns about older programmers by claiming that those programmers' experience is in COBOL, a language popular in the 1960s and 1970s but radically different from the languages used today. Is this true?

Virtually none of the older programmers I talk to around the nation who have trouble finding programming work are COBOL people. Their experience is in the C programming language. Java and C++, two of the hottest languages today, are extensions of the C language.

The industry lobbyists then claim that the C language is not enough, asserting that Java and C++, with their "object-oriented programming" (OOP) philosophy, represent an "abrupt change in the paradigms of programming." This is simply false. Those of us "dinosaurs" who have been programming since way back in the days of punched cards have heard claims of "abrupt paradigm changes" many times as programming languages have evolved over the years. The claims have always simply been hype. Programming is programming is programming, and it has always been a straightforward matter to quickly become productive in a new language.

Question: Since the issue of specific programming skills issue is central, is the solution to increase government or private training programs?

No, this is absolutely the wrong "solution," for these reasons:

- Any competent programmer can pick up a new software skill on his/her own, on the job, without formal instruction.

14

- The training programs are for technicians, not programmers, and thus are not achieving their stated purpose of reducing the industry's usage of H-1Bs.

  This is not a "career path" issue. Technicians do not later become programmers. The two jobs are unrelated, just a computer technician at a magazine would not become a writer, a lighting technician in a theater would not become an actor, etc.

- Even if retraining programs were to focus on programmers instead of technicians, they would be useless. Employers are not willing to hire a veteran programmer who has taken a course in a new software skill. They want actual work experience.

See Section 8.

Question: But training does seem to be working. Press accounts in the year 2000 have reported that the training programs funded by the H-1B fees are resulting in actual hires.

Those programs are training people to fill jobs which are not taken by the H-1Bs anyway, not the programming jobs taken by H-1Bs. The training is for jobs as a technician, a completely different job which requires a level of general education at only the high school diploma level; the H-1B visa is for jobs requiring a college degree. (Again, note that technicians do not later become programmers.)

Thus the programs are not accomplishing the goal Congress had in establishing them — to reduce industry usage of H-1Bs, to make use of the older ex-programmers who were forced out of the industry, etc.

This point was illustrated in the September 18, 2000 issue of *eWeek*. It notes that $153.7 million has been raised by H-1B fees, but:

> eWeek reporting supports the claim that retraining programs funded by H-1B fees are failing to lessen dependence on imported IT talent. Calls to companies on the list of corporate partners of one Labor-funded program, Bay Area Video Coalition, or BAVC, in San Francisco, didn't turn up a single organization that could claim to have reduced its use of H-1B visa holders because of the program...
>
> Even big IT employers familiar with the H-1B fee-funded training programs say they haven't been used to reduce dependence on workers from outside the United States. Sun, for example, donates cash, equipment and curriculum development to training programs funded by the H-1B fees, yet within Sun itself, **the programs have brought about no impact on H-1B visa usage.** Why isn't Sun hiring training program graduates into positions held by H-1B visa workers? Because the skill levels of the two groups are worlds apart, said a Sun spokesman. "There's no data on actual skill levels, but the Sun people who are on H-1B visas are very highly skilled," said the spokesman, in Washington.
>
> Like Sun, many IT employers see a vast discrepancy between the high skill levels of most H-1B visa holders and the entry-level skills of most graduates of H-1B fee-funded training programs

(Emphasis added.)

The article then quotes some industry lobbyists as saying the problem is government bureaucratic bungling. But that is an obfuscation of the basic fact that industry does not want to reduce H-1B usage in the first place; the attractions of indentured servitude, salary savings and so on are things the industry just does not want to give up. Even industry lobbyist Rick Swartz has stated this.

Question: If employers really would be better off hiring on the basis of general programming talent rather than on specific skills, won't market competition solve that problem? Won't the employers with better hiring policies naturally rise to the top of the market?

No. The classical economic models of "perfect competition" don't apply to this industry.

- Studies have shown that programmers who are twice as productive are paid on average only 10% more.

- The Intel processor chip has dominated the market even though it is not the best (Bill Gates once called it "brain damaged").

Question: The industry says that it will need H-1B visas temporarily, until more programmers can be trained. Is this true?

No, it's false and dishonest. The employers know that this labor "shortage," in the manner they have defined it, will be **permanent**; they intend to rely heavily on H-1Bs **permanently,** as explained below.

The industry has been using this "temporary need" stall tactic for years, ever since the H-1B law was enacted in 1990. In the early- and mid-1990s, for example, the industry kept saying that H-1Bs wouldn't be needed after the laid-off defense programmers and engineers were retrained, but never carried out its promise. It hired those laid off in low-level jobs such as technician (which is all the retraining programs prepared them for), and hired H-1Bs for the programming and engineering work.

It is important to note that though the industry has claimed that the H-1B visa program is just a "temporary" solution to the claimed labor shortage, that claimed/perceived "shortage" will be permanent. The reason for this is that, since software technology will continue to change extremely rapidly, and since employers are not willing to hire a veteran programmer who learns a new software skill via coursework, it will always be the case that most programmers do not possess the latest software skills, and thus there always will be a "shortage."

Indeed, immediately after the H-1B bill passed Congress in the year 2000, Texas Instruments and other high-tech firms said that they would need H-1B for "the next 20 years."

Question: Are U.S. universities producing enough computer science graduates to meet industry's needs?

"Pushing the Education Button" is a tried and true method for obfuscating any issue, this case being a prime example.

The leading industry lobbying group for increasing the H-1B quota, the ITAA, claimed in its original literature in 1997 that American students had neither the interest nor the background to study computer science. But in actually, the ITAA knew that computer science enrollment was skyrocketing, and it deliberately suppressed that fact in its report. New computer science enrollment doubled nationwide in the latter half of the 1990s.

Other industry lobbyists have continued to present highly misleading data since that time. They also continue to obfuscate the issue by talking about enrollment in engineering, even though as mentioned earlier the vast majority of high-tech H-1Bs have degrees in computer science, not engineering; the H-1Bs are overwhelmingly programmers, not engineers.

Contrary to the claims that American youth lack interest in computer careers, the fact is that university enrollment in computer science programs has risen and fallen in almost perfect correlation to the job market in this field.

Moreover, these supposedly-desperate employers are ignoring most of the new graduates. If you ask a large employer about their recruiting at a typical large university, they will admit that they extend offers for programming positions — again, this is what the H-1Bs are hired for, thus the category of interest here — to only a small handful of the new graduates at that school. Amdahl, for example, made only six offers to new graduates at UC Davis during the two recruiting seasons 1998 and 1999.

A small number of graduates are highly courted by employers, but most graduates cannot get programming positions, and are relegated to semitechnical jobs like customer support. To be sure, salaries are good even in those semitechnical positions, but most CS grads have worked very hard in their studies, preparing to do the "real" work, i.e. programming; instead, the employers are hiring the H-1Bs for programming positions. Moreover, once someone without job experience in programming gets a customer support position, it is quite difficult to move into d evelopment jobs; most will never become programmers.

The economic slowdown of 2001 hit new graduates very hard, according to reports in early Spring. All the problems cited above became more severe. The situation was dramatized by the revelation that Intel even had contacted some of those to whom it had made recent job offers, now turning around and offering to pay them NOT to accept those offers; a number of other firms did the same.

See Section 6.

Question: Are large numbers of university computer science majors foreign students?

No. Only 6% of Bachelor's degrees in computer science are awarded to foreign students.

See Section 6.

Question: What about at the PhD level? Are they largely foreign students?

This is a red herring to begin with, since fewer than 1% of the computer-related H-1Bs have a PhD. (And only 7.5% have a Master's.) But some other points are worth mentioning as well:

It is true that a substantial percentage of computer science PhD degrees in the U.S. are awarded to foreign students. But that is irrelevant because one does not need a graduate degree to do the work in this field. Bill Gates, founder of Microsoft, does not even have a Bachelor's degree, and similar statements hold for Larry Ellison, founder of Oracle, and Steve Jobs, founder of Apple and Pixar. A joint Stanford/RAND study found that we are overproducing PhDs in science and engineering.

The decision of American students not to pursue a PhD is indeed a rational response from a salary perspective: National Science Foundation data show that the salary premium for a PhD over a Bachelor's is one of the smallest of all science and engineering fields. There is simply no incentive to pursue the degree for domestic students, whereas foreign students can use their U.S. education (which is typically a graduate degree) as a better steppingstone to a greencard (it allows them to avoid the onerous "body shop" employers since they make industrial contacts through their professors, they get priority for greencards via using the EB-2 category instead of EB-3, etc.). The NSF was aware of this and actually planned for it.

Even a highly biased pro-industry National Research Council committee calculated that graduate study is a losing proposition financially for domestic students. They found that the holder of a Master's degree takes 10 years to make up for income lost while in graduate school, and a PhD takes a staggering 50 years to compensate.

Those who are plied by the industry's feigned interest in PhDs would be baffled by the following incident. On October 13, 1999, a team of Intel engineers recruiting for new graduates visiting my department at UC Davis. I mentioned that I had a couple of PhDs in electrical engineering I could refer to them, one a new

graduate and the other a 1992 graduate. In reply one of the recruiters blurted out, "No, Intel is not very interested in PhDs." The other added that she did not think a PhD would have enough to challenge him or her at Intel, except in the case of very highly specialized research areas. Keep in mind, Intel lobbyists in particular have told Congress they need H-1Bs because so few domestic students pursue a doctorate. This is shameless hypocrisy.

Why, then, do employers hire MS/PhD H-1Bs, even in relatively small numbers? One reason is the "ethnic connection": A manager who is, say, from India and came to the U.S. as a student will often hire others in his own image. Another reason is that foreign students are local: One can call their professors to check on their abilities, and it is easy to bring them in for an interview. So one gets the indentured servitude with some degree of quality control.

See Sections 6.3.3 and 9.7.

Question: The industry lobbyists claim that the H-1Bs tend to be "the best and the brightest" from around the world. Is this true?

Certainly not. We should definitely facilitate the immigration of the outstanding talents throughout the world, but only a small proportion of the H-1Bs fall into this category. 75% of the H-1Bs earn less than $65,000, far below the salaries of top talent in this field, which exceed $100,000.

A House Immigration Subcommittee hearing in 1999 revealed that, contrary to the industry's claim that the H-1Bs are usually of exceptionally high quality, many H-1Bs do not have the qualifications their sponsor claims for them.

See Section 9.6.

Question: The industry claims that each job held by an H-1B generates several new jobs for Americans. Is this true?

This is an obvious fallacy. The employers could fill those positions with Americans (U.S. citizens and permanent residents) instead of H-1Bs and still get the job-generating effect.

Question: What about the industry lobbyists' citing of the Asian-born entrepreneurs in Silicon Valley?

The Saxenian study that the industry lobbyists are citing here shows that the Asian-immigrant programmers and engineers in Silicon Valley actually have a <u>lower</u> per-capita rate of entrepreneurship than do natives.

Also these firms may not employ many programmers and engineers anyway. For instance, according to Saxenian, 36% of the Chinese-owned firms are in the business of "Computer Wholesaling," meaning that they are simply assemblers of commodity PCs, with no engineering or programming work being done.

Moreover, even Saxenian (whose study was funded by a foundation related to the high-tech giant, Hewlett-Packard) notes that the immigrant entrepreneurs tend to hire from their own immigrant ethnic groups; those jobs are largely not open to natives.

See Sections 9.9 and 9.10.

Question: The industry lobbyists say that only a tiny percentage of H-1B visas lead to complaints about underpayment of wages.

The affected parties do not dare speak out: The H-1Bs rely on the job to stay in the U.S. and also fear blacklisting, and their U.S. citizen/permanent resident co-workers at the same company fear retribution by their employers as well.

Even those outside the company find that complaining to the DOL is futile. First, people outside the company do not have access to H-1B information, other than submitting a Freedom of Information Act request to the Dept. of Labor. Much more importantly, the DOL has itself complained that Congress tied its hands, giving the DOL only very limited ability to investigate and prosecute violations. One of the biggest obstacles is the fact that the law has so many loopholes in it; it is pointless to complain to DOL about these, as Congress is the party which made these laws.

Question: Lobbyists for the large U.S. firms concede that there is abuse of H-1Bs, but that this is mainly among the "body shops" owned or run by Indo-Americans. Is this true?

No.

First of all, this focus on Indo-Americans is unwarranted scapegoating.

Second, who are the clients of those Indo-American agents? They are the large mainstream American firms, the same ones that are trying to distance themselves from the "body shops" by statements like those above.

The large American firms are just as interested in cheap labor as anyone else. Sun Microsystems, for example, has bragged in a *Los Angeles Times* interview that it hired Russian programmers (to work there) "at bargain prices." Intel and Hewlett-Packard use H-1Bs supplied by Northwest Software, which pays the foreign workers wages well below average. General Dynamics imported H-1Bs from England, with the appeal being, according to federal court documents, the "indentured" status of the foreign workers, promised by the agency to be "prepared to work here in the United States for as much as a 40% reduction in current United States salary levels."

See Section 9.4.

Question: Rather than H-1Bs being a source of cheap labor, the industry claims that legal fees make the H-1Bs actually more expensive than American workers. Is that true?

The legal paperwork needed to sponsor an H-1B costs only about $1,000.

It does cost more to sponsor a worker for a greencard, around $10,000, but often the employers have the foreign employees pay the legal fees for greencards themselves. And even when employers foot the bill, the cost is usually far less than they save in salary, accumulated over the several years it now takes to get the greencard.

Note also that an employer who rents an H-1B from an agency avoids the fee a recruiter would charge in a regular hire, which is considerably more than $10,000.

See Section 9.3.3.

Question: Why are the H-1Bs de facto indentured servants?

Most H-1Bs hope to get U.S. permanent residency status, i.e. green cards. But during their sponsorship by employers for greencards, they are in essence indentured servants: The green-card process takes several years, so H-1Bs dare not change employers. Changing employers would mean starting the green-card clock all over again.

The legislation passed in late 2000 tempers the indentured servitude problem somewhat, but is far from a solution. Immigration attorneys estimate that H-1Bs will still typically have a period of indentured servitude of 3 or 4 years.

Starting in early 2001 (or late 2000), the industry experienced a sharp slowdown. There were now many more H-1Bs than jobs which employers wished to fill with H-1Bs. Accordingly, many employers no longer

offered green card sponsorship when they hired H-1Bs. Though this would at first appear to at least give the H-1Bs more freedom of movement, they now had a new problem — deportation. If they were laid off or fired from one job, they would have to find another within 10 days, or face deportation. (Some immigration attorneys challenged this, but the INS chose not to respond.) So, it was *de facto* indentured servitude all over again.

Question: Since the industry says that the H-1Bs are so important to them, has it lobbied Congress to expedite the greencard process?

Very few employers have done this. On the contrary, the ITAA's Harris Miller, in an interview with the press, said to the H-1Bs in essence, "If you don't like it, go home":

> They don't have to use the H-1B program They can stay in their own country or they can go to another country. They are trying to turn this into an entitlement program.

This is an amazing statement for Miller to make. He has repeatedly claimed that the H-1Bs are vital to the U.S. economy, so why would he invite them to leave the U.S.? His emotional outburst illustrates the fact that ISN's lobbying exposes the real reason why Miller's clients want H-1Bs, indentured servitude.

Even Rick Swartz, a pro-immigration lobbying kingpin who has represented both industry firms such as Microsoft and also the ISN, an organization of H-1B workers, recognizes this, as seen in *Electronic Business*, March 2001:

> What's more, there are no politically powerful folks pushing for a reform of the system. There is no consensus among high-tech companies to push for it, says Swartz. Some companies "get it," he says, while he believes that other companies may want to keep the program as is in order to keep their foreign employees "under their thumb." Although the Immigrants Support Network's leadership has talked to some high-tech companies and found that some support its goals in theory, no company has come forth with financial support for the group, says Swartz.

Question: The industry claims that if it cannot bring H-1B workers to the U.S., it will be forced to move software operations to where the workers are overseas. Is this true?

This is a bogus threat, an obvious contradiction: Why does the industry want to bring Indian programmers to the U.S. as H-1Bs in the first place? Why not just employ those programmers in India? The answer is that it is not feasible to do so.

The fact is that, although a small amount of work is done abroad (largely old mainframe software), this will not escalate to become the major mode of operation of the industry. The misunderstandings caused by long-distance communication, the problems of highly-disparate time zones and so on result in major headaches, unmet deadlines and a general loss of productivity.

Just look at Silicon Valley. This is the most "wired" place in the world, yet those massive Silicon Valley free-way traffic jams arise because very few programmers telecommute. They know that face-to-face interaction is crucial to the success of a software project.

See Section 9.5.

Question: The industry says H-1Bs comprise only a small percentage of their workers. If that is true, why is there such a controversy?

The Department of Commerce, in their report *Digital Economy 2000* (June 5, 2000), found that H-1Bs now account for 28% of all information technology industry hires requiring at least a Bachelor's degree.

Moreover, many of the large employers claiming that only a small proportion of "their" work forces consists of H-1Bs are hiding behind the fact that they "rent" many H-1B workers from agencies.

Question: How was the industry able to get Congress to pass the H-1B increase in 1998, given that a Harris Poll had shown that 82% of Americans opposed the increase?

The high-tech industry wields enormous, unstoppable clout on Capitol Hill and in the White House, and even in academia.

In Spring 2000, a major supporter of pending legislation which would increase the H-1B quota, Rep. Tom Davis (R-Va.), had the gall to say, "This is not a popular bill with the public. It's popular with the CEOs...This is a very important issue for the high-tech executives who give the money." Rep. Davis is chair of the Republican Congressional Campaign Committee.

Then when the Senate passed the H-1B bill on October 3, 2000, even more outrageous talk came from Capitol Hill, as reported by the *San Francisco Chronicle*:

> "Once it's clear (the visa bill) is going to get through, everybody signs up so nobody can be in the position of being accused of being against high tech," said Sen. Robert Bennett, R-Utah, after the vote. "There were, in fact, a whole lot of folks against it, but because they are tapping the high-tech community for campaign contributions, they don't want to admit that in public."

(The AFL-CIO did not campaign against the bill. In fact, it actually considered supporting the H-1B increase.)

One place where the industry lobbyists cannot simply flash their money is the court system. As of this writing, there have been two court cases in which the author's writings have produced a favorable outcome:

- A 1999 case, in which programmers sued Siemens for age discrimination, and won a very favorable settlement, in part due to my testimony.

- A 2001 case, in which a court held that the onerous contracts which many H-1Bs are forced to sign amounted to illegal indentured servitude. My writings played a major role here as well.

Several other related lawsuits are pending.

Extensive details are given in Sections 2.3, 2.2 and 11.

Question: Does this discussion really boil down to whether one should protect the natives?

We should definitely encourage "the best and the brightest" programmers and engineers around the globe to come to the U.S. But as discussed above, the vast majority of H-1Bs are not in that category.

And it is not a "natives vs. immigrants" issue. Many immigrant American programmers are negatively impacted as well. Thus when we refer to "Americans," we mean U.S. citizens (native or naturalized) and legal permanent residents (greencard holders). The employers' access to the H-1B labor pool makes it easy to shun American programmers, both native and immigrant; immigrant computer programmers encounter the same age discrimination when they reach age 35 or 40 that natives do. As pointed out by Shankar

Lakhavani, an official with the Institute of Electrical and Electronic Engineers (IEEE), "There are many immigrants like me who are American citizens, and they would like a crack at these jobs [which are going to H-1Bs]."

Question: How has the high-tech slowdown of 2001 affected H-1B usage?

Numerous articles appeared in 2001, discussing laid-off H-1Bs who faced deportation and were desperate to stay in the U.S. Worse yet, many employers in 2001 stopped offering the H-1Bs green cards altogether. There were so many excess foreign workers available that employers who wished to hire foreigners could afford to not offer green cards.

Since jobs were now scarce, the H-1Bs were even more beholden to their employers than before.

The industry lobbyists, embarrassed by the fact that massive layoffs occurred almost immediately after the lobbyists got Congress to approve an increase in the H-1B quota, tried to spin the news their way. They predicted that the new larger quota would not be used, and "therefore" employers must be hiring Americans instead of H-1Bs. But the facts show this analysis to be incorrect.

H-1B visa usage through the end of May 2001 (the latest figures available at the time this is written) show that nonexempt H-1B visas are being issued in 2001 at the same rate as in 2000. And since Congress greatly expanded the number of visas exempt from the quota in October 2000, many visas which would have been counted as nonexempt in 2000 were not included in that May 2001 count.

In other words, H-1B usage is up, while job openings are down. Clearly, American employers in 2001 were even more keenly interested in H-1Bs than in the past. This is apparently due to the fact that the economic tightening caused employers to have increased interest in hiring cheaper labor.

One firm, ADEA, even issued a press release in May 2001 in which it blatantly announced it would actively recruit such workers, in order to take advantage of their desperate status. Thus, although the numbers of H-1Bs hired may have been down, the percentage of new openings being filled by H-1Bs may have actually increased.

Question: The industry lobbyists say the alleged high-tech labor shortage is due to the failure of our K-12 educational system to develop math skills for engineering careers. Is that true?

The main answer to this question is that the vast majority of high-tech H-1Bs are programmers, not engineers, and programming does not use math.[2] So, the question is a red herring to begin with.

Even if the industry lobbyists insist on focusing on the small minority of H-1Bs who are engineers, for whom math is important, this "math skills" claim is highly misleading. This is quickly seen by noting, for example, that average math test scores of some individual U.S. states such as Iowa and Utah are quite similar to those of the East Asian nations with whom the U.S. is often compared unfavorably. What is so special about Iowa and Utah? The answer is that their scores are not hampered by having a large socioeconomic underclass, as the U.S. as a whole is. There are a number of other serious problems with the study.

Quite contrary to industry's claim that math education is superior in other countries, especially in East Asia, in an article in the September 1999 issue of the American Society for Engineering Education's magazine *Prism*, an engineering professor in China warns his nation that the engineers being produced by Chinese universities are not good enough for China to compete in the global high-tech market. Professor Chen says the educational system in China produces students who cannot think independently or creatively, and cannot

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[2]An obvious exception is software for mathematical applications, and theoretical computer science as an academic discipline is sometimes of a mathematical character.

solve practical problems. He writes that the system "results in the phenomenon of high scores and low ability." Many other academics have written about this problem, and the governments of China, Japan and South Korea all are making attempts to remedy it.

The U.S. has more than double the number engineers per capita of the nations which the industry lobbyists say have superior school math scores: South Korea, Taiwan, Singapore, Switzerland, and so on.

See Section 6.3.2.

Question: Why not just have an open-borders policy, at least for high-tech workers? What would be the harm of issuing instant green cards to anyone with experience as a programmer or engineer?

Even the very pro-industry National Resarch Council committee found that the swelling of the high-tech labor supply by the H-1Bs was suppressing wage growth in the field.

Furthermore, the larger the labor pool, the worse conditions would be for older workers in the field, already a serious problem; the more workers there are, especially younger ones, the easier it is for employers to avoid the older workers.

These problems exist currently with H-1Bs, and would still exist with an "instant green card" policy.

We should definitely facilitate the immigration of the world's "best and brightest," but the vast majority of H-1Bs are not in that category at all. And having open borders simply to bring in cheaper labor would be a wrong-headed policy, which among other things would greatly discourage our young people from entering this field.

2 The Players: Industry, Academia, Politicians, the H-1Bs, American Labor

Here we will discuss the motivations on the part of industry and academia to claim a programmer labor shortage, and the reasons why Congress accepts such arguments while rejecting the pleas of organizations representing programmers and engineers.

2.1 Industry: Desires for Cheap Labor and "Indentured Servitude"

In early 1997, the ITAA industry lobbying group began its massive national public relations campaign to develop an image of a software labor shortage in the public consciousness. Many critics speculated at the time that access to cheap labor, in the form of foreign nationals, was the "hidden agenda" behind the ITAA's campaign. Though ITAA's Harris Miller originally denied this (*Electronic Engineering Times*, December 8, 1997), another ITAA official blurted out around the same time that its "number one priority" in 1998 would be to push Congress to increase the yearly quota of H-1B work visas (*San Jose Mercury News*, November 21, 1997), which turned out to be the case; ITAA led the successful campaigns to raise the H-1B cap in 1998 and 2000.

Amazingly, the prominent computer-industry business magazine, the *Red Herring*, admitted in its July 1998 editorial that the charges I make in this report are correct, and even more amazingly, actually endorsed the idea of hiring H-1Bs as a means to accessing cheap labor. The *Red Herring* put it this way:

> The congressional General Accounting Office found "serious analytical and methodological weaknesses" in the [ITAA/Dept. of Commerce] reports. The American Engineering Associa-

tion criticized common IT hiring practices that eliminate more than 95 percent of applicants. A University of California at Davis professor decried "rampant" age discrimination by the industry and suggested that technology companies prefer to hire young, cheap, foreign programmers who are willing to work 80-hour weeks.

Though factually correct, these criticisms are, we feel, ingenuous. Companies have a fiduciary responsibility to keep labor costs low. If U.S. technology companies cannot find highly trained, highly motivated American employees at a competitive cost, then a shortage does exist. And if companies say they want to hire more skilled foreign workers because those workers are cheaper, we should believe them — and increase the number of visas issued.

Equally important as cheap labor as an attraction to industry is the *de facto* "indentured servitude" of the H-1B workers whose employers are sponsoring them for greencards. As explained in Section 9.4, such workers are essentially immobile for a period of five years or more. This means a programmer cannot suddenly leave the employer in the lurch on an important project by leaving for another company, an extremely important consideration to employers. It also enables the employers to give them smaller raises, work them more hours and so on.

This point in particular demonstrates the insincerity of the industry' s claim to legitimately need the H-1Bs. The industry did not support legislation in 1998 and 2000 which would have greatly reduced the time it takes for an H-1B to get a greencard, thus ameliorating the indentured-servitude problem. Clearly, the industry finds indentured servitude quite appealing.

Even Rick Swartz, a pro-immigration lobbying kingpin who has represented both industry firms such as Microsoft and also the ISN, an organization of H-1B workers (see Sec. 2.3.4), recognizes this, as seen in *Electronic Business*, March 2001:

> What's more, there are no politically powerful folks pushing for a reform of the system. There is no consensus among high-tech companies to push for it, says Swartz. Some companies "get it," he says, while he believes that other companies may want to keep the program as is in order to keep their foreign employees "under their thumb." Although the Immigrants Support Network's leadership has talked to some high-tech companies and found that some support its goals in theory, no company has come forth with financial support for the group, says Swartz.
>
> They should, he says. After all, these reforms are in the best interests of U.S. companies, too, which should want to keep these workers after they've invested the time, energy and money in training them

The H-1Bs are well aware of this, and many express quite bitter feelings about it in Internet discussions. A good description of this appeared in *Tech Week*, January 10, 2000:

> Rajeev calls himself a high-tech indentured servant.
>
> An H-1B visa holder from India, he arrived here nearly five years ago to design chips for a semiconductor firm. Rajeev (not his real name) expected to get a greencard within a few years and pursue his dream of doing challenging tech work in Silicon Valley. Instead, immigration rules and bureaucratic delays have kept him at the same firm, which is now failing. All the talented engineers have fled to greener pastures, he says, while he and other H-1B visa holders are stuck, mopping up the mess and praying to get their greencards in the mail.

"It's total exploitation," he says. "It's just Indians and Chinese who are doing all the work-because they have to"...

Mistreatment of H-1B workers is not surprising to guest workers in Silicon Valley. Recently, a group of five Indian H-1B technology professionals met with TechWeek to discuss problems with the system. All asked to remain anonymous for fear of reprisal from their firms, and several felt betrayed by bosses who shunted them into grunt-work duties. Much of the guest workers' frustration with the high-tech industry, however, stemmed from their perception that firms were purposefully ignoring the immigration dilemma. To them, it seems Silicon Valley firms favor a revolving door system of H-1B workers who are easy to exploit.

"The tech industry could help us by lobbying the INS," Rajeev says. "But they choose not to, because they're getting H-1Bs."

An organization of H-1Bs mainly from India, the Immigrant Support Network, www.isn.org, has arisen to lobby Congress to remedy the H-1Bs *de facto* indentured status. (See Sections 2.4 and 9.4.)

Ironically, the worst victims of current hiring policies are the employers themselves. This is detailed in a later section, titled "Employers Are Shooting Themselves in the Foot with Their Hiring Policies."

2.2 Motivations in Academia

Universities and colleges have extremely strong incentives to support the claims by industry lobbyists of a desperate software labor shortage and the "need" for a higher H-1B quota:

- Public university college administrators use the shortage claims as leverage to demand increased funding from state governments.

  Many also have started special computer-related training courses aimed at the nonstudent public, which, by charging higher fees than those of their mainstream courses, become "profit centers."

- Universities and colleges depend heavily on industry donations of equipment, research funds and even entire buildings.

- As discussed in Section 6.3.3, we are overproducing PhD's in science and engineering. Yet universities use PhD production to obtain lucrative federal research grants. Since domestic high-tech students correctly perceive that they do not need a PhD to work in this industry, most of them, including most of the top students, forego graduate work and instead go straight to industrial work after finishing their undergraduate degree. To make up for this "deficit," universities admit large numbers of foreign students to their PhD programs. The latter use their U.S. degrees as steppingstones to H-1B visas and eventually greencards.

  In short, if there were no H-1B program, the foreign students would not come to the U.S. for graduate study; universities would find their graduate programs depopulated and they would lose their grant monies.

- Universities themselves hire H-1B workers for research projects, and actually have pressed Congress to exempt them from the law (widely flouted in industry anyway) requiring H-1Bs to be paid at least the level of "prevailing wages."

One of the most prominent academic supporters of the H-1B program has been Professor Ed Lazowska of Department of Computer Science at the University of Washington. A glance at his department's Web page (as of March 16, 2000) shows just how financially beholden they are to industry:

The home page includes a place to click on "Information for Industry," and after clicking there, one of the items in the next page is "Corporate Support." And there you have it: $1.5 milion from Ford Motor Co. in research funds; "several million dollars" in equipment from Intel; $500,000 from Boeing for an endowed faculty chair; another $500,000 chair from Microsoft; another one from Boeing; some miscellaneous items; and finally, $3 million from the Bill and Melinda Gates Foundation for two endowed chairs (soon to be filled).

The contortions through which university officials will go to support the industry party line was illustrated in an 1998 interview of Professor Randy Katz, then chair of the Computer Science Dept. at UC Berkeley, another school which enjoys huge industrial donations. Katz actually tried to justify age discrimination in the software industry on the PBS Newshour with Jim Lehrer:

> SPENCER MICHELS: For example, Katz says that the new programming language called Java, which allows programs to run on any computer, may be easy for his students to learn but difficult for older workers.
>
> PROFESSOR RANDY KATZ: The analogy that I like to use is I always wanted to learn Swedish. And it's harder for me as a forty-two-year-old to learn Swedish today than if I learned it when I was six years old, or if I tried to learn it when I was eighteen. And the same thing is true about these modern ways of programming computers.

Word on the computer science academic grapevine following that broadcast was that Katz's colleagues considered his remarks to be "stupid," and it was also pointed out that if older computer scientists can't learn new things, then professors like Katz are incapable of teaching those new things, and should be forced out. I was told by journalists that Katz subsequently refused to return their calls.

Those who might have thought of academia as a center of integrity must keep in mind that universities are exceedingly political entities, with money playing a central role in all activities. Industry lobbyists know that they can count on academia to produce seemingly "unbiased" studies which in fact are designed from the outset to produce results supportive of industry's position. In an impressive moment of candor, prominent immigration attorney Austin Fragomen, who has lobbied Congress in favor of liberal H-1B visa policies, wrote in *Workforce Magazine*, March 1996. He said that when the Senate was considering scaling back the H-1B program in that year,

> ...The business community mobilized, forming American Business for Legal Immigration (ABLI), a Washington, D.C.-based lobbying group that represents a number of associations and employers, and **commissions academic studies to support its position.**

(Emphasis added.)

The academic/industrial connections of Alan Merten, the chair of a supposedly impartial government committee appointed to review criticisms of the H-1B program, made for huge sources of bias. See Sections 4.4 and 2.3.6.

2.3 Politicians and Lobbyists

2.3.1 Amazing Candor from the Chair of the Republican Congressional Campaign Committee

In Spring 2000, a major supporter of pending legislation which would increase the H-1B quota, Rep. Tom Davis (R-Va.), had the gall to say, "This is not a popular bill with the public. It's popular with the CEOs...This is a very important issue for the high-tech executives who give the money." (*National Journal*, May 5, 2000 and *New York Daily News*, May 3, 2000.) Rep. Davis is chair of the Republican Congressional Campaign Committee.

In the last few years, both major political parties have been making tremendous efforts to curry favor with the high-tech industry. (*The New Republic*, June 8, 1998; *Newsbytes*, April 27, 1999; *Washington Post*, June 13, 1999.) The *Dallas Morning News* described it most succinctly, in a June 29, 1999 article:

> "The presidential candidates are tripping all over themselves to be seen as having the computer industry seal of approval," said Larry Makinson of the Center for Responsive Politics, a Washington group that monitors campaign spending.

> "Both Democrats and Republicans are coming away from Silicon Valley with bagfuls of money," he said. "It's probably the single most-sought-after industry there is. It's the turn-of-the-millennium equivalent of Hollywood."

(It should be noted that what is most important here is not the donations to individual politicians, but rather the "soft money" which goes to the political parties. There is a limit on donations to individuals but no limit on donations to parties.)

2.3.2 And Amazing Candor from Senator Robert Bennett

After the Senate vote on October 3, 2000 to increase the H-1B quota, the *San Francisco Chronicle* reported on October 4,

> "Once it's clear (the visa bill) is going to get through, everybody signs up so nobody can be in the position of being accused of being against high tech," said Sen. Robert Bennett, R-Utah, after the vote. "There were, in fact, a whole lot of folks against it, but because they are tapping the high-tech community for campaign contributions, they don't want to admit that in public."

2.3.3 Whatever the Industry Wants, It Gets

Whatever the industry wants, it gets. After President Clinton initially sided with the American Trial Lawyers Association (a close ally) on the issue of stockholder lawsuits against high-tech firms, Clinton switched his stance after heavy pressure from the industry. Even Clinton signed the increase into law, and then immediately went on a fundraising tour of Silicon Valley. In 1999, the industry wanted to limit their legal liability on the Year 2000 bug problem, and Congress/Clinton approved this too.

The industry lobbyists have made major efforts during Clinton's presidency to get a "direct line" to him. For example, during the 1996 expose' of "coffees" held in the White House for donors to meet Clinton, one of the attendees on June 19, 1996 was reported to be Dr. Howard Rubin, a Hunter College computer science

professor who is paid by the industry and who has been a prominent ally of the ITAA industry lobbying group.[3]

Eventually, in 1997, Clinton wrote a memo to his Department of Commerce (DOC), asking them to co-operate with the ITAA. The Department of Education was also brought in, as the ITAA's theme was that education was the long-term solution to the claimed labor "shortage," but that in the meantime an increase would be needed in the H-1B visa quota.[4] On the other hand, the Department of Labor was largely shunted out to the margins, as the industry lobbyists viewed DOL as the "enemy," for having criticized the H-1B program in the past. The DOC issued its own report in September 1997, a virtual carbon copy of the ITAA report, with no input having been sought from opposing voices. (Later, after pressure from the American Engineering Association and a congressional staffer, DOC did establish ties with those who disagreed with the "shortage" claims, and produced a more balanced report in June 1999, *The Digital Workforce: Building Infotech Skills at the Speed of Innovation*, by Carol Ann Meares and John Sargent, Jr.)

The ITAA, out to attain the government's imprimatur for their "shortage" claim, got DOC approval to lend the Commerce name to a January 1998 Convocation held in the San Francisco Bay Area. In reality, though, the ITAA ran the show. (*San Francisco Chronicle*, January 22, 1998.) Keynote speakers were Secretary of Commerce William Daley and Secretary of Education Richard Riley. The Executive Branch's lack of integrity in this matter was illustrated when Riley pointed to a recent *Wall Street Journal* article (January 8, 1998) which had claimed that H-1Bs do not adversely affect job opportunities for American programmers. Riley avoided mentioning that that same article had also stated that American firms recruit abroad because "recruiting foreign talent is cheaper than hiring Americans," quoting an American recruiter of foreign programmers as saying that he pays them $20,000 to $25,000 less than Americans with the same skills.

Immediately after Clinton signed into law the large H-1B quota increase in 1998, he went on a major fundraising tour of Silicon Valley and some other high-tech regions.

And even though some officials in the Department of Labor have been critical of the H-1B program (and thus the DOL was excluded in the collaboration between the ITAA and the Departments of Commerce and Education), the DOL has limited itself to addressing only egregious individual violations of H-1B law, rather than modifying regulations in a way that would have broad impact. In particular, the DOL could, entirely within its legal mandate, rewrite its prevailing-wage regulations so that a job's specific software skills requirements (e.g. the Java programming language) must be factored in to calculation of prevailing wage. (See Section 9.2.5.) Yet they have refused to do so.

The *Baltimore Sun* reported on February 21, 2000:

> The industry groups and the companies employing H-1B workers have a powerful ally in the American Immigration Lawyers Association. AILA members have thrown their financial muscle and support behind the congressmen who play a key role in determining the fate of the program.
>
> Sen. Spencer Abraham, chairman of the Senate Immigration Committee, has been a speaker at AILA's national conferences and held a series of fund-raisers in tandem with AILA events.

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[3]See the Center for Responsive Politics, http://www.opensecrets.org, section titled "White House Coffees and Sleepovers." The full entry reads, "RUBIN, HOWARD POUND RIDGE, NY DOCTOR, / Rubin Systems 6/19/1996. Attended a coffee hosted by Vice President Gore."

[4]This argument, used in 1997 and 1998, is a common industry tactic, which they used in 1995 as well. At that time the theme was, "As soon as we get the laid-off defense engineers and programmers retrained, we won't need H-1Bs." This, of course, never materialized.

When AILA met last summer in Seattle, the Michigan Republican held a $500-a-plate breakfast at the hotel where most of the conventioneers were staying. He held a similar fund-raiser during an earlier AILA conference.

Sen. Abraham, in holding hearings on the H-1B program on October 21, 1999, did not invite any critics of the program to present testimony. All five witnesses (two industry CEOs, two representatives from industry trade groups, and one think-tank analyst) testified in favor of raising the H-1B cap.

(Sen. Abraham lost his bid for re-election in 2000, partly due to TV ads bought by immigration-reform groups, criticizing his support of liberal immigration policies.)

The amazing political clout wielded by the industry made even an advocate of the H-1B program, immigration attorney Arthur Zabenko, express wonderment. In the September 28, 2000 issue of *Immigration Daily*, an electronic newsletter which he edits, Zabenko wrote

> Despite the recent GAO report titled *H-1B Foreign Workers: Better Controls Needed to Help Employers and Protect Workers*, which pointed out our weaknesses in the program, there has been no discussion about major changes to the H-1B education and salary requirements.

