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Software and Internet Industry Workers: Implications for the Future of Work in Massachusetts

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Those at the leading edge of the new economy — workers in software and Internet workplaces — can tell us something about the future of work in our new world. The authors have conducted a National Science Foundation-funded study of women and men working in IT. They find that while pay and the opportunity to do interesting work are major attractions, challenges facing this workforce include stress, difficulties balancing work and family, and concerns about employment security. While women and men reported similar attitudes and experiences in many areas, in others there were still significant differences.

Workers in the information technology (IT) sector are on the cutting edge of changes in the nature and structure of work. They are often the first to experience new technologies, new work arrangements, and the volatility of an industry in constant flux. While relatively highly paid and highly educated, this workforce has experienced a series of challenges over recent decades, most recently the outsourcing of IT jobs to growing IT centers in other nations. Not only is this workforce important for its own sake because of its very substantial contribution to regional economic vitality; it can also foreshadow future trends in the nature and structure of work.

This industry and this workforce shape the work of people in other sectors to a remarkable extent. Just as machinists of the industrial era created the tools that workers in other manufacturing sectors used to perform their jobs, so today's IT workforce crafts the tools used by employees in all sectors in today's Information Age. Understanding the IT workforce is thus doubly important.

In the pages that follow, we review the findings of Project TechForce,* our study of women and men working in the software and Internet industry in Massachusetts. We focus particularly on three major issues for this workforce: work/family and flexibility; security; and work motivation and

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meaning. Employees report that longer than average work hours and lack of sleep coupled with high levels of stress for some can interfere with family and non-work activities; flexibility in work schedule and work location can help ease these stresses to some extent, but many employees are unable to take advantage of this sort of flexibility even when flextime and telecommuting programs are officially on the books. Security is important for these workers as for those in other industries, but in IT "employability" is the watchword, rather than the "job security" of the old economy, since frequent changes of job is the norm. Finally, pay is the most important motivator for women and men, but intrinsic motivators like the attractions of "puzzle solving" and the chance to do challenging work are also very significant.

All of these are important dimensions of work in IT, and they all have implications for the ability to recruit and retain future workers and thus for the shape of work in the future. In the final section of our paper, we spell out some implications of our research for recruitment and retention of IT workers and for the possibility of promoting collective action in this important segment of the workforce.

Methods

Our research used a multi-method approach combining survey, interview, and focus group approaches to data collection. Our World Wide Web–based survey was created with input from our research partner, the Massachusetts Software & Internet Council (MSIC), and from focus groups of Women In Technology International (WITI) members. We sent electronic mail to representatives of companies listed in the MSIC database of approximately 3,400 software and Internet companies, asking that they distribute the link for our survey-web page to their employees. We also distributed a link to the survey to the members of the Boston chapter of WITI, enabling us to over-sample women. We received 1,690 responses during the six weeks our survey was posted, beginning in late March and ending in early May 2002.

Beginning in May 2002 and continuing through the summer, we interviewed 100 women and 100 men using a semi-structured interview guide. Interviews lasted from one to two hours and were conducted at a location chosen by the interviewees, typically at their workplace, home, or a local coffee shop. The majority of interview participants were drawn from survey respondents who volunteered, and by snowball sampling from names suggested by interviewees.

When cross-tabulations of survey data were available from the survey firm that created the website and collected the responses, we met in focus groups with WITI members and members of the MSIC Board to discuss our findings, reviewing in particular any puzzling or seemingly contradictory results.

Survey respondents (see Table 1) were 40 percent female, with a median age of 40. Most — 87 percent — were U.S. citizens and only 13 percent identified themselves as racial minorities some of whom were citizens. Three-quarters of the men and more than half of the women (57 percent) identified themselves as holding technical jobs when asked about their job category. Nearly one-quarter hold a computer science degree.