2.3.4 H-1B and Immigration Policy Is Set by a Small Group of DC Insider Lobbyists

The ITAA's focus on immigration, so vehemently denied throughout 1997 by ITAA president Harris Miller, is illustrated by the fact that Miller is a former immigration lobbyist. Moreover, prior to Miller's lobbying career, he was a congressional staffer who specialized in immigration legislation, and thus who had the perfect Capitol Hill connections on which to base his subsequent immigration-lobbying business.

Interestingly, Miller tries to conceal his immigration-lobbyist background. In an October 16, 2000 interview with the *Washington Times*, he said:

> When I was hired five years ago some of the members of the ITAA said to the election committee "What are you doing? You need to hire someone who is a techie or a trade association executive. Why would you hire a lobbyist?"

The fact is that the ITAA needed an immigration specialist like Miller. In 1995, when Miller was hired by the ITAA, both the Senate and the House had introduced measures which would have scaled back the H-1B program. The ITAA apparently reacted to this by hiring Miller, a consummate Washington insider on immigration issues.

What we have, then, is a classic example of people writing laws and then taking lucrative jobs in the private sector which benefit from those laws. As *The New Republic*, October 19, 1987 reported, Miller is unapologetic about this:

> "I believe in interest groups and the right of interest groups to be represented, and if I can represent them on the Hill, well, I will do it," says Harris Miller, a former aide to Kentucky Democrat Romano Mazzoli's House Judiciary subcommittee on immigration who now has his own lobbying firm. Miller's first big client was the National Council of Agricultural Employers, a group of large growers who use migrant and illegal alien workers.

Interestingly, Miller used many of the same arguments for farm workers then as he is doing now in the case of H-1B visas for the high-tech workers.

These lobbyists know very well how to play the political game. They know, for example, that politicians like to use academic "studies" for cover. We have seen earlier immigration attorney/lobbyist Fragomen open admission that industry commissions academic studies with the understanding that the outcome of the studies will be in industry's favor. Miller, who used to work for Fragomen, has used the same tactic.

Miller's case illustrates the fact that H-1B policy is similar to immigration policy in general, which is set by a small group of Washington insiders who are unknown to the general public but who pop up repeatedly in different key roles over the years. These people who often profit from their insider status, through jobs, contracts and so on.

A February 20, 2000 article in the *Baltimore Sun*, for example, reported that former congressman Bruce Morrison had run an investment-visa business which exploited a bill he had authored while serving as chair of the House Immigration Subcommittee in 1990. Paul Donnelly, Morrison's former press secretary from Congress, established a similar business in Maryland.[5]

Morrison's bill also established the H-1B visa program (which modified its predecessor program, called H-1), and also mandated the establishment of the bipartisan Congressional Commission on Immigration Reform. In 1995, Morrison himself was appointed to the commission, and Donnelly was hired as a commission staffer.

The kingpin of the "immigration legislation insiders" is lobbyist Rick Swartz. The *New Republic* tells the story (December 23, 1996; see also *Wired* magazine, August 1996) about what happened when the Commission on Immigration Reform recommended a thorough overhaul to address major problems with U.S. immigration policy, including the H-1B visa program:

> [Immigration] lobbyists, alerted by the friendly reception that the commission's recommendations received, began organizing. Central to this effort was Rick Swartz, who runs a public relations business out of his Washington home. Swartz introduces himself as a former civil rights lawyer and liberal, but he is funded primarily by the political right. His main patrons are Wall Street financier Richard Gilder and his Political Club for Growth, a conservative funding group that helped launch Newt Gingrich's gopac and subsidizes a variety of efforts, from the Cato Institute to Empower America.
>
> Swartz got seed money to work on immigration from Gilder and was hired to advise two computer companies, Microsoft and Intel, which feared that Congress, heeding the commission and the Department of Labor, would seek to regulate the hiring of skilled immigrants and temporary workers. (Emissaries from the Jordan Commission [on Immigration Reform] had tried to explain to Microsoft that its proposals to replace labor certification with a fee would save it time without costing more money, but the company was dead set against any change.)

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[5]The "small group of insiders" nature of immigration legislation is illustrated by the case of a partner of Morrison's in the investment-visa business, Maria Hsia. Hsia, a self-described "immigration consultant," was later convicted for her alleged role in the "Buddhist temple scandal" involving illegal campaign donations to Vice President Gore in 1996. Hsia worked closely with John Huang, who was the center focal point of the influence-peddling scandal involving Gore and President Clinton in 1996. Huang was the one who got Clinton to do a sudden flip-flop on then-pending legislation to eliminate the so-called Fourth Preference immigration category. (*Boston Globe*, January 16, 1997.) Clinton had earlier reached an agreement with Congress to eliminate the category (following a recommendation by the Congressional Commission on Immigration Reform), then suddenly, within a one-week period, flip-flopped in response to Huang's urging. Huang had successfully retained the Fourth Preference provision during the drafting of the 1990 bill, a fact which a lobbying group noted (ironically dovetailing with our "small group" theme here) "Most people outside of a handful do not know that [Huang] was intimately involved in the Immigration Act in 1990."

One of those "emissaries" was Donnelly. (Personal communication with Donnelly, June 29, 2000.) The commission's proposal was that the labor certification process for employer-sponsored greencards be replaced by a fee. This would save the employer time and effort by eliminating the multi-year legal process needed to secure a greencard for the foreign worker. The proposal would also be of tremendous help to the foreign workers, who would get "instant greencards," and thus not have to wait in limbo on H-1B visas during the lengthy processing time for green cards. The fact that Microsoft refused illustrates just how much industry likes the *de facto* "indentured-servant" nature of the H-1B visa.

2.3.5 A Bill Passed in Stealth

The pervasive corruption involved in H-1B legislation in the year 2000 was capped by an amazing sequence of events in the House of Representatives.

In the morning of October 3, 2000, the Senate passed its version of the H-1B bill. At that time, two versions existed in the House, by Rep. Lamar Smith and Rep. David Dreier, both Republicans. Industry liked the Dreier bill (which was largely similar to the Senate version) and was adamantly opposed to the Smith bill, as the latter would have imposed various worker protections. The Smith bill, though, had the upper hand in the parliamentary sense, as it already passed through the proper committees.

That afternoon, it was announced in the House that no vote would be taken on the H-1B issue that day, so the congresspeople went home. Yet a vote actually was taken that evening, with only 40 congresspeople present out of a membership of 435. In addition, the vote was on the Senate bill, adopted whole, instead of either the Smith or Dreier versions, thus slickly solving the problem of what to do with the Smith bill.

Here is how the incident was reported by the Cox News Service, dateline October 3, 2000:

> WASHINGTON – The speed – and stealth – with which the House voted Tuesday to increase visas for skilled foreign workers left one lawmaker shaking his head. "Incredible," said Rep. Lloyd Doggett, D-Texas, a major supporter of increased visas...
>
> Doggett, who had co-sponsored a bill to increase the so-called H-1B visas for foreign workers, gave this account of the evening:
>
> "At about 3:30, it was announced that there would be no further votes" on important issues in the House, he said. Because many lawmakers wanted to get home early to watch the presidential debates, nearly everyone left, he said.
>
> "But at about 5:30, an e-mail was sent over here" announcing that an H-1B debate would begin shortly. "I didn't see the email until about 6," he said.
>
> Doggett said he scurried to the House floor, while other major supporters of the legislation also rushed back to Capitol Hill. Using various procedural moves, the GOP leaders ended the debate quickly and called for a voice vote, even though the House was nearly empty.

Note that Doggett, a Democrat, also advocated increasing the H-1B quota.[6] As noted earlier, the industry had a stranglehold over both major political parties. But some of the Democrats did want to add some mitigating amendments to the bill, and didn't get a chance to do so. And of course Smith's worker protections never saw the light of day.

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[6]Reportedly Doggett even accepted campaign donations from H-1Bs. See Section 2.4.

2.3.6 Case Study: The Membership Makeup of the National Research Council's IT Workforce Committee

A National Research Council study was mandated by Congress in 1998, as part of legislation which increased the H-1B quota. The charge, as codified in the law, was to investigate (a) whether age discrimination is common in IT, and (b) the impact of the H-1Bs on the labor market. But the blatantly biased membership makeup of the NRC committee resulted in the study being little more than a case of "the fox guarding the hen house."

Though the project committee did include some pro-labor members, it was dominated by industry representatives and allies of industry from academia. The committee included members from Intel and Microsoft, the latter representative being Ira Rubinstein, Microsoft's chief lobbyist for H-1B visas. Moreover, the pro-labor members were not only outnumbered but also outgunned; the industry representatives had access to huge resources (data, extensively researched counterarguments, etc.) while the pro-labor members had nothing, and in fact did not even have much time to devote to the committee. (The latter point was noted to me by Prof. Sara Kuhn, a committee member.)

Another committee member, Helen Wood, is a government bureaucrat by profession, but according to the committee's Web page, her position on the committee was to serve as a representative of the IEEE Computer Society. This is highly significant, since corporate and academic interests in IEEE-CS, together with the IEEE parent organization, were the ones who pressured IEEE-USA into greatly reducing its lobbying activities against the H-1B increase. (See Section 2.5.1.) IEEE-USA had no representative on the committee.

Another member, Peter Saflund, is director of a technical education training center, a prime candidate for receiving training funds raised by the H-1B fees.

The committee's chair, Alan Merten, is president of George Mason University. As shown in Section 2.2, academics have huge incentives to toe the industry line on the H-1B issue, and in addition, Merten sits on the boards of several high-tech firms, such as BTG Inc., Comshare and the Indus Group. (*Washington Technology*, August 29, 1996.) At least one of those, BTG, hires H-1Bs at below-market rates; a Freedom of Information Act request revealed that BTG had hired a Computer Engineer at a salary of only $30,000 (http://www.ShameH1B.ZaZona.com), Project Engineers at $37,000, and Programmer Analysts at $43,000, all far below the median salaries for these professions.

Merten decided *before* his NRC study began, without waiting for results, that the industry claims of a shortage were at least partly true, an irresponsible prejudgment for someone serving as chair of this committee. (*San Jose Mercury News*, September 20, 1999.) Actually, he had already made such a prejudgment more than a year earlier, as will be seen below, during the formation of his alliance with the industry.

The following excerpt from a March 2000 article in *Atlantic Monthly* illustrates Merten's source of bias as well:

> In 1998 James S. Gilmore, the governor of Virginia, promised to increase stated funds for GMU [George Mason University] by as much as $25 million a year provided that the university better serve the region's high-tech businesses. GMU's president, Alan G. Merten, a computer scientist and a former dean of the business school at Cornell, hardly needed urging. "We must accept that we have a new mandate, and a new reason for existence," he announced at the World Congress on Information Technology, a gathering of industry executives hosted by GMU in the summer of 1998.

At the IT congress, Governor Gilmore announced that he was appointing four computer industry executives to GMU's 16-member governing board. (*Washington Post*, June 22, 1998.)

Merten had already started toeing the industry line in his keynote speech at the IT congress at GMU (http://www.gmu.edu/highlights/1998worl.html), even claiming a job growth rate wildly exceeding even the industry's claims: "Here in the national capital area, thousands of 'Information-Technology-related' positions remain unfilled because there are simply not enough qualified candidates. There may be enough candidates but we (you and I) have not done enough to make them QUALIFIED candidates...Last year, the United States had about five million computer scientists, engineers, programmers, and analysts — the positions that by-and-large define the high-tech workforce and drive the information economy. The problem is, most experts predict that the need for these people will DOUBLE in the next two to three years." [7] (Emphasis in the original.)

GMU and the ITAA held a joint breakfast on May 19, 1999 (apparently a regular series of jointly-sponsored events between the two; for example there was another such event held on November 3 of that year). The featured speaker was Rep. Tom Davis, chair of the Republican Congressional Campaign Committee, who later in Spring 2000, had the gall to say about the pending bill to increase the H-1B quota, "This is not a popular bill with the public. It's popular with the CEOs...This is a very important issue for the high-tech executives who give the money."

Clearly, in producing the NRC report, committee chair Merten was not going to "bite the hand that feeds him."

When the NRC committee originally set hearings in Silicon Valley in September 1999, the committee invited testimony from a number of Silicon Valley employers, and their allies in academia, but did not invite even one speaker who is critical of H-1B policy. After I contacted them to complain, they did set up one panel session to hear the non-employer side of the issue, but they had been prepared to spend three days in Silicon Valley without having such a panel.

It should also be noted that the NRC is funded by industry. The NRC unit responsible for this study, the Computer Science and Telecommunications Board, lists as its current sponsors Cisco Systems, Sun Microsystems, Hewlett-Packard, Intel, Microsoft, Texas Instruments, and Time-Warner Cable. With the exception of Time-Warner, all of these firms have been in the forefront of lobbying for increases in the H-1B program.

Not surprisingly, the committee's report, released in October 200, was extremely biased. This is discussed in Section 4.4.

2.4   The H-1Bs

As explained in Section 9.4, most H-1Bs are *de facto* indentured servants. Moreover, toward the end of the 1990s, many faced the real possibility that they would reach their six-year H-1B visa limit before their greencard approvals came through, forcing them to leave the U.S. empty-handed.

For this reason, they formed the Immigrants Support Network (www.isn.org) in 1998, with the goal of influencing Congress to pass legislation to alleviate their plight. ISN is comprised mainly of Indians, but includes H-1Bs from other nations as well.

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[7]Merten's recognition that there are lots of applicants for these jobs seems to indicate that the ITAA had already tipped him off to the fact that critics of the H-1B program had exposed the fact that employers do in fact get lots of applicants, contrary to the claims they had been making.

After failing to achieve their goals in the 1998 H-1B legislation, ISN met with Rick Swartz, a highly-influential immigration-legislation lobbyist, on October 21, 1999, [8] and decided to retain his services. (See Section 2.3.4.)

Swartz's fee was $10,000 per month, and he estimated that the entire project would run approximately $100,000. Later, Carrie Kirby, a reporter for the *San Francisco Chronicle*, told me that Swartz had started on a *pro bono* basis but began paid work for ISN in May 2000.

Swartz's representation of both ISN and his corporate clients such as Microsoft and Intel presented a conflict of interest, which is apparently why he chose a middle ground: He lobbied Congress for certain reforms in H-1B law and the employment-based greencard process which would bring about a mild reduction in the duration of the H-1Bs' indentured servitude, but which would still provide industry with a long enough duration to make hiring H-1Bs attractive. Swartz delivered on this promise; see Section 9.4.4.

ISN noted on its Web page the constraints it faced in terms of lobbying, both from its tax-exempt status and political issues:

> Clearly as 501-C-4 organization ISN can not contribute to campaign funds. According to Mr. Shwartz [sic] it is not a desirable strategy to win our goals according to. Especially in the wake of spying scandals and the infamous campaign contributions to President Clinton controversy.

Only U.S. citizens and permanent residents may legally make campaign contributions. Thus it would be illegal for H-1Bs to make such contributions. Yet at least some H-1Bs did so anyway, according to a report in the *Austin-American Statesman*, November 19, 2000:

> The immigration concessions resulted from a season of organized clamor and lobbying – including a $10,000 contribution to Rep. Lloyd Doggett, D-Austin, from local H-1B workers. The tech industry was filling campaign coffers.

As of October 2000, the ISN claimed 18,000 members nationwide. This number actually represented the number of people on ISN's e-mail list. The number of active members is likely to be much smaller. According to an October 6 e-mail message to the e-mail list from ISN Board Member Murali Krishna Devarakonda, only 762 members had actually contributed money for ISN's expensive lobbying efforts.

And even without contributing money, ISN can command meetings with politicians on the strength of ISN's status as an "ethnic lobbying group." According to a message broadcast by ISN on May 7, 2001, the ISN was to meet with Maryland senator Barbara Mikulski on May 9, via the Indian American Legislative Council, which meets with the senator once a month. ISN said it would lobby the senator to increase the yearly green card quota for employer-sponsored immigration, so as to alleviate a long backlog of H-1Bs waiting for green cards.

2.5 Groups Advocating on Behalf of Programmers and Engineers

2.5.1 IEEE-USA

In 1998, the engineering professional organization IEEE-USA (Institute of Electrical and Electronic Engineers-USA) had lobbied Congress against the H-1B quota increase which was proposed that year. As an organi-

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[8]This and much of the other information following was obtained from ISN's Web page.

zation of over 200,000 members nationwide, it was a force to be reckoned with.

However, IEEE-USA knew that its action would not be appreciated by the corporate and academic interests which dominate the parent organization IEEE, who had strong vested interests in the H-1B program. So, IEEE-USA pulled its punches, refraining from using the only truly effective tool at their disposal: It refused to send out a mass mailing calling on its members to engage in a letter/fax assault on Congress.

In 2000 IEEE-USA came under enormous further pressure from the IEEE parent organization to moderate its position. IEEE-USA then hired Paul Donnelly as a consultant, whose job was "to help wean the organization from its outright opposition to immigration." (*The New Republic*, June 19, 2000.) Donnelly is the former staffer with the Congressional Commission on Immigration Reform described in Section 2.3.4.

Around the same time, IEEE-USA greatly toned down its Web site. It removed its "Misfortune 500" file, a compendium of 500 engineers, mainly older, who were having trouble finding engineering work in spite of the alleged high-tech boom. It also removed from the site its report on a 1998 Harris Poll which had shown that 82% of Americans opposed the H-1B increase.

Donnelly convinced IEEE-USA to support his proposal — similar to one formulated by Congressional Commission on Immigration Reform as mentioned above — under which industry could bring in foreign engineers and programmers on an expedited basis, giving them "instant green cards" and bypassing the H-1B stage. This new stance on IEEE-USA's part was counter to its previous view that industry should hire/retrain American programmers and engineers, but apparently the organization felt that its new position would relieve the pressure brought to bear on it by the parent organization.

However, Donnelly was up against his rival, Rick Swartz (again, see Section 2.3.4), and up against Swartz's allies representing the computer industry, who apparently wanted to retain the "indentured servant" nature of the H-1B workers. Those lobbyists dismissed Donnelly as "anti-immigrant," in spite of his work as a consultant to immigrants and as a longtime advocate for relieving the greencard backlog for the spouses and children of immigrants. (*Wired News*, May 15, 2000.)

Meanwhile, Swartz had acquired a new client, the Immigrant Support Network, an organization of H-1Bs who were hoping to get Congress to alleviate the "indentured servitude" problem. (See Section 2.4.)

Donnelly still tried to get Microsoft to support the "instant greencard" proposal. However, Microsoft's counsel and lobbyist, Ira Rubinstein, simply stalled, saying that he may support the proposal in the future but now wished to concentrate on H-1Bs. Later Rubinstein tried other stall tactics as well. (Personal communication with Paul Donnelly, June 17, 2000.)

Personally I do not support the Donnelly proposal, because although it would fix the problem of H-1B "indentured servitude," a worthy goal, it would not address the problems of age discrimination and so on which are being fueled by the influx of foreign programmers. Nevertheless, the industry's continuing rejection of the Donnelly proposal, which would bring in the workers they say are needed and would reduce paperwork and trouble for the employers, shows that they do indeed wish to retain the indentured-servant nature of the H-1B program. And the personal attacks on Donnelly are uncalled for.

2.5.2   Others: AFL-CIO, AEA, APG, Washtech, Etc.

The AFL-CIO raised various concerns about the bill to increase the H-1B quota in 1998, but in the end chose not to oppose the increase. (Interpress, September 25, 1998.) When the next H-1B increase was proposed in 2000, the AFL-CIO again did not oppose the increase. In fact, the AFL-CIO were actually considering

supporting the increase. (See the article by labor activist David Bacon in *LA Weekly*, January 16, 2001. [9])

The American Engineering Association (www.aea.org, not to be confused with the American Electronics Association, an industry lobbying group) has been a strident critic of the H-1B program for many years. Its influence is hampered by its relatively small size.

The same is true for the American Programmers Guild (http://www.colosseumbuilders.com/american.htm), which was formed in 1998 in response to the H-1B increase proposed in Congress that year. As of November 2000, it had about 1,000 members nationwide.

The Washington Alliance of Technology Workers (http://washtech.org) is a Seattle-based organization which consists of a much broader membership than just programmers and engineers. It has opposed the H-1B increases, but focuses on other issues.

Immigration-reform organizations, such as the FAIR and NumbersUSA, have also lobbied against the H-1B program. However, as with the AFL-CIO, these organizations also have other legislation to deal with, and have not always been able to devote full resources to the H-1B issue. Indeed, sometimes there has been conflict between issues. For example, in 2000 some Democrats in Congress tried to tie the H-1B quota increase to a partial amnesty for certain categories of illegal aliens. While this might have had the effect of derailing the drive to increase the H-1B quota, it might on the other hand result in both an H-1B increase and amnesty, the worst of both worlds from the point of view of these organizations.

3 Focus on Software Developers

3.1 Reason for This Focus

In an attempt to obfuscate the issues, industry lobbyists who pushed Congress to increase the H-1B work visa quota in 1998 talked about shortages of "information technology" (IT) workers, running the entire gamut of all jobs having any connection to computers, including nontechnical jobs such as marketing. **Yet the vast majority of H-1Bs hired for computer-related work are programmers, meaning software developers having titles such as Programmer, Software Engineer, System Analyst, Computer Engineer and so on.**

This focus on software is especially important to keep in mind in the H-1B setting. The overwhelming majority of H-1Bs are in the computer science area, not electrical engineering. Department of Labor data show that the computer science H-1Bs outnumber the electrical engineering ones by nearly a 15-to-1 ratio. (*Dallas Morning News*, April 19, 1998. Also see a similar figures in *Characteristics of Specialty Occupation Workers (H-1B)*, U.S. Immigration and Naturalization Service, February 2000; the number of H-1Bs in "occupations in systems analysis and programming" is 10.9 times the number in "electrical/electronics engineering occupations.") Though the boundaries between the two fields as viewed as undergraduate majors is not crisp — in fact, many, probably most, electrical engineering graduates eventually end up doing software — the key point is that **the vast majority of high-tech H-1Bs are working on software, not hardware**. For this reason, our report here focuses mainly on software, though we do also mention hardware/electrical engineering examples at some points.

Similarly we use the word *industry* to mean all employers of software developers, not just those in the high-tech field. This means that we include not only software publishers, such as Microsoft, but also employers such as banks, insurance companies and so on who develop software only for their own internal use.

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[9]A very small component of the AFL-CIO, the Department of Professional Employees, did oppose the bill but was overruled by the AFL-CIO parent organization.

3.2 Need for Care Regarding Job Titles

It is very important to note that titles such as Programmer and Software Engineer are interchangeable. The choice of title depends on the employer, not on the type of work done. Many programmers may also have titles such as System Analyst, Computer Engineer and so on.

In his 1999 guide to programming careers,[10] consultant and author Jesse Liberty warns readers not to read anything into a job title in the software development field: "Some companies distinguish between programmers, analysists, architects...Others call all these people software engineers." Actually, the Programmer title is rather archaic in today's job market.

John Miano of the American Programmers Guild noted (e-mail, May 21, 1999):

> For all practical purposes the titles Programmer, Programmer/Analyst, System Analyst, Software Engineer, Software Specialist, Systems Architect etc. are functionally equivalent. The difference in titles is representative of the type of industry rather than the job function.

> For example, a bank would most like call an employee a "Programmer/Analyst" where the person doing the same job in a software development company would be called a "Software Engineer."

> The amount of vertical division in programmer functions has virtually disappeared over the years. In the olden days of batch processing you had the Analysts who looked at problems and drew flow charts, the Programmers took the flow charts and converted them to code, the Data Entry people would convert the code sheets to punch cards. Operators took the punch cards and ran them as batch jobs. (A Programmer Analyst was an intermediate level between Analyst and Programmer.)

> With the advent of timesharing and later PCs, you can just type in the code, compile it, and have the results back in seconds. As a result even the most senior developer codes these days, while in the past coding (i.e. being a Programmer rather than an Analyst) was considered low skill work. Even Dave Cutler, the head of [Windows] NT development at Microsoft codes.

A major failure of many studies of the IT workforce has been that they artificially separate these titles, leading to many false conclusions. For example, the Programmer title tends to be used more for older, mainframe-based jobs. Some researchers have expressed puzzlement about some oscillations in numbers of Programmer jobs and their salaries, without realizing that these seeming anomalies are explainable by two opposing forces: (a) The general decline in the use of mainframe usage, and (b) a temporary resurgence, starting around 1997, due to increasing attention paid to the Year 2000 bug.

It is also important to note that the ITAA continues to deliberately "mix apples with oranges" as of Spring 2000, claiming 800,000 open positions in "IT," when in fact if you read their statement more closely it shows that the biggest portion of those jobs is for technicians, not for programmers. In fact, the ITAA admits that only 20% of new IT jobs are for programmers. (*Executive Summary - Bridging the Gap: Information Technology Skills for a New Millennium*, ITAA, www.itaa.org.) Again, this is very important, because the H-1Bs are programmers, not technicians.

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[10]*The Complete Idiot's Guide to a Career in Computer Programming*, Jesse Liberty, Que, 1999.

4   There Is No Desperate Shortage of Computer Programmers

Even former Intel CEO Andy Grove has said (*Washington Post*, April 24, 1998), "I don't buy into the hyperventilated description of the technology worker shortage." [11] But even nontechies can see that there is no shortage, simply from the facts that (a) employers hire only a small fraction of their applicants for software positions, and (b) programmer wages are showing only a very moderate rate of increase.

4.1   Employers Are Flooded with Re'sume's, But Are Extremely Picky

4.1.1   Very Low Hiring/Interview Rates

Industry employers claim a "desperate" labor shortage, but in fact their extreme pickiness in hiring shows they are not desperate at all. They are flooded with re'sume's but hire only a small percentage of the applicants.

The subtitle of a March 22, 1999 article in *Computerworld* says it all: **"Stream of Applicants Belies Labor Shortage."** Early in the article is a related quote (emphasis added):

> **"We are inundated with resumes,"** said Kathy McLean, human resources information systems manager at the Eden Prairie, Minn., company [Best Buy, Inc.].

Industry lobbyists exhort Congress and the press to "Look at all those Sunday newspaper ads for IT positions." What they do not say, though, is that employers are not willing to fill those jobs with most programmers who apply for them, as can be seen from the extremely low percentages of applicants whom they actually hire, such as shown in the table.

[Microsoft (Redmond, Washington): Associated Press (*Tacoma News Tribune*), May 13, 1997; Deltanet (San Francisco): Patrick Schmidt, interview by the author, November 5, 1997; ECbridges (San Francisco Bay Area): Raymond Lim, interview with the author, November 7, 1997; Flashpoint (San Francisco Bay Area), Francine Beanan, interview with the author, October 31, 1997; Broderbund (San Francisco Bay Area): Mary Bjornstad, interview with the author, October 31, 1997; American Management Systems (Fairfax, Virginia): *Washington Post*, November 30, 1997; Inktomi (San Francisco Bay Area): Amy Hanlon, interview with the author, February 26, 1998; Qualcomm (San Diego): *San Diego Union Tribune*, March 7, 1998; Cohesive (San Francisco Bay Area): Ned Roberts, interview with the author, July 21, 1998; H.L. Yoh (Minnesota): John Sturgeleski, interview with the author, June 16, 1999 (Sturgeleski said "I will submit 10-15 applications to our clients per week; 1-2 will get interviews, and the numbers go down a lot from there"; I am assuming a 30% offer rate to interviewees, as seen below); "New England firm" (New England): interview with Director of Software Development, June 17, 1999; Net Perceptions (Minnesota): Ann Reishus, interview with the author, June 25, 1999; Red Hat (Durham, North Carolina): *Business Week*, June 30, 1999; Radiant Systems (Alpharetta, Georgia): Heather Arnold, interview with the author, August 1, 1999 (she said 300 re'sume's are received per week for software dvelopment positions, and they hire approximately 35 developers per year); DataScan (Alpharetta, Georgia): Karen (surname not stated), interview with the author, July 30, 1999 (said hired 70 last year out of "thousands" of re'sume's; I am using the conservative figure of

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[11]Equally significant is that fact that Grove went on to remark, concerning the congressional proposal to increase the quota of H-1B visas for foreign high-tech workers, that all industry needed was access to the foreign students studying at U.S. graduate schools, about 3,000 of whom graduate per year — far less than the 65,000 quota in place at the time. In other words, the quota should be reduced, not increased.

American Management Systems	2%
Broderbund Software	1%
Cisco	5%
Cohesive	2%
Datascan	5%
Deltanet	4%
ECbridges	2%
Flashpoint Technology	2 to 5%
R.D. Raab	1%
H.L. Yoh	4%
Inktomi	less than 5%
Microsoft	2%
Net Perceptions	2%
New England firm	1%
Qualcomm	4.5%
Radiant Systems	under 1%
Red Hat Linux	under 1%
Tangis	under 1%

Table 1: Percent of software applicants hired

1,500 here for the latter); R.D. Raab: *Computerworld*, December 6, 1999; Cisco: *San Francisco Chronicle*, May 19, 2000; Tangis: interview of Randy Sheets with the author, June 19, 2000.]

Industry lobbyists have attempted to "spin" the above data in various ways, but they do not seem to communicate with their industry clients: **The employers admit that they are extremely picky in their hiring, and that they reject the vast majority of their applicants without even an interview.** Indeed, when asked about the author's citing of a low 2% hiring rate, Microsoft admitted that it is "very, very selective." (*Boston Globe*, March 8, 1998.)

And it is important to note that it is not just Microsoft that is hiring only a tiny proportion of the applicants. The above companies comprise a broad range of employers, from giants to the tiny five-programmer startups, from the software vendors to the applications firms that write software for their own internal use, and so on.

In fact, I have served as an invited panelist on IT workforce issues at various conferences in which the audience consisted primarily of HR people and hiring managers from the IT industry (ITAA/DOC Convocation, January 1998; MEPTECH II, November 1998; *San Jose Business Journal* Power Breakfast, June 1999; etc.), and none of these people has ever challenged my point that hiring rates are down in the 2% range.

The situation is typified by the fussy John Otroba (*Washington Post*, November 30, 1997, emphasis added), who

> ...**has no shortage of incoming re'sume's.** When he logs onto his office computer every day, he has at least 50 in his electronic mailbox...But only about one in 12 re'sume's leads him to pick up the telephone to call the job seeker. Some don't pass that screening step. Of those who come in for an interview, fewer than a quarter are offered jobs [making an overall rate hiring rate of under 2%].

In other words, there is no shortage of "bodies," i.e. there is no shortage of experienced computer programmers. The problem is that employers are not willing to hire them. Employers are only willing to hire from three narrow categories of programmers:

- New or recent (within a few years of graduation) college graduates, who have cheaper salaries. Note, though, that even among new computer science graduates, fewer than half are hired as programmers.

- Foreign nationals on work visas, who have cheaper salaries.

- A relatively small number of experiencedprogrammers who have background in certain highly-specialized software technologies.

It should be emphasized that tiny hiring rates seen above are for programming positions, not for, say, marketing jobs. In conducting my own interviews, for instance, I am very specific in asking for rates for programming jobs.

The companies' re'sume'-scanning machines search for key words corresponding to currently-"hot" skills desired by the employer. Any re'sume' lacking these words is rejected, untouched by human hands. [12] The same is true for the employment Web sites set up by most companies in the industry, which filter responses based on skill sets and reject any applicant who lacks the given skills.

Moreover, the industry claims of a labor shortage are even more strongly contradicted by the fact that **even among applicants who have the skills demanded by "picky" employers, less than half are made offers**. Patrick Schmidt of Deltanet notes that the programmer employment agencies he uses will only refer an applicant to an employer if the applicant is an exact match to the skill set defined by the employer — and yet even then Schmidt says he hires well under 10% of such applicants, due to the large number of agencies which send him applicants.

This was illustrated quite well in an article in *IT Recruiter* in October 1999:

> Connaissance's HR director, Martin, who says his organization is constantly trying to find top talent but has difficulty doing it, would rather take another route. "On-the-job learning] is certainly a consideration," he says. "But if you find someone who's already been trained, why do you need to train someone?"

In other words, the reason Martin's firm does not need to retrain older programmers in new skills is that he is able to hire people who do have those newer skills. So where is the "shortage"?

In this light, it is very instructive to look at offer rates, meaning the proportion of those made offers among those who are interviewed (in person, not just on the telephone). Those who are interviewed have already been prescreened for skills criteria; the employer will have chosen the applicant's re'sume' because of specific skills listed, and will have typically performed a mini-interview with the applicant by telephone, in order to verify that the person does indeed have the skills. The table shows offer rates.

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[12] A June 26, 1998 *Wall Street Journal* article on the problems of middle-aged professionals in the job market reported that "[one] man phoned a prospective employer to ask why he didn't land a job interview, only to learn that his resume had been prescanned electronically for 'action verbs' that failed to turn up. 'I've had the privilege of being rejected by a computer,' he said." It is interesting that the *Journal* should take such a view of this practice, since the very companies the WSJ has supported in their demands for H-1Bs give thousands of applicants this same "privilege" of being rejected by a computer.

American Management Systems	under 25%
Aspect Technologies	20%
Broderbund	30%
City of San Jose (civil service)	10%
Cohesive	20%
DataScan	12%
Deltanet	possibly as much as 40%
ECbridges	20%
ESP	10%
Flashpoint Technology	25 to 30%
high-tech job fairs	as few as 6%
Inktomi	50%
Madison, WI recruiter	20%
Mensch, Tim	5%
Microsoft	25%
Net Perceptions	50%
New England firm	25 to 30%
Quintet	under 5%
Radiant Systems	under 15%

Table 2: Percent of interviewees made offers

[Microsoft (Redmond, Washington): Microsoft recruiting head David Pritchard, ABC Nightline, January 1, 1998; Deltanet (San Francisco): Patrick Schmidt, interview with the author, February 26, 1998; Flashpoint (San Francisco Bay Area): Francine Beanan, interview with the author, February 26, 1998; AMS and job fairs (Fairfax, Virginia and greater DC area): *Washington Post*, November 30, 1997; Inktomi (San Francisco Bay Area): Amy Hamlin, interview with the author, February 26, 1998; Quintet (San Francisco Bay Area): Ali Moussi, interview with the author, February 26, 1998; Broderbund (San Francisco Bay Area): Jennifer Ranghiasci, interview with the author, February 26, 1998; City of San Jose: Debi McIntyre, interview with the author, March 5, 1998; ECbridges (San Francisco Bay Area): Raymond Lim, interview with the author, March 5, 1998; Cohesive (San Francisco Bay Area): Ned Roberts, interview with the author, July 21, 1998; Aspect Technologies (San Jose): *San Jose Mercury News*, July 19, 1998; "New England firm": Director of Software Development, interview with the author, June 17, 1999; ESP, Sean Sweeney, interview with the author, June 18, 1999; Madison, WI recruiter: interview with the author, June 22, 1999; Net Perceptions (Minnesota): Ann Reishus, interview with the author, June 25, 1999; Tim Mensch, startup founder, Oakland, CA: *Tech Week* letters to the editor, July 12, 1999; Radiant Systems (Alpharetta, Georgia): Heather Arnold, interview with the author, August 1, 1999 (she said 1 out of 7 or 8); DataScan (Alpharetta, Georgia): Karen (surname not stated), interview with the author, July 30, 1999.]

Note that these low rates are for offers, not hires. Thus the low rates cannot be explained away, for instance, by postulating that an applicant gets multiple offers but can only accept one, or by suggesting that many re'sume's are casually submitted via e-mail by programmers who may not really be in the job market but are merely "testing the waters." So we do indeed see that employers are very picky in their hiring. Again, note that Microsoft admitted this, and indeed any industry employer, large or small, will admit this when asked.

Instead, it is clear that even if one grants the employers' claim that they must hire someone with a given skill

41

set (which I strongly disagree with), they still are being very selective in their hiring — contradicting their claims to be "desperate" to hire.

Employers also admit that when an applicant for a programming job interviews, typically six or eight of the firm's programmers will meet with the appilicant, and each of those programmers has "veto power" — if just one of them is negative or lukewarm about the applicant, then the person is usually not hired, no matter how strongly positive the assessments of the others are. Again, this is quite counter to the employers' claim to be desperate to hire.

Occasionally industry people will even admit that they are not "desperate." Note for instance the following, from *Computerworld's* publication, *College Careers Spring 1999*:

> Although there may be a shortage of programming talent in the Seattle area, employers aren't so desperate that they'll take just anyone, says Bob Stange, a vice president at Staffing Options, a Lynwood, Wash.-based executive recruiting firm. "It's not enough just to be a good programmer," Stange says. "My clients want people who are going to be able to understand what it is they do in the marketplace."

Any policymaker or journalist interested in the IT hiring issue should treat an article, "Why Are Employers So Picky?" in the November 22, 1999 edition of *Infoworld* **as required reading.** This article should be read, and regularly re-read, because it so succinctly describes the state of hiring in the industry.

4.1.2 Statistical Analysis of the Hiring/Interview Rates

(Readers who are not interested in the statistical analysis may skip this section.)

Nonstatisticians may at first wonder if the sample sizes in Section 4.1.1 are sufficient. However, when estimating percentages near 0% or 100%, excellent estimates may be obtained from seemingly-small samples.

For example, in the hiring-rate data above, as of June 2000 the sample size was n = 18. Let p denote the proportion of all employers who hire fewer than 5% of their applicants. Our sample proportion was 1.0, i.e. all 18 of the 18 employers hire fewer than 5% of their applicants. Using the exact binomial distribution (rather than the normal approximation), one finds that a 95% confidence interval for p is (0.85,1). In other words, we can be confident to the usual levels of statistical accuracy that at least 85% of all employers have the property that they hire fewer than 5% of their applicants.

4.2 Salary and Nonsalary Compensation

4.2.1 Salaries

In some very narrow segments of the programmer labor market, some salaries have indeed risen substantially. (*America's New Deficit: The Shortage of Information Technology Workers*, Dept. of Commerce, Fall, 1997.) As stated earlier, employers are overdefining job requirements, with ads like "Must have experience writing C++ code for TCP/IP applications on SPARC platforms." The pool of programmers satisfying such conditions is of course small, thus raising salaries for those within that narrow pool.

However, outside of these subsegments, programmer salaries are not rising rapidly. Bureau of Labor Statistics data show that salaries of programmers overall — i.e. combining the ones who have currently-

"hot" skills and the "ordinary" programmers — rose about 7% in 1997. The private Datamasters survey (www.datamasters.com) has shown similarly mild growth rates since 1997, showing for example a 5.4% increae in 1998. RHI Consulting, predicted that IT workers could experience average salary gains of 6.8% in 2000. (*Interactive Week*, October 19, 2000.) Again, these figure <u>include</u> the programmers who are commanding a high salary because they know a new language like Java; so we can see that the salaries of "ordinary" programmers are not rising much, if at all.

Data from a number of both public and private sources are presented in *Building a Workforce for the Information Economy*, National Research Council, 2000. For example, the 1999 National IT Salary Survey presented mean salary increases from 1998 to 1999 for a number of IT occupations, ranging from a low of 5.4% for Senior System Analysts to a higher of 10.7% for Senior Webmasters.

And though these figures are a few percentage points above inflation, they are still very mild. **If employers were desperate to hire, as they claim, they would certainly be willing to pay a premium of more than 7%.** Wages in almost all professions have been going up at least this much. (See Section 4.2.2 below.)

Urban Institute/American University economist Robert Lerman, in his testimony before the Senate Judiciary Committee on February 25, 1998 (http://www.urban.org/TESTIMON/lerman2-25-98.html) also pointed to wages, whose mild rate of increase does not indicate a massive labor shortage.[13]

A 1998 UC Berkeley study ("The Perceived Shortage of High-Tech Workers," Clair Brown, Ben Campbell, and Greg Pinsonneault, Dept. of Economics, UC Berkeley) found that

> To determine if there is currently a shortage of high-tech workers, we looked at their wage growth in the economy. If there is indeed a labor shortage, we would expect to see earnings of high-tech workers increase more rapidly than earnings of other workers. This did not happen. Although average earnings for engineers have increased over the last ten years, we find that the increased earnings for engineers have not been transmitted fully to the more experienced workers. In addition, we find that high-tech engineers and managers have experienced lower wage growth than their counterparts. This is strong evidence against the existence of a labor shortage...
>
> In the entire economy, a professional with 20 years of experience in 1985 earns 48% more than a professional with no experience, and by 1995 this increases to 73%. In the high-tech industries, an engineer or professional with 20 years of experience earned 55% more than a new-hire in 1985 but only 59% more in 1995.

A Bureau of Labor Statistics paper by Carol Veneri, "Can Occupational Labor Shortages Be Identified Using Available Data?" (http://stats.bls.gov/opub/mlr/1999/03/art2full.pdf), also states that the data do not support the industry's claim of a labor shortage:

> ...the labor market conditions for this period [1992-1997] indicate that neither the occupational group consisting of computer systems analysts, engineers, and scientists nor the computer programmer occupation has exhibited both higher than average employment growth and higher than average growth in wages.

Comparisons of 1996 and 1997 salaries in Silicon Valley by the employment agency Heuristics Search Inc., were presented in *Tech Week*, March 9, 1998. Salaries were tabulated for five areas of skill sets (software

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[13]By contrast, the June 23, 1998 issue of the *Wall Street Journal* reported on a butter shortage in the U.S., with prices for Grade AA butter rising 73% in the past year.

engineers, client/server, communications, database and graphical user interfaces), over four levels of experience (0-2 years, 3-8, 8-9, 10 or more). Once again, the differentials between 1996 and 1997 were in most cases in the 6-9% range. Later comparisons have been similar (http://www.heuristicsearch.com).

Similar figures were found for other regions of the country in the Datamasters survey, cited in the same article (and the Datamasters Web page at http://www.datamasters.com/dm/survey.html also shows similar figures comparing 1997 to 1998). This survey also features detailed salary information yearly starting with 1990, extremely useful.

House Report 657, on House bill HR 3736, 1998 (http://rs9.loc.gov/cgi-bin/cpquery/z?cp105:hr657:) quotes Prof. Lerman further:

> [The data cited in the ITAA report] are inconsistent with other private surveys as well [as] with public data sources. A survey conducted by Deloitte and Touche Consulting Group revealed that salaries for computer network professionals rose an average of 7.4% between 1996 and 1997. Coopers and Lybrand found average salary increases at 500 software companies were 7.7% in 1995 and almost 8% in 1996.

Even the industry-sponsored *Silicon Valley Joint Workforce Initiative Study* (A.T. Kearney Co., May 18, 1999), in claiming that a labor "shortage" was costing employers $5,000 to $6,000 per employee in various ways, allotted only 3.0% for its Salary Premium factor due to the alleged shortage. Again, if employers were desperate to hire people, which they claim, they surely would be willing to pay a premium of more than 3.0% to get someone.

When the industry claims a shortage of programmers, what they mean is a shortage of cheap programmers. A September 28, 2000 article in the *Chicago Tribune* said it succinctly:

> "If you're willing to pay market rate, you can find people," said Pete Georgiadis, founder and CEO of eBlast Ventures, a company that funds and builds technology firms. "The issue is if you're budget-constrained, you can't get the people you want."

Salaries for new college graduates in computer science rose 3.9% during 1996-1997.[14] Qualcomm, another firm which insists there is a high-tech labor shortage, admitted that its starting salaries were rising only about 4% per year. (*San Diego Union-Tribune*, March 7, 1998.) Starting wages for new computer science graduates of UC Berkeley were rising at the rate of 5.5% yearly during 1996-1998.[15] The increase from 1999 to 2000 was 6.4%, according to the National Association of Colleges and Employers (NACE); see

http://www.naceweb.org/press/display.cfm/2000/pr042700.htm

And in spite of wild newspaper stories in 1998 about new computer science or engineering Bachelor's graduates getting salaries approaching six figures, the going rate was in the mid-$40,000 range, even in high-cost-of-living regions(*Computerworld*, March 30, 1998; *San Diego Union-Tribune*, March 7, 1998; Forum, KQED-FM, San Francisco, March 6, 1998; TJ Rodgers, Cypress Semiconductor, Reuters, February 25, 1998), and averaged $40,843 for new computer science graduates in April 1998, according to NACE. In September 1999, the national average was $44,345, again according to NACE; see

http://www.naceweb.org/press/display.cfm/1999/pr070199.htm

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[14]*Software Workers for the New Millennium*, National Software Alliance, Arlington, VA, January 1998.

[15]Letter to the editor to the *San Francisco Chronicle*, April 4, 1998, by Professor Randy Katz, chair of the UCB CS Dept.

As of the year 2000, salaries for new graduates average \$48,695 for new computer science graduates, and \$46,739 for new computer engineering graduates. (Graduating Engineer and Computer Careers Online, http://www.graduatingengineer.com/futuredisc/compsci.html.)

4.2.2 Wage Growth Comparisons to Other Fields

The late 1990s were an era of wage growth for all the professional fields.

Surveyors and dieticians saw their salaries increase far more than programmers in 1997, beating inflation by 20% and 17%, respectively (*Business Week*, June 29, 1998).

Inflation-adjusted starting salaries for new computer science graduates tracked from 1979 to 1999, showed a rise/fall pattern which was virtually identical to that of business majors; see *Economic Snapshots*, EPI, December 8, 1999,

http://www.epinet.org/webfeatures/snapshots/archive/120899/snapshots120899.html

EPI says:

> This pattern, perhaps surprisingly, is the same for wage offers to students who accepted jobs in the computer science field. Wage offers peaked in 1986 at \$39,005 (in 1998 dollars), fell to \$36,321 in 1989, and bottomed out at just \$33,434 in 1994. Thus, employer wage offers to computer science employees fell 14%, or \$5,571, from 1986 to 1994.
>
> Wage offers in computer science have bounced back, particularly since 1997, but it was not until 1998 that employer wage offers for computer science personnel returned to their prior peak in 1986. It should not be surprising, then, that enrollment in computer science programs declined in the late 1980s and early 1990s. This trend also suggests that the supposed emergence of an IT worker shortage – to the extent that there is one – is partly induced by the stinginess of wage offers from 1986 to 1994. In fact, only recently has the alleged shortage of IT workers had a positive effect (from the workers' perspective) on wages. Interestingly, offers to computer science grads have followed the same pattern as those for business majors, indicating that there does not seem to be anything special about the situation in the information technologies workforce.

The October 2, 2000 issue of *Newsweek* showed showing growth in starting salaries for new graduates during 1995-1999, for various fields. Computer Science (CS) starting salaries went up only 20% during that time, an average of less than 4% per year. This so-called "hot" field was outpaced by Business Administration (30%), Math/Statistics (24%), Accounting (25%) and Sales/Marketing (23%). Engineering was about the same as CS, 21%. The only fields with lower growth rates than CS were Teaching and Chemistry.

The industry lobbyists constantly say that the IT "shortage" is due to poor science and math curricula at the K-12 level. (See Section 6.3.2 for an explanation of why this is a red herring.) Yet in spite of the fact that IT was supposed to be the hottest field in the last few years, CS wage growth was exceeded by the growth in wages for Sales/Marketing — an area where not many science and math skills are required. And the college major with the most wage growth, Business Administration, is not a hotbed of science/math whizzes either.

4.2.3 Bonuses, Stock Options, Etc.

The ITAA industry lobbying group says that salaries are less relevant because of nonsalary compensation such as bonuses and stock options. **Yet the ITAA made no claims that total compensation (i.e. salary plus bonuses, stock options and so on) is rising at more than the 7 or 8% rate we see in salaries.** On the contrary, the median value of stock options only rose $2,900 between 1996 and 1998, [16] certainly not enough to support ITAA's claims of dramatic increases in overall compensation.

The key point is not whether there exist nonsalary forms of compensation — this has always been true in this industry, since 1980 or earlier — but rather whether the amount of such compensation has been rising. If overall compensation, both salary and nonsalary, is rising only at a mild rate like 7%, then employers are obviously not desperate to hire.

Except for a few cases of "miracle" companies, the profit made through stock options in established firms is on average also a small portion of salary, typically about 1%. [17]

Of particular interest is a special kind of bonus, the "bounty" paid to an employee who introduces a friend to the firm who is then hired. At Oracle, for instance, the size of this bonus was $1,000 in 1998 for a job paying more than $40,000, and $500 for one paying less than that. The size of this bonus has been constant at Oracle for several years; in fact, the figure ($1,000) was common in the industry even in the 1980s. **So we once again do not see evidence of escalating levels of desperation among employers. If employers were that desperate, they would certainly raise the finder's bounty to encourage people to bring in more leads.**

4.3 Criticism of the ITAA/VPI/DOC "Shortage" Survey Methodology

Much has been made of dizzying claims of numbers of open positions made by the ITAA and its partners (Dept. of Commerce and the Virginia Polytechnic Institute, VPI). The methodology underlying these claims has been strongly criticized by the General Accounting Office (*Washington Post*, March 23, 1998) and the Bureau of Labor Statistics.

The GAO cites a number of flaws in the ITAA/VPI study, and other flaws have been pointed out by others as well. For example, the ITAA/VPI survey counts a position as "open" even if it is currently filled by outside consultants. The fact that many programmers now prefer to work as consultants ("contractors") instead of as salaried employees does not mean we have a shortage of programmers.

The ITAA/VPI has also been strongly criticized for the fact that its survey simply asked how many openings a firm had overall, not in the U.S. In other words, the survey's counts include all the jobs U.S. multinationals have open in foreign countries.

Interestingly, the ITAA/VPI study's author, Linda Leffel, noted in a side comment in the study that "even if 346,000 qualified applicants [ITAA's estimate of the number of unfilled positions at the time — NM] ...appeared today, in all probability immediate positions would not be available–to translate this number to an absolute would be misleading." For example, many jobs are open just to "test the waters": There may be,

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[16] IT Workforce Data Project: Report IV, *Assessing the Demand for Information Technology Workers*, November 1999.

[17] The ITAA has cited an Associated Press story (*Tacoma News Tribune*, May 13, 1997) in which Bret Bertolin of the Office of the Forecast Council of the State of Washington notes that a large number of programmers in Washington cashed in on stock options in 1995, bringing their overall compensation to over $100,000. But Bertolin, in an interview with me on May 12, 1998, said, "That's misleading. This is mainly Microsoft employees cashing in on options they received six years earlier. A new employee cannot walk into Microsoft today and count on a windfall six years from now."

say, four job ads placed when the firm intends only to hire two workers. The four jobs may be under four different managers, who are "competing" with each other for two job slots.

A November 2, 1998 article in *Infoworld* shows further how firms can play games with their numbers of job openings:

> Logic suggests that if a company has posted a want ad, it wants to fill that position. That is not always the case. Some companies use ads as a kind of public relations stunt to showcase themselves as up-and-coming. One company even placed a want ad during a hiring freeze just to generate publicity. Some larger companies have an ongoing need for employees and use the ads to generate resumes for unspecified future positions. Many organizations that receive federal funds are required by law to place ads, even if there is an internal candidate ready to take the position.

It should be noted that Leffel and VPI have strong incentives to find that there is a labor shortage, because VPI formed a new program, aimed at the nonstudent public, conferring a computer studies degree. The tuition for this program is higher than for the university's mainstream courses, and thus has become a "profit center." Leffel, as Director of Continuing Education for VPI, is in charge of the program. (See more about this point in Section 2.2.)

In any case, as the economist Robert Lerman cited earlier pointed out in his testimony before the Senate Judiciary Committee, **the size of the demand for labor is irrelevant anyway; what matters is the <u>difference</u> between the supply and demand, and these studies do not address that question.** Dr. Lerman noted that industry lobbyists used their vacancy statistics in an attempt "to bowl over people by saying that a worker shortage is obvious...The mere existence of vacancies does not demonstrate a shortage." (*Sacramento Bee*, March 14, 1998.)

Similarly, the ITAA claims a 10% vacancy rate for IT positions — but does not mention that the industry always has had high vacancy rates. ECbridges' Raymond Lim even considers 10% low, saying that rates of 20% were typical a few years earlier. (Interview with the author, March 5, 1998.)

It is also important to note that the ITAA continued to deliberately "mix apples with oranges" as of Spring 2000, claiming 800,000 open positions in "IT," when in fact if you read their statement more closely it shows that the biggest portion of those jobs is for technicians, not for programmers. In fact, the ITAA admitted that only 20% of new IT jobs are for programmers. (*Executive Summary - Bridging the Gap: Information Technology Skills for a New Millennium*, ITAA, www.itaa.org.) Again, this is very important, because the H-1Bs are programmers, not technicians.

4.4   The NRC Study on Workforce Needs in IT

A National Research Council study was mandated by Congress in 1998, as part of legislation which increased the H-1B quota. (*Building a Workforce for the Information Economy*, National Research Council, 2000.) The charge, as codified in the law, was to investigate (a) whether age discrimination is common in IT, and (b) the impact of the H-1Bs on the labor market. But the blatantly biased membership makeup of the NRC committee (see extensive details in Section 2.3.6) resulted in an exceptionally biased study. I have published an article on this (*Backgrounder*, March 2001, Center for Immigration Studies, http://www.cis.org/articles/2001/back301.html), detailing the severely misleading analysis in the NRC report, but here is a sampling of some of the points:

First of all, the committee failed to cite a number of findings of studies–well known to analysts in this field and known to the committee, which were damaging to the claims made by the industry, such as:

- The 1999 finding by the DOC that there is not enough data to determine whether a labor shortage exists, reversing its 1997 finding of a shortage. (The NRC report mentions the 1997 finding but not the 1999 one!)

- The finding in the DOL audit that 19% of the H-1Bs were not even being paid what their employers had stated on the visa application.

- The finding in the INS audit that 21% of the H-1B applications were found to be fraudulent, and 29% more "were either probably or possibly fraudulent."

- The finding by the GAO that the H-1B program fails to protect either American workers and the H-1Bs themselves.

- The finding in the study by Papademetriou and Yale-Loehr (Carnegie Institute for International Peace and Cornell University) that employers who were sponsoring foreign nationals for greencards were paying them salaries which on average were more than 20% below normal, in violation of the maximum 5% gap mandated by law.

- The finding by American University professor Laura Langbein that the time needed to find another job for laid-off engineers increases three weeks for each additional year of age.

- The Informationwek survey showing that only 2% of hiring managers would seek a worker having more than 10 years of experience.

- The Network World survey data showing that the younger the manager, the less likely they are to hire people over 40.

Many of the pro-labor arguments are absent from the report, or are dismissed out of hand by a counterargument to which the committee knew there is a counter-counterargument. Granted, in some cases there are points to make for both sides, but that is exactly my point here–the committee did not give the reader both sides. These are too complex to discuss here, which I will do in the abovementioned article, but will give one example: The committee parrots the industry line that exploitation "must" be rare, since the DOL has found rather few cases of it. This is an egregious misrepresentation, since (a) the H-1Bs are in no position to complain about exploitation, due to fear of recrimination, and (b) the DOL itself has said repeatedly that Congress tied DOL's hands so that it has very little power to investigate violations.

The committee restricts its study of older workers to legally-defined age discrimination. This is in direct violation of the mandate Congress gave the committee: Congress asked NRC for a general assessment of the problems faced by older workers, not only legally-defined age discrimination. (Even the report, in its preface, said that Congress asked them "to investigate the status of older workers in the information technology field.") Moreover, even though the committee does look somewhat at the broader issue and finds some problems (older workers are more likely to be laid off, get paid less in their new jobs, etc.), it still does so in the context of legality, describing these as legitimate business decisions which do not violate age-discrimination laws. It is legal under federal law for employers to shun older workers on the grounds that they may be more expensive than younger ones.

In other words, the committee is basically saying that since it is legal for employers to shun older American workers, who are perceived as more expensive, in favor of the younger and thus cheaper American workers,

it is also fine for American employers to shun older American workers and hire young H-1Bs instead. Even the industry lobbyists have never gone this far in their public statements.

4.5   Comments on Other Studies of a Possible IT Labor Shortage

Here are some brief remarks about some other studies:

- The second Dept. of Commerce (DOC) study, *The Digital Workforce: Building Infotech Skills at the Speed of Innovation*, by Carol Ann Meares and John Sargent, Jr., June 1999:

  DOC has conceded that it regards industry as its "constituents," and I have earlier in this paper chronicled the relation of DOC to ITAA, but of all the studies commissioned or requested by industry, this one is by far the fairest, though it does have a number of problems.

  The study dares to discuss the age discrimination issue and cites significant problems in this area. It zeroes in on one of the most important problems, the employers' refusal to hire older programmers who do not match a given skills list, though unfortunately the study tries to justify this by the short time-to-market for many software products (an argument I refute later in Sec. 8.2).

  The report's coverage of the issue of "retraining" for older programmers is rather self-contradictory. On the one hand, the report is to be greatly commended for stating that employers typically are not willing to retrain older programmers in the new skills. And even better, the report notes more than once that employers are not willing to hire programmers who retrain themselves, say by taking courses. But in light of the latter point, why does the report then advocate training programs as the "solution"?

  Also, on the retraining issue, the report notes several times that employers don't want to retrain a programmer in, say, Java, because then the programmer would defect to some other employer who will pay him/her more. Yet the report fails to notice the implication of that statement by employers: It is an admission that the employers want cheap labor. There is no shortage of labor, just a shortage of cheap labor.

  The study makes too much distinction between various job titles, such as Programmer, Software Engineer and so on. As I have discussed earlier in this paper, people with these different titles actually tend to do the same work.

  It was disappointing to see pages and pages of material on how to increase the number of school kids entering the IT career pipeline, including that classic ITAA line about the "nerd" image of the profession. It is important to keep in mind that the ITAA originally formulated that line to "explain" the alleged "decline" in computer science enrollment in U.S. colleges. American kids just aren't interested in such a nerdy field, the ITAA claimed. Yet as the DOC itself report points out, CS enrollment had skyrocketed in the recent years. Thus all this material in this newer DOC report was addressing a problem which did not exist in the first place, as DOC itself discovered. And much more importantly, how can the report simultaneously worry about age discrimination on the one hand yet on the other hand advocate expanding the labor supply, which would exacerbate the age discrimination problem?

- The industry-sponsored *Silicon Valley Joint Workforce Initiative Study* (A.T. Kearney Co., May 18, 1999):

  This study is not remarkable in any particular aspect except one: The study allotted only 3.0% for its Salary Premium factor due to the alleged shortage. Again, if employers were desperate to hire people, which they claim, they surely would be willing to pay a premium of more than 3.0% to get someone.

- The Computing Research Association Study, *The Supply of IT Workers in the United States*, 1999:

  I have earlier in this paper described the vested interests in industry and academia which give these groups incentives to declare an IT labor shortage. (This CRA study stops short of declaring that a shortage exists, but it does say that "the preponderance of evidence" suggests a shortage, or at least a tight labor market.) The panel overseeing this study consisted of members from both of these groups, and as a result the study is, unfortunately, one of the most lacking of those I am reviewing here. The study sidesteps the age discrimination issue entirely, completely ignores the key issue of overspecification of skills in job requirements, and so on — all the issues that the second report by the Dept. of Commerce, an overtly pro-industry body, had the courage to address.

  The report is quite biased in its coverage of the H-1B issue. It airily dismisses the charge that the H-1Bs are exploited in terms of low salaries, by simply repeating the industry claims. In spite of the report's implicit claim to gather together all available data, it ignores studies by UCLA Asian-American Studies Professor Paul Ong, Cornell University Law Professor (and immigration attorney) Stephen Yale-Loehr, and my own statistical study, clearly showing the exploitation.

  This report also makes the same serious error made by the second DOC study, by incorrectly separating the various job titles for software developers. There are many, many other serious errors, too many to list here.

  The management of the research in this report appears to have been very shoddy. When I tried to verify the citation for one of the statistics in the report (concerning career longevity in IT), I found that the cited reference, an issue of the *Digest of Educational Statistics*, did not contain the claimed data. I asked both of the study's authors about this. One of them said he didn't know, and referred me to the other author. The latter admitted that the cited referred did not contain the claimed data, and said that he didn't know the correct source. He stated the name of the assistant who did this work, but did not respond to my request for contact information for her.

- The IT Workforce Data Project, sponsored by the Sloan Foundation:

  This is a bland analysis, due to the authors' insistence on using only the coarsest government data. It again makes the same serious error made by the second DOC study and the CRA study, by incorrectly separating the various job titles for software developers. It also makes a number of errors in its analysis of foreign-born IT workers (for example, incorrectly stating that "most [H-1Bs] come to the attention of U.S. employers because they are already here, pursuing advanced degrees at American universities," which is not correct; see our Sec. 9.7).

  Concerning the industry's labor shortage claim, the authors conclude that "A review of five different kinds of indicators of demand yields no compelling evidence that there is a current shortage of IT workers or that such a shortage threatens to damage the industry in the near future." (http://www.uefoundation.org/itworkfp.html; *Dr. Dobb's Journal*, April 2000). Interestingly, the authors state that employers in this field prefer the younger workers, and IT professionals may be forced out of the field at age 40 by H-1Bs, but say (in their *Dr. Dobbs Journal* essay), "Our advice is to get used to it."

- American University professor Robert Lerman's study (http://www.urban.org/TESTIMON/lerman2-25-98.html):

  This report has been mentioned above. It finds that there is no evidence of a labor shortage. However, again it is not detailed enough to address issues such as age discrimination, overspecification of job requirements, etc.

- UC Berkeley professor Clair Brown's study (http://heather.cs.ucdavis.edu/ClairBrown.html):

The same comments apply here as for Professor Lerman's work: It finds that a shortage does not exist, but the analysis is coarse.

- A study by Professor Peter Cappelli of the Wharton School of Management at the University of Pennsylvania (*Is There A Shortage of Information Technology Workers?*, report to McKinsey and Company, June 2000):

  Again, the characteristics of this study are similar to those of the Lerman and Brown studies. However, this study is more interesting in that it analyzes the role of poor management practices in producing the perception of a "shortage."

- A study by Professor Thomas Espenshade of Princeton University.

  I have not seen this study. It is cited in a *Chicago Tribune* article, May 28, 2000:

  > "What high-tech employers really want is access to a relatively inexhaustible supply of labor having the appropriate skill sets, willing to work long and hard hours, at 'reasonable wages' and conducting themselves in a relatively docile manner–that is not fomenting too many activities of a pro-sort of union nature," said Thomas Espenshade, a Princeton University sociologist who has studied the trend. "If these conditions are not met, then there is an alleged worker shortage."
  >
  > Espenshade said his research shows that over nearly the last three decades, wages for workers in science and engineering fields have declined 10 percent in real terms.

The "shortage" claim is related to two other issues: (a) age discrimination, and (b) importation of foreign programmers and engineers as cheap labor. Some studies and surveys related to these issue which are discussed elsewhere in this paper are:

- A study of the relation of age to unemployment duration among engineers, by Prof. Laura Langbein. (Sec. 5.)

- An *InformationWeek* survey of hiring managers which found that only a small fraction of them would prefer to hire an applicant with more than 10 years of experience. (Sec. 5.5.)

- A *Network World* survey of hiring managers which found that the younger the manager, the less likely he/she would be to hire an older programmer. (Sec. 5.10.)

- Prof. Paul Ong's study showing salary exploitation of immigrant engineers. (Sec. 9.2.3.)

- A study by Prof. Stephen Yale-Loehr and Dr. Demetrios Papademetriou showing salary exploitation of H-1B programmers. (Sec. 9.2.3.)

- An audit by the Department of Labor regarding salary exploitation of H-1Bs. (Sec. 9.2.2.)

4.6   The Central Role of HR in Creating a "Shortage"

I hear constant complaints about Human Resources Departments from all parties concerned — hiring managers, programmers, and sometimes even the industry lobbyists.

Hiring managers have often complained to me that their firm's Human Resources Dept. screens out re'sume's of applicants who the managers feel qualified. HR apparently decides to screen out the applicants who are too expensive or too old — and then complains that there is a "shortage" of applicants.

This has also been noted in a formal survey by IEEE-USA, reported in the *Electrical Engineering Times* (November 13, 2000):

> [IEE-USA's] O'Neill also cited differences in the way supervisors and HR people ranked skills in order of importance. Technical knowledge was rated most important by HR staffers, but supervisors rated it fifth. Supervisors ranked problem-solving first; HR people ranked it second. Communications was ranked third by supervisors and fifth by HR respondents.

It should be noted, though, that it would be quite incorrect to put the full blame on HR, since HR presumably is only implementing policy set by the firm's top executives. As explained earlier, the primary motivation is saying money on salaries.[18] Nevertheless, there are some HR policies which would horrify even thrifty executives if they knew of them.

There does seem to be coordination among the HR departments of the various firms. The HR departments of the major firms in Silicon Valley hold monthly meetings, at which the firms exchange information with each other on policy, salaries and so on. (Personal communication from Paul Donnelly, IEEE-USA, June 30, 2000.) It is then no wonder that the hiring policies in this industry (not just in Silicon Valley, but also nationwide) are so uniform:

- All the firms hire an extremely low percentage of their programming applicants, due to the fact that all the firms overstate job requirements.

- Almost all firms aim for applicants having three to seven years (or two to eight) of experience.

- Almost all firms reject out of hand new graduates with grades under 3.0.

- Almost all firms automatically shunt new graduates who lack internship experience to nonprogramming jobs such as customer support and software testing.

An IT workforce commission in Virginia described some of the problems quite well (*Investing in the Future: Toward a 21st Century Information Technology Workforce*, Governor's Commission on Information Technology, September 1, 1999):

> ...In our online surveys of IT workers, for example, most of our respondents identified the source of experience requirements as being for internal human resources policy or other reasons not directly related to job performance...

4.7 The Claimed "Labor Shortage" — As Defined by the Industry — Will Be Permanent

It is important to note that though the industry has claimed that the H-1B visa program is just a "temporary" solution to the claimed labor shortage until the educational system can produce more

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[18]In Section 10, I explain how hiring policies are actually costing employers money, rather than saving it, but the point is that they believe that these policies are saving money.

programmers, that claimed/perceived "shortage" will be permanent. The reason for this is that, since software technology will continue to change extremely rapidly, and since employers are not willing to hire a veteran programmer who learns a new software skill via coursework, it will always be the case that most programmers do not possess the latest software skills, and thus there always will be a "shortage."

As explained in Section 6, U.S. universities are producing enough graduates to meet industry's needs, contrary to industry claims. So, producing even more graduates would simply give the industry more job applicants to reject.

Though after the bill increasing the H-1B quota passed Congress in the year 2000 ITAA president Harris Miller was still insisting that the H-1Bs would just be used to fill a "short-erm gap" (ABC World News Tonight, October 8, 2000), some companies were being more frank. An article on the ISN Web page (http://indentured servitude.unices.org), unattributed but apparently from the October 11 issue of the *National Journal*, put it this way:

> But many members of Congress still expect the high tech industry to ask for H-1B visa relief again in three years, when the cap drops back to 65,000 from the 195,000 limit set this week. Rep. Eddie Bernice Johnson, D-Texas, who oversees technology policy for the Congressional Black Caucus, said companies in her district - such as Texas Instruments - have told her they expect to need H-1B visas to fill job openings "for the next 20 years."

4.8   The Situation in 2001

The fact that the industry cries of "shortage" were nothing more than a political ploy was illustrated by the fact that heavy layoffs in the industry began around January 2001, just two months after the industry lobbyists were insisting to Congress that there was a "desperate" shortage (and nearly a year after the NASDAQ stock index started falling).

Even the Federal Reserve Bank, which in 1999-2000 had called for an H-1B increase, stated in March 2001 that the shortage was now largely gone. (*Computerworld*, March 9, 2001.) How could there be a huge "shortage" one month, and then be largely gone a few months later?

In the economic slowdown of 2001, employers became even pickier than before. Whereas before a job ad might require only Java, the same ad now was phrased something like "Requires Java and XML, in real estate applications, residential real estate preferred."

5   Rampant Age Discrimination — at Age 35

Mid-career programmers often have a very difficult time finding programming work, so much so that large numbers of them leave the field.[19]

5.1   Quantitative Evidence

The following is very instructive (*IEEE-USA Perspectives*, March 1999):

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[19]We are using the term *age discrimination* in the broad sense in which it is popularly understood, meaning that it is difficult for older workers to get work in the field. We do not mean it to be restricted to the very narrow technical definition in federal law.

IEEE-USA's 1998 Unemployment Survey shows that despite a growing economy in 1998, the mean duration of unemployment among our members has increased from 84 weeks in 1995 to 103 weeks in 1998. Using data from the survey, Dr. Laura Langbein of American University has calculated that each additional year of age of members seeking new jobs translates into three additional weeks of unemployment.

Building a Workforce for the Information Economy, National Research Council, 2000, presents a number of numerical comparisons between older (40 years of age and older) and younger IT workers regarding layoffs:

- Older IT workers are more likely to be laid off than younger IT workers.

- The length of time needed to become re-employed after being laid off is longer for older IT workers than for younger ones.

- Upon becoming re-employed, older IT workers on average take a pay cut, while younger IT workers get a raise.

The related data are presented in the tables.

field	40+ yrs old	< 40 yrs old
IT	12.3%	10.6%
non-IT	8.2%	6.7%

Table 3: Percentage laid off

field	40+ yrs old	< 40 yrs old
IT	13.5	11.1
non-IT	13.6	10.1

Table 4: Mean weeks to re-employment after being laid off

field	40+ yrs old	< 40 yrs old
IT	-13.73%	+6.57%
non-IT	-19.73%	-5.73%

Table 5: Percentage change in wages in re-employment after being laid off

The July 5, 1999 issue of *Information Week* presented a striking illustration of the problems which older programmers face:

It seems safe to say that experience may not be the most valued commodity, according to a survey of 200 IT managers nationwide conducted by InformationWeek Research in May. Though age wasn't specified in the question, only 2% of the managers said they would most likely hire a worker with 10 or more years' experience. Almost half–46%–preferred to hire a worker with four to 10 years' experience, while 26% said they would hire a worker with less than three years' experience, and another 26% wanted an entry-level worker or recent college graduate.
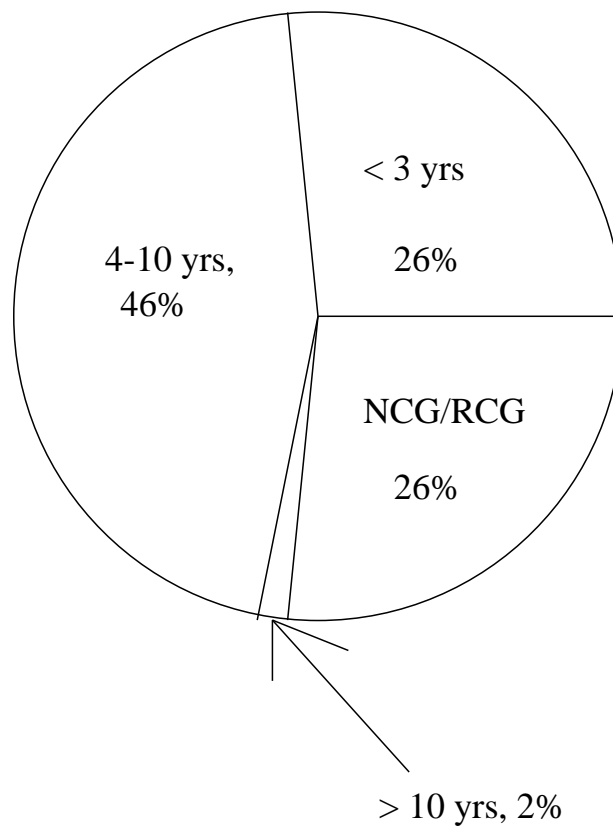
Figure 1: InformationWeek poll results

An article in *Network World*, September 14, 1998 found disturbing results in its reader survey:

Age does matter when it comes to IT hiring, according to a survey of 200 Network World readers with some degree of hiring responsibility. The survey clearly shows that younger network managers tend not to hire older workers.

Only 13% of the 30 survey respondents in the 20-30 age group hired anyone over 40 in the past year, but that percentage increased as the age of the hiring manager increased. Of the 80 network managers in the 31-40 age group, 24% had hired an over-40 person in the past year. The percentage rose to 39% for the 57 managers in the 41-50 age group and up to 45% for the 31 respondents over 50...

The survey results don't surprise Kathy Nichol, who has 18 years' experience as a high-tech recruiter in the Dallas area. Nichol says she works with one thirtysomething hiring manager who gravitates toward "young fast-track managers." When Nichol has recommended older workers, her client rejected them, saying the candidate lacked energy, couldn't cut it in a fast-paced environment, or should have been further along careerwise. "He doesn't even recognize what he's doing," Nichol says...

Companies don't want to hire older workers for entry-level jobs because they don't want a 40-year-old reporting to a 24-year-old. "It's a cultural thing," [Nichol] says. Naturally, the company won't come right out and say age bias is coming into play, but managers will come up with some other reason not to hire that person, she says.

Figure 2: Network World poll results

The figure shows data, extracted from the National Survey of College Graduates in 1993, showing the percentage of computer science graduates working in software development various numbers of years after they finish school.

These attrition rates are striking. Five years after finishing college, about 60 percent of computer science graduates are working as programmers; at 15 years the figure drops to 34 percent, and at 20 years — when most are still only age 42 or so — it is down to 19 percent. Clearly part of this attrition is voluntary, but most are forced to seek other work when they see the handwriting on the cubicle wall: Employers do not want to hire older programmers.

It should be noted that other technical fields do not show this rapid decline of work in their area. For example, consider civil engineering majors. Six years after graduation, 61% of them are working as civil engineers, and 20 years after graduation, the rate is still 52%; compare this to the decline for computer science majors from 57% to 19% seen above.

Industry lobbyists have tried to dismiss the large attrition rate among computer science graduates by saying "They all became managers!" **But civil engineers become managers too, and yet we don't see a large attrition rate for that profession.** Another analyst then postulated that computer science graduates have a greater tendency to become managers than do civil engineers, but this is not the case either. If anything, the opposite is true: The NCSG data show that among those who have been out of school 16 years or more, 13% of the computer science graduates were managers, while 18% of the civil engineers graduates held managerial positions.