Table 1. Selected Characteristics of Survey Respondents

Total No. of Respondents	**1690**
Gender (%)	
male	60
female	40
Median age	
men	40
women	39
Citizenship (%)	
U.S. Citizen	87
Green Card holder	5
Non-U.S. Citizen, temp visa	4
Other	4
Racial/Ethnic background (%)	
White/European	87
East/Southeast Asian	4
South Asian	3
Hispanic/Latino(a)/Chicano(a)	2
Black/African American	1
Other	3
Highest level of education (%)	
Doctorate	6
Masters	30
Bachelors	49
Less than Bachelors	15
Most commonly held technical degrees (%)	
Computer Science	25
Mathematics	13
Chemical Engineering	12
Information Science	9
Job category (%)	
Women	
Technical	57
Non-technical	43
Men	
Technical	77
Non-technical	23

Work/Family and Flexibility

An idealized picture of new economy workplaces suggests that the flexibility they offer to professional employees eases the challenges of balancing work-family demands. In fact, our Project TechForce data document a much more complex picture, highlighting the struggles facing both men and women software and Internet industry workers as they wrestle with meeting responsibilities at their workplaces and at home.

An important factor in an employee's ability to meet commitments to family as well as to work is hours of work. Almost all of our respondents, 96 percent, worked full-time (among the few who work part-time, two-thirds are women). Fifty-six percent report working between 41 and 50 hours per week, and another 25 percent report putting in 51 to 70 hours per week, with a small percentage working even more hours. Men were more likely than women to say they work over 50 hours, and were slightly more likely to be among the 12 percent of respondents who reported other sources of employment in addition to their primary job.

In view of many employees' reports that they work long hours, it is not surprising that over half the respondents wished that they worked fewer hours. Women (32 percent) were more likely than men (27 percent) to state that working too many hours was one of three top reasons that they would leave the software and Internet field. Getting enough sleep was also a problem for over half of the respondents. Two-thirds of respondents, both male and female, reported often working during what are supposed to be family or after work hours. Overall, three out of four workers reported having a lot of stress in their lives, again with women (78 percent) reporting this somewhat more frequently than men (71 percent). Taken together, these responses suggest a workforce under significant pressure, with employee wellbeing and family life a casualty.

Ideally, employers' family-friendly policies and the opportunity to telecommute could ease the burdens of this fast-paced industry. The reality reported by survey respondents did not fit the ideal. While 70 percent of firms offer personal days and half offered unpaid family leave, only 30 percent offer paid leave and less than two percent have on site day care. And even when family-friendly policies are on the books, well over half of the respondents report that their employers do not encourage them to use these options.

The telecommuting story has a similar picture. While over two-thirds of respondents report that their companies have a policy of permitting telecommuting, only one-third of the respondents in those companies telecommute despite the fact that two-thirds of this group say that telecommuting provides a satisfying work experience. Of those whose companies do not allow telecommuting, a strong 70 percent of respondents,

both women and men, say that they would like to telecommute. Furthermore, three quarters of respondents say that their place of work is solely or primarily the employer's premises, but only a minority (47 percent) prefer this arrangement (see Table 2). Telecommuting offers the chance to better integrate work and family by offering more flexibility, but it also contributes to the blurring of boundaries between work and family about which some interviewees complained.

Table 2. Telecommuting among survey respondents

My company enables employees to telecommute		
Yes		68%
I currently telecommute	33%	
I find telecommuting provides a satisfying work experience	68%	
No		32%
I would like to telecommute	69%	

Earlier studies have indicated that those on the top of the organization were most likely to telecommute[1] but data from our Project TechForce interviews suggest that workers in the middle tier were most apt to have this option. Employees in the lower echelons of the organization were more likely to be tied to their workplaces; for example, one network engineer we interviewed started his day at home over coffee reading his email, but then had to drive to the office where the network he was working on was located, in order to install, upgrade, or troubleshoot. Those at the top of the hierarchy were managers (often with a technical background) who spent significant time in meetings, and who also felt it important to be physically present on site in order to oversee, confer, and set an example to other employees.

For both men and women, having