There is no better way to show the industry's emphasis on youth (and its general disinterest in workers who are in their 40s or even 30s) than to look at how firms in this field define "senior" workers. Consider for example the employment Web page of Sun Microsystems (as of March 14, 1998), one of the most vocal firms claiming a labor shortage. One of the first questions asked of the job seeker there is "Experience Level," which of course is a proxy for age, and thus possibly an illegal question. But even more interesting

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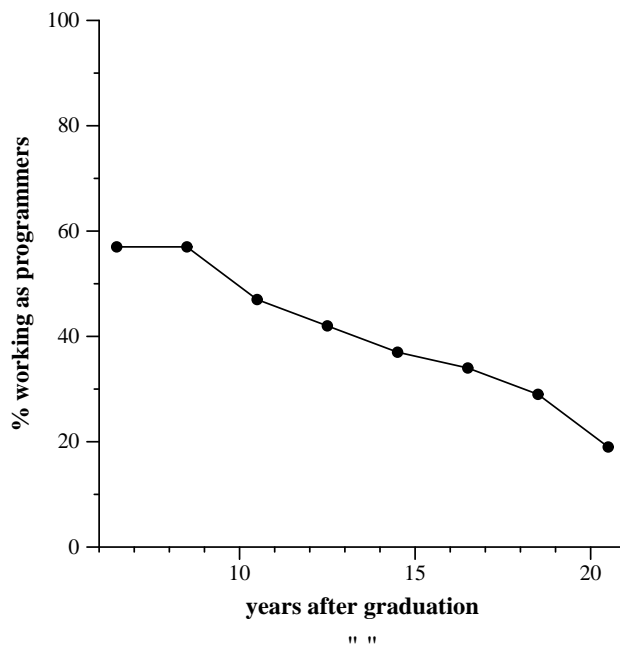
Figure 3: attrition rates from CS grads working as programmers

is the choices the user is given for answers to this experience question:

```
[ ] Entry Level (0-2  years )
[ ] Intermediate (3-5 years )
[ ] Senior (6+ years )
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In other words, if you are 28 years old, six years out of school, Sun classifies you as "Senior"!

Sun turns out to be typical in this regard. The table lists the numbers of years of experience (as a programmer and engineer in general, not in a given skill) listed in job announcements by various firms.

Best Buy	Senior Programmer Analyst	2 years
Compaq	Senior Software Engineer	3-5 years
Geoworks	Senior Software Engineer	5 years
Intel	Senior Software Engineer	5 years
Lotus	Senior Software Engineer	5 years
Oracle	Senior Software QA	4 years
Sun Microsystems	general technical	6 years
Corsair Communications	Senior Software Infrastructure Engineer	3 years
Baan USA	Senior Technology Engineer	3 years
The Learning Company	Senior Software Engineer	5 years

Table 6: Years of experience to qualify for a senior position

(Most of these are drawn from specific jobs on the firms' Web sites. An exception is Geoworks, whose information is drawn from a Geoworks job ad in *Tech Week*, July 12, 1999.)

5.2 Underlying Factors

Dr. Langbein's study cited above (the full study is available at http://www.ieeeusa.org/EMPLOYMENT/langbein.pdf) did not determine the cause of this phenomenon. However, abundant evidence from many other sources shows three underlying factors:

- Older workers often lack work experience in the most up-to-date software skills. (Note: The key phrase is *work experience*. Employers are not willing to hire an older programmer who has taken a refresher course in a new skill.)

- Employers like to hire new college graduates or young workers within a few years of graduation, because they work for lower salaries, and because they generally are single and thus can work large amounts of overtime without being constrained by family responsibilities. Employers may also perceive that the new graduates have more modern skill sets, though this effect is limited. [20]

- The "I only hire those who look like me" syndrome: Many of the hiring managers are young, and are either consciously or unconsciously uncomfortable with hiring older workers.

5.3 Typical Example: Intel

Intel lobbyist Eva Jack conceded to *Computerworld* magazine (*IEEE Computer*, February 1996) that the firm often focuses its hiring policy on new graduates. Tim Jackson's book, *Inside Intel* (Dutton, 1997), provides a number of disturbing details:

- Intel's policy apparently was instituted in response to a suggestion "by management consultants who feared the company was aging too fast, [recommending] easing older employees out of the company and replacing them with younger ones."

- Craig Barrett, Intel's Chief Operating Officer (and later CEO), replied to a corporate downsizing question raised at a stockholders' meeting dismissively, commenting "The half-life of an engineer, software, hardware engineer is only a few years..."

- Intel's focus on new or recent college graduates is so intense that it even has a special acronym for the term, RCG (Recent College Graduate), which dominates its employment recruiting discussions.

- Intel has also been the defendant in several age-discrimination lawsuits, including by one of its top salesmen, 40-year-old Bill Handel, who Jackson reports "was a great deal more expensive to keep than a newcomer only a few years out of college."

To my knowledge, Intel has never denied these claims, including when I cited the claims during public debates at which Intel officials were present, such as in a television debate between the author and Intel representative Coeta Chambers (Bay TV, San Francisco, March 3, 1998). And when the author offered during that debate to give Intel a list of older unemployed or underemployed software specialists who are seeking jobs, Intel declined the offer.

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[20]The new graduates may know Java, for instance, but not TCP/IP, SAP or any of the literally hundreds of software technologies in use today. There is no way a college curriculum can teach them all.

5.4   Comments by Recruiters and Analysts on the Age Problem

Even an *Information Week Online* article (March 30, 1998) which claimed a severe software labor shortage correctly stated that the opportunities are mainly for the young:

> "Younger people with hot skills have the most options open to them," says Tom Morgan, a VP in the Chicago office of Pencom Systems, a national IT recruiting firm.

Employment agents tell the story clearly. Andrew Gaynor notes (interview with the author, July 1, 1996) that anyone with 10 or more years of experience without currently-"hot" skills "is at a complete disconnect" in finding work. Susan Miller says (interview with the author, June 26, 1996) that former defense industry programmers "are usually shunned by the industry. I get a tremendous number of re'sume's from them but I can't place them." Gaudi Lucca told the author in August 1997 that very few programmers with 10 or 15 years of experience but lacking current skills would be able to find programming work. And Kim Lee, of the Network Connections employment agency in the Silicon Valley remarked (interview with the author, June 26, 1996), "In 1988 the employers would have retrained [older] people but *they're not desperate enough to do so today.*"

Prominent software project management writer Edward Yourdon, who follows national trends in the industry, comments,

> ...a lot of [older] programmers have disappeared — I've visited organizations that used to have 100 software people...then returned two years later to find that the staff had been reduced to a dozen younger and less expensive people." (*The Rise and Resurrection of the American Programmer*, Yourdon Press, Prentice-Hall, 1996.) He then notes that a major trend (in the computer applications realm) has been to replace older workers with "cheap, young C++ programmers.

A *Dallas Morning News* article (June 2, 1999), noted that:

> The age issue often boils down to a hot-skills issue, said Andrew Jackson, president of Bravo Technical, a Dallas provider of technical talent.
>
> "When someone comes to us and says they need someone with skills in Java [a programming language used on the Internet], we go to our database, and what we come up with is that people who have this experience are 25 to 35 years old," he said. "Does it happen? Yes. Is it intentional? No."

It should be noted, though, that often it in fact is intentional. While there are some sincere employers as Jackson indicates, the sad truth is that many others — in my experience especially those who are speaking the loudest in claiming a labor shortage — who deliberately use the skills issue as a pretext to avoid hiring the older, perceived-expensive, programmers.

Though age discrimination is not caused by the H-1B work visa program, it is clear that the program greatly exacerbates that discrimination. If the employers did not have the foreign labor pool to draw from, they would be forced to pay more attention to the older programmers here. The *San Francisco Chronicle*, May 19, 2000 noted:

Silicon Valley headhunter Linda Tuerk said that in her experience, employers are saving a lot of money by hiring H-1B workers, no matter what the rules say.

"Companies are firing older, more-expensive workers – people making 80 grand – and they can turn right around and hire two people right off the plane for 45 grand each," Tuerk said.

And from the same article:

The companies are in too much of a hurry to make use of the talent that's available to them, said Bill Payson, the head of SeniorTechs, an employment firm. "There's a shortage of ready- made techies," he said. "What they really want is somebody who's been doing exactly what they're looking for as recently as yesterday, available tomorrow."

Payson insists the real reason the tech companies are using the labor shortage argument is to save money by hiring foreign nationals at lower salaries...

Payson has 12,000 reasons to believe that there's no huge talent shortage in IT. That's the number of unemployed and under-employed, experienced technology workers listed in the database of his employment firm. Most are over 50, although Payson has been getting more interest from professionals in their 40s who feel they are already experiencing age discrimination.

"Our success rate is minimal. One out of 10 employers (who clients visit) hire somebody," Payson said.

5.5 Industry Officials and Lobbyists Admit That the Older Programmers and Engineers Have Difficulties Getting Hired

Some employers' insistence on hiring only programmers who have a specific software skill is sincere, though again, misguided since any competent programmer can learn a new software skill quite quickly. **But for too many employers, especially the ones who lobby heavily in Congress, the skills issue is just a red herring, a pretext for avoiding the older programmers and hiring cheaper workers.** Age discrimination is rampant in the industry, as more and more employers focus their hiring on the cheaper young people.

An article in *IT Recruiter* in October 1999 contained a quote which illustrates the situation:

...Arthur Martin, HR director for Connaissance Consulting, an IT telecomm and consulting firm in Columbus, Ohio. Martin says about 20 percent of his applicants are older, though **fewer than that have been hired.**

(Emphasis added.)

Martin goes on to say that the discrepancy is due to lack of skills. (Recall that for some employers the skills issue is just a pretext, though some sincere, though misguided, employers do apply this screening too.) But at the very least his remark shows that the older programmers do face problems getting work.

We have seen earlier that Intel has admitted preferring new graduates, and has dismissed the problems of older engineers by saying they have a "half-life" of only a few years. This attitude is not limited to Intel by any means; it actually pervades the industry. One engineer phrased it this way (*San Jose Mercury News*, September 4, 1995):

"There definitely seems to be a life cycle to engineers," said Fred Fehrer, 52, who was an engineer for Hewlett-Packard Co. for 13 years. "Engineers seem to be most valuable when they're five to 10 years out of college. Then there's a slow decline after that."

This problem has also been described for Microsoft. (*The Microsoft Way*, by Randall Stross, Addison-Wesley, 1996.) A hiring manager in a Silicon Valley firm who is a former UC Davis student told the author (March 28, 1997),

> Well, I want to state that this is in my opinion not a good policy, but the top management in our company has directed us to focus our hiring on new or recent graduates only. These are people who have no family and can work long hours. Yes, salary is a major factor; that's what it boils down to. You work the young ones for five years and then replace them. I have objected to this, because I believe that many of our projects are being hurt by the fact that everyone is so inexperienced.

A July 14, 1997 article in the *Washington Times* quotes NeuroSystems CEO Ed Robertson as to the central issue in hiring recent college graduates:

> If we go out to the marketplace and find a 40-year-old software engineer, we'll have to pay that individual more.

The March 22, 1999 issue of *Internet Week* observed (emphasis added):

> For many expanding companies, college recruiting represents a major part of the hiring strategy. There are pros and cons to hiring college students. And to be successful, the hiring process requires careful attention. But **recruiters say there's no better way to access a pool of eager and low-cost talent.**

Actually, as explained in Section 6.2.1, even new graduates are not sought after much by employers, contrary to industry claims. The employers prefer a modicum of experience — but they shun those with "too much" experience. An *InfoWorld* article (July 20, 1998, http://www.idg.net) featured summarizes the problem:

> "The most sought-after person has three to 10 years of experience — they're not highly paid yet — and they've got a lot of education in the latest tools and OSes," says Bill Schaefer, president of Schaefer and Associates, in Melbourne, Fla...
>
> "I'd love to have somebody with 20 years of experience, but unfortunately I'm only paying for three or four," says the IT director at a large law firm on the West Coast.

The article goes on to note that even though many older workers state that they are willing to work for less, employers' perception to the contrary means that the workers do not even get interviews. Many older programmers tell me they have encountered this problem.

Sharon Gadberry, president of Transitions Management/Outplacement National in San Francisco, noted that job ads will specify "five years of experience — they usually mean no more than that...Companies are trying to screen out the older workers [often to save on salary]."[21]

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[21]Ms. Gadberry was quoted in the *San Jose Mercury News*, September 4, 1995.

Lars Poulsen, head of RNS, a network router firm in Santa Barbara, said that he aims for a median length of experience of five to seven years among his engineers. (Interview with the author, June 24, 1996.)

This trend was noticed in the March 29, 1997 issue of *The Economist*:

> Age and experience, which elsewhere get people promoted, are no help in the [Silicon Valley]; on the contrary, there is a distinct bias in favor of youth. Nowadays the average software-engineering qualification becomes obsolete in around five years, so a student fresh out of college may be more valuable to a company than a 40-year-old.

Ann Reishus of Net Perceptions in Minneapolis told the author (June 25, 1999) that her firm primarily recruits programmers with three to seven years of experience. Another recruiter, who is with a major net-working systems firm, gave exactly the same age range to the author (June 24, 1999).

Intel's own internal recruiting literature points to a focus on "NCGs" (new college graduates) and "RCGs" (recent college graduates). (The time limit for an RCG is one year after graduation, according to Intel recruiter Pearl Seto.) These terms apparently are used for some other firms as well; I have seen internal documents from them indicating that various positions were earmarked for RCGs.

One CEO (Bob Forman of IMI Systems, a national programming consultancy) who heard me speak on this subject approached me after my presentation and said, quite angrily, "You are wrong that the industry does not hire older people who don't have hot skills. My company is anxious to hire as many programmers as it can get."[22] I then suggested that my wife, a software engineer with 15 years of experience, send his company her re'sume', and that if the re'sume' were rejected without an interview, I use his firm as an example in my future writings on this topic. He quickly backpedaled, saying that my wife's re'sume' might be rejected because the firm finds that her current salary is too high.

My reply to Forman was that this indeed is the problem. The industry claims there is a shortage of workers when what they really mean is that there is a shortage of cheap workers, in the form of new college graduates and imported foreign nationals. I discovered later that Forman is Chair of the ITAA's Immigration Policy Committee, in charge of lobbying for an increase in the H-1B work visa.

The industry also says that if they retrain their programmers in a "hot" skill, the newly-enfranchised pro-grammers will leave them for higher pay elsewhere. (*Workforce Magazine*, May 1999; *Orange County Register*, June 19, 1999; also see the ITAA report.) But **in saying they refuse to retrain on the grounds that the programmers would then demand more money, employers are thereby admitting that they are hiring the younger domestic programmers and the H-1Bs because of their cheap labor.** The same point applies to those employers who say they don't hire older programmers at young-programmer salaries because they would leave for higher pay at another firm later on.

The author debated the issue of the alleged labor shortage with Warren Leiden, president of the American Immigration Lawyers Association. (KQED-FM, San Francisco, March 6, 1998.) Leiden was one of the drafters of legislation proposing an increase in the yearly cap on temporary work visas for foreign profes-sionals. During the debate Leiden defined "mid-level" programmers to be those having only "a year or two of experience."

This was stated more formally in October 2000 in a question about Career Level for registration for a Career Center account at the online job database Monster.com (http://6steps.monster.com/new.asp). There "Mid Career" is defined as 2+ years of experience.

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[22]Forman is also quoted in a similar comment in *Computerworld*, January 19, 1998.

5.6 Shunned Even Though Possessing a "Hot" Skill

In many cases, even if an older programmer does have a "hot" skill, he/she still may find it difficult to get work. Bill Halchin is a case in point. In the spring of 1998 Sun Microsystems Vice President Ken Alvarez, who had been heavily lobbying Congress for an increase in the yearly H-1B quota, stated that he needed to hire H-1Bs for operating system kernel development because he could not find American programmers in that field. Halchin, who had nearly 20 years of kernel experience, with a re'sume' reading like a *Who's Who* of industry firms, applied to Sun. He did not even get an interview. After four months of unemployment, he finally found a programming position at another firm.

Halchin had a similar experience in the spring of 1999 with Ecutel of Alexandria, Virginia. The firm's CEO, John Harrison, issued a news release through PRNewsire on March 17, discussing his testimony that day to the House Science Committee. He had expressed to the committee the usual claims made by the industry lobbyists, as seen in this excerpt from the press release:

> Something is wrong when you put an ad in the Washington Post for a software engineer and the only qualified applicants you receive are from non-U.S. Citizens, said John Harrison, CEO and co-founder of Ecutel, one of the nation's most promising high-tech companies.
>
> In testimony before the House Science Committee today, Harrison told of the extraordinary cost and difficulty he has experienced trying to keep his company staffed with engineers. Harrison asked our nation's lawmakers to proceed on a two-pronged approach — dramatically stepped up math and science education for today's students, and for the short-term, eased immigration laws...
>
> Harrison explained how the difficulty of hiring skilled engineers that are U.S. citizens has hindered his company. Ecutel paid legal fees of $80,000 to address immigration issues faced by its engineers last year. The company was prohibited from bidding on contracts that required security clearances and was unable to work in some areas of encryption/decryption. Further, its non-U.S. engineers were not able to be used for sales calls outside of the U.S. as few have multi-entry VISAs, which are costlier and more difficult to obtain.

Ecutel's Web site said that the firm was seeking people with the following skills:

> Intermediate and Senior Engineer Positions Looking for several energetic and self-motivated Software Engineers with at least 5 years of experience or familiarity in 2 or more of the following: C/C++, TCP/IP, Mobile IP, IPSec, Device Driver, Internet RFC, Mobile Computing, GUI, RDBMS, Networking, Security, Web Development, Microsoft/Unix OSes, general Internet communication protocols.

Halchin had years of work experience in six of the skills this ad expressed interest in, considerably more than the threshhold of two stated by the ad itself. Yet he was not even called for an interview when he applied to the firm, even after two followup e-mail messages to Harrison.

A subsequent inquiry under the Freedom of Information Act (FOIA) by Robert Sanchez showed that Harrison was paying many of his H-1B programmers only $35,000 per year. (http://www.ShameH1B.ZaZona.com.)

Ed Petron found that even being a successful author on Linux (a popular version of the UNIX operating system) is not enough for most employers:[23]

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[23]E-mail to me, February 2, 2000

I have been out of work for several months now...I am the author of *Linux Essential Reference* from New Riders Publishing which was first released in December '99 and is about to enter its second printing. I...have never even been considered for any kind of UNIX job, even an entry level one.

5.7   Careers in Programming Are Short-Lived

As a result of age discrimination, most careers in the programming field are short-lived. (Recall that the claimed "IT labor shortage" is actually in the programming area, as the vast majority of high-tech H-1Bs are doing programming.) It is very difficult for most programmers to get programming work after age 40; some still work in nonprogramming but computer-related jobs such as customer support, marketing and so on, and many leave the computer field altogether.

We saw the quantitative evidence of the short-lived nature of programming careers in Section 5.1, showing that careers in programming are far shorter than in civil engineering. This is true even though both fields are technical and require attention to detail. The difference is that skill sets change rapidly in programming, but not in civil engineering. And again, it is not that programmers are incapable of acquiring the new skills, but rather that the employers won't give them the chance to do so.

This same point was found in a study by the United Engineering Foundation (UEF), as reported in *IT Professional*, May/June 1999:

> Most credentialed IT workers do enter a core [IT] profession, but then leave as they age. **This happens in other technical professions, but it happens a decade earlier in the IT industry.**

The difference between attitudes toward hiring in programming and civil engineering was described well by one civil engineer who read an earlier version of this paper:

> I had no idea that these firms were screening resumes with scanners [for highly specific technical skills]! That is incredibly shortsighted. In thinking about this more, I think in our business [civil engineering] it is pretty easy to show that people with more experience are more productive because they have done many of the things before. Just today, a young engineer came to me looking for some information from a specific manufacturer to do some hydraulic calculations on filters. I told him not to even bother looking because it was going to be insignificant in the overall analysis. If he had done them a few times, he would not have wasted an hour or so looking around.

5.7.1   Unemployment Rates Are Meaningless for Programmers

Since people who cannot find programming work leave the field, unemployment statistics for programmers are meaningless. The former programmer who cannot find programming work and thus becomes, for example, a bus driver (as did a laid-off programmer involved in suing Siemens; see Section 11) counts in government statistics as an employed bus driver, not an unemployed programmer. (Carol Veneri, "Can Occupational Labor Shortages Be Idenitified Using Available Data?", Bureau of Labor Statistics, http://stats.bls.gov/opub/mlr/1999/03/art2full.pdf.)

Here is an analogy: Suppose in a certain small town economic conditions became very poor, and the majority of working-age people could not find jobs and thus had to move out of the town. The few working-age people who did have jobs would remain, so the unemployment rate in this town would be very low — a completely misleading measure of the town's economic health.

Rebecca Eisenberg of the *San Francisco Examiner* wrote (May 31, 1998),

> Personal testimonials are even more powerful than the statistics. "There were 10 situations where I interviewed and was turned down...," said a 62-year-old computer programmer with 30 years of engineering experience in Silicon Valley, who preferred to remain nameless. "I work in food service now. I deliver a lot of pizzas to high tech companies. We (cater) a lot of high-tech parties. Anybody with two eyes in their head can canvass the meetings and parties and see that in many companies there are few people who are over age 40," he said. The programmer described a conversation he overheard at a recent company event: "Age became an important topic of discussion at this mid-day meeting, and they decided that the oldest person in their section of the company was 29"...
>
> "I get rather annoyed at unemployment statistics," the programmer said. "They might be talking about unemployment, but they are not talking about underemployment. Former high tech people have long since exhausted their unemployment benefits or are employed at something that they did not expect to be doing at their age."

So unemployment rates do not give an accurate picture of the employers' general refusal to hire the older workers.

Reportedly there was a high 17% unemployment rate for programmers over age 50 as of August 1997, according to *Computerworld* (January 12, 1998). This figure has not been confirmed, and as noted above unemployment rates are not meaningful anyway, but since the figure has often been cited, some comments are in order:

The 17% statistic was questioned by reporter Miranda Ewell (*San Jose Mercury News*, April 5, 1998), who said that such information (the unemployment rate for programmers over age 50) was available only in the 1990 Census, and thus the 17% figure could not be for 1997. But this is not true, as each year a survey like the Census is taken, the Current Population Survey, and thus data are available for every year. The information may not be in the published summaries, but it is certainly available by direct analysis of the raw data, which is collected each year in the CPS.

I checked with the author of the *Computerworld* article, Laura DiDio (now an analyst with Giga Information Group of Cambridge, Massachusetts), who stated that she doggedly went through call after call to the Bureau of Labor Statistics to get the exact information she wanted, and she finally did find someone who was able to provide it. She said that she stated this to Ewell, but Ewell did not put it into her article. (Personal communication with DiDio, April 6, 1998.)

The DiDio claim was also challenged by Dan Griswold in an article in www.intellectualcapital.com in the year 2000, but it turns out that his source was the Ewell article (personal communication with Griswold, September 18, 2000), which as explained above is incorrect.

It is not clear to me what really transpired here, and which side is right concerning that 17% statistic.

At least one thing is certainly clear: Most programmers are young, as a stroll around any high-tech company will confirm.

Hiring policies have spawned a cottage industry in self-help books for programmers who find that they are no longer desired by employers, such as *The Computer Professional's Survival Guide*, *Downsized But Not Out: How to Get Your Next Computer Job* and *The Programmer's Job Handbook: The Skills You Need for Long-Term Job Security and Programming Success*.

5.8   How Re'sume'-Scanning Programs Lock Out the Older Programmers

As has been mentioned, most big firms scan re'sume's electronically, searching for certain "hot" software languages or platforms. Both in the case of insincere employers who wish to weed out the older applicants, and in the case of sincere employers who have genuinely (though misguidely) become obsessed with specific skills, this has the effect of locking the older applicants out, excluding them from even consideration for an interview.

This has been such a problem that *PC Week* ran an article (November 1, 1999) describing the problem and giving programmers advice in how to circumvent it. Here is an excerpt:

> "At a big company, when they get re'sume's, human beings don't read them," said Bill Payson, president of The Senior Staff Inc., a staffing company in Campbell, Calif., that places mature IT workers. "As far as possible, they clue the [software] to exclude candidates that don't fit a pre-conceived profile. The profile is probably written by somebody in their mid-20s. ... That's one of the problems tangential to the age problems — most large companies with HR departments have very young people as hiring managers."

5.9   It Is NOT a "Failure of Programmers to Keep Their Skills Up to Date"

Again it is crucial to keep in mind that **the plight of the older programmer cannot be solved simply by the programmer taking some refresher courses in the new software skills. Even if a programmer takes a course in, say, the new Java programming language and then applies for a job requiring Java, employers will still not hire him or her, because the employer insists on actual work experience when hiring older people.** As noted by software employment agent Maryann Rousseau in the San Francisco Bay Area, "Taking a course is just not going to work for a senior person, given his salary." (Interview with the author, July 1, 1996.) Why hire a newly-retrained but more expensive 40-year-old when a newly-trained cheap new graduate is available? An *IDG.net* article (July 20, 1998, http://www.idg.net) observed, regarding "a large law firm on the West Coast,"

> ...some say a recommitment to training programs could help solve the problem...[But even if a veteran programmer] takes a Visual BASIC class, it doesn't guarantee that they will qualify for a [Visual BASIC] job. "I wouldn't hire them because they would not have the skill set," says [the] firm's IT director.

John Sturgeleski of the H.L. Yoh Company in Bloomington, Minnesota said (interview with the author, June 16, 1999), "Taking a class doesn't matter. The employers want experience in the actual work environment, to hit the ground running with no learning curve on the job. The rare exception might be if the hiring manager already knows the programmer personally."

Ann Reishus of Net Perceptions in Minneapolis, who hires Java programmers, made a virtually identical statement (interview with the author, June 25, 1999): "We don't do training. They need to hit the ground running. A class in Java is not enough."

Kim Lee, a Silicon Valley recruiter, also used the phrase "hit the ground running" in this context. (Interview with the author, June 26, 1996.)

I spoke with Frank Bellarmino of Parallel Partners in Chicago on July 29, 1999. He said that a recruiter, "We can't say [to a client] we've got a guy who has just taken a class."[24]

Kristen Linblad of Utek Recruiter in Oak Brook, Illinois, discussed with me (July 29, 1999) a hypothetical case in which a programmer had years of programming experience but was only self-taught or had course-work in the Perl programming language. She said, "This would work if the employer only specified Perl as a 'plus' in the job requirements. If the employer specified Perl as a 'must', then no."

Heather Arnold of Radiant Systems in Alpharetta, Georgia told me (August 1, 1999) that an applicant for a programming position must at a minimum have work experience in SQL. When I asked if coursework would be acceptable from a veteran programmer who applies, she said no, because "When you think of the tons of re'sume's we get, my eyes are going to be caught by those that are dead on [in terms of skills matches]."

A woman at Technical Staffing Corporation in San Francisco (who was not willing to give me her name) made similar comments to me when I interviewed her on December 16, 1997. I asked what would be available to a mid-career programmer, say 10-15 years of experience, who has been working with the C programming language but doesn't have currently-hot skills. She replied, "Just C, nothing else? They might find a position staffing a help desk." I then asked where such a person could take a course, say in Java, and then get a programming job. Her reply was "No, not without hands-on [i.e. job] experience."

5.10 Younger Managers, Older Programmers

In March 1998 a former employee of Inktomi, then one of the hottest new Silicon Valley firms, sent me a quite thoughtful account of his observations of the hiring process. He mentioned that one job applicant, a programmer with an excellent re'sume', was

> gung-ho to work, learn what he needed, and was obviously smart enough, but he didn't fit Inktomi's profile and [so his re'sume'] was tossed [into the trash]

When I then asked why this applicant did not fit Inktomi's "profile" and was rejected, the reply was that the applicant was in his 30s (not even 40s) and — heaven forbid — married! Inktomi's two founders were ages 23 and 29 when they started the company in 1996. The firm's employment Web site boasts that the company is "jam-packed with fun people," an atmosphere which presumably would not be enhanced by the older, married-with-children crowd.

Similar observations were made in *InfoWorld*, July 20, 1998:

> ...both older workers and younger managers may be daunted by the idea of a staff member working for a manager who could be his daughter. Almost half of the InfoWorld reader survey's

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[24]He speculated that this was primarily due to the fact that the client firms must pay him a referral fee. However, as seen by our other examples here, that is not the case. Employers will not hire a veteran programmer with only coursework in hot skills even if he/she applies directly, instead of via an agency.

respondents younger than 30 years old said they were managers, and more than one in five of the respondents older than 50 years were staff members.

"It definitely happens that you end up working for somebody half your age, so you have to present yourself as somebody who can be comfortable in that circumstance," says Joyce Plotkin, president of the Massachusetts Software Council, in Boston.

Another frequently cited reason for older workers' trouble finding jobs is the perception that they don't have the energy and commitment of younger workers...

Because of family and other commitments, older workers are perceived as less willing to work long hours than younger workers.

However, *InfoWorld's* survey found that the average number of hours worked per week was high but remarkably consistent: 48 hours for every age group.

5.11 Sample Profiles of Underemployed and Unemployed Programmers

After seeing me quoted in the press on this topic, many older programmers have sent me laudatory e-mail, saying my description of the plight of such workers fit them perfectly. Here are a few geographically-diverse samples:

(From a man in the San Francisco Bay Area:) I have programmed since 1976, but lost "hot skills momentum" during 1991-1995, during which time I worked as an applications specialist for a local oil company. I was replaced by a much younger worker. Since then I have been studying networks, Visual BASIC, and other newer languages, but can't obtain so much as an interview offer. I now earn about $24,000 per year in retail sales and management.

(From a woman in Portland, Oregon:) Your statements about "middle age" programmers are right on target. I am 41, and had been out of the industry for five years [running my own business]. Upon my deciding to go back into software engineering, I [could only get offers for nonprogramming positions]...This after 15 years experience in software QA, as well as five years running my own business...I was fortunate enough to eventually find my current employer, and they were willing to take a chance and offer me a job based on REAL experience and intelligence...[but] as long as employers think that I'm out of date because I was studying computer science before they were born, I guess it will be hard to do anything based on my background.

(From a man in the Washington, DC area:) It is interesting to note that it is Oracle and MCI/WorldCom that are cited in [a 1999 article in which the two firms were pushing for an increase in the H-1B quota] as crying about the lack of "qualified" applicants in this area. I interviewed with BOTH of them, MCI (actually UUNet) TWICE, with no luck. I know I qualified for both of the jobs, otherwise why a face-to-face interview after the resume screening? I can only assume that when they saw my gray beard, that was the end of the process...It also was interesting that I starting getting a LOT more interest in my resume when I cut out 14 years of experience (1967-1981).

(From a man in Tennesse:) Based on personal experience, I'd say you are right in your summary of the true state of the IT job market: Nobody wants to pay serious money except for a handful

of super-hot areas like Year2000 or fixing some Microsoft problems. I've got an MSEE from Caltech, six years at NASA, and six years running a PC business, and I quit to get one of those "hot jobs" that was supposed to be plentiful. Big mistake!!! At least I've found nothing meaningful in the Nashville area.

(From a man in New York City:) With over 10 years of experience in programming, I've been out of work and looking for over a year and a half with absolutely no luck...A friend suggested to me that looking in California for a Java job would be better, so I faxed my re'sume' to a recruiter two weeks ago. I spoke with the recruiter in San Francisco this afternoon, and she told me that my experience in other languages was worthless...and also that in my present circumstances (unemployed) that I was "out of the field"...She mentioned to me another person, with 10 years experience in the [software engineering] field whom she was helping, [but] who could not get a Java job because he had no paid experience in Java. I asked her if there was any age-discrimination in California (in the software field), and she indignantly replied "no." She also suggested that I look in New York because the companies out there [in San Francisco] wouldn't want to interview me (i.e. bring me such a "long distance"). I replied that they didn't seem to mind bringing people from China, which was an even greater distance.

(From a 47-year-old man in the San Francisco Bay Area:) I believe I have highly transferable skills in several key areas of strong demand and intensive growth in Silicon Valley, but in 15 months of essentially full-time searching have really only gotten two formal interviews...Emphasizing modest salary requirements and an eagerness to accept 'entry level' positions has proven entirely futile, as have all offers to submit to some form of testing to prove my competence...I claim competence in C++, perl, Unix, Windows95, etc., and in the course of my career have rapidly adapted to many computing environments, from various mainframes, Crays, to PCs. One anecdote you may appreciate: in stepping up to a contract agency's booth at a recent job fair, I was almost immediately greeted with "We haven't been getting many legacy jobs lately" (I have a mostly gray beard). Another very large agency told me flat-out that most of their clients are only interested in younger people.

(From a man in the Southwest:)

I am an India born US citizen and am opposed to this program allowing 95000 work visas for foreign hi-tech workers. I believe that the shortage, if any, has been created by laying off older hi-tech people such as myself.

I am 51 years old...I have over twenty years of experience... I applied for a job at [company name deleted] and I got a reply from them saying they did not have a suitable position for me. Since they have large advertisements in the paper for software jobs for people with my background, I believe that I was rejected on the basis of my age. [This company is] actively recruiting in India. I know this because my brothers live in India and keep me posted of this.

(From a 27-year-old man on the West Coast who had graduated three years earlier:) [When I interviewed for a position for a Java project], not one difficult technical question got thrown at me — all the questions were behavioral or opinion type questions. The most frequently repeated question was "When did you graduate — I don't see that date here." After I was offered the job, I pointed out that I knew a coworker who is much more passionate about Java programming. He has one more year of experience over me. The manager shook his head, "I don't think you

69

understand — we are looking for more recent college graduates. Your case is a special case because we have to change the requirements to hire you."

Longden Loo, in the Los Angeles area, posted the following to an online forum run by the *San Jose Mercury News* in September 1998:

> As a recently laid-off programmer with 20 years of experience, I'll attest to the incongruity of the industry's H-1B desperate clamor for more foreign help, ostensibly to relieve the shortage of needed technical labor.
>
> Shortage? And here I, and my fellow 40 something programming breathren, have been begging for jobs, some for as long as four months with nary a bite from the same desperate employers! Personally, with over a hundred resumes submitted, 4 job fairs, 17 recruiters [employment agents]... I've netted only 2 interviews.
>
> The H-1B supporters harp on the failure of our schools to provide an adequate supply of technical labor, but to which of my three children should I suggest a career to follow in Dad's footsteps and be obsolete and unemployable by the age of 40? I'd be derelict as a parent to do so.

Loo had been laid off by Northrup Grumman. Yet the ITAA's Harris Miller told the *Electronic Engineering Times* (October 8, 1998) that Northrup Grumman currently had a "plethora" of openings for programmers. Loo's response to this (in e-mail to me) was:

> ...Two more fellows were [recently] laid-off from my old group [at Northrup Grumman]...What burns me about the "plethora" of openings at Northrop are how empty those opportunities actually were.
>
> After receiving my layoff notice, I made inquiries to several of those positions including divisions on the East coast, but was told I was "too experienced."
>
> A few months before my layoff notice, I applied for an ideal inter-company position with a perfect match to my qualifications and only a few miles from my home. I waited and inquired for over 8 months and was always told (right up to my last week with Northrop) by HR that the position was still open and that they were still reviewing candidates. An insider friend of mine tried to circulate my resume there, but advised that there was a hiring freeze on positions related to various projects, possibly also the one I was interested in, though that certainly didn't deter them from continuing to run the ad in the posting of positions...

6   Educational Issues

"Pushing the Education Button" is a tried and true method for obfuscating any issue, this case being a prime example.

The fact that the lobbyists consider education to be merely a diversionary tactic was illustrated in late 1998, right after an H-1B increase was enacted on the strength of education being a long-term solution, MEPTECH, an industry conference in Silicon Valley, held a session on the "educational solution" to the claimed labor shortage. There were representatives from industry and academia. Yet the industry representatives did not say a single word about education, the supposed theme of the conference session; instead, they talked about the "need" for an H-1B increase — which had already been enacted.
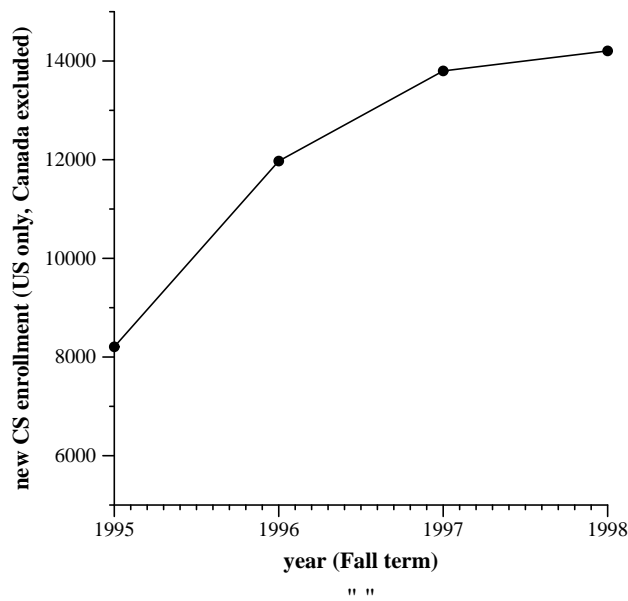
Figure 4: new CS enrollment in US

As will be seen below, the industry lobbyists have consistently manipulated the education issue. It is an excellent stalling tactic, under which the lobbyists say, "In the long run education will close the labor gap, but for now we need H-1Bs." This, of course, has also provided an easy out for the people in Congress who want to please the industry.

6.1 University Computer Science Enrollments

The ITAA industry lobbying group claimed throughout 1997 computer science enrollments were declining, and called on the federal government to fund programs to attract more college students to the field. But ITAA's assertion was so misleading as to border on fraud.

The ITAA report lists declining numbers of computer science Bachelor's degrees from the late 1980s to 1994. But new computer science enrollment reversed its declining trend in 1995, increasing by 5% in 1995-1996, and by a whopping 40% nationwide in 1996-1997, and then by another 39% in 1997-1998, according to the Computing Research Association (CRA), a national consortium of university computer science departments.[25] **New enrollment in computer science doubled nationwide in the late 1990s.**[26]

This information (the first 40% increase) was conveyed to ITAA's Harris Miller and Tony Vickers by a CRA official when ITAA distributed a preliminary draft of their report at a roundtable discussion organized by the

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[25] *Computing Research News*, March 1997 and March 1998; see their Web page, www.cra.org.

[26] Update: The same publication reported in March 1999 that "The recent precipitous rise in undergraduate [computer science and computer engineering] enrollments appears to have leveled off, at least for the moment (Figure 3). After doubling in the two years between 1995 and 1997, new undergraduate enrollments in CS and CE are off 4.2% this year." However, this drop appears to have occurred only in Canada, not the US. Then in March 2000, the publication report was headlined "Ph.D. Enrollment Levels Off; M.S. and Undergrad Continue to Rise," noting that new CS enrollment was "down slightly" (down 1%) due apparently to a shift to CE, whose enrollment was up 12%.

It should be noted, though that new enrollment at my university, UC Davis, has declined, due not to a reduction in demand by students to enter our CS major but rather because we requested our campus administration to reduce new enrollment, due to extremely overcrowded classes.

Stanford Computer Industry Project on February 19, 1997. Though ITAA stated at the time that they were soliciting comments and suggestions for improving their report, they did not include this information about the sharp increase in computer science enrollment in the final version of the report, apparently because it undermined their argument. In fact, ITAA continued to claim enrollment is declining (*San Francisco Chronicle*, January 8, 1998), even after ITAA's suppression of the 1995 reversal trend was brought up in an interview with ITAA by the *Electronic Engineering Times* (September 29, 1997), until forced to stop when even the Department of Commerce found ITAA's claim to be untrue. Since that time, the ITAA statements have avoided using the present tense in the word *decline*, but they continue to obfuscate the issue by discussing what happened in 1994, leading the listener to believe the situation still holds today. Interestingly, in his April 21, 1998 testimony to the House Immigration Subcommittee, Miller claimed that the ITAA had never suppressed the information about the rise in enrollment, a stark revision of history. [27]

Later, after I had exposed this ITAA deception, the lobbyists again obfuscated the issue by saying that enrollment in engineering was down, not computer science. This statement, if accurate, is highly misleading, because as discussed in Section 3, the high-tech H-1Bs are computer scientists, not engineering, with H-1B computer science graduates outnumbering electrical engineering (the largest engineering group among H-1Bs) by a ratio of 15-to-1.

It also should be noted that, contrary to the ITAA's claim that the decline in computer science enrollment in the early 1990s was due to lack of interest among American students, even industry representatives interviewed by *Business Week* (March 10, 1997) blamed that earlier decline partly on "a glut of programmers in the mid-1980s." The lat4er increase in enrollment was a response to the rapid expansion of the job market which began around 1994. In other words, market forces are working quite well here; the supply of computer science students has been quite elastic to demand.

The ITAA later admitted that the decline in the numbers of computer science majors in the early 1990s was due to a slack labor market, rather than to some sort of "deficiency" in U.S. college students, as ITAA had claimed earlier. ITAA president Harris Miller told *Infoworld* (February 8, 1999):

> The cutbacks in aerospace and defense sent a signal to the job market that engineers and math and science degrees were not going to be as much in demand in the 1990s as they were, in fact, going to be. Students were seeing the end of the Cold War, corporate restructuring, and layoffs. To tell them that they should focus on a computer science degree rather than a business or law school degree was not an easy sell.

Also in the same *Infoworld* article was the following:

> Nate Viall, an IT market researcher at Nate Viall and Associates, in Des Moines, Iowa, says the late-1980s recession began with big layoffs in 1989 at Digital Equipment, followed by cuts at IBM. That was followed by the corporate "merger mania" of the early 1990s, which also resulted in thousands of IT workers losing their jobs, he says.
>
> "All through the 1990s to about 1995, there were few months when there was not some news headline about IT layoffs," Viall says.

So, quite contrary to ITAA's assertion that students do not want to study computers, due to claimed "nerd" images of the field, or do not have the background to do so, the fact is that **computer science enrollment has responded quite well to labor markets demands, rising and falling with the demand.**

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[27]Other reports commissioned by the industry, such as one supported by the American Electronics Association, have also been misleading in this regard, again typically by using a misleading range of years in which to measure CS graduation rates.

6.2 How The Job Market for New Graduates Works

6.2.1 Not a Seller's (i.e. Worker's) Market

Industry lobbyists tell the press how "desperate" employers are to hire new graduates. They paint a picture in which new graduates have multiple offers, all with fat salaries and signing bonuses, months before they even graduate. Here, for instance, is what two industry executives testified to the U.S. Senate, concerning the bidding wars they said firms were having over hiring new graduates (Reuters, February 25, 1998):

> Microsoft's Murray agreed that recruitment was incredibly competitive, saying, "It has almost become a frenzy."

> Texas Instruments' Leven added: "It's getting like athletics and I'm beginning to wonder if I'm living in a different solar system."

Yet if you pin one of these employers down and ask how many actual offers they made to graduates at a particular school in a given year, they will admit that it was only a handful. Amdahl, for example, made offers to only six new graduates at UC Davis during the two recruiting seasons 1998 and 1999, and the firm stated that this number was larger than for other schools. (E-mail from Jessica Boverio, Amdahl recruiter, to the author, February 1, 2000.)

As explained below, the frenzied bidding wars are mainly for outstanding graduates from the elite schools.

The industry lobbyists' claim that new graduates of university computer science programs can easily find good jobs in the field was also debunked in a *Computerworld* insert in college newspapers, titled *Careers Spring 1999*, which was filled with articles with job-hunting advice for graduating seniors in computer science. Again contrary to the stories fed to the press by industry lobbyists claiming that most new graduates in computer science are besieged with job offers from anxious employers, the truth is that finding a job is not that easy after all. The insert starts by stating,

> As a computer science or engineering major at an institution of higher learning, you already have taken large strides toward building a lucrative career. Soon, however, you will be pounding the pavement alongside a horde of other recent grads armed with re'sume's touting the same impressive information technology credentials that you have. How do you distinguish yourself?

If employers are courting the new graduates so heavily, why the need to "distinguish oneself?"

The insert then says this more explicitly:

> The Silicon Valley job market is so crowded that it isn't always easy for even the best-apportioned IT grads to differentiate themselves even with a broad array of programming language experience...

> Having fantastic technical skills just isn't enough in the highly competitive world of information technology...

> It takes more than technical skills to get a high-tech job.

The job market is "crowded," "highly competitive"? This certainly is not what the industry lobbyists are telling us. They claim it is the employers who must compete for workers, rather than *vice versa*.

6.2.2 Fewer Than Half of New Computer Science Graduates Get Programming Jobs

Recall that the vast majority of H-1Bs are programmers, so that is where the claimed "shortage" is. Yet my own surveys of graduating seniors at UC Davis reveal that fewer than half of the graduating seniors in computer science get jobs in programming, and are instead shunted into semitechnical (albeit well-paid) jobs like customer support. Informal comments by colleagues at other universities have confirmed that this is the case nationally.

In addition, Nate Viall, an industry analyst in Iowa, stated (personal communication, June 10, 2000) that the graduates who get programming work, according to "placement staff and professors,"

> ...are the better students who have higher GPAs (above 3.25), one or more internships, more campus visibility through leadership roles in clubs, class and labs.

The data in the 1993 National Survey of College Graduates showed 57% getting programming jobs at that time (*The Long Term Educational Needs of a High-Technology Society*, by Kenneth Button, *et al*, George Mason University), already low, but it has gotten even lower even though economic conditions have become much stronger since then.

Some of the UC Davis students were interviewed by *Tech Week*, in an article which appeared June 30, 1999. Here is an excerpt:

> One student graduating with a bachelor's degree in computer science from the University of California at Davis, was disappointed he couldn't get a position in the Bay Area as a programmer. The student, who had a 3.1 GPA, was offered local jobs designing Web pages, work he considers to be beneath his skills.
>
> Ultimately, he took a networking job in the Portland, Ore., area. "It seems [for] all the interesting positions in the Bay Area you need a graduate degree or a lot of experience," he said. "It they're desperate for workers, I don't see it."
>
> Howard Louie, a 24-year-old who earned his bachelor's degree in computer science at UC Davis in March, also feels high-tech firms in the Bay Area are "picky" rather than parched for programmers. Louie decided to continue in UC Davis' computer science master's program to enhance his job prospects. But he still had some difficulty landing an internship in the Bay Area, let alone the promise of a job a year from now. A top business consulting firm declined to give Louie either, despite the fact that he graduated with a 3.6 GPA, interned for two summers at Intel and served as a network administrator at Davis for about a year. "The company has] some real technical divisions," Louie says. "I can't imagine why they wouldn't want someone that can leave grad school in one year."

According to Eric Hays of the UC Davis Career and Internship Center, 31% of graduating seniors in engineering in 1998 still had not found a job as of June 1998, right in the thick of employer screams of a high-tech labor shortage.

6.2.3 The Job Market for New CS Graduates in 2001

The economic slowdown of 2001 hit new graduates very hard, according to reports in early Spring. All the problems cited above became more severe.

Pam Swartwood of the UC Davis Career Internship Center, told me that employer recruiting in the 2000-2001 academic year was down significantly from the previous year.

The situation was dramatized by the revelation that Intel even ha contacted some of those to whom it had made recent job offers, now turning around and offering to pay them NOT to accept those offers. (Associated Press, April 21, 2001.)

6.2.4 Do Employers Hire Non-Computer Science Graduates As Programmers?

The industry lobbyists also say that college computer science curricula are only producing 25% of the nation's needs for programmers, again claiming this is due to a decline in enrollment. But it has always been the case that programmers have always come from many different fields, not just computer science. For instance, according to the National Science Foundation's SEASTAT data, only 26% of all those working as programmers in 1993 had computer science degrees. In that sense, the situation today is no different from the past, contrary to the alarmist tract written by the ITAA.

Yet we are beginning to see some anecdotal evidence that employers are in general no longer willing to hire non-CS majors as programmers. After all, as we have seen, they are not even willing to hire of the CS majors into such jobs, let alone the non-CS majors. Indeed, Chapter 7 of the industry-biased NRC IT Workforce Committee report (see Sections 4.4 and 2.3.6), made such an argument, insisting that formal CS coursework is the only way to produce good programmers. Yet the report offered no evidence for that, and indeed conceded that even the ITAA survey found than less that 20% of the IT hiring managers mentioned a college degree as being an important qualification.

Yet, even if formal CS coursework is taken to be important, one must note that Clifford Adelman of the federal Department of Education has found that large numbers of non-computer science majors take at least mid-level courses in computer science.[28]

6.2.5 The Role of Internships/Co-ops

The employers' HR departments automatically shunt new graduates who lack internship experience to non-programming jobs such as customer support and software testing, while hiring the H-1Bs for the programming positions. (It should be noted that these semitechnical jobs usually do not lead to programming positions later.)

Ideally, an internship is excellent for both the student and employer. An employer gets a chance to really find out a student's capabilities during an internship. (Grades, used by HR as a filter, are a very poor way to assess a student's capabilities. Many students hate computer science theory but love programming, and are crackerjack programmers. Bill Gates never would have been interested in the theory courses, had he stayed in college instead of leaving after his freshman year.) If the intern is good, the employer will generally make an offer of a permanent position later when the student graduates. This is a very good approach, and it should be used much more.

However, HR does not use internships in this way. Instead, they will automatically reject for programming jobs new-graduate applicants who don't have internship experience. And they automatically forward to managers the re'sume's of those who do have it, even if the internship was with another company and

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[28]*Leading, Concurrent or Lagging: the Knowledge Content of Computer Science in Higher Education and the Labor Market*, Clifford Adelman, U.S. Dept. of Education, May 1997.

thus the first company doesn't have the first-hand knowledge of the student, which is the purpose of the internship.

And it is equally wrong for HR to reject out of hand the applicants who don't have an internship. Most students are unaware of the importance of an internship (most university faculty are clueless on this, and thus don't advise the students accordingly), and many students really can't do an internship, due to constraints of family obligations, financial problems, and so on. Also, there aren't enough internships for all students anyway.

6.2.6 The Role of the Ranking of School

It should be noted that most firms recruit at only a few colleges. As noted in *Computerworld*, December 1, 1997, "...the likes of AT&T Corp., Intel Corp. and Hewlett-Packard Co. can afford to be choosy, selecting only those students with dazzling grades and extracurricular work experience." But it is not just the large firms which have such policies; most of the small firms do too.

For example, at San Francisco State University, right in Silicon Valley's back yard, only a handful of computer industry employers do on-campus recruiting. This was stated in an interview by the author with the Computer Science Department Chair, Dr. Gerald Eisman in June 1996. When the author spoke with him again in the spring of 1998, he stated that recruiting by the big firms had even decreased further since I had talked to him in 1996. Even Intel, with its heavy emphasis on new or recent college graduates, does not recruit there.[29]

TJ Rodgers, the CEO of Cypress Semiconductor who has been so outspoken in favor of using the H-1B program to help remedy a claim high-tech labor shortage, admitted in a debate with me (*San Jose Business Journal* Power Breakfast, June 24, 1999) that his firm does not recruit computer science graduates from my school, UC Davis. Apparently realizing that this created a bad impression, he hurriedly contacted UC Davis later that day and posted some job openings for his firm there, announcing them at another debate with me on local radio two days later. When I pointed out that even then the positions he posted were not for programming, he said that UCD CS graduates were not "qualified" for such work.

The table presents the numbers of schools at which various firms recruit.

Cisco	20-40
Cypress Semiconductor	26
Lucent	10
Nortel (Winter/Spring interviews)	14
Qualcomm	20+
Synopsys	10

Table 7: Numbers of schools at which firms recruit new graduates

[Cisco: Randy Levinson, statement to the author, June 24, 1999; Cypress: J Rodgers of Cypress Semiconductor, testifying in Senate Judiciary Committee hearings, February 25, 1998; Lucent: James Seay, statement to the author, June 24, 1999; Synopsys, statement to the author, June 24, 1999; Qualcomm, the firm's Web page ("We visit over 20 campuses every year"), July 30, 1999.]

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[29]Meeting with Intel college-relations staff, January 1998; see also Coeta Chambers, Intel lobbyist, *Take Issue*, Bay TV, San Francisco, March 3, 1998.

These are tiny numbers compared to the 1,061 colleges and universities offering Bachelor's programs in computer science. (The Computing Research Association Study, *The Supply of IT Workers in the United States*, 1999.) True, they cannot recruit at all of these schools, but again keep in mind that the employers are saying that they are "desperate" for new graduates. If they were desperate, they would be recruiting a more than just a tiny fraction of the schools producing graduates in this field.

Indeed, even the ITAA's Harris Miller has admitted this to *Tech Week*'s Umberto Tosi: [30]

> TW: It is possible that high-technology companies are contributing to the shortage by all looking to the same small pool of elite universities for candidates rather than opening up their searches?
>
> Miller: That's part of the mind-set change we need to get from the companies. Some of them are there, some are not yet.

(Miller goes on to say that he believes employers should hire more programmers who have only Associate of Arts degrees. Again, this is apparently motivated by a desire to reduce salary costs. A similar statement holds for efforts aimed at retraining secretaries or other nontechnical workers into programmers.)

After James Seavey, an executive at Lucent, had given a speech at an industry gathering, complaining that the universities were not producing enough high-tech workers (*San Jose Business Journal* Power Breakfast, June 24, 1999), I approached him and asked if Lucent could set up some internships for my students at UC Davis. His reply was that Lucent was only interested in working with a small number of schools.

6.2.7   The Role of Grades

The Human Resources departments of most firms have rigid screening criteria for new graduates, based on grades. Granted, there is at least some meaning to grades, but the fact is that many outstanding programmers had lesser grades when they were students, and many graduates with excellent grades turn out to be poor programmers. Indeed, Wharton School of Management professor Peter Cappelli goes further, saying "college academic credentials, such as grades, predict almost nothing about subsequent job performance." (*Is There A Shortage of Information Technology Workers?*, Peter Cappelli, report to McKinsey and Company, June 2000.) Given that the industry claims to be "desperate" to hire, one would think they would cast their net more widely, but they do not.

As a rough rule of thumb, at UC Davis — and confirmed by colleagues at various schools across the nation — I have observed that graduates with grades in the 3.5-4.0 range (on a scale of 4) tend to get the technical jobs, i.e. programming; those in the 3.0-3.5 range tend to get only semitechnical jobs, such as customer support or software testing; and those under 3.0 have trouble getting jobs in the industry altogether. There are certainly a number of exceptions to this (most of them involving students who already have some internship work experience in the industry), but this is the typical pattern.

Doug Pecchenino of Xilinx told me (August 26, 1998) that his firm is only interested in graduates with grade-point averages (GPAs) of above 3.8 on a 4.0 scale. Valaiya Smith, a new graduate writing in *Computerworld* (August 3, 1998), complained that employers' restriction to those having GPAs higher than 3.5 is unfair to people like Smith who are married with families and working full-time while going to school.

Two Intel engineers recruiting at UC Davis on October 13, 1999 (Linus Maxino and Pearl Seto) told me that Intel has no interest in those with GPAs below 3.0, with rare exceptions made only if the applicant is very close to that threshhold.

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[30]February 13, 1998. See http://www.techweek.com.

In summer 1998, a new UC Davis graduate mentioned to me that he had been unable to get any offers for technical positions. He had a GPA of 3.4, is a first-rate programmer, has a very keen work ethic, is very articulate and so on. I then pressured a Silicon Valley firm which I will call XYZ Corp. XYZ had in the last few years hired five or six UCD graduates, all of whom had GPAs in the 3.8-3.9 range. A year earlier I had pushed them to hire a UCD grad whose GPA was only 2.9, and the company had subsequently reported to me that he had turned out to be one of their top programmers. Yet even then they decided not to hire my new "case," the one with a GPA of 3.4. Even more interesting was their grounds for their decision: Of the dozen or so people who had interviewed him, all but one were very positive in their evaluation of him, but the fact that the one exception was lukewarm was enough to reject him.

A former UC Davis student (with top grades) told me,

> [When I graduated and started work with Oracle in 1989] Oracle's policy was to only hire from the top 12 universities in the country...At one point, I interviewed with a manager in the application division. While we were sitting there talking, I noticed that he had a chart of his organization [of people who already working there] in front of him. Instead of just names and titles, this chart had much more detail. It listed each person's skills, where they graduated from, and their GPA. I was shocked and greatly relieved that nothing came of the interview.

To Oracle's credit, the firm is now one of the few in Silicon Valley to recruit at San Francisco State University. But the incident above is bizarre, to say the least, and not in Oracle's own best interests. And Oracle, one of the firms most vociferously claiming a worker shortage in 1998, still was not so desperate to consider applicants who were not in the very top of their graduating class; their employment ad in *San Jose Mercury News*, October 4, 1998, began by asking "Are you in the top 1% of your class? Are you looking for a job with a company in the top 1%? If you answered yes to both of the above questions, then this is your opportunity to join Oracle..."

Harris Miller, president of the ITAA industry trade group, made a similar remark to *CFO Magazine* (November 2000):

> "Too many companies operate like the NFL," remarks the ITAA's Miller. "They let universities develop the talent, then recruit [only] the best. They should follow a baseball model, creating farm teams and developing people themselves."

All this is completely inconsistent with Miller's own statement in the *Ottawa Citizen* (June 20, 1997):

> [Miller] said guidance teachers and parents should stop discouraging students with average grades from entering high-tech training...

Even the National Research Council report (*Building a Workforce for the Information Economy*, NRC, 2000), heavily biased in favor of industry, admonished employers for hiring only those with top grades. The NRC committee noted that research has shown that the correlation between grades and future work performance is very weak.

6.2.8   Case Study: Samuel Lin

Even top grades from a top school may not be enough to get a job. Samuel Lin did all the right things society asks — top grades at Princeton for his Bachelor's degree, and then the same for his Master's at

Cornell University, one of the nation's foremost engineering schools. Yet in spite of having a newly-minted Master's in Electrical Engineering in the spring of 1998, specializing in the semiconductors area, not one company offered him a position. He wrote to congressional offices, stating that

> ...it is NOT correct to simply dismiss concerns about this issue as being xenophobic and anti-immigrant. Although I am a U.S. citizen, my parents were both immigrants from Asia...[However,] regardless of the dramatic statistics and numbers that are being thrown around, my experience is that the purported "desperate shortage" of skilled workers is simply NOT true.

> Of particular relevance to my experience is the recent testimony (April 21, 1998) before the Subcommittee on Immigration and Claims of the House Judiciary Committee by Daryl Hatano of the Semiconductor Industry Association (SIA) in favor of raising the H-1B immigration visa cap (posted at their website — http://www.semichips.org/). Hatano supports the claim of a "workforce shortage" with a considerable and impressive list of "employment opportunity websites at SIA member companies."

> The crucial fallacy here is that just because a job description is posted does not mean that the company is willing to hire a qualified candidate whether foreign or domestic...

> The companies may insist they have a "desperate shortage," but I personally have already applied for employment to most of the companies that Hatano claims have "500 openings for semiconductor positions,' with, so far, NO success.

Lin never did find an engineering position in the industry.

6.3   ITAA Claims About U.S. Youth's Lack of Interest/Qualifications to Study Computer Science Are Incorrect

6.3.1   Exploding CS Enrollment Disproves the Claim

The ITAA claims that American students do not study computer science because (a) they think it is "nerdy," and (b) they lack math skills. But as discussed earlier in this paper, computer science enrollments have risen and fallen directly in response to the ups and downs of the IT job market. **The fact that computer science enrollment skyrocketed in the late 1990s shows that there are plenty of students with the interest and background to study this subject.**

This was also illustrated quantitatively in data collected by Larry Mishel of the Economic Policy Institute; see *Economic Snapshots*, EPI, December 8, 1999,

http://www.epinet.org/webfeatures/snapshots/archive/120899/snapshots120899.html

6.3.2   The Role of Mathematics Education

The industry lobbyists say the alleged high-tech labor shortage is due to the failure of our K-12 educational system to develop math skills. Again, this is an emotional appeal to "push the Education Button," and is completely misleading.

As discussed in Section 3, the vast majority of high-tech H-1Bs are programmers, not engineers, and programming does not use math. So, the question is a red herring to begin with.

One does not use math in most software development. The reader can verify this by picking up any book on, say, Java programming at a local book store. In fact, in his 1999 guide to programming careers, [31] consultant and author Jesse Liberty even advises would-be programmers not to worry if they have never been math fans: "...skill in math is almost irrelevant [to the programming field] today." [32]

Even if the industry lobbyists insist on focusing on the small minority of H-1Bs who are engineers, for whom math is important, this "math skills" claim is highly misleading. This is quickly seen by noting, for example, that average math test scores of some individual U.S. states such as Iowa are quite similar to those of the East Asian nations with whom the U.S. is often compared unfavorably. What is so special about Iowa? The answer is that their scores are not hampered by having a large socioeconomic underclass, as the U.S. as a whole is. There are a number of other problems, such as the fact that the U.S. aims for universal education through high school, whereas in some of the "competing" countries high school is only for the academically elite, thus artificially inflating the average math scores; etc. (See *The American Prospect*, March-April 1998, and *Los Angeles Times*, March 15, 1998.)

Much has been made in the press (and by the industry lobbyists) about the results of the 1999 Third International Mathematics and Science Study-Repeat (TIMSS-R). Out of 41 countries compared regarding eighth-grade students, the U.S. finished only 19th in math and 18th in science. Yet an essay by David Berliner of Arizona State University (*Contra Costa Times*, February 3, 2001; originally published in *Commentary*) puts this in perspective:

> In TIMSS, at the eighth-grade level among the 41 nations, 32 nations statistically outscored Louisiana in mathematics. But only six nations in the world beat Iowa and Nebraska in mathematics. In science, 26 nations outperformed Mississsippi, but only one nation, Singapore, scored above Colorado, Connecticut, Iowa, Maine, Massachusetts, Minnesota, Montana, Nebraska, North Dakota, Oregon, Utah, Vermont, Wisconsin and Wyoming.

Quite contrary to industry's claim that math education is superior in East Asian countries, in an article in the September 1999 issue of the American Society for Engineering Education's magazine *Prism*, an engineering professor in China warns his nation that the engineers being produced by Chinese universities are not good enough for China to compete in the global high-tech market. Professor Chen Lixun says the educational system in China produces students who cannot think independently or creatively, and cannot solve practical problems. He writes that the system "results in the phenomenon of high scores and low ability." Many other academics have written about this problem, and the governments of China, Japan and South Korea all are making attempts to remedy it.

The U.S. has plenty of kids who do well in math, and in fact the U.S. has far more engineers per capita than do the nations which the industry lobbyists say have superior school math scores: South Korea, Taiwan, Switzerland, Singapore and so on, as seen in the table (*Los Angeles Times*, August 13, 2000).

6.3.3   PhD and Master's Degrees

Lobbyists also decry the fact that about 40% of U.S. PhD's granted in computer science go to foreign students, with the implication being that there is "something wrong" with American students. [33]

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[31] *The Complete Idiot's Guide to a Career in Computer Programming*, Jesse Liberty, Que, 1999.

[32] An obvious exception is software for mathematical applications.

[33] Some newspaper reports have erroneously stated that large numbers of U.S. undergraduates in computer science are foreign students. This is incorrect; only 6% of the computer science Bachelor's degrees nationwide are awarded to foreign students. See

Israel	135
U.S.	70
Japan	65
The Netherlands	53
Canada	38
Switzerland	35
Taiwan	34
Britain	38
South Korea	25
Iceland	22
Singapore	19

Table 8: Engineers per 10,000 employees

The industry lobbyists' claim is a red herring to begin with, since fewer than 1% of the computer-related H-1Bs have a PhD, and only 7.5% have a Master's. And even more importantly, **we are overproducing PhDs and Master's degree holders in the first place.**

It is true that a substantial percentage of computer science PhD and Master's degrees in the U.S. are awarded to foreign students. But that is irrelevant because one does not need a graduate degree to do the work in this field. Bill Gates, founder of Microsoft, does not even have a Bachelor's degree, and similar statements hold for Larry Ellison, founder of Oracle, and Steve Jobs, founder of Apple and Pixar.

In addition to graduate degrees not being needed from a technological point of view, the American students' choice not to pursue graduate degrees is indeed a rational response from a salary perspective: The salary premium for a computer science PhD over a Bachelor's is one of the smallest of all science and engineering. An article in the Fall 1999 issue of *The American Outlook* found that, based on National Science Foundation data, the field of computer science paid the smallest salary premium for a PhD over a Bachelor's degree among the fields analyzed, for example.

Computer Science	38.7%
Physics	73.8%
Economics	116.0%
Political Science	150.0%

Table 9: Salary premiums paid to PhDs relative to Bachelor's graduates

This shows why U.S. students don't go on for a PhD, and shows that industry itself does not value the degree. There is simply no incentive to pursue the degree for domestic students, whereas foreign students can use their U.S. education (which is typically a graduate degree) as a better steppingstone to a greencard (it allows them to avoid the onerous "body shop" employers since they make industrial contacts through their professors, they get priority for greencards via using the EB-2 category instead of EB-3, etc.). The NSF was aware of this and actually planned for it (see below).

Computing Research News, March 1998. The CRA data are only for PhD-granting universities. However, see also the testimony by pro-H-1B Alison Cleveland of the U.S. Chamber of Commerce, House Committee on Judiciary, August 5, 1999. Cleveland cited a figure of 2,165 aliens out of 24,098 Bachelor's degrees granted in computer science, and 4,756 aliens out of 62,114 Bachelor's degrees in engineering. Note that even these numbers are higher than the true figures, since they include all aliens, including greencard holders, not just foreign students.

Similarly, even pursuing a Master's degree would be a losing propostion for domestic students. A Master's typically takes two years to complete, and the salary premium is roughly equivalent to two years' worth of raises for a Bachelor's holder. Add to that foregoing two years of salary, a loss of more than $100,000, and a Master's looks quite unattractive for domestic students.

In spite of a heavy bias toward industry, the NRC IT Workforce Committee report (see Sections 4.4 and 2.3.6) put a specific value on these disincentives for American student to pursue graduate study. A student who elects to pursue a graduate degree instead of simply going to work in industry after obtaining a Bachelor's degree incurs a short-term financial loss by forgoing industry salary while in graduate school. NRC committee decided to estimate how long it would take to recoup that loss in the future, through the higher salary one might obtain due to possessing a graduate degree. The committee found that this process would take 10 years in the case of a Master's degree, and *50 years* in the case of a PhD. (*Building a Workforce for the Information Economy*, NRC, 2000.)

Moreover, only 8% of programming jobs ask for a Master's degree (*Investing in the Future: Toward a 21st Century Information Technology Workforce*, Governor's Commission on Information Technology, September 1, 1999), and the number that ask for a PhD is truly minuscule. Thus a domestic student who is considering graduate study not only has direct financial disincentives against such study, but also risks being considered overqualified by employers later on. Indeed, a study by Dr. Laura Langbein of American University found the time needed for laid-off engineers to find a new engineering job was extended ten additional weeks for each graduate degree. (http://www.ieeeusa.org/EMPLOYMENT/langbein.pdf)

In his 1999 guide to programming careers,[34] consultant and author Jesse Liberty notes that "If you are interested in an academic career, or want to do research, or are interested in artificial intelligence, a doctorate in computer science may well be required. If you want to develop software for commercial applications, not only is a doctorate not necessary, it may be detrimental to your career."

A report by William F. Massy of Stanford University and Charles A. Goldman of the RAND Corp., *The Production and Utilization of Science and Engineering Doctorates in the United States*, studies the problem in great detail (Stanford Institute for Higher Education Research, Stanford University, July 1995), finding for example that we are overproducing PhD's in electrical engineering by 44%.

And this is an understatement of the problem, because the study was based on unemployment, whereas the real problem is underemployment. While a PhD may be employed, as found in the Stanford/RAND study, he/she is in almost all cases doing work which does not need a PhD. Overproduction of computer science PhD's was a major theme in an article by Professor Anthony Ralston of the State University of New York at Buffalo in the *Communications of the Association for Computing Machinery* (March 1996), the ACM's flagship professional journal. Ralston writes:

> [In the coming years] we are almost certain to continue to produce more — probably far more — PhDs in computer science than will be able to find the kinds of research jobs which attracted them to seek doctorates in the first place, and perhaps more than will be able to find jobs at all. Many of us are, in fact, accepting students under false pretenses...

Ralston goes on the say that the PhDs may still be hired for computing jobs that do not need a PhD, but countered, "But does this justify the cost — to taxpayers, to government, to the students themselves — when the attainment of a PhD adds little to the abilities of the candidates to do [these] jobs?" [35]

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[34]*The Complete Idiot's Guide to a Career in Computer Programming*, Jesse Liberty, Que, 1999.

[35]Ralston's point about the taxpayers refers to the vast sums spent by the federal government for the research projects on which the PhD students work.

A May 28, 2000 article in the *Chicago Tribune* reported:

> ...Jose Ramos wondered how it could be possible that someone with a doctorate in electrical engineering from Georgia Tech University and eight years of experience, would need three years of intense searching to find a decent job.
>
> He depleted his savings, occasionally deleting the PhD from his resume so as not to appear overqualified, and ultimately watched foreigners win the positions he had sought.
>
> "I think the problem is that for the price of one U.S. citizen, they can bring in two engineers," said Ramos, 43, an associate professor at Indiana University-Purdue University Indianapolis.

Those who are plied by the industry's feigned interest in PhDs would be baffled by the following incident. On October 13, 1999, a team of Intel engineers recruiting for new graduates visited my department at UC Davis. I mentioned that I had a couple of PhDs in electrical engineering I could refer to them, one a new graduate and the other a 1992 graduate. **In reply one of the Intel recruiters blurted out, "No, Intel is not very interested in PhDs."** The other added that she did not think a PhD would have enough to challenge him or her at Intel, except in the case of very highly specialized research areas.

This is shameless hypocrisy, given that Intel lobbyists in Washington have claimed to need to hire H-1Bs because so few domestic students pursue a PhD. For example, Michael C. Maibach, Vice President for Government Affairs at Intel, wrote in an *Upside* column (March 1, 1996),

> It's far more expensive to hire foreigners; we do so because they have the skills we need. More than 40 percent of engineering and physics graduate students at U.S. universities are foreign born. We must be able to hire these students, who have been trained by the American taxpayer.
>
> Let's staple a green card to every engineering PhD earned by non-Americans...

Universities have lobbied heavily for liberal H-1B policies, for reasons directly related to the PhD issue. PhD production and research are, as the Stanford/RAND report noted, the currency by which faculty and administrator success is measured. Research is what brings in the large federal grants, which not only increase faculty salaries but are also used by the universities for operating expenses. A faculty member's promotions are determined largely by his/her amount of federal funding, number of PhD students and so on.

This relates to the H-1B issue in the following way. Since the training gained through a PhD is not needed for work in the industry, and since the gap between industry salaries and graduate-student assistantship stipends is so large, most domestic students are not interested in pursuing a PhD. By contrast, foreign students use U.S. study as a steppingstone to a greencard. The NSF was aware of this and actually planned for it.

Thus the universities must turn to foreign students to populate their PhD programs. Rather than simply allow PhD production and research to fall to the relatively low level justified by industrial and societal conditions, the universities will do anything to maintain high levels of these activities. Hence their vigorous lobbying for liberal H-1B policies. Note also that universities themselves employ H-1B researchers, and one aspect of their lobbying efforts has been to get Congress to exempt universities from paying H-1Bs market wages.

Again, we do not need to produce so many PhDs in the first place. However, it is interesting that the **federal government's National Science Foundation (NSF) actually promoted policies which they knew would result in low enrollments of domestic students in PhD programs.** As we will explain later in our section on the use of H-1Bs as a source of cheap labor (Sec. 9.2.2), MIT mathematician/economist Eric Weinstein

found that the NSF actually planned to hold down PhD wages by bringing in a glut of foreign scientists and engineers. The NSF documents reveal that NSF realized that by holding down PhD salaries they would cause domestic students to lose interest in PhD programs, while foreign students would still enroll in those programs as steppingstones to immigration.

Since the lobby for increased H-1B quotas has often made use of data provided by allies in the NSF, Dr. Weinstein's discoveries take on special significance. NSF, which is now complaining that not enough domestic students pursue PhDs, actually planned for that to occur.

6.3.4   Case Study: Gene Nelson

The ITAA's claim that if only American youngsters were better at science and math then we would not need to import H-1B workers is a cruel joke to the legions of underemployed programmers who excelled in those subjects during their formative years. Gene Nelson, for example, won an award in high school at the International Science Fair, and went on to earn a PhD in biophysics. He eventually became a programmer, but after being laid off in 1997 has failed to find further programming work. He was unemployed for several months in 1998, and finally found a job staffing a software phone-in help desk, a nonprogramming position at half his previous salary; even that job vanished when he was laid off in early 1999.

6.4   Older People with New Degrees Are Often Shunned by Employers

The ITAA and other industry lobbyists claimed in 1998 that their request for an increase in the quota for foreign programmers was just temporary, with education being the long-term solution. As shown earlier in this report, this is false; we do not lack people trained in high-tech, but instead we have a problem in that the industry is not making use of the available labor force.

The industry seems to be especially disinterested in hiring "older" people, even in their early 30s, who have gone back to school and obtained a high-tech degree. Anyone who thinks that "education is the answer" should consider cases like the one cited in the *Sacramento Bee*, March 14, 1998:

> One such prospective high-tech employee [with an advanced degree in computer science who cannot find work] is Peter Van Horn, 31, who is looking for a job in computer graphics. He has an undergraduate degree in aeronautical engineering and a master's in computer science from California Polytechnic State University, San Luis Obispo.
>
> In nearly four months of looking for a job, he has applied to more than 38 companies and has, so far, talked to only two. "At Cal Poly, I always heard how great the market was, how if you have a degree in computer science you could get a job," said Van Horn, now a Bay Area resident.
>
> "My credentials are good...Companies are constantly talking about a shortage of workers, but if that were the case, you would think I'd have more than two interviews."

Van Horn did "all the right things," everything society told him to do, and yet he could not even get an interview, right in the middle of Silicon Valley, for four months. In addition to sending out re'sume's on his own, he also was working through employment agents, but with no results. After four months, at the end of March 1998, Van Horn did finally get a programming job, but his experience shows quite graphically that these supposedly "desperate" employers are not so desperate after all.

Van Horn's experience, at the "old age" of 31, was shared by Bard-Alan Finlan, age 43, who also went back to school and was shunned by employers after he graduated. (*San Diego Union Tribune*, March 7, 1998.) Armed with a new computer engineering degree from UC San Diego, he applied four times to Qualcomm, a large San Diego firm which claimed to be desperate to hire engineers, and yet Qualcomm did not even give him an interview. He had no luck with all the other firms he applied to either; at the time the newspaper article appeared, Finlan had had only one interview in a year and a half. He finally did secure a job, but even then it was only as a technician, a job typically paying much less than what an engineer makes. [36]

Another college returnee, Christin Luka, was so frustrated by her failure to find a position after graduation that she wrote an op-ed about it in *USA Today*, October 28, 1999:

> It's hard to open the business section of any newspaper these days without running across an article bemoaning the "skilled-labor shortage" that is supposedly threatening the heart of American business. It's time someone called these companies on the farce they're so busy publicizing, because the workers are out there. The perceived shortage lies in the difference between the employers' notions about what the "ideal" candidate looks like, and the reality of the American workforce.

> I am a recent college graduate — again. A career-changer with nine years of professional experience, I maintained a 3.9 GPA in Information Technology while working and attending classes at night. After graduating, I discovered the cold hard truth about entry-level job seekers: we are pariahs. The very same companies that are putting pressure on institutions of higher learning to produce high-tech workers refuse to even consider hiring new graduates...

> The "skilled-labor shortage" is really a refusal by employers to open their minds to the rich diversity of job seekers that are pounding the pavement at this very moment. Undeniably, the classifieds are brimming with employment opportunities. But read between the lines, and you'll find a plethora of preconceived notions of the ideal candidate. He or she should be the right age, have neither too little nor too much experience, live in the right place, look a certain way and be willing to accept whatever compensation is offered.

The following letter to the editor appeared in the August 1998 issue of the IEEE magazine *Computer* (the more complete text quoted here was posted on the IEEE Web page):

> I have been following the give and take on the so-called IT worker shortage for months. I don't have any hard evidence, but my personal experience makes me believe that the shortage is a hoax.

> Several years ago, I was doing embedded systems work, and the company hired someone in over my head because I did not have a degree. I began looking for a new job, but prospective employers always cited my lack of a degree if they bothered to give a reason for turning me down.

> Three years ago, I enrolled in college, and last month I graduated with a B.S. in Computer Science and a 4.0/4.0 GPA. I figured that formalizing my experience with the expected degree would surely ease the way. During the past six months, I've sent out over forty resumes and posted it on several web sites. So far, I've had four offers to interview. After the last interview,

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[36] Qualcomm then claimed in the same newspaper on March 26 that it had just called him to hire him when he got the technician job. However, Finlan told me that just the opposite was the case; Qualcomm did indeed call him, but only to tell him that they had reviewed his re'sume' again, and that they believe that they had made the correct decision in NOT interviewing him.

I was told that my qualifications were impressive but not quite a match with their current needs (which had evidently changed since before the interview). I believe there was another reason: they had not expected a recent graduate to be forty-five years old.

It is time to put a name on this "shortage," and that name is age discrimination. I suppose my view is pretty narrow, but as long as I am unemployed there is no shortage.

Terry Vaughn

The *San Jose Business Journal* (August 24, 1998) stated,

> One person on that list is Terry Oldberg, a 58-year-old Los Altos Hills resident with master's degrees in mechanical and electrical engineering. He said he took a year's worth of programming courses in order to find work after leaving a nuclear engineering job in 1988 — but hasn't had any luck. "I was willing to work for people for free to get re-established in a new field," he said. "No one was willing to take me up on it."

Another example, from the *San Francisco Chronicle*, May 19, 2000:

> When he got his degree in computer science from the University of California at Santa Cruz in 1997, Don Harlor thought he could write his own ticket in Silicon Valley's booming job market.
>
> But after three years of sending out resumes, relentlessly networking, attending job fairs and going through two to three interviews a month, Harlor is working as a census taker to keep himself occupied.
>
> Although he hasn't given up his dreams of landing a job in software quality assurance, Harlor realizes that at 56, he's fighting an uphill battle in an industry that puts a premium on younger workers...

Jeffrey Sunnergren sent me the following e-mail on December 3, 2000:

> I am 49 years old and a year 2000 graduate of Lafayette College with a BS in EE and a 3.1 average. I was a part time student working full time with travel, and a student at night. I have also been unemployed for over a year. Prior to my unemployment, I was a software writer for a British CAD/CAM company (RADAN CIM). Last year they shut down the main United States office in Philadelphia and laid everyone off (US employees). Since the son of the owner lived in California, the board elected to move the office to California and staff it with H1-b's from England. They would work for half of our salary ($30,000) and were given a car and rooms at company expense. Since then I have applied everywhere and been told that I have no useful skills...I also passed the state exam for professional engineers (EIT) but that doesn't help. I have been told by head hunters that unless I made $100,000 a year or were a manager that I have no value to society, that I was a failure. When I went to the Lafayette College Career Center, the woman there just opened her book and said you should expect $50,000 /yr and here are some books you should read...The state of Pennsylvania sent me a letter after my unemployment ran out saying I needed to be retrained. They thought truck driving school could be a new career. Yes, they knew I was a recent grad. I don't think I am special in the treatment I am receiving however in this booming economy I have sent out about 200 resumes

from electronic tech to starting software writer and have only received one reply. That was as a drill press operator. Either Lafayette College is a trash school or the age discrimination is larger than anyone believes.

As these examples show, education is NOT the answer; in all of these examples, the workers have brand-new high-tech degrees, and thus up-to-date skills, and yet the industry is not anxious to hire them.

6.5 No Shortage of Applicants for Computer Science Teaching Positions

It should be pointed out that there is no shortage here either — our Computer Science Department at UC Davis has been contacted by hundreds of applicants each year for faculty positions (for typically two or three openings).

There are, however, interesting analogies in academic hiring to the case of programmer hiring. Just as in industry's insistence on hiring only programmers with very specific software skills, research-oriented universities insist that applicants for faculty positions have research experience in a very specific micro-area. For example, they may wish to hire someone who has done research in "mobile computing" — Internet access via wireless networks. The department would not be willing to hire someone who has done research in computer networks in general, much less someone who has done research in computer science in general. And worst of all, in general older professors from other schools need not apply for the position in the first place — where "older" generally means "over 30." Once an academic is more than two or three years out of graduate school, his/her chances of changing jobs from one school to another are very slim, unless he/she has attained truly outstanding fame.

7 On Skills Requirements

7.1 Employers' Extreme — and Ever-Worsening — Obsession with Specific Software Skills

ITAA president Harris Miller, in his claims that the industry is experiencing a desperate labor shortage, is fond of telling journalists, "Just look at all those job ads in the Sunday newspapers!" The fact is that those ads tell a story that Miller doesn't want reporters to notice: Employers are not willing to hire "just any programmer." The ads insist that the programmer have experience in a specific software technology. As mentioned earlier, most employers use re'sume'-scanning machines to screen applicants, automatically rejecting anyone who is not an exact fit for certain skills sought by the employer.

The rapidity of change in which skills are in demand is illustrated by a finding by Wharton School of Management professor Peter Cappelli that " SAP programmers were in first place in the salary rankings of IT professionals in 1998 but fell to sixth place 18 months later as demand for their skills fell relative to others." (*Is There A Shortage of Information Technology Workers?*, Peter Cappelli, report to McKinsey and Company, June 2000.)

One contracting programmer told me how absurd this overemphasis on skills can become:

Back in the early 90's I was a Clipper application development specialist. I had worked with every version of Clipper since 1986. The early versions of Clipper used names like Autumn

86, Summer '87, etc. Around 1991 they decided to go with a number oriented version scheme, starting with 5.0. By 1993 I had over 6 years of experience in Clipper, and was current through version 5.2 or 5.3...a headhunter shop called me up and asked if I knew Clipper. I had 5.2 listed on my resume. They called me back...and said the client's human resource department passed me over [because] "the client is using Summer '87, and you only have Clipper 5.2 on your resume."

Another contract programmer, Bill Halchin, had worked on device drivers in operating system kernels for nearly 20 years, but happened to work for about a year on other computer projects. When in January 1999 he then sought another position in device drivers, a recruiter in Texas then complained, "Don't you have any device driver experience after November 1997?"

As we will discuss in detail below, this obsession with specific skills is unwarranted, akin what would happen if Chevy dealers refused to hire seasoned mechanics with experience on Fords. Amazingly, the current trend is even worse: Many employers want not only experience with specific software, but also experience in specific application industries, say banking. An April 5, 1999 article in *Computerworld* illustrates this (emphasis added):

> Employees with C++, Java, electronic data interchange (EDI) and data warehousing skills are in demand...And given the importance of electronic-commerce projects, companies are getting more specific about what they need, seeking not just generic knowledge of technologies, but "people with specific platform and most importantly specific **industry** expertise," Fox says.
>
> Neish agrees. "We had some very precise needs," he says. For example, he says, it's not that there aren't a lot of people with SAP experience out there, but being part of a large team implementing SAP and having an in-depth understanding of how it relates to industry-specific EDI and Internet development for mission-critical projects is another matter altogether.

Since software technology will continue to change extremely rapidly, and since employers are not willing to hire a veteran programmer who learns a new software skill via coursework, employers have set up a system which guarantees that the claimed/perceived labor "shortage" will be <u>PERMANENT</u>.

The point made by Neish in the quote above is especially significant in this regard. The glut of programmers on the labor pool is now getting to the point where there are many applicants with the skill he wants, SAP. So now he can afford to be even pickier, insisting on experience in a given applications industry.

Similarly, a November 22, 1999 article in *Infoworld* quoted David Foote, managing partner at IT compensation consulting company Foote Partners and Foote Research Group, in New Canaan, Conn.:

> "It's one thing to say that you have a year of SAP [experience], and it's another thing to say that you have a year of SAP [experience] working with one company on one project, and you actually saw the project through to completion," Foote says. "For many candidates, there's an experience factor that's missing."

The same attitude was noted earlier in this paper, in *Computerworld's* publication, *College Careers Spring 1999* (similar comments appeared in their Fall 1999 issue):

> Although there may be a shortage of programming talent in the Seattle area, employers aren't so desperate that they'll take just anyone, says Bob Stange, a vice president at Staffing Options,

a Lynwood, Wash.-based executive recruiting firm. "It's not enough just to be a good programmer," Stange says. "My clients want people who are going to be able to understand what it is they do in the marketplace."

On October 13, 1999, two Intel recruiters visiting UC Davis told me that even in the case of new graduates, Intel does a skills match in selecting which applicants, if any, to interview.

Similarly, an August 9, 1999 article in the online edition of *The Red Herring* quoted entrepreneur John Chang:

> "There are plenty of straight programmers in the Valley," says Mr. Chang, "but there are very few people who can take business logic and translate it into software code."

In fact, the employers have been repeatedly upping the ante. In 1997 they were saying there were not people who are programmers; after the fact came out that employers receive large numbers of applications from programmers but only hire around 2% of them, they became more restrictive, insisting that there are not enough people who are programmers and have specific software skills; then, as seen above, they become even more restrictive, saying there are not enough people who are programmers and have specific software skills and know a particular business sector well.

So again, there is an ever-increasing pickiness among employers. The larger the labor pool, the more the employers cry "shortage." They thus are creating an artificial "problem" which their own actions render physically impossible to solve.

An IT workforce commission in Virginia described some of the problems quite well (*Investing in the Future: Toward a 21st Century Information Technology Workforce*, Governor's Commission on Information Technology, September 1, 1999):

> In our online surveys of IT workers, for example, most of our respondents identified the source of experience requirements as being for internal human resources policy or other reasons not directly related to job performance...
>
> In general, companies need to take an innovative look at their open positions and experience needs. Does a requirement for three years' experience mean that it really takes three years for an individual to become fully conversant with all aspects of his/her specialty or do those three years turn out to be one year of experience repeated three times or even three months' experience repeated a dozen times? This is not a rhetorical question because our survey data indicate that, at the working level, there is often considerable skepticism about the validity of the requirements stated in job postings.
>
> After taking an in-depth look at whether they have made themselves victims of experience "requirements creep" and, once convinced that their business needs are accurately described, companies must seriously address how they are going to help "grow their own" experienced employees.

HR Departments are similarly inflexible and overselective in the manner in which they hire new graduates. See Section 6.2.

7.2 Employers Should Hire on General Programming Talent, Not Specific Software Skills

This obsession with specific skills is unwarranted. What counts is general programming talent — hiring smart people — not experience with specific software technologies.

Studies show a dramatic 10-to-1 variation in programmer productivity, by virtually any criterion — time to finish a product, number of errors, and so on. (See for example, in *Peopleware: Productive Projects and Teams*, by Tom DeMarco and Timothy Lister, Dorset House Publishing Co., 1987, pp.44ff.) In other words, the best programmers work 10 times faster, produce 10 times fewer errors, and so on, than the worst ones.

Some studies have shown an even more dramatic range. Time to complete the writing of a program varied in a range of 20-to-1 in one recent study. (P. Lutz, "Comparing Java vs. C/C++ Efficiency Differences to Interpersonal Differences," *Communications of the ACM*, 42 (10), 1999, cited in *Building a Workforce for the Information Economy*, National Research Council, 2000.)

In other words, raw analytical talent, not paper credentials, is what really counts.

A study quoted *Myths and Methods: a Guide to Software Productivity* by David T. Fisher (Prentice-Hall, 1991) found that the factor Personnel Capability, i.e. general talent and energy of the programmers, counted for a score of 4.18 in a productivity prediciton equation. This was by far the largest factor; the next largest was Product Complexity, with a score of only 2.36. The factor (Programming) Language Experience, i.e. experience with a specific software skill, had the smallest score among the 15 factors studied, with a score of only 1.20. Fisher comments:

> The relatively small impact of language knowledge is an important fact which is not intuitively obvious. Judging by advertisements for programmers it would seem that [IT] managers tend to overemphasize specific language experience.

Bill Gates has described Microsoft hiring criteria as follows: "We're not looking for any specific knowledge because things change so fast, and it's easy to learn stuff. You've got to have an excitement about software, a certain intelligence...It's not the specific knowledge that counts." (*Wall Street Journal*, November 8, 1994.)

Jim McCarthy, one of Gates' software development managers at Microsoft, points out in his book, *Dynamics of Software Development* (Microsoft Press, 1995, p.168),

> The biggest mistake I see managers make as they hire people for software development teams is that they overvalue a particular technology. To verify this tendency, all you have to do is look at the want ads: 'Wanted: foobar programmers. Experience with whatsit required.' Obviously, conversance with a given technology is a wonderful attribute in a candidate, but in the final analysis it's an extra, not mandatory. After all, most software development technologies have a half-life of about one year.

Ironically, Microsoft has grown so large that Gates' and McCarthy's philosophies don't reach down to the shop floor, and managers there are now just as obsessed with skills as the rest of the industry. The first demand made of users accessing Microsoft's employment opportunities Web page (and those of most other software firms) is "State your skill set."

7.3 New Software Skills Can Be Picked Up Quickly

Programmers can become productive in a new software technology in a matter of weeks.

As Garrent Bechler, a recruiter with RHI Consulting in Walnut Creek, California put it, "Any programmer who already knows C [the industry standard for the last 15 years], needs only a week, maybe two, to reach proficiency in Java." (Interview with the author, March 24, 1998. See details in Section 8.)

This point on the quickness with which new software technologies are learned can be seen in data on factors affecting completion time for software development projects, cited in one of the classic works on software engineering, *Software Engineering Economics*, by Barry Boehm (Prentice-Hall, 1981, p.530). Those data indicate that programmers reach perhaps 80% of their full productivity level by one month, and full productivity by the next time period studied, four months.

Silicon Valley employment agent Andrew Gaynor told *US News and World Report* (March 16, 1998) that shortsighted employers who are insisting on a given skill will let a job go unfilled for months, when in fact an experienced programmer without the skill "could easily come up to speed in a few weeks."

Amit Kamra, head of Information Systems Transition Services, said that his company could not afford to hire someone who would have to learn the given technology on the job, say Microsoft Windows programming. (Interview with the author, August 24, 1995.) But when I asked him how long it would take for an experienced programmer to become productive in Windows if he/she did not know this technology beforehand, he answered, "[Up] to two weeks, maybe all the way up to a month and a half to become truly productive." I asked why they did not hire such people, given the shortness of such time periods, to which Kamra replied, "Well, we could, and we did so once with good results [he then gave the details]...But well, during those two weeks [of learning] the project is slowed down a bit, especially since others on the project would have to help the new person." Though Kamra's remarks show that learning on the job is of course not ideal, the point is that they certainly show that the industry is wrong in claiming that possession of specific skills is an absolute necessity.

8   The Retraining Issue

The industry lobbyists have adopted a mantra of "H-1Bs for the short term, retraining for the long term." This is designed to fit perfectly into the desire for people in Congress to find an excuse to vote in favor of the industry's requests for more H-1Bs, and to fit perfectly the mentality of government bureaucrats and even organized labor. **But to put it bluntly, the retraining issue is simply a red herring.**

8.1   On-the-Job Learning, Not Formal Retraining, Is Best

It should be strongly emphasized that the term *retraining* is itself misleading, as it implies formal instruction. The fact is that any competent programmer can pick up a new software skill on his/her own, on the job, without formal instruction. Say for instance the skill to be learned is Java, and that the programmer has been up to now been using the C language, the industry standard for the past 15 years. (By the way, contrary to the claim that most older programmers who have trouble finding work are old COBOL programmers, most of the ones who contact me are actually C programmers.) All that need be done is give the programmer (a) two or three books on Java, (b) a real Java project to work on, and (c) a Java resource person to contact as a

last resort if some question is not answered in the Java books.[37]

The industry lobbyists sometimes claim that the so-called "object-oriented" programming (OOP) style used in Java and C++, both of which are extensions of C, is radically different from past practices.[38] The industry-dominated Committee on Workforce Needs in Information Technology of the National Research Council called it an "abrupt change in the paradigms of programming." (*Building a Workforce for the Information Economy*, NRC, 2000.) The charge, as This is simply false. Those of us "dinosaurs" who have been programming since way back in the days of punched cards have heard claims of "abrupt paradigm changes" many times as programming languages have evolved over the years. The claims have always simply been hype. Programming is programming is programming, and it has always been a straightforward matter to quickly become productive in a new language.

A key point is that typically programmers work in groups, not alone. A programmer will be assigned to work on one small piece of a large program, with the broad outlines of the program already in place. It is especially easy and quick for the new team member to adapt to the language used, in this case Java, in this context. For example, the fact that the data structures, relations between components and so on are already there means that the programmer makes a natural transition to Java's "object-oriented" viewpoint (as opposed to "using Java to write C").

A competent C programmer making this transition will writing Java code for the project within a week, will be fully up to speed within two weeks, and will feel like an "old pro" in Java within a month. Note that the programmer will not learn "every nook and cranny" of Java during this period — but he/she will likely never do so (and any veteran Java programmers hired by the project also will not know every possible detail either). Instead, the programmer will pick up new esoteric details of the language on an as-needed basis, if and when the need arises.

8.2   Most Employers Are Unwilling to Retrain

Most employers are unwilling to retrain, either through formal instruction or via on-the-job learning as described above. As mentioned earlier, Kim Lee, of the Network Connections employment agency in the Silicon Valley, has noted that (interview with the author, June 26, 1996) "In 1988 the employers would have retrained [older] people but they're not desperate enough to do so today."

The point was made quite forcefully by Susan Miller, a computer industry employment agent who says that 90% of the workers she places are foreign nationals. (Interview with the author, June 26, 1996.) Pointing out frankly that her own high income as an employment agent depends largely on the fact that the industry is not providing retraining for existing employees, she nevertheless feels that

> It's a very closed industry in that respect [retraining]. The trap the industry falls into is that they don't spend time retraining. It would be much more cost-effective for them to retrain the employees they already have; by not retraining they are driving salaries way up, since so few people have the "right" skill sets. The employers haven't been smart. They have been very closed-minded, with blinders. If I could change one thing about the industry, that would be it.

Two of the industry firms claiming most vociferously that there is a labor shortage have been a mass of

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[37]Note the term "last resort" here. Assuming the newly-hired programmer has general competency in programming, he/she will not put much burden at all on the Java resource person.

[38]OOP is not new either. It extends back to the 1960s, in the SIMULA language, and the Smalltalk and C++ languages were developed in the early 1980s, though the concept did not become popular in industry until the 1990s.

contradictions on the retraining issue. Intel has said that it does retrain (Bay TV, San Francisco, March 3, 1998) and that it is not willing to retrain (*IEEE Computer*, February 1996; also CNN, March 1998). Cypress Semiconductor also said yes (California Report, NPR, March 27, 1998) and no (The Newshour with Jim Lehrer, April 3, 1998) to the retraining question. [39]

HR Magazine (June 1998) quotes Joe Nyitray, director of staffing for Dow Jones and Co. Inc., as saying that "There's a real focus on skill sets needed right now. I recently attended a conference on retention where participants were simultaneously hiring and laying off — even in IT — all because of the need to get things involving new skill sets done fast. Training never came up as an alternative."

Computerworld reported in June 2000 that IBM, Hewlett-Packard, Ernst and Young and so on

> [are laying off programmers off while] hiring people with the right skills — not teaching old dogs new tricks.

A 1998 UC Berkeley study ("The Perceived Shortage of High-Tech Workers," Clair Brown, Ben Campbell, and Greg Pinsonneault, Dept. of Economics, UC Berkeley) found that

> Companies have little incentive to train older engineers because they can hire from the large flow of newly-trained and cheaper engineers. Companies save money on training since the recent graduates already have cutting-edge knowledge.

Investing in the Future: Toward a 21st Century Information Technology Workforce (Governor's Commission on Information Technology, Commonwealth of Virginia, September 1, 1999) found that:

> Formal "career development" in many technology companies is almost a non-sequitur. Beginning in the early to mid-90s, after many downsizings, outsourcings, and other turbulence in the job market, companies began to formally inform employees of the obvious: they were no longer guaranteed long-term employment and they would have to be more aggressive about keeping their skills (and resumes) updated...Employees in the IT industry seem to have received the message clearly and have been looking out for their own interests with a vengeance. Many picked their current job with an eye to the next one and salaries have gone up as job tenure has gone down.

Many employers will indeed train their existing employees, but refuse to hire new ones who need retraining. I have often observed this myself, and it was also stated in a *Dallas Morning News* article (June 2, 1999):

> Cathy Rodewald, senior vice president and chief information officer for Amresco Inc., a Dallas-based real estate and financial services firm, said she trains existing staff but wants a new employee ready to go.
>
> If a valued employee shows interest in a posted job, "we'll try to retool that employee. That's because they've already proved themselves," she said. "If I go out on the open market to try to find a person, I'm probably going to require the exact skill set."

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[39]Days after a lobbyist for a highly prominent Silicon Valley electronics firm had told national media about the large sums of money the firm spends annually on training, I discussed this with a high-level official in the company. Speaking to me on background, he at first repeated the large figures his firm spends on training. Yet, when pressed he conceded that the company mainly provides training for its technicians, not its engineers or programmers.

Indeed, the industry often says it cannot afford the time to retrain, because they need to hire personnel for a project immediately. But this is disingenuous, as the industry is also claiming that as many as 30% of software positions take six months or more to fill. (*Wall Street Journal*, December 1, 1997.) The *Silicon Valley Joint Workforce Initiative Study* (A.T. Kearney Co., May 18, 1999) found that the average time a job is left unfilled, among <u>all</u> high-tech jobs in Silicon Valley, was 3.7 months. During this time the same programmers employers are unwilling to hire now because of lack of a hot skill could learn the given technology and be productive.

This point was also noted in an article in *Computerworld* (January 3, 2000), highlighting the incongruity of searching for six to nine months for someone who can "hit the ground running" without retraining:

> Partly because of the competition [for programmers having specific software skills], and partly because IT shops want people who can hit the ground running, IT positions often linger unfilled as long as six to nine months, managers say — a lifetime when business is moving at Internet speed...

> But because many of the technologies driving staffing needs are not much older than that three to five years companies are looking for — if that old — solid experience is hard to come by. That creates a vicious circle, says the technology director at a retailer based in the Southwest, who asked not to be identified. "You don't want to hire an entry-level person, because it takes time to get people trained," the director says. **"You keep hoping you can find somebody, but then by the time you do, you could have trained someone."**

(Emphasis added.)

The industry also says that if they retrain their programmers in a "hot" skill, the newly-enfranchised programmers will leave them for higher pay elsewhere. This is correct, but the employers are missing the point: If the industry did not pay a premium for these skills in the first place (a consequence of refusing to hire programmers who lack the skills), this frequent job-hopping would not occur.

> **Moreover, in refusing to retrain on the grounds that the programmers would then demand more money, employers are admitting that they are hiring the younger domestic programmers and the H-1Bs because of their cheap labor.**

As pointed out earlier, programmers seeking work cannot remedy the problem by retraining on their own. Employers will not hire a older programmer for a Java project on the basis of the applicant's having taken a Java course.

8.3 Retraining Programs Do Not Reduce H-1B Usage

As indicated earlier, given the opportunity any competent programmer can pick up a new software skill on the job, quickly, so what is needed is a change in employer hiring policies, not formal retraining programs. Moreover, **the retraining programs funded by the H-1B fees are not achieving their stated goal of reducing H-1B usage, as they don't train for jobs taken by H-1Bs.**

The 1998 legislation stipulated that part of the H-1B visa fees be used for training in IT occupations. However, again the occupations for which traing was provided in the year 2000 were technician jobs, not programming/engineering jobs. The programs set up provided technician training for young minority workers having little or no college background, a laudable effort but one which did not accomplish the legislation's

stated goal of reducing usage of H-1Bs, who by law are college graduates and, as pointed out earlier, concentrate in the programming/engineering fields.

(This is not a "career path" issue. Technicians do not later become programmers. The two jobs are unrelated, just a computer technician at a magazine would not become a writer, a lighting technician in a theater would not become an actor, etc.)

This point that the H-1B training fees will not reduce usage of H-1Bs was illustrated in the September 18, 2000 issue of *eWeek*. It notes that $153.7 million has been raised by H-1B fees, but:

> eWeek reporting supports the claim that retraining programs funded by H-1B fees are failing to lessen dependence on imported IT talent. Calls to companies on the list of corporate partners of one Labor-funded program, Bay Area Video Coalition, or BAVC, in San Francisco, didn't turn up a single organization that could claim to have reduced its use of H-1B visa holders because of the program...
>
> Even big IT employers familiar with the H-1B fee-funded training programs say they haven't been used to reduce dependence on workers from outside the United States. Sun, for example, donates cash, equipment and curriculum develop ment to training pro grams funded by the H-1B fees, yet within Sun itself, the programs have brought about no impact on H-1B visa usage. Why isn't Sun hiring training program graduates into positions held by H-1B visa workers? Because the skill levels of the two groups are worlds apart, said a Sun spokesman. "There's no data on actual skill levels, but the Sun people who are on H-1B visas are very highly skilled," said the spokesman, in Washington.
>
> Like Sun, many IT employers see a vast discrepancy between the high skill levels of most H-1B visa holders and the entry-level skills of most graduates of H-1B fee-funded training programs

The article then quotes some industry lobbyists as saying the problem is government bureaucratic bungling. But that is an obfuscation of the basic fact that industry does not want to reduce H-1B usage in the first place; the attractions of indentured servitude, salary savings and so on are things the industry just does not want to give up.

Past programs (prior to the 1998 act) often boasted a high placement rate, but again the problem is that the engineers and programmers who "graduate" from them didn't get jobs as engineers and programmers. Then tended to get jobs as technicians, customer support personnel and so on. See for example testimony by Bill Bold of Qualcomm to the California state legislature, March 25, 1998. Even the Massachusetts Software Council, widely viewed as the best of the software retraining programs, only places 20% of its participants in software development positions, according to a report by the Dept. of Commerce retraining task force, prepared for the ITAA/DOC convocation held in Oakland, California, January 1998.

9 The Role of Programmers and Engineers Imported from Abroad

9.1 Overview

9.1.1 Nature of the H-1B Visa

The H-1B visa allows foreign workers possessing a Bachelor's degree or equivalent to work temporarily in the U.S.

Congress established the H-1B visa type in 1990, replacing the old H-1. The H-1 had the following features:

- It was designed to bring only the workers of exceptional talents to the U.S.

- It required that the U.S. employer show that an American could not be found to fill the job.

- There was no limit on the number of visas given each year.

The H-1B, by contrast:

- Is not restricted to the highly-talented. It merely requires a Bachelor's degree or equivalent.

- Does not require that the employer show that an American could not be found for the job.

- Has a yearly quota.

The original H-1B quota was 65,000. It was "temporarily" increased to more than 100,000 in 1998, and again to almost 200,000 (plus various quota-exempt categories) in 2000.

The 1998 law also requires that "H-1B-dependent" employers show that an American could not be found to fill the job, with this category defined to be firms whose workforce consists at least 15% of H-1Bs. The political clout of the industry is illustrated by the fact that it took the Clinton administration two full years to implement this provision. In any case the provision will have only a minuscule effect, since the word *workforce* includes nontechnical workers such as marketers, secretaries, janitors and so on, diluting the percentage of H-1Bs. Indeed, according to immigration attorney Jose Latour's e-newsletter message sent out January 6, 2001 (http://www.usvisanews.com/memo1192.html)

> DOL states that only 50 out of the 50,000 estimated H-1B employers will meet the standard [of "H-1B dependency"].

9.1.2 Relevance of the H-1B Visa to Problems Such As Age Discrimination

As we have seen, industry employers tend to shun older programmers. One of the major factors fueling this is that employers have another labor source to turn to, in the form of foreign nationals whom they sponsor for immigration or work visas.

Industry lobbyists make claims along the lines of "Only 5% of our workers are H-1Bs," but this is highly misleading. First of all, they mean the word "workers" to include nontechnical staff such as secretaries, marketers, janitors and so. Industry executives have admitted this to me on background, and a June 25, 2001 article in *Computerworld* noted it in the public sector as well:

> (Quoting acting CIO Ted Michaels:)
>
> "Right now, we are training for Windows 2000 rollout. But we also have a significant Macintosh user community, so we are preparing for Mac OS X as well. And Linux training is becoming important because its use is growing at the lab."
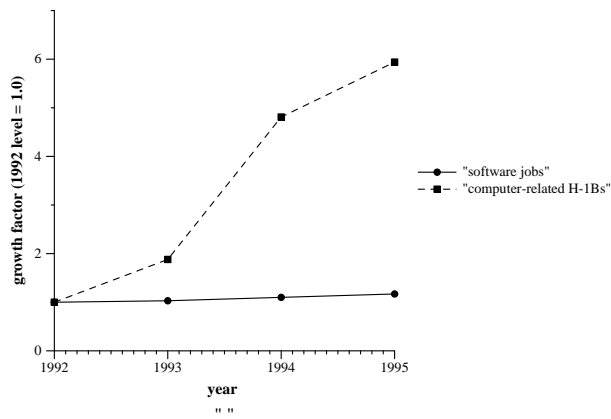
Figure 5: comparison of growth rates

This is low-level OS training for secretaries, technicians and the like, not programmers and engineers.

Second, they are not counting all the H-1B workers at their firms who are subcontracted by agencies. In fact, the Department of Commerce, in their report *Digital Economy 2000* (June 5, 2000), found that H-1Bs now account for 28% of all information technology industry hires requiring at least a Bachelor's degree.

Even more importantly the industry lobbyists are failing to disclose that many more of their technical staff originally started as H-1Bs but then were sponsored by their employers for greencards. About one-third of Silicon Valley programmers and engineers were foreign-born as of 1990, most of them sponsored for immigration originally by employers. The proportion is much higher today, said to exceed 50%, though exact figures are not yet available. The reasons for the increase include the 352% increase in H-1B visas during 1990-1995, and the Chinese Student Protection Act of 1992, which gave greencards to an estimated 100,000 Chinese nationals, most of them in technology areas.

Future trends are difficult to predict, given how much the situation has changed in the 1990s. For instance, ethnic Chinese comprised 76% of the immigrant programmers and engineers in Silicon Valley in the 1990 Census, but in 1999/2000, among computer-related job, the Indian H-1Bs outnumbered the Chinese ones by more than an 8-to-1 ratio. (Personal communication from Michael Hoefer of the INS, July 9, 2001. The ratio of Indians to Chinese in the general H-1B population is a little over 4-to-1.)

In any case, the central point is that without the foreign-national labor supply, employers would be forced to use the existing domestic labor pool of older people. For this reason, the foreign-labor issue is central to our theme here, and will be addressed in this section.

It is easy to see that there is something very wrong with the H-1B program, in that **the number of software H-1Bs is growing 10 times faster than the growth rate in jobs:** The number of H-1B work visas requested by industry for computer programmers increased by 352% from 1990-1995, during which time the number of programming jobs increased by only 35%.[40]

The "country of choice" among employers importing this labor is currently India. In 1999/2000, among computer-related jobs, the Indian H-1Bs outnumbered the Chinese ones by more than an 8-to-1 ratio. (Personal communication from Michael Hoefer of the INS, July 9, 2001. The ratio of Indians to Chinese in the

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[40]*Software Workers for the New Millennium*, National Software Alliance, Arlington, VA, January 1998. Note that before 1990 the H-1B program had the name H-1. The graphic here is only for H-1Bs, with statistics starting in 1992. Note that though this might not be anomalous during a period of a labor shortage, this dramatic growth of H-1B usage occurred during a national recession, when large numbers of high-tech workers were laid off.

general H-1B population is a little over 4-to-1. This and many other facts about the H-1B population as of early 2000 are available in *Characteristics of Specialty Occupation Workers (H-1B)*, U.S. Immigration and Naturalization Service, February 2000.)

9.2   H-1B Work Visas As a Source of Cheap Labor

On October 21, 1999, Susan deFife, CEO of womenConnect.com of McLean, VA, testified to the Senate in support of higher H-1B quotas. She gave the example of a new graduate she had hired in 1998 as a system administrator, a Mexican national who had just graduated from a U.S. school. Ms. deFife emphasized that she found this worker only after months of exhaustive searching. Yet a subsequent inquiry under the Freedom of Information Act (FOIA) showed that deFife was only paying this person $35,000 per year — when the national average for new graduates was $45,000.

Similarly, John Harrison, CEO of Ecutel in Alexandria, Virginia, testified to the House in March 1999 in support of an H-1B increase. He issued a press release which said,

> Something is wrong when you put an ad in the Washington Post for a software engineer and the only qualified applicants you receive are from non-U.S. Citizens, said John Harrison, CEO and co-founder of Ecutel, one of the nation's most promising high-tech companies.

A FOIA request later revealed that Ecutel had hired several H-1B programmers at a salary of $35,000, again far below average.

This is outrageous. Here were two of the best examples the industry lobbyists could find in claimed support of the H-1B program, and yet both of them were in fact paying their H-1Bs salaries well below average.

(They were paying both below the national average and below the local average. The DC area where they were located is in about the middle of the nation in terms of IT salaries. See www.datamasters.com, or data presented in *Building a Workforce for the Information Economy*, National Research Council, 2000.)

I often find that employers who tell the press that they "desperately" need H-1Bs are shown in the FOIA database to be underpaying their H-1B workers. For example, a September 5, 2000 article in *The Oregonian* cited Northwest Software as such a firm, yet the FOIA database shows that Northwest hired many software engineers in Silicon Valley — one of the highest cost-of-living areas of the nation — at salaries of $32,000, $38,000 and $40,000.

Similarly, a September 24, 2000 article on www.msnbc.com, "The Catch-22 of Coveted H-1B Visas," quoted Raj Shah, CEO of Capital Technology Information Services:

> "It's an incredible source for bringing in cost-effective labor that we have a shortage for." says Shah, whose Rockville, Md., company manages information for the health-care industry.

"Cost-effective," indeed: The H-1B database shows that CITS hired some H-1B programmers in the greater DC area for salaries of $30,000, $33,000, $35,000 and $43,000. Note that an escalator mechanic on the DC Metro earns $49,000. (*Washington Post*, September 20, 2000.)

Many employers find H-1B (pre-greencard) programmers and engineers attractive because they will accept lower salaries and poor working conditions. We will discuss the details in this subsection.

9.2.1 Some Cautionary Notes

Before getting into the details on this issue, **we wish to emphasize that one must be extremely careful with salary studies, because if the proper variables are not adjusted for, salary differences can be masked.**

In particular, it is extremely important to note that **salary exploitation occurs primarily in the first 5-10 years of the foreign national's time in the U.S.** This is because of the fact that employers have enormous leverage over the worker during the time the worker's greencard is pending. (See Section 9.4 below.) For some workers, the salary gap also persists for some time after the worker receives a greencard, but the gap eventually is closed for almost everyone.

Therefore, **salary studies which lump together all immigrant workers, both newly-arrived and long-established, may not reveal the exploitation of the newly-arrived**. Even worse, if a study merely looks at foreign-born status, it will pick up those who immigrated to the U.S. as children under family reunification laws; these people had greencard or citizen status when they entered the workforce and thus were not exploitable by employers.

It would also be misleading, for instance, to compare the salaries of immigrants having Master's degrees and working in high-wage regions with those of natives having Bachelor's degrees and working in low-wage regions. This is a common problem with many studies and surveys, such as those of the National Science Foundation (cited by ITAA analyst Stuart Anderson, who also makes similar errors in his critique of the UCLA data), the *Electronic Engineering Times*, and the Institute of Electrical and Electronic Engineers, all of which typically omit important variables.

Another way in which salary differences can be masked is the study does not account for specific software skills. As explained below, the "prevailing wage" aspect of H-1B law does not require employers to account for skills in wage determination. Thus an employer can hire an H-1B programmer with a background in Java, for which the employer would normally pay a salary premium, for the price of a generic programmer who does not know Java, and yet still technically comply with the law. So, **a salary study which does not account for specific software skills might misleadingly make it appear that the foreign-national workers are being paid as well as natives, even though in actuality they are being underpaid.**

Another major problem with relying on "prevailing wages" is that this does not account for age discrimination. As shown earlier, employers wish to hire younger American workers, since they are cheaper than the older ones. When the supply of young American workers is exhausted, the employers then turn to young foreign workers, shunning the older American workers. So an employer could be paying his/her young foreign workers the same as his/her American ones of the same age and yet still be abusing the H-1B program with the goal of saving on salary costs.

9.2.2 Government Analyses

The Department of Labor has found widespread abuse of the work-visa program.[41] Among other things, they found that 19% of the employers were not even paying the salaries they had promised in their H-1B applications, even more remarkable because the salaries in the applications tend to be low to begin with. The employer requesting an H-1B is supposed to pay the prevailing wage, but there is such a large variation in wages anyway that it is easy to mask an offer of an unfairly low salary. (This issue will be discussed in

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[41] *The Department of Labor's Foreign Labor Certification Programs: The System is Broken and Needs to be Fixed*, Final Report No. 06-96-002-03-321, Joseph Fisch, Assistant Inspector General for Audit.

much greater detail below.)

DOL also found that though state employment departments are supposed to refer domestic candidates for jobs for which an employer-sponsored green card is pending, "Of the 28,682 applicants referred on 10,631 job orders during the period, only 5 (0.02 percent) were hired."

The INS found that in 2000 the median salary for H-1B programmers and system analysts was $53,000. (*Characteristics of Specialty Occupation Workers (H-1B)*, U.S. Immigration and Naturalization Service, June 2000.) This is well below the nationwide average of $66,000 for 1999 for application software engineers. (*Wired News*, May 25, 2001, quoting the Department of Labor.)

When median wage data for computer-related H-1Bs is broken down by nationality (personal communication from Michael Hoefer of the INS, July 9, 2001), we see a suggestion that the H-1Bs from the poorer countries are more exploitable than the ones from the rich countries:

Australia	$75,000
United Kingdom	$74,000
Canada	$70,000
Germany	$70,000
Israel	$65,000
France	$64,000
Turkey	$58,000
Romania	$55,000
Poland	$55,000
China	$55,000
Mexico	$54,000
India	$52,000
Philippines	$52,000
Bulgaria	$50,000
Pakistan	$50,000
Bangladesh	$49,000
Ukraine	$48,000
Indonesia	$47,000

Table 10: Median wage of computer-related H-1Bs, by nationality

(Medians have been rounded to the nearest thousand dollars.)

Of course, this data set by itself is not conclusive, as other variables need to be examined. (See Section 9.2.1.) Yet it certainly suggests that the H-1Bs from Third World countries are more exploitable.

Amazingly, policy makers in another federal agency, the National Science Foundation (NSF), actually planned to bring in foreign nationals to hold down wages in science and engineering, at least at the postgraduate degree level. In early 1998, Dr. Eric Weinstein, then a mathematician at the Massachusetts Institute of Technology, uncovered internal NSF documents which expressed concern that science and engineering salaries were getting too high, and proposed as a solution to this "problem" bringing in a glut of foreign labor. It is amazing that a federal agency would actually plot to keep U.S. citizens' salaries down. Subsequent to the writing of these documents, the NSF pushed Congress to establish the current H-1B program, in much expanded form compared to the old H-1 program.

Dr. Weinstein's paper on this scandal is available at

`http://nber.nber.org/~peat/PapersFolder/Papers/SG/NSF.html`

9.2.3 Analyses from Academia and Research Institutions

A researcher with the pro-immigration Carnegie Endowment for International Peace put it this way (*Kansas City Star*, July 16, 1995):

> "Do you want me to call it a sham?" asks Demetrios Papademetriou, a former Labor Department immigration official now with the Carnegie Endowment for International Peace. "Do you want me to call it a hoax? Sure it is. This program has never worked, and it never will."

Papademetriou and Stephen Yale-Loehr — who is an immigration lawyer and thus would be expected to oppose reform of the H-1B process — reported in their book, *Balancing Interests: Rethinking U.S. Selection of Skilled Immigrants* (Carnegie Endowment for International Peace, 1996), on their study of wages paid to foreign nationals in various professions. In data from the labor certification applications in the process of sponsoring the foreign workers for greencards. the foreign applicants in Computer Programmer positions in New Jersey were being offered salaries which were on average 21% below the mean for that profession, with an 11% figure in Texas. In the Computer Systems Analysts and Scientists category, gaps of 30% and 21% were found in New Jersey and New York, respectively. By law the gap is supposed to be no more than 5%.

Asian-American Studies Professor Paul Ong of UCLA, after correcting for a host of important variables — including English proficiency — found that immigrant engineers were paid up to one-third less than their native counterparts, and that the gap took 20 years to close. [42] And though Ong hypothesized various factors,[43] he cited earlier findings that the foreign engineers may be "willing to accept lower salaries in order to obtain full-time employment in the U.S., a prerequisite for permanent residency," and the bottom line is that Ong noted that **"Companies took advantage of immigrants."** (*Electronic Engineering Times*, July 18, 1994.)

My own analyses of the 1990 Census data on programmers and electrical engineers in Silicon Valley found that the immigrants were paid on average 15-20% less than natives of comparable age and education. In one of the analyses, for instance I tabulated salaries in Silicon Valley, for workers who had Master's degrees (and not a PhD), and at most 32 years old. For the foreign-born, the worker was included if his entry to the U.S. had been no more than eight years earlier.

(This last condition is crucial; as mentioned earlier, and detailed in Section 9.4, the major exploitation of immigrant programmers occurs during their first few years in the U.S., while in a *de facto* "indentured

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[42] *The State of Asian Pacific America*, Paul Ong (ed.), LEAP Asian Pacific American Public Policy Institute and UCLA Asian American Studies Center, 1994, p.179-180. The article is reprinted in *New American Destinies*, D. Hamamoto and R. Torres (ed.), Routledge, 1997.

[43] One of those factors was an American education, which Ong found to make a 10% difference in salary. This was later used by ITAA researcher Stuart Anderson to downplay Ong's findings of employer exploitation of immigrant engineers. But this 10% figure is well short of the 33% overall gap Ong found, and the 10% figure itself is inflated, as it includes people who had immigrated as children with their families, who already had greencards or citizenship by the time they entered the labor market and thus were not exploitable by employers. In any case, Ong's comment, cited below, that "Companies took advantage of immigrants," makes his interpretation of his work quite clear.

servant" state. Moreover, one must eliminate immigrants who had come to the U.S. as children through family immigration, and who thus were not exploitable later when they entered the workforce.)

I then simply computed mean salaries for all native and all foreign-born. The results were (in 1990 dollars):

native: $51,480
foreign-born: $42,845

The native figure is 20.2% higher than the foreign-born one.

A 1998 UC Berkeley study ("The Perceived Shortage of High-Tech Workers," Clair Brown, Ben Campbell, and Greg Pinsonneault, Dept. of Economics, UC Berkeley) found that the presence of the foreign engineers had indeed held down engineering salaries.

9.2.4   Statements by the Industry and Its Allies Themselves

We noted earlier that the *Red Herring* magazine, the "business bible" of Silicon Valley, actually endorsed the idea of using foreign programmers and engineers as a source of cheap labor, saying in its July 1998 editorial

> ...if companies say they want to hire more skilled foreign workers because those workers are cheaper, we should believe them — and increase the number of visas issued.

General Dynamics, the aerospace giant, even admitted in federal court that the imported workers from England were presented as attractive due to their "indentured" status; the pitch made by the British employment agency to General Dynamics said that its clients were "prepared to work here in the United States for as much as a 40% reduction in current United States salary levels."[44]

Even a *Wall Street Journal* article (January 8, 1998) claiming that American firms recruit abroad because of a labor shortage stated that "recruiting foreign talent is cheaper than hiring Americans." The article quotes an American recruiter of foreign programmers (John Nyhan, vice president of International Management Resources) as saying that he pays them $20,000 to $25,000 less than Americans with the same skills.

And the pro-business *Forbes* magazine said (May 31, 2000):

> Indian programmers working in the U.S. on temporary H-1B visas typically earn 25% to 30% less than their naturalized colleagues. Kalra, for example, will earn $60,000 this year, while others with his experience here could easily earn $75,000.

Moreover, the simple law of supply and demand tells us that, again, even the sincere employers who hire H-1Bs bring down the price of labor, by increasing the supply. Industry officials have admitted this, such as this comment on CNN on February 9, 1998:

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[44]This statement was made in the document, "Falcon International's Proposal to Supply International Labor for General Dynamics's Convair Division," August 2, 1989. The document was used as an exhibit in the Department of Justice's prosecution of General Dynamics, and was obtained under the Freedom of Information Act by SoftPac, an organization lobbying against the H-1B program.

Robert Walley, executive vice president of Gemini, says that unless his company and others are able to find a new source of workers, "it would increase the prices of the resource pool. The people out there looking for jobs, they're demanding premium salaries now, and it will just drive that higher."

Similarly, the ITAA industry lobbying group also worried that "We can anticipate further increases in the salaries of IT workers" which make "U.S. companies risk their profitability." (*Help Wanted: The IT Workforce Gap At the Dawn of a New Century*, ITAA, 1998.) In other public statements, the ITAA worried about IT salaries causing inflation. ITAA's solution: Use foreign workers to expand the labor supply, thus reducing salaries.

Industry also freely admits that abuses also occur abroad; Sun Microsystems, a firm often cited by ITAA analyst (and later Senate Immigration Subcomittee staffer) Stuart Anderson as paying fair wages to foreign nationals, has boasted of employing programmers in Russia at "bargain prices." (*Los Angeles Times*, November 15, 1993, and also July 15, 1996.)

Joseph Costello, then-CEO of Cadence Design Systems, a leading CAD software firm, stated that when Cadence was considering setting up a development branch in India, a bullet item in a slide presentation on the proposal listed "salary savings" as an inducement for the move. [45]

On June 10, 2000 I was a participant in a TV debate on the H-1B issue. (Straight Talk, produced by the Santa Clara County Democratic Club.) One of the other participants was Steve Yurash, an engineering manager at Intel. Yurash is highly critical of the H-1B program, and is an advocate of reducing immigration levels in general, so he of course is not impartial here, but his comments are significant nonetheless. (The third participant was Murali Devarakonda of the Immigrants Support Network, a militant group of Indian H-1Bs who were lobbying Congress to pass legislation to alleviate their *de facto* indentured servant status.) Yurash discussed the fact that, as a manager at Intel, he had to take matters into his own hands in order to NOT hire an H-1B at Intel:

> It's a matter of what are the mechanisms, how does a hiring manager in Silicon Valley get a hold of re'sume's? What happens is, you get a lot of H-1B re'sume's. I had to go out myself, instead of relying on the Personnel Dept., to go and advertise at several colleges where I thought I would be able to find some good employees. And lo and behold, I found a very good one at Cal Poly, Pomona.

9.2.5 Severe Problems in the Concept of "Prevailing Wage"

H-1B law requires the employer to pay the foreign worker the "prevailing wage," which industry lobbyists have cited as "proof" that the H-1Bs are not exploited. But this law is riddled with loopholes.

Even if an H-1B employer pays a prevailing wage determined by a government survey, that wage will usually be lower than the market rate for the job's skill requirement, as follows. As explained earlier, the only programmers who are enjoying large increases in salary as those with "hot" skills, say Java. H-1Bs are brought to this country ostensibly for those skills. **Yet an employer need only pay the prevailing**

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[45]Panel discussion at a conference on immigration, Hoover Institution, Stanford University, October 18, 1996. Costello quickly added that he had rejected cost as a criterion. However, though he and two other Silicon Valley CEOs on the panel (Dado Banatao of S3 and Phil White of Informix) claimed that their only criterion for setting up foreign development branches was the existence of "pools of talent," it certainly is no coincidence that the sites they chose were almost all in low-wage countries.

wage for programmers in general, rather than the prevailing wage for, say, Java programmers. Thus the employer gets a Java programmer for the price of a generic programmer — all while technically complying with the prevailing-wage requirement of the law. As noted by immigration attorney Donna Fujioka of Oakland, California (interview with the author, March 5, 1998),

> [The prevailing wage law] takes a meataxe approach...It doesn't appreciate how hot a skill is [such as SAP]...This is great if you are an attorney representing an SAP programmer.[46]

Note also that many H-1B workers have stated that after they are hired, they become "indentured servants" (see below) and may not get raises in salary like U.S. citizen/permanent resident workers do. Thus even if their original salary was on par with the Americans, employers save money by not increasing their salaries later on.

Another common ruse is to underclassify an H-1B worker, giving him/her a job title at a level lower than that of the work he/she is performing, in order to make a low salary comply with the prevailing wage.

Moreover, Department of Labor regulations allow the employer to provide his/her own data on prevailing wages, such as listing typical salaries in his/her own firm, rather than being determined by the DOL, clearly producing enormous potential for abuse.

Concerning the greencard process that most H-1Bs undergo, immigration attorney Joel Stewart has boasted, "Employers who favor aliens have an arsenal of legal means to reject all U.S. workers who apply." See "Legal Rejection of U.S. Workers," *Immigration Daily*,

http://www.ilw.com/lawyers/colum_article/col_joels/2000,0424.shtm

9.2.6 Indirect Salary Savings Gained from Hiring H-1Bs

Another major problem with relying on "prevailing wages" is that this does not account for age discrimination. As shown earlier, employers wish to hire younger American workers, since they are cheaper than the older ones. When the supply of young American workers is exhausted, the employers then turn to young foreign workers, shunning the older American workers. So an employer could be paying his/her young foreign workers the same as his/her American ones of the same age and yet still be abusing the H-1B program with the goal of saving on salary costs.

The median age of H-1Bs is 28. (*Characteristics of Specialty Occupation Workers (H-1B)*, U.S. Immigration and Naturalization Service, February 2000.) The *San Francisco Chronicle*, May 19, 2000 noted:

> Silicon Valley headhunter Linda Tuerk said that in her experience, employers are saving a lot of money by hiring H-1B workers, no matter what the rules say.
>
> "Companies are firing older, more-expensive workers – people making 80 grand – and they can turn right around and hire two people right off the plane for 45 grand each," Tuerk said.

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[46]Fujioka did counter that by complaining that the new DOL regulation implemented in 1998 sets up two only categories for prevailing wage, Entry Level and Experienced, asserting that this was unfair since the worker with five years of experience will be measured against a prevailing wage calculated on a group that includes people with 25 years of experience. But as seen in my "short-lived career" data above, almost no one lasts 25 years in this field, so the point is moot.

9.3 Enforcement of the Laws Is Almost Impossible

The industry lobbyists claim that abuse of the H-1B program is rare, citing low numbers of complaints. But the fact is that (a) neither the H-1Bs nor their American co-workers are in a position to complain about abuses, fearing recriminations, and (b) Congress has tied the Department of Labor's hands, severely limiting what DOL can do to investigate and prosecute alleged abuses.

A September 21, 2000 article in the *San Francisco Chronicle* described (b):

> But there's a big catch: Labor officials can investigate potential fraud or abuse only after a complaint has been lodged by an H-1B worker. Few workers dare jeopardize their employment status or green-card prospects by filing such complaints. "The notion that this program can be enforced on a complaint-only basis is naive, if not misguided," said John Fraser, deputy administrator of the Labor Department's wage and hour division.

One of the biggest obstacles working against complaints by American workers is that the law has so many loopholes in it. The DOL is powerless to remedy this.

9.3.1 The Indian View

Since the largest nationality among the H-1Bs is Indian, it is not surprising that Indians, who see the situation at close range, are among the most critical of the program.

An industry analyst in Bangalore, India quoted by MSNBC News in August 1997 also says that Indian programmers imported to the U.S. under the H-1B program make 30% less than their American peers.[47] A financial newspaper in India, the *Business Standard* (May 27, 1998), noted that if Congress were to truly enforce the prevailing-wage law, then

> This step is significant because this will act as a counterweight against the brain drain fear expressed in some quarters. If the smaller Indian firms have to pay higher salaries, their cost advantage does not remain as strong — and Indian firms have traditionally relied on lower labour charges to bring down costs.

Dinesh Gandhi, a naturalized U.S. citizen, was featured in an article in *California CPA*, January 2, 2001:

> A year ago Dinesh Ghandi, with a master's degree in computer science and six years of experience as a programmer, went looking for a job in the high-tech industry. He posted his resume on various job Web sites. "To be frank I got a lot of responses," says Ghandi, 33. No surprise there. At the time, the computer industry was begging for skilled programmers. The only thing that seemed to stand between Ghandi and his dream job was his American citizenship. "I look like an H-1B visa person, and they called me up because of my name," the native of India explains. "Then they asked me, 'What is your status?' and I said, 'I am a U.S. citizen.'" Once companies learned that, he said they stopped calling. "It made me frustrated because I went all through the interviews, and then my final [citizenship] status comes into the picture."

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[47]He did say they catch up after five years. Presumably he was referring to the fact that after the H-1B gets a greencard, typically taking five years, they can go out on the open market and get market-rate salaries.

Ghandi says this happened with three different companies before he finally landed a good job as a programming manager at a biotech firm. Further, he knows the people who were hired with the other companies he'd interviewed with, knows his skills were equal to theirs, and knows they were hired on H-1B visas.

Kumar Babu, another naturalized U.S. citizen, complained to the NBC Nightly News (June 14, 1998) that "The main [employer goal] is to depress the wages of the rest of the people."

9.3.2 Views of Other Immigrant Communities

Immigrant computer programmers encounter the same age discrimination when they reach age 35 or 40 that natives do. As pointed out by Shankar Lakhavani, chairman of the workforce committee for the the Institute of Electrical and Electronic Engineers (IEEE) and a Pakistani immigrant, "There are many immigrants like me who are American citizens, and they would like a crack at these jobs [which are going to H-1Bs]."

I am married to a Chinese immigrant, am fluent in Chinese, and have been active in the Chinese immigrant community for 25 years. Most of the Chinese immigrant programmers and engineers that I know strongly feel that the H-1B program is very badly abused.

The Independent Federation of Chinese Students and Scholars (IFCSS) did not engage in lobbying in favor of the 1998 bill to increase the H-1B quota. This is in stark contrast to the massive, masterful lobbying campaign they waged in favor of the 1992 Chinese Student Protection Act, which gave greencards to students from China studying in the U.S. during the 1989 student protests in Beijing. Apparently the IFCSS' inaction in 1998 stemmed from the perception that the bill would harm IFCSS members who already had greencards or citizenship, again illustrating the fact that immigrants feel their access to jobs needs to be protected just as much as that of natives.

The Organization of Chinese Americans, also extremely active in lobbying in favor of liberal immigration policies, also chose not to take a stand on the 1998 bill which proposed increasing the H-1B work visa quota.

9.3.3 False Claims of High Legal Fees

Industry lobbyists say that instead of employers saving money by hiring foreign nationals, it actually costs them more to hire the foreign nationals because of the legal fees involved. This is one of their most misleading arguments.

First of all, filing for an H-1B is quite simple and cheap; and **the typical legal fee for it is only about $1,500 for small employers who hire only a few H-1Bs, and down to about $700 for large employers who file many H-1B applications.** A *Computerworld* article (March 8, 1999) reported, "Congress instituted a $500 fee when it raised the H-1B cap last summer...Additionally, employers pay a $110 filing fee plus attorneys' costs. All told, companies estimate the cost of obtaining an H-1B visa under the new regulations will range from $1,300 to $2,500, including attorneys' fees." I have interviewed numerous immigration lawyers on this point, and they all confirm this fee range. For example, an employer in Washington DC told the author in December 1997, "Most attorneys around the U.S. charge $1,000 to $1,500 for an H-1B petition." An attorney in Oakland, California put the typical figure at $1,200 to $1,500 in a discussion with the author on March 5, 1998. Robert Baizer, a San Francisco immigration attttorney, in an interview with the author also on that date, gave figures of $1,500 to $2,000, and also is the source of the $700 figure above. See

also similar data in David North, *Soothing the Establishment: the Impact of Foreign-Born Scientists and Engineers on America,* University Press of America, 1995, p.52.

This is far less than the $10,000 the ITAA claims for the H-1B. In a different category, that of employer-sponsored greencards, the fees do tend to be around $10,000.[48] However, it should be noted that **many employers have the foreign employees pay the legal fees for greencards themselves** *Electronic Business***, March 2001), and even when employers foot the bill, the cost is usually less than they save in salary.** Recall that if an H-1B is sponsored for a greencard, it takes five years or more to get the greencard application to be approved, during which time the worker is essentially trapped; thus any salary savings obtained by the employer extend over five years, and thus far outweigh the legal fees for the greencard.

Note also that an employer who hires an H-1B (directly, i.e. not through a "job shop") avoids the fee a recruiter would charge in a regular hire, which is considerably more than $10,000.

After industry lobbyist claims of the $10,000 attorney fees for H-1Bs were exposed as false, the lobbyists tried a new tack, claiming relocation expenses from abroad for the foreign programmers and their families swelled the cost of hiring an H-1B.

But according to a Department of Labor official, the vast majority of H-1B visas are granted to workers who are *already* in the U.S. The workers move from job to job; when one job ends, rendering their current visa invalid, the worker finds another employer, who then sponsors them for a new visa. This is why the industry pushed Congress so hard in 1997 regarding the "245(i)" clause in immigration law; Congress wanted to make it more difficult for foreign nationals to stay in the U.S. after their visas expire, and the high-tech industry strongly objected, in order to retain their access to the "floating population" of H-1Bs which they employ.

For that matter, a recruiting agency for H-1Bs, Hi-Tech US, claims on its Web page that "Research has shown that the cost of relocating a foreign national is typically less than relocation [of] someone within North America."

The industry lobbyists also claim that must really "need" the H-1Bs since it is so much trouble to hire them. For example, consider this from *Computerworld*, March 12, 2001:

> "Many people are intimidated by what they need to do to hire a foreign professional," says Howard Skolnick, in-house counsel for SAI Software Consultants Inc. in Kingwood, Texas, which hires many H-1B holders.

Skolnick's firm didn't feel any intimidation at all when it hired an H-1B for a position in Systems Analysis and Programming for $30,524, and other programmers in the low $40K range. Even new graduates get considerably more than that (mid-$40s in 1998, the time of Skolnick's firm hired the cheap H-1Bs). (http://www.ShameH1B.ZaZona.com.)

9.4   De Facto Indentured Servitude of the H-1Bs

Though the H-1Bs typical have mobility in the legal sense, they are in the *de facto* sense indentured servants. This is explained in next few sub-subsections.

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[48]This difference between two visa categories was often confused, sometimes deliberately, during the 1998 congressional debate on whether to raise the H-1B quota.

9.4.1 Why Indentured Servitude Is of Such High Appeal to Employers

The indentured servitude issue is central to the H-1B discussion. For many employers, indentured servitude is even more important than salary, as the impact of a programmer leaving a project can be devastating. Jim Finkelstein of Arthur Andersen consulting has even claimed that each time a worker leaves a firm, the overall costs to the firm, both direct and indirect, amount to a staggering $150,000. (*San Jose Business Journal* Power Breakfast, June 24, 1999.) That latter figure may be overstated, but clearly the adverse impact is quite large, and thus the attraction of hiring programmers who cannot leave is quite high.

For example, consider a round table discussion held by *CIO Magazine* on November 28, 2000, regarding what it termed the IT "staffing crisis." Participants consisted of two CIOs presenting the industry point of view, Justin Yaros of 20th-Century Fox, and Rob Collins of a software development firm, Cognos, and two critics of industry labor policies, Professor Peter Cappelli of the Wharton School of Management and myself. (Representing the industry side was also ITAA president Harris Miller.) Asked whether they were experiencing a crisis in hiring programmers, the two CIOs surprised the moderator and Miller by saying that they have lots of applicants did not have trouble hiring programmers. Instead, they said their problem was retention — too many programmers leave them within a year or two, a situation which is now common in the industry. Though they did not state whether their firms hire H-1Bs, it is clear why the indentured servitude of H-1Bs is so attractive to many employers.

9.4.2 Nature of the Green Card Process

In order to understand the *de facto* indentured-servant nature of the H-1Bs, one must first understand the structure of the employment-based programs for obtaining a "greencard," i.e. U.S. permanent-residency status.

Though there are many different routes to a greencard via employment,[49] the high-tech H-1Bs typically use one of the following routes:

- The National Interest Waiver provision in the EB-1 category: This is for scientists and engineers who can document that they are of truly outstanding talent. From the foreign worker's point of view, the major advantage of this category is that the worker sponsors him/herself, and thus is not beholden to an employer. However, very few of the H-1Bs qualify for this elite category.

- The EB-2 category, for alien workers possessing a Master's or PhD degree.

- The EB-3 category, for those possessing a Bachelor's degree.

Again, there are many exceptions and variations to the three situations outlined above (and the procedures discussed below), but those are by far the most typical cases for H-1Bs in high-tech.

The employer-sponsored greencard process for an H-1B consists of three main stages: (1) Filing/processing for labor certification, to DOL;[50] (2) filing/processing of the I-140 form, which is used to apply to the INS for an EB-series visa for the worker; and (3) filing/processing of the I-485 form, to "adjust status to permanent residency," i.e. actually obtain the greencard.

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[49]For that matter, there are also other visas than the H-1B which allow one to work in the U.S. temporarily.

[50]The *labor certification application* associated with the greencard process should not be confused with the *labor condition application* associated with applying for an H-1B visa.

In contrast to the H-1B visa, whose quota is not nation-specific, the EB-series greencards are subject to per-country limits. Each nation is subject to a limit of 9,700 visas per year including, it is important to note, the spouses and minor children of the sponsored workers. The EB-series as a whole has a quota of 140,000 per year. The wait in step (2) above is associated with the wait for these visas.

Since almost half of the H-1Bs are from India, and another tenth are from China, H-1Bs from these two countries have found that the per-country limits on EB-series greencards have become a major obstacle in recent years. Thus, step (2) above has become the major bottleneck in the delay to getting a greencard, with the severity of the situation accelerating. In the late 1990s, an increasing number of H-1Bs became worried that they would reach their 6-year limitation on the H-1B visa before obtaining a greencard, thus having to leave the U.S.

9.4.3   The Nature of De Facto Indentured Servitude

Note that an H-1B employee is essentially immobile during the years while the greencard is pending, thus refuting ITAA's argument that H-1Bs who are exploited in terms of salary can simply move to another job. The workers certainly do not want to start the greencard process all over again.

In addition, before the 2000 legislation, they would risk having their H-1B visas expire before the greencard is approved. That legislation enabled them to stay past the 6-year limit if their greencard applications were pending. Nevertheless, it is still the case, after 2000, that the H-1Bs do not want to give up the years they have put in with an employer in the greencard queue, and thus they remain *de facto* indentured servants today.

It is crucial to keep mind the implications of this "indentured servitude" aspect of the H-1B: Not only does it allow unscrupulous employers to give the H-1Bs smaller raises than they would get out on the open market, but even more importantly, it gives employers a sense of "security" — by hiring H-1Bs, they don't have to worry that the H-1B will suddenly jump ship, leaving the employer in the lurch, possibly within months of a pressing project deadline. **For many employers, this aspect is even more important than the issue of salary.**

In a July 13, 1999 column by Nathan Cochrane in an Australian publication, *Fairfax IT*, computer graphics guru Carsten Haitzler noted, "Be wary of H1-B visas in the USA - you basically get shackled to a company...Being a non-American in the USA is almost like being a second-class citizen."

The anonymous author of an op-ed piece in *TechWeb News*, March 16, 1998, wrote,

> I am an immigrant from India...the H-1B visa allows someone to work only temporarily at a high-tech job for a few years. An employer has to sponsor one for an H-1B visa. These engineers cannot switch jobs at will. To do so requires a new H-1B visa.
>
> Companies love these H-1B workers, as they are eager to please their sponsors [in the hope] that they can be sponsored for greencards. These engineers are virtually "indentured slaves" of their sponsors.
>
> Once a company initiates the process of sponsoring a candidate to greencard, it can currently take three to four years. Companies love this and frequently delay the process on purpose. Some big companies have this delay built into their sponsoring process. During this period, candidates are virtual slaves. They are forced to work long hours at low wages. And usually they do not get good raises or promotions...

I myself left my company when I got a greencard and I got a raise of 40 percent.

Department of Labor statistics show that many of the H-1Bs do leave their employers soon after they get their greencards, just like the case of the anonymous author above. The Inspector General's report (*The Department of Labor's Foreign Labor Certification Programs: The System is Broken and Needs to be Fixed*, Final Report No. 06-96-002-03-321, Joseph Fisch, Assistant Inspector General for Audit) found that

> ...many left the employer who sponsored them shortly after obtaining permanent [i.e. greencard] status: 8 percent left within 90 days, 17 percent left within 180 days, and 33 percent left within 1 year.

Presumably many of the remainder who stayed beyond a year did so only after negotiating a large pay increase, by threatening to leave.

An in-depth article in the *Washington Post* (July 26, 1998) noted,

> According to foreign workers, recruiters and U.S. officials, the high-tech braceros generally earn less than their American counterparts, despite laws requiring employers to pay them "prevailing wages." The workers are beholden to the employers who sponsor their visas in what the system's critics describe as a form of indentured servitude. If they wish to move to another company, they not only must obtain a new work visa, but often must pay a penalty of $10,000 to $20,000 to their original employer.
>
> To keep them from seeking higher pay elsewhere, employers frequently dangle the promise of sponsoring them for "greencards," denoting much-coveted status as legal permanent residents. This gives the companies enormous leverage, since the process is a lengthy one and must be started over from scratch if the worker moves to another employer...
>
> Besides receiving lower starting pay, H-1B workers complain of getting fewer and smaller raises, remaining mired in relatively menial jobs and, as salaried employees, having to work long hours without overtime.

Immigration attorney Jose Latour admitted this problem of "indentured servitude" on his Web page,

http://www.usvisanews.com/fasttrack.html

in discussing National Interest Waivers (NIW). (First noticed by me in 1999; still on the Web as of September 2000.) NIW is a "fast track" to a greencard, in which the foreign national applies on his/her own, rather than the employer applying on his/her behalf. Latour cites the benefits of NIW as opposed to the ordinary greencard route:

> The applicant sponsors himself/herself based upon his/her abilities, education, and experience. This means that present employment is not required, and if the applicant is employed, the employer does not have to get involved in the process. Why is this important? FREEDOM! The applicant does not have to stay with the employer for a certain number of years while the process is undertaken. Second, **permanent residency** [i.e. the greencard — NM] **is taken away from the employer as a bargaining chip in the employer/employee relationship.**

(Emphasis on the word *freedom* was Latour's; emphasis in the last sentence was added by me.)

Another immigration attorney, Sherry Neal, made similar comments in an article in the *Dayton Daily News*, July 11, 1999:

> Neal said foreign nationals may appear to be more loyal workers because they aren't as mobile as other in-demand tech workers. The Immigration and Naturalization Service must give approval before foreign nationals change jobs–a process that can take six weeks. "Some of the U.S. workers, they get a job offer and they are gone in a week," she said.

Similarly, *Workforce Magazine*, a publication for HR executives, noted in its May 1999 issue that

> ...There are two good things about H-1Bs. First, they allow you to travel the globe while you identify technical professionals who want to work in the United States. Second, the H-1B is valid only for the employer who arranges it. If you bring a technical professional into the country and he or she decides to jump ship, its likely that the ship he or she will have to jump on is the one thats going back to the home country. If the person wants to come back, he or she has to start the immigration process all over again. As a result, most H-1B visa holders demonstrate remarkable loyalty.

This use of the euphemism *loyalty* for the indentured status of H-1Bs is also used repeatedly by an international recruiting firm, Hi-Tech US (http://www.innes-consultancy-plus.co.uk/whoarewe/hitechus.htm), whose Web page notes:

> There are also a number of other additional benefits in recruiting outside the USA:
>
> Loyalty: Research has demonstrated that foreign nationals prove to be more loyal and will not jump from company to company. Coupled with the fact that most tend to be tied to a 3-year work Visa.
>
> Control wages: Unrealistic wage increases can be brought back under control by recruiting outside the USA as you are helping the critical resource shortage not adding to it.
>
> Reduce Relocation costs: Research has shown that the cost of relocating a foreign national is typically less than relocation someone within North America. When considered with the loyalty and control of wages above then the cost saving can be significant.

Similarly, in a September 24, 2000 article on www.msnbc.com, "The Catch-22 of Coveted H-1B Visas," an HR director says "It's a way to find really loyal employees."

And in a September 28, 2000 message sent out to the Employment Law Channel (http://www.erexchange.com), Audra Slinkey says,

> The most important benefit [to hiring an H-1B] is that your newly sponsored [H-1B] will more likely stay in your organization longer because of the difficulty in transferring a visa. With turnover rates reaching an all-time high for IT workers, retention is very important factor to consider.

The dissident organization FACE Intel (Former and Current Employees of Intel) states that

[Intel] HR representative Donna Hasbrouck presented to Microprocessor Technology (MT) staff, while J.C. Cornet (VP of MT) and Joseph Krauskoph (Director of Test) [were] present, as how to hire foreign students.

Ms. Hasbrouck told the MT group "after hiring the foreign student, delay the immigration paper work process, because when they get their greencard we lose them to companies like Sun Microsystems and Silicon Graphics, they pay them about 30% more."

Accordingly, the industry lobbyists have never pushed Congress to reform the greencard process — they **like** the indentured-servant nature of the current system. In fact, they have actively opposed reform of the green-card process, as we discussed in Section 2.3.4.

A January 10, 2000 article in a Silicon Valley magazine, *Tech Week*, discussed the issue in some depth. Here are some excerpts:

Rajeev calls himself a high-tech indentured servant. An H-1B visa holder from India, he arrived here nearly five years ago to design chips for a semiconductor firm. Rajeev (not his real name) expected to get a greencard within a few years and pursue his dream of doing challenging tech work in Silicon Valley. Instead, immigration rules and bureaucratic delays have kept him at the same firm, which is now failing. All the talented engineers have fled to greener pastures, he says, while he and other H-1B visa holders are stuck, mopping up the mess and praying to get their greencards in the mail. "It's total exploitation," he says. "It's just Indians and Chinese who are doing all the work-because they have to." What's more, the 29-year-old fears he may not get the proper papers before his six-year H-1B visa expires, forcing Rajeev to leave the country and jeopardizing the prospect of his ever attaining permanent residency...

Mistreatment of H-1B workers is not surprising to guest workers in Silicon Valley. Recently, a group of five Indian H-1B technology professionals met with TechWeek to discuss problems with the system. All asked to remain anonymous for fear of reprisal from their firms, and several felt betrayed by bosses who shunted them into grunt-work duties. Much of the guest workers ' frustration with the high-tech industry, however, stemmed from their perception that firms were purposefully ignoring the immigration dilemma.

To them, it seems Silicon Valley firms favor a revolving door system of H-1B workers who are easy to exploit.

"The tech industry could help us by lobbying the INS," Rajeev says. "But they choose not to, because they're getting H-1Bs."

The Immigrants Support Network (www.isn.org), an organization of H-1Bs mainly from India, has heavily lobbied Congress to remedy their indentured-servant status. [51]

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[51]In September 2000, apparently on the advice of their public-relations consultant Rick Swartz, ISN sent a letter to the *Washington Post*, published on ISN's Web page, denying that ISN considers H-1Bs to be indentured servants. This was of course false. For example, their Web page at that time (on the same day they sent the letter) contained a link to a *Red Herring* article titled "High-Tech's Indentured Servants," which ISN headlined on their Web page as "High Tech's Indentured Servants - RedHerring writes about our issues." So the ISN actually approved of the indentured-servant description after all. On June 10, 2000, in a TV debate on the H-1B issue (Straight Talk, produced by the Santa Clara County Democratic Club), one of the panelists was Murali Devarakonda, who is on ISN's Board of Directors. He distributed flyers saying, among other things, that H-1Bs are indentured servants, and during the show said the following:

This is legal human rights violation in America...You [as an H-1B] are an indentured servant, a modern-day slave,

Though one or two employers have expressed sympathy, most have not lobbied for congressionals proposals made to solve the problem. On the contrary, the ITAA's Harris Miller expressed downright hostility (*Dallas Morning News*, August 6, 2000):

> "They don't have to use the H-1B program," said Harris Miller, president of the Information Technology Association of America, which represents tech companies. "They can stay in their own country or they can go to another country. They are trying to turn this into an entitlement program."

This is an amazing statement for Miller to make. He has repeatedly claimed that the H-1Bs are vital to the U.S. economy, so why would he invite them to leave the U.S.? His emotional outburst illustrates the fact that ISN's lobbying exposes the real reason why Miller's clients want H-1Bs, indentured servitude.

(The Immigrant Support Network, the organization of H-1Bs, angrily reacted to Miller's remark in an August 28, 2000 e-mail posting, saying in all-capitals form, "THIS IS CLEARLY AGAINST WHAT ALL H-1B VISA HOLDERS ARE TOLD BY THEIR EMPLOYERS.")

The length of time needed to get a greencard has become so long that a Georgetown University study estimated in the year 2000 that only 25% of the H-1Bs working in the U.S. at that time would ever be able to get a greencard; the rest would have to return to their home countries. See *H-1B Temporary Workers: Estimating the Population*, by B. Lindsay Lowell, Georgetown University,

http://www.ieeeusa.org/grassroots/immreform/ISIMh1brelease.html.

In addition to the *de facto* indentured servitude which results from the long wait for greencards, in many cases "job shops" impose a *de jure* indentured servitude, by forcing the H-1Bs to sign contracts in India before coming to the U.S. A February 21, 2000 article in the *Baltimore Sun* quoted one H-1B who was under contract but "on the bench," meaning that the job shop had no work for him:

> "We go to the company office every day and try to line up business. We get $500 a month plus the apartment, but no other money," he said. "They told me, 'You don't want health insurance. It's just a pain in the neck.'"
>
> He also was required to sign a contract. "They don't give it to you till the last minute. They tell you your flight is leaving in a half-hour. You don't even have a chance to read it"...
>
> In fact, many H-1Bs live in fear of being sued. It is a fear that is well-founded.
>
> Court records show that Mastech has sued dozens of former workers who tried to leave for other jobs. The lawsuits accuse workers of failing to comply with an agreement to stay with the firm for periods of one to two years. The lawsuits seek damages ranging from $10,000 to three months' salary...
>
> Tata Consultancy Services, or TCS, which is based in India and has U.S. operations in Rockville, ships workers worldwide. Its parent firm is India's largest conglomerate. In 1998, Tata had 2,000 workers with H-1B visas on assignment in the United States. The firm had 490 H-1Bs approved in 1997. Records at Tata's Rockville office show that their largest customer in the region is the National Association of Securities Dealers, which has 32 H-1B visa holders assigned to its headquarters.

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because...you must leave the country...You can't be promoted. You are legally prohibited from competing and going up...We cannot compete legally.

Like Mastech, Tata has sued dozens of workers who left the firm for other American jobs. Many lawsuits were filed in Montgomery County Circuit Court. Tata, according to its records and those on file in the court, assigns dozens of its H-1B workers to area businesses, including the Nasdaq stock exchange, USFandG Corp. and the Maryland offices of IBM.

(See the *Sun* article for extensive details.)

It should be noted that even the creator of the H-1B visa program, former congressperson Bruce Morrison, complains that it has become an indentured-servitude vehicle. In the *Sun* article above, he said, "Our system is based on the power of people to look out for themselves. That's all destroyed by indenturing our workers."

9.4.4   De Facto Indentured Servitude, After the Year 2000

The H-1B bill passed by Congress in October 2000, S. 2045, contained provisions which should improve the plight of the H-1Bs, but due to the limited nature of the reforms, indentured servitude will continue to be a strongly appealing "benefit" to employers who hire H-1Bs.

The main benefit to H-1Bs in the new law will be that the law in essence abolishes the per-country quotas for employer-based greencards. These had slowed down step (2) in Sec. 9.4.2 above for H-1Bs from India and China, since their categories were oversubscribed. The yearly greencard quotas for many countries had not been exhausted each year, and now these will be usable by H-1Bs from India and China. Thus the duration of step (2) will be reduced.

This indeed occurred in mid-2001, when the backlog will be entirely eliminated. However, that was largely due to a one-time event (use of 140,000 unused green card slots from 1999 and 2000, enacted in the 2000 bill). Thus the situation will be short-lived, with the backlog resuming as the increased H-1B quotas generate huge demands for greencards. (See ISN announcement, June 12, 2001, www.isn.org.)

The new law allows an H-1B to change jobs if step (3) has taken more than 180 days to process. However, the impact of this change will be minor, since it involves only the very last stage of the process. Other similar provisions will have only secondary impacts as well.

The new law does allow an H-1B to change jobs immediately, instead of waiting for a transfer of the visa to another employer to be approved. But as before, most H-1Bs will not be able to take much advantage of this, since the problem still remains that their greencard processing would have to begin from scratch again, something most H-1Bs would consider unthinkable if they have already put in a couple of years toward a greencard under their present employer.

All in all, under the new law, my estimate (confirmed by immigration lawyers) is that the greencard process should now take about 3 to 4 years, definitely an improvement over the 5+ years it had been taking in the late 1990s. However, that still means 3 to 4 years of indentured servitude, so H-1Bs will continue to be enormously attractive to employers for that reason.

And it could be even worse if employers compensate for the compression of step (2) by dragging their feet on their ends of the operation. For example, the dissident organization FACE Intel (Former and Current Employees of Intel) has stated that in the 1990s

> [Intel] HR representative Donna Hasbrouck presented to Microprocessor Technology (MT) staff, while J.C. Cornet (VP of MT) and Joseph Krauskoph (Director of Test) [were] present, as how to hire foreign students.

Ms. Hasbrouck told the MT group "after hiring the foreign student, delay the immigration paper work process, because when they get their greencard we lose them to companies like Sun Microsystems and Silicon Graphics, they pay them about 30% more."

Worse yet, many employers in 2001 stopped offering the H-1Bs green cards altogether. (Personal communication with immigration attorney Kim Fanning, of the firm Cooley and Goddard, April 2, 2001.) There were so many excess foreign workers available that employers who wished to hire foreigners could afford to not offer green cards. The H-1Bs who had been laid off, and the new workers who hoped to get H-1B visas, were so desperate that the ADEA Group, a major employer of H-1Bs, stated the following in a May 3 press release (emphasis added):

> We are currently focusing on professionals with H-1B visas because they most likely have the level of experience we need for mission-critical projects and A SENSE OF URGENCY IN SECURING NEW EMPLOYMENT IF THEY HAVE BEEN RECENTLY LAID OFF.

(*Wired Online News*, May 25, 2001.)

The new law allows an H-1B to exceed the 6-year time limit on the visa, if a greencard application is pending. From the H-1Bs' point of view, this of course is preferable to having to leave the U.S., but from the employers' perspective, it means that the period of indentured servitude can be extended even longer.

Immediately after the bill passed Congress, immigration attorney Jose Latour assured nervous employers that it would indeed continue to be business as usual in terms of indentured servitude. Writing on his Web page,

http://www.usvisanews.com/fasttrack.html

Latour noted that many employers were asking, "Won't this [new bill] mean that H-1B employees will start jumping from job to job more often?" Latour assured them that "the need for stable employment for the realization of permanent residency remains unchanged," i.e. H-1Bs will continue to need to stick with their employers for the several years while the greencard is pending. Indentured servitude will continue to be alive and well.

Starting in early 2001 (or late 2000), the industry experienced a sharp slowdown. There were now many more H-1Bs than jobs which employers wished to fill with H-1Bs. Accordingly, many employers no longer offered green card sponsorship when they hired H-1Bs. Though this would at first appear to at least give the H-1Bs more freedom of movement, they now had a new problem — deportation. If they were laid off or fired from one job, they would have to find another within 10 days, or face deportation. (Some immigration attorneys challenged this, but the INS chose not to respond.) So, it was *de facto* indentured servitude all over again.

9.5   A Bogus Threat

Industry lobbyists have threatened that if the yearly cap on H-1B work visas is not raised, employers will ship software work to foreign countries, where the labor is even cheaper.

This is a bogus threat, demonstrably so: Programmer wages in India are much lower than in the U.S. Given that, why does the industry want to bring Indian programmers to the U.S. as H-1Bs? Why not just employ those programmers in India in the first place? The answer is that it is not feasible to do so.

While it is true that some companies have experimented with having work done abroad (mostly old mainframe software), this will not escalate to become the major mode of operation of the industry. The misunderstandings caused by long-distance communication, the problems of highly-disparate time zones and so on result in major headaches, unmet deadlines and a general loss of productivity. See the author's analysis at

http://heather.cs.ucdavis.edu/pub/Immigration/ImmigAndComputerIndustry/SVReport.html

for extensive details on this point, including many quotes from industry figures.

For example Bill Gates says (*San Jose Mercury News*, March 9, 1997):

> For a company like Microsoft, it's worth a real premium for us to have very strong collaboration. We have found projects that make sense to do other places, in Israel, in Tokyo for example. But it makes sense for the bulk of our operations to be in one location and for the foreseeable future we're going to stick with that. We will spend what is necessary to have most of our development groups at our headquarters and have them meeting face-to-face every day. We want to make sure there is a place where customers can come in and talk to us in person and make sure the products fit together in the right way.

These problems are so severe that Northwest Airlines, which had experimented with offshore software development, decided to move operations back to the U.S., according to a November 1, 1999 report in *CIO Magazine*. NWA's vice president for information services, said "It can be difficult to work through language barriers and time-zone differences."

Symmetrix CEO Paul Hiller is engaged in a joint venture with a company in India. He said that the problems of long-distance communication had really impeded progress on the project. He added, "You really need to be able to talk [about the project] face to face." (Interview with the author, July 20, 1995.)

This point is made quite forcefully in UC Berkeley Professor AnnaLee Saxenian's study of the computer industry, *Regional Advantage* (Harvard University Press, 1994, pp.156ff). For example, she quotes Tom Furlong, former manager of Digital Equipment Corporation's workstation group in Palo Alto as saying, "Physical proximity is important to just about everything we do...The level of communication is much higher when you can see each other regularly. You never work on the same level if you do it by telephone and airplane...An engineering team simply cannot work with another engineering team that is three thousand miles away, unless the task is incredibly explicit and well defined — which they rarely are."

Just look at Silicon Valley. This is the most "wired" place in the world, yet those massive Silicon Valley freeway traffic jams arise because very few programmers telecommute. They know that face-to-face interaction is crucial to the success of a software project.

In the May 29, 1998 issue of the *Raleigh News and Observer*, an article describes Rila Software, a firm in Bulgaria hoping to do software subcontracting work for American companies. Again is shows why this will not become a major mode of operation:

> Still, Triangle companies involved in Year 2000 solutions say that hiring Eastern Europeans is not a panacea to any labor shortage. Mike Pileggi, a manager who helps distribute Sapiens International N.V.'s Year 2000 correction product, said foreign software shops are not always as quality-driven as domestic ones. And it can be harder to supervise their work. Sapiens uses a group of 30 to 40 programmers in Russia, but it took significant time and investment to give

them the adequate training. "They have some very key core skills [in Eastern Bloc countries]," Pileggi said. "But even at the discounted rates, it can end up costing you more in the end."

A CNN television report on February 7, 2000 reported:

> [Internet entrepreneur Joe Kraus] knows why Internet services, which by their nature can operate anywhere in the world, still cluster in Silicon Valley.
>
> "It is ironic that the Internet is a global phenomenon — yet if you're not in Silicon Valley, it's really hard to get a sense of the pace and the connections between those companies. So many of the ideas get transferred in hallway conversations, meetings over lunch and the casual interactions of the companies that are proximate," said Kraus.
>
> There's a lot of idea-sharing across the backyard fence and at other social gatherings in the valley. The ambiance alone, he said, helps drive the industry.
>
> "I think it's very difficult to be a successful Internet company that isn't based in Silicon Valley," said Kraus.

Actually, the computer industry has the lowest percentage of overseas research and development of all major industries. (D. Dalton and M. Serapio, *Global Industrial Research and Development*, Dept. of Commerce, 1999, cited in cited in *Building a Workforce for the Information Economy*, National Research Council, 2000.)

In an October 9, 1995 *Wall Street Journal* article, William Schroeder, chief executive officer at Diamond Multimedia Systems says "There is a 'natural limit' to how many skilled jobs can be moved abroad because of the costs of communication and other factors."

9.6 Most H-1Bs Are Ordinary Workers, NOT the "Best and the Brightest"

9.6.1 We Should Indeed Bring in the Best and the Brightest

It is my opinion that in the case of foreign nationals of extraordinary talent, our immigration law should indeed facilitate the ability of employers to hire such workers. I personally have helped a number of extremely bright foreign students, mainly Chinese and Indians, find jobs with Silicon Valley employers, and have strongly supported making offers to many outstanding foreign applicants for faculty positions in our Computer Science Department at UC Davis.

However, as will be shown later **workers of extraordinary talent comprise only a small fraction of the overall population of H-1Bs and employer-sponsored greencards.** For example, the vast majority of computer-related H-1Bs make less than $58,000 per year, far below "genius" levels, which approach or exceed $100,000.

9.6.2 The American Computer Industry Has NOT Relied on Immigrants for Technical Innovation

The industry lobbyists say that the H-1Bs are needed to retain the industry's technological edge, but the fact is that the vast majority of technological advances in the computer field have been made by U.S. natives. This can be seen in rough form, for example, in the awards given by the Association for Computing Machinery

(ACM). Concerning the Turing Award, which is the most prestigious honor conferred by the ACM, as of 2000 only six of the 34 American recipients have been foreign born. Among 450 American ACM Fellows, only 67 have been foreign-born. Of 50 American recipients of the ACM System Software Award (this is the aware most closely with innovation in practice), only 1 has been foreign-born.

Note that these percentages are below the foreign-born representation in the workforce. Similarly, only 16 of 42 ACM Dissertation Awards have gone to foreign students, even though foreign students comprise 50% of the PhDs granted in this field.

(I have not listed rates of production of research papers or patents, as these are usually group efforts rather than the products of individuals. The rates for these are comparable to the

Quite contrary to industry's claim that the H-1Bs are "the best and the brightest," in an article in the September 1999 issue of the American Society for Engineering Education's magazine *Prism*, an engineering professor in China warns his nation that the engineers being produced by Chinese universities are not good enough for China to compete in the global high-tech market. The U.S. industry also claims that the imported professionals are better trained than the Americans. Yet again to the contrary, Professor Chen Lixun complains in the article about China's "obsolete teaching content and materials." Professor Chen says the educational system in China produces students who cannot think independently or creatively, and cannot solve practical problems. He writes that the system "results in the phenomenon of high scores and low ability." Many other academics have written about this problem, and the governments of China, Japan and South Korea all are making attempts to remedy it.

9.6.3 The H-1Bs Are Ordinary People, With Ordinary Salaries

Dept. of Labor official Raymond Uhalde testified to the U.S. Senate in February 1998 (see also House Report 657 on the bill HR 3736, 1998, http://rs9.loc.gov/cgi-bin/cpquery/z?cp105:hr657:) that **79% of the H-1Bs make salaries under $50,000, hardly what "geniuses" are paid in this field, where a top programmer can earn a salary approaching or even exceeding $100,000.** (See similar figures, more occupation-specific, in *Characteristics of Specialty Occupation Workers (H-1B)*, U.S. Immigration and Naturalization Service, February 2000. That document found that 75% of the H-1Bs working as systems analysts and programmers were making less that $54,500.)

Mary Dumont, a Palo Alto attorney who represented Californians for Population Stabilization in a lawsuit against Hewlett-Packard's hiring of Indian engineers via the Tata Corporation, described the judge's questioning of a Hewlett-Packard representative. When the judge asked about the quality of the imported Indian workers relative to American students (citizens and permanent residents) from, say, the nearby University of California at Berkeley, the Hewlett-Packard executive conceded that the UC graduates were better.

Recall that Sun Microsystems, which claims to scour the globe for "the best and the brightest," seems to be also interested in the cheapest; it boasted to the *Los Angeles Times* that it had employed programmers in Russia "at bargain prices."

Though not specifically addressing H-1Bs, computer science professor Dr. Howard Rubin of Hunter College has claimed that programmers in India are more productive than American ones. (*Computerworld*, April 15, 1999.) Rubin is a prominent ITAA ally who is a consultant paid by the industry. His analysis is questionable in many different ways — any manager at Microsoft would be outraged by Rubin's counterproductive suggestion that the manager work to maximize the numbers of lines of code written per day — but what is more interesting is what Rubin omitted from the information he gave *Computerworld*: In his analyses he also found that software written by U.S. programmers has the lowest defect rate in the world. (Rubin

9.7   The Vast Majority of H-1Bs Are NOT PhD Graduates of U.S. Universities

Industry lobbyists have often told the press that most of the H-1Bs are foreign students newly graduated from U.S. university PhD programs. This is completely false. Although as discussed in the section on education earlier in this paper, it is true that 40% of U.S. computer science PhD's are awarded to foreign students, **computer science foreign students comprise only a small proportion of the H-1B population.** To illustrate this, we will use *Characteristics of Specialty Occupation Workers (H-1B)*, U.S. Immigration and Naturalization Service, February 2000, which will be referred to here as *CSOW*.

According to *CSOW*, only 7.6% of all H-1Bs have a PhD. That figure is already small, but in fact for computer-related H-1Bs the figure is even smaller, since the 7.6% statistic includes postdoctoral researchers in university biology programs, and so on. Here is how the true figure for the computer field can be determined:[52]

CSOW reports that 56.7% of the H-1Bs are in computer-related occupations. At Spring 2000 levels (Spring 2000), this translates to approximately 60,000 computer-related H-1Bs. Yet only about 344 foreign students in U.S (and Canadian) universities were awarded PhDs in computer science and computer engineering in 1999. (See *Computing Research News (CRN)*, March 2000.) That works out to be a figure of only 0.6%.

In other words, fewer than 1% of the computer-related H-1Bs have PhDs from U.S. universities.

(This was verified independently in a July 9, 2001 personal communication from Michael Hoefer of the INS, 1.6% of the computer-related H-1Bs in 1999/2000 had a PhD. This is very similar to my figure above, though a bit higher, since it includes those with PhDs in fields other than computer science and computer engineering, say biology, who get computer-related jobs.)

If one then turns attention to Master's graduates, the above analysis cannot directly be extended to them, since the *CRN* data are only for PhD-granting universities. However, *Educational Statistics Quarterly*, Spring 2000, reports that in 1997 there were 10,098 Master's degrees in computer science awarded in the U.S., and if we take *CRN*'s figure showing that 45% of Master's degrees are awarded to foreign students, that would be about 4,500.

In other words, only about 7.5% of the computer-related H-1Bs have Master's degrees from U.S. schools.

Even the congressional sponsors of a 1999-2000 bill to exempt foreign graduates of U.S. schools from H-1B quotas estimated that only a small proportion of H-1Bs would be affected. (CNet News, October 1, 1999, http://abcnews.go.com/sections/tech/CNET/cnet_gradtech991001.html) It should be noted, though, that if such a law were to be enacted, it likely would create its own demand. Employers, seeing "free" H-1B visas, may wish to hire non-computer science majors for programming jobs at low salaries, e.g. hiring a mathematics graduate who has taken some programming courses but paying him/her a math-graduate salary, which would be much lower than a CS-graduate salary.

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[52]This excludes electrical engineering, but our available data on foreign students in only for computer science, and electrical engineers comprise only 4.9% of the H-1Bs anyway.

9.8 H-1B Fraud

Far from being the top-quality programmers claimed by the industry, many of the H-1Bs do not even have the qualifications claimed for them by their employer sponsors. *Computerworld*, May 10, 1999, reported:

> Officials from the U.S. Immigration and Naturalization Service and other agencies last week called for tighter controls over issuing H-1B visas after testifying before a House subcommittee meeting about growing abuses.
>
> William Yates, acting deputy commissioner at the INS, told the subcommittee that 21% of more than 3,200 H-1B visa applications that were filed during the past year through the American consulate in Chennai, India, and audited were found to be fraudulent. The INS began working with the consulate last year to detect H-1B visa fraud. The consulate processed 20,000 H-1B applications last year, mostly for computer programmers.

In addition to the 21% confirmed fraud rate, the INS found that 29% more "were either probably or possibly fraudulent."

More detail was given in the *Baltimore Sun*, February 21, 2000:

> [Upon arriving in the U.S., an H-1B programmer] learned that his resume, the one officially submitted to U.S. officials as part of his visa application, listed training in several areas that he never had received.
>
> "I saw this resume only after coming to the United States. When I saw it I was shocked for a minute, as it contained stuff that I never worked on. I was told not to worry about it," he said, "as it was done 'to get me here.' "
>
> ...
>
> In another Mastech lawsuit, a former [H-1B] employee said company officials "tailored and tampered" with his resume to get him an assignment at an accounting firm. Srinath Nagabhirava said he was placed in "a totally new environment in which I haven't had any skills or experience."

A September 21, 2000 article in the *San Francisco Chronicle* reported: [53]

> Federal authorities have started nationwide investigations into the hiring of foreign high-tech workers, including charges of visa fraud and allegations that the practice is riddled with abuse, The Chronicle has learned...
>
> "We deny tens of thousands of (visa) cases every year," said Bill Yates, a senior immigration service official in Washington, D.C. "But are we catching most of the fraud? The truthful answer is that we're not."
>
> He said immigration agents began re-examining H-1B cases throughout the country in July as part of a sweeping attempt to gauge the scope of "misrepresentations" by visa applicants and employers, which include some of the biggest names in the U.S. tech industry...

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[53]It should be mentioned that the article also quoted a programmer who is very critical of the H-1B program, Rob Sanchez, as saying that many H-1Bs are filling a legitimate need in the software industry. Sanchez complained vehemently (personal communication, September 21, 2000) to the *Chronicle*, denying making such a statement.

[Immigration attorney] Raja freely admitted that other body shops [i.e. agencies employing H-1Bs] may not be as scrupulous as his wife's in upholding the law. "Of course, there is fraud," he said. "Everybody knows it"...

"It's a well-known fact that people in India will take two or three classes in Java programming, then the body shop will create a resume for them," said Inder Singh, a former H-1B visa holder now working as a programmer on the East Coast.

"You will find that a lot of them don't have the work experience they claim to have," he said. "The body shop does it for them. They are very good at glossing over resumes"...

But there's a big catch: Labor officials can investigate potential fraud or abuse only after a complaint has been lodged by an H-1B worker. Few workers dare jeopardize their employment status or green-card prospects by filing such complaints. "The notion that this program can be enforced on a complaint-only basis is naive, if not misguided," said John Fraser, deputy administrator of the Labor Department's wage and hour division.

Many programmers from around the nation have told me of finding that the H-1Bs they were working with were learning the given programming language on the job (ironically, just what I say the employers should be allowing the American programmers to do), rather than having prior work experience as claimed.

9.9 Immigrant High-Tech Entrepreneurship

A 1999 study by UC Berkeley professor AnnaLee Saxenian, *Silicon Valley's New Immigrant Entrepreneurs*, detailed entrepreneurship by Asian immigrants in Silicon Valley.[54] The study has been cited by industry lobbyists as "showing" that rather than displacing U.S. citizens and permanent residents from jobs, the high-tech immigrants are creating jobs. Yet the fact is that the study's own findings show this to be false.

Saxenian's data show that *the rate of immigrant entrepreneurship is no higher than, and in fact is likely less than, the immigrant proportion of the workforce.* In other words, **the immigrants are creating fewer jobs than would be created if natives were in the positions in the workforce held by the immigrants, a net job loss.** Saxenian finds that the Asian immigrants comprised 21% of the technical workforce in 1990, but comprised only 19% of the new business during 1985-1989. In the late 1990s, Valley sources estimate that the Asian-immigrant proportion of the technical workforce exceeded 50%,[55] while their proportion of new business was lagging behind at 29%, according to Saxenian's data.

It must also be pointed out that these firms may not employ many programmers and engineers anyway. For instance, according to Saxenaian, 36% of the Chinese-owned firms are in the business of "Computer Whole-saling," meaning that they are simply assemblers of commodity PCs, with no engineering or programming work being done.

Moreover, the situation is even worse when one notes that the immigrant entrepreneurs — and for that matter, immigrant managers in nonimmigrant-founded firms — tend to hire from their own immigrant ethnic groups.[56] Those jobs are largely not open to natives. This is discussed in the following subsection.

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[54]See www.ppic.org The study was funded by the Public Policy Institute of California. That organization is in turn funded by an industry-related source, William R. Hewlett, co-founder of Hewlett-Packard. As noted earlier, the industry has stated before that one of its tactics is to "commission academic studies to support its position."

[55]Saxenian herself states that the proportion had grown quite a lot by that time, though she does not have data for this yet.

[56]This fact is also alluded to by Saxenian herself.

9.10 H-1B Hiring by Fellow Immigrant Ethnics

One major factor underlying the large demand for H-1Bs is that, as noted by by UC Berkeley professor AnnaLee Saxenian in her paper *Silicon Valley's New Immigrant Entrepreneurs*, immigrant entrepreneurs, as well as immigrant managers in nonimmigrant-founded firms, tend to hire from their own immigrant ethnic groups. It is very common to see a company department, or even an entire firm, in which the technical staff is all Indian or all Chinese.

In *H-1B Temporary Workers: Estimating the Population*, B. Lindsay Lowell of Georgetown University finds that "...a study of the top 100 companies employming H-1Bs in 1998 shows that 60 percent of their CEOs had South Asian surnames."

Pauline Lo Alker, herself a Chinese immigrant and Silicon Valley CEO, mentioned this point, explaining that "There is a high tendency to surround themselves with people they are comfortable with." (*New York Times*, January 14, 1992.)

The Chinese Software Professionals Organization now even holds its own job fair, separate from the large "mainstream" job fairs such as Westech.

Melanie Erasmus pointed out that "at Cadence Design Systems, a software company, foreign-born Chinese-American engineers may represent as many as 80 percent of the technical staff." ("Immigrant Entrepreneurs in the High-Tech Industry," in *Reframing the Immigration Debate*, published by Leadership Education for Asian Pacifics, 1996, p.180.)

On July 19, 1995 I interviewed Isaiah Choo, manager of the El Cerrito Computer Company (San Francisco Bay Area), whose classified ad for a software engineer I had seen in the July 15 editon of the Chinese-language *Sing Tao Daily*. When I asked in which newspapers Choo had placed an ad, he replied that the only other paper was also Chinese-language, the *World Journal*. He admitted, "Yes, we are looking for a Chinese programmer...No, it is not because of language. We don't care what language the programmer speaks as long as they get along. Well, I'm just following the instructions of the Taiwanese owner."

The April 16, 1999 edition of the *San Jose Mercury News* ran an in-depth analysis of the situation, in an article titled, "Divisions: Segregation Trends Emerge in High-Tech Industry, Experts Say." Though the analysis was broader than just the area of engineering and programming, the article noted that

> ...even among engineering professionals, subtle ethnic division is part of the valley's culture.
>
> A half-dozen university researchers studying the valley's workplaces say the segregation patterns are disturbing.
>
> "You're seeing more and more firms that are homogenous ethnically, from the entrepreneur all the way down to the production worker," said Edward Park, a University of Southern California sociologist who has visited dozens of Silicon Valley firms over the past decade...
>
> Workers say the tension is especially pronounced between engineers from India and mainland China. The Indian engineers coming on temporary H-1B work visas now outnumber the Chinese by 5-1...
>
> ...one Intel engineer who emigrated from mainland China [said] "Many Chinese think that Congress has a policy of favoritism toward India." He asked that his name not be used, saying it would hurt him in his largely Indian work group.
>
> Many Indian engineers say they sense the resentment and feel uncomfortable. Others shrug it off.

9.11 Highly Deceptive Proposals Involving a Master's Degree or a $60,000 Compensation Floor

In 1999 Senator Phil Gramm and Representative Zoe Lofgren introduced bills which would allow an <u>unlimited</u> number of foreign high-tech workers to be brought to the U.S. (In 2000 they were joined by similar bills by Senator Abraham and Rep. Dreier.) Though they differed in some details, after negotiations the likely conditions set for this new category would be that the worker have a Master's degree or equivalent, or be offered compensation of $60,000 or more.

(Gramm's bill actually stipulated that both the degree condition AND the salary condition must hold. However, during negotiations on these bills, employers in low cost-of-living regions would likely demand that the provision "Master's degree AND $60,000" be changed to "Master's degree OR $60,000." They would argue such a change is needed because the $60,000 cutoff is unreasonably high relative to salaries in their regions. They would also point out a precedent, in that the condition "Master's degree OR $60,000" appears in the definition of "H-1B dependency" in the 1998 law.)

Though the authors of these bills tried to justify the establishment of this special category by claiming that workers who satisfy these conditions are of outstanding talent — Lofgren calls them "geniuses" — the fact is that the conditions were essentially meaningless.

Here is why these conditions seeming to guarantee high quality were actually a sham:

- The $60,000 level was nowhere near genius-level salaries for this profession, which approach and often exceeded $100,000. On the contrary, the proposed $60,000 threshhold actually matched the median salary nationwide in 1998 for professional staff in information technology (IT), according to the annual Datamasters survey. And this median includes all education levels; the figure for those with a Master's degree would be significantly higher.

- As pointed out earlier, in terms of specific technological skills acquired, a postgraduate degree is not needed in order to do work in the computer industry. Though research experience gained at a top university has some "cultural" value, for most students at most schools a Master's degree does not add much value to a worker's productivity. Microsoft founder Bill Gates does not even have a Bachelor's degree, let alone a Master's. The same is true for Oracle founder Larry Ellison, Apple/Pixar founder Steve Jobs, and countless others. (I was a software developer in industry, and later became a computer science professor conducting research and teaching in the field, and yet have no formal training in computer science at all.)

- One certainly need not be a "genius" to earn a Master's degree. On the contrary, most holders of Bachelor's degrees in computer science would qualify for hundreds of Master's programs nationwide, if they were interested in advanced study. Therefore, a Master's degree does not signify special talent.

- Salaries in the high-tech professions have been rising at a rate of nearly 10% per year. Yet these legislators have not included any provision in their bills to adjust the $60,000 threshhold as nationwide salaries rise. The $60,000 level would be the equivalent of less than $50,000 within two years, and would continue to erode after that.

- Employers in regions with high costs of living would have especially high potential to exploit the foreign workers. Assuming that Lofgren's bill is indeed changed to conform to Gramm's, the proposed legislation would be of huge benefit to employers in Lofgren's Silicon Valley district, which has an astronomical cost of living. It is so expensive to live there that a four-person family there actually qualifies as low-income for the purposes of federal housing assistance if its income is as much as

$53,100^{57}$ — not far below the $60,000 threshhold Lofgren describes as "genius" pay. Lofgren herself has stated that the mean high-tech salary in Silicon Valley is in the mid-$80,000 range (House Immigration Subcomittee hearing, April 21, 1998), and her own press secretary blurted out that $60,000 is considered just "peanuts" wages in that region. [58].

- Gramm and Lofgren defined their $60,000 level not just in terms of salary, but also including "cash bonuses and similar compensation," and Lofgren's includes "stock options, bonuses and other similar compensation." Capers Jones, a well-known analyst of software development economics, estimates that nonsalary compensation is on the order of 30% of base salary. [59] Thus the $60,000 level corresponds to a salary of only about $46,000.

  And how would total compensation for a foreign worker be calculated under these bills? The values of bonuses and stock options are unpredictable. Bonuses may or may not materialize, and stock options usually end up worthless. Thus employers would have to be allowed to merely estimate the values of such compensation. Given the industry's abysmal track record — an audit by the Department of Labor found that a fifth of H-1B employers were not even paying the salaries they had promised in their applications for the visa [60] — we can be sure that many employers would make greatly exaggerated "estimates" for such nonsalary compensation, in order to meet the magic number of $60,000.

- The language in Gramm's legislation was actually "Master's degree *or its equivalent*," not just "Master's degree." (Again, such language has a precedent in the H-1B dependency section of the 1998 law.) An employer could state that two years of work experience are equivalent to a Master's, a common HR rule of thumb.

So, quite contrary to the legislators' claim that the special, unlimited-numbers categories they propose would apply only to those workers who are of especially high quality, the practical effect could be merely that the worker have at least two years of experience.

10 Employers Are Shooting Themselves in the Foot with Their Hiring Policies

10.1 The Employers Are Harming Their Own Firms' Profitability

The fact is that the industry lobbyists are not doing right even by their industry constituents, because under current hiring policies the employers are shooting themselves in the foot:

- **Employers are shooting themselves in the foot by driving up salaries in certain narrow segments of the market.**

  Employer obsession with specific software skills is resulting in sharp increases in salaries within the very narrow segments of the software labor market corresponding to those highly-specific skills. (Again, programmers outside of those narrow segments are not experiencing sharp increases in wages.)

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[57] *San Jose Mercury News*, August 15, 1999

[58] *Red Herring* magazine online, August 9, 1999

[59] *Software Workers for the New Millennium*, National Software Alliance, Arlington, VA, January 1998.

[60] *The Department of Labor's Foreign Labor Certification Programs: The System is Broken and Needs to be Fixed*, Final Report No. 06-96-002-03-321, Joseph Fisch, Assistant Inspector General for Audit.

It is simply not cost effective to pay someone $10,000-15,000 more in salary simply because he/she knows Java,[61] given that any competent programmer can learn Java and be productive in it within a couple of weeks.

A March 16, 1998 article in *US News and World Report* reported that

> [Recruiter] Susan Miller, notes that while pay scales for programmers with hot skills have reached "insane heights," much of the money is spent "stealing people" from other companies. "Everybody wants the same person," Miller says. "This is one of the problems in Silicon Valley that's making me rich, as a matter of fact."

- **Employers are shooting themselves in the foot by causing crippling high turnover rates.**

The fact that the industry pays a premium for certain skills is resulting in frequent job-hopping by programmers who are out to maximize their salaries. Employers say they place high value in finishing projects under deadline. Yet if a programmer who knows a project inside out suddenly leaves the employer in the lurch by jumping to another company, clearly this has a sharply adverse effect on the first employer's ability to complete the project on time. In fact, Jim Finkelstein of Arthur Andersen consulting has claimed that each time a worker leaves a firm, the overall cost to the firm is a staggering $150,000. (*San Jose Business Journal* Power Breakfast, June 24, 1999.)

So here too, employers are shooting themselves in the foot under their current policies.

- **Employers are shooting themselves in the foot by often failing to hire the most talented workers.**

By using unimportant skills as their re'sume'-screening criteria, employers are not using the criterion which far outweighs any other: General programming talent. The best way to ensure success of a software project — finishing under a short deadline, minimizing the number of program bugs, maximizing innovation and so on — is to hire talented programmers, not people with specific software skills.

A good account of this is given, for example, in *Peopleware: Productive Projects and Teams*, by Tom DeMarco and Timothy Lister (Dorset House Publishing Co., 1987, pp.44ff). These studies show a dramatic 10-to-1 variation in programmer productivity, by virtually any criterion — time to finish a product, number of errors, and so on. In other words, the best programmers work 10 times faster, produce 10 times fewer errors, and so on, than the worst ones. One oft-cited study even found a 20-to-1 ratio. In other words, raw analytical talent, not paper credentials, is what really counts.

So again employers are shooting themselves in the foot under their current policies, missing many of the smartest people.

- **Employers are shooting themselves in the foot by unnecessarily leaving jobs open far too long.**

Employers, by unnecessarily overspecifying job requirements, are leaving many jobs open for several months (recall that 30% of the position are open for more than six months) — absolute dead time in terms of productivity, and thus a major loss to the firm.

As pointed out in a *Dallas Morning News* article (June 2, 1999),

> "A lot of employers don't consider the opportunity cost of holding a position vacant," said Ed Rankin, president of People Solutions, a Las Colinas human resource firm.

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[61]The salary premium for Java found in the *Computerworld* Skills Survey, November 16, 1998, was 16%. The premiums found for many other skills were even higher.

Recall the similar comment made by recruiter Andrew Gaynor (*US News and World Report*, March 16, 1998, shown more fully here than in our earlier citation):

> This [obsession with skill matches] leads some hiring managers to let vacancies go unfilled for months, says Andrew Gaynor, a headhunter based in Redwood City, Calif., rather than consider an applicant who, with a little training, "could easily come up to speed in a few weeks."

The fact is that although employers shun the older programmers in favor of new college graduates and foreign nationals in an attempt to reduce personnel costs, **if the employers were to utilize a more broad-based hiring policy, then their overall costs (not to mention headaches) would actually decrease.**

Perhaps worst of all, university students are beginning to be aware of the age discrimination problem, and though as shown earlier in this report, computer science enrollment trends are currently on the upswing (more details below), in the future this may deter many of them from pursuing computer science majors. An article in the January 13, 1998 edition of the *New York Times* says that

> [current Stanford computer science student Graham Miller] is already thinking about an exit strategy [from the computer field]. "Programmers only last up to 10 years or so," Miller said. "After that, you need to find something else to do."

Once word gets around among the students about the short-lived careers in this field, employers may well find in the coming years that their current hiring policies deter students from majoring in computer science. If at the same time, the world supply of H-1Bs decreases due to development of software industries abroad (as predicted by the Stanford Computer Industry Project in 1995, and coming true in 2000, when Germany, England, Japan and Israel all were considering starting "H-1B" programs of their own), U.S. employers will indeed have shot themselves in the foot.

10.2   "But Don't the Employers Know Best?"

Such is the mystique enjoyed by the high-tech industry in this country that many people have difficulty understanding how employers in the field could have policies which are actually harmful to their firms' profitability. Yet, a closer look shows that they are not very good in handling employment matters after all.

Studies have shown, for example, that programmers who are twice as productive are paid only 10% more. (*Peopleware: Productive Projects and Teams*, by Tom DeMarco and Timothy Lister (Dorset House Publishing Co., 1987)).

And 1997 Rep. Lamar Smith uncovered significant degrees of fraud in the H-1B program, with large numbers of H-1B programmers having been found to lack the credentials claimed for them in the H-1B applications. Yet apparently the employers could never tell the difference; the employers never noticed that the H-1Bs did not have competence in the areas they were supposed to have.

And the industry is far from the perfect competitive market taught in economics course. The best products in this industry do not necessarily rise to the top. Intel's processor chip was once called "brain-damaged" by Bill Gates, and IBM's engineers had favored using other chips in the PC, yet Intel of course has been the market leader. The same is true for labor — the best workers do not necessarily rise to the top, because the employers are not good at identifying them.

11 Age Discrimination/H-1B Lawsuits Brought Against High-Tech Firms

As mentioned earlier, Intel has been sued for age discrimination several times. Apparently none has been successful. (As of September 2000, I believe the suit brought against Intel by attorney Dru Keegan of San Jose is still pending.)

Intel's lobbyists claim that no age-discrimination lawsuit against the high-tech industry has ever succeeded. This is not correct. The plaintiff in *Dodoo v. Seagate Technology Inc.* did win his case, a verdict which was later upheld on appeal by the defendants (10th Cir., No. 99-6352, 12/15/00).

Also, the federal Equal Opportunity Commission served a "letter of violation" on Siemens Energy and Automation in Minneapolis in 1997. The 11 programmers who brought the complaint against Siemens then sued in federal court, and the case was settled out of court in August of 1999. Though that settlement included a secrecy provision and thus the details cannot be divulged (I served as an expert witness on behalf of the plaintiffs), a small part of the evidence in the case is in the public record, as part of an article in the *San Jose Business Journal*, December 14, 1998:

> Advanced Micro Devices Inc., Intel Corp. and Siemens Energy and Automation Inc. are being sued by seniors who claim they were denied employment because of their age. In the Siemens case, 11 former employees over the age of 40 say they were laid off from a software facility in Minnesota, only to be replaced by younger workers.
>
> Some applied for similar jobs at Siemens that opened up after the layoffs, but they were unable to even get interviews, according to the plaintiffs' attorney, Stephen Snyder. The Equal Employment Opportunity Commission has sided with the workers. In a "letter of violation" sent to Siemens in 1997, the EEOC said it found "reason to believe" that age discrimination had occurred. According to the EEOC, the layoffs that included 11 former employees unfairly targeted older workers. "The termination rate disproportionately affected software engineers over 40, resulting in the termination of 21 percent of the software engineers over 40, and only 2 percent of the software engineers under 40"...
>
> Mr. Snyder, the attorney representing the Siemens plaintiffs, said his clients were unable to find work after they were laid off, despite years of experience. One became a bus driver.

The FOIA database of H-1B salaries shows that Siemens hires a number of software engineers at low-end salaries ($50,000) in Minnesota.

In a landmark court case in 2001, a court held that the onerous contracts which many H-1Bs are forced to sign amounted to illegal indentured servitude. (*Los Angeles Times*, July 1, 2001.)

12 What Should Be Done

> **Technology will continue to change rapidly in the coming years. Therefore unless employers abandon their current obsession with the latest specific software skills, the perceived/claimed labor "shortage" — and the heavy usage of H-1Bs as a percentage of the programmer workforce — will be underlined permanent.**

Here is what should be done to avoid this problem:

12.1   What Congress Should Do

Unless Congress finally is able to resist the huge pressure imposed on it by the industry lobby, the percentage of programming jobs which go to H-1Bs will continue to grow indefinitely, until all new programming jobs go to H-1Bs. Strong actions should be taken:

- The H-1B program's goal should be changed back to that of the old (pre-1990) H-1 visa, i.e. to bringing in "the best and the brightest." Standards should be high, similar in stringency to those currently in place for the EB-1 National Interest Waiver (NIW) greencard program, which provides those of truly outstanding talent a fast track to permanent residency which does not depend on sponsorship by an employer.[62]

- The H-1B quota should revert to the original (i.e. pre-1998) value of 65,000. It may not be possible to reduce below that figure, since the U.S made an international commitment to maintain a yearly quota of at least 65,000 H-1B visas in the General Agreement on Trade in Services (see the *U.S. Schedule of Commitments* section of that agreement) in 1994.

- H-1B law should be made to conform to the GATS agreement (see above), in that employers who wish to hire an H-1B worker should be required to demonstrate that they made good-faith efforts to find a U.S. citizen or permanent resident to fill the position.

  Most importantly, employers should not be allowed to require overly specific skills in their review of citizen/permanent resident applicants.

  To this end, the legislative language used would be along the lines of the following:

  > An employer who petitions to hire an alien under the H-1B visa must specify a job category from the list used by the Bureau of Labor Statistics, such as Computer Programmer. The employer must state the number of applicants who were available for the position in question who have substantial experience or qualifications in that general job category, and among these, the number interviewed and the number offered the position. The petition will be granted if these data indicate that the employer has not failed to hire U.S. citizen/permanent resident applicants with general competence (not competence in a particular skill within that category) in the given job category. The data regarding numbers of applicants, interviews and offers, as well as listings of the salaries, degrees and years of experience for each H-1B hired, must be made readily available to the public on the World Wide Wide, with individual files subject to Department of Labor audit for firms hiring more than 15 H-1B workers per year.

- Remove programmers and engineers from the Exempt category regarding overtime. In other words, programmers and engineers should be paid for overtime work. This provision is important because a major reason employers find younger and/or foreign workers attractive is the perception that they are willing to work large amounts of unpaid overtime.

- The government should NOT set up retraining programs for programmers to learn new software skills. These are unnecessary and wasteful of taxpayer money, since a programmer can learn quickly on the job.

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[62]NIW standards are high; mere possession of a graduate degree or publication of jointly-authored research papers is not treated as sufficient evidence of outstanding talent.

12.2   What the Executive Branch Should Do

As explained in Section 9.2.5, a major employer loophole in the H-1B regulations is that the Dept. of Labor does not require that determination of the "prevailing wage" account for specific software skills. An employer can hire an H-1B programmer with a background in Java, for which the employer would normally pay a salary premium, for the price of a generic programmer who does not know Java, and yet still technically comply with the regulations.

In short, DOL is not enforcing the law, creating a very serious problem. The President should issue an Executive Order that the law be enforced.

12.3   What Employers Should Do

As shown in Section 10, it is in employers' best interests to re-examine their hiring policies.

- Hire on the basis of general programming talent, not specific skills. As shown above, the employers are shooting themselves in the foot with their current obsession with skills.

  This will require a major shift in operations. HR will have to work far more closely with hiring managers. The managers will need to better utilize the time they devote to recruiting, for example becoming more effective in assessment at the phone interview stage, so that less time is wasted on in-house interviews on weak candidates who are ultimately rejected. [63]

- Do not shunt competent programmers (old or young) into positions like customer support or software testing. Those jobs can be done just as well, maybe better, by people with other backgrounds.

- For applicants who look promising but are somewhat "high-risk" — for example, a bright PhD in physics who has done some programming but does not have extensive experience in it — consider hiring on a temp-to-become-permanent basis.

- Place far less emphasis on grades and prestige of institution when hiring new college graduates to fill programming positions. Grades are affected by too many factors unrelated to the programming talent, such as the need for some students to work part-time (in many cases even full-time) while in school. And though there is some correlation between prestige of institution and a student's potential as a worker, that correlation is far from perfect, and every school has a number of students who would make fine programmers.

- Greatly expand college internship programs. Observing a student "in action" is a far better way to assess his/her potential as a permanent worker than is scrutiny of his/her grades. Furthermore, the internships should involve at least some "real" programming work, not just something like software testing.

12.4   What Recruiters Should Do

- Recruiters should help convince employers not to hire on the basis of skill sets. As an incentive, a recruiter might offer to take a reduced commission if an employer hires a programmer who is very

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[63] A very good phone interview technique is the "PhD oral exam" approach: Ask the applicant about a topic he supposedly knows well, and then let him talk, interjecting some followup questions during his exposition. By probing in this manner, one can usually get a good assessment of whether he has any genuine insight on the topic.

bright but lacks the skill set specified by the employer. Once that programmer works out well, the employer will be more open-minded, and more amenable to hiring similar programmers recommended by this recruiter in the future (at full fee).

12.5   What Universities Should Do

Here is what universities should do:

- Strive toward making sure that every student works in at least one internship during his/her college career.

- Monitor the "outcomes" of the undergraduate curricula. Strive to determine the job status for every graduate three months after graduation — not only whether they are employed, but also what kind of work they are doing.

- On the one hand, continue to make sure curricula include "practical components," including both extensive programming assignments but also assignments which develop *practical* insight into computer infrastructures (computer architecture, operating systems, networks).

- On the other hand, resist the pressure from industry to offer courses in all possible software technologies (Visual BASIC, MFC, SAP, Oracle, etc., etc.). There are literally hundreds of these, and what satisfies one employer would be unacceptable to another, and it would be impossible to teach them all.

- Return research to its tradition role of scholarship, rather than its current role as a university "revenue enhancer." Scale back graduate programs to levels needed by industry and society.

12.6   What Current University Computer Science Students Should Do

It is absolutely crucial that current university computer science majors acquire internship experience during their college career. The situation has reached the point at which most HR Departments will automatically shunt a new college CS graduate into jobs in customer support or software testing, instead of programming, if he/she does not have internship experience. Note, by the way, that the internship also must be "real" work, writing code (fixing bugs is fine), not helping secretaries learn to use e-mail.

As explained in Section 6.2.7, when you graduate and look for a job, employers will definitely pay close attention to your grades. But that will only "get you in the door" for an interview. During the interview, what will really matter is your fundamental understanding of computer science concepts. So, when you are taking courses, remember that concepts should be learned for the long term, not just "temporary storage" for a final exam.

It may surprise you to know that when interviewing for a job, you probably will be given an informal test of your technical knowledge. You should be able to engage in an intelligent discussion of, for example, how an operating system manages user files, what a network socket is, and so on. Trying to do a "cram review" of all your coursework before an interview is obviously impossible; instead, the best way to prepare is to continually sift the concepts through your mind as you take the courses, keeping in mind the fact that you will need to know this material later on, not just for a final exam.

Another important factor in preparing for a career is the development of good verbal and written communication skills. In a job interview most employers equate verbal ability with intelligence. Talkative, outgoing applicants are more frequently hired than equally qualified passive, silent applicants.

12.7   What Programmers Should Do

As explained in Sec. 5.9, an experienced programmer CANNOT get a job using a new skill by taking a course in that skill; employers demand actual work experience. So, how can one deal with this Catch-22 situation?

The answer is, sad to say, that you should engage in frequent job-hopping. **Note that the timing is very delicate, with the windows of opportunity usually being very narrow, as seen below.**

Suppose you are currently using programming language X, but you see that X is beginning to go out of fashion, and a new language (or OS or platform, etc.) Y is just beginning to come on the scene. The term "just beginning" is crucial here; it means that Y is so new that there almost no one has work experience in it yet. At that point you should ask your current employer to assign you to a project which uses Y, and let you learn Y on the job. If your employer is not willing to do this, or does not have a project using Y, then find another employer who uses both X and Y, and thus who will be willing to hire you on the basis of your experience with X alone, since very few people have experience with Y yet.

Clearly, if you wait too long to make such a move, so that there are people with work experience in the skill, the move will be nearly impossible. As one analyst, Jay Whitehead humorously told ZD-TV Radio, if your skill shows up as a book in the *Dummies* series, that skill is no longer marketable.

What if you do not manage to time this process quite correctly? You will then likely be in a very tough situation if you need to find a new programming job, say if you get laid off. The best strategy is to utilize your social network, including former coworkers whom you might know only slightly — anyone who knows the quality of your work. Call them and say, "You know that I'm a good programmer, someone who really gets the job done. I can learn any skill quickly. Please pass my re'sume' to a hiring manager."

13   Author's Background and Further Reading

Dr. Norman Matloff is a professor of computer science at UC Davis, and was formerly a statistics professor at that institution. He is also a former software developer in Silicon Valley. For his bio, see http://heather.cs.ucdavis.edu/matloff.html

This document will be frequently updated; see

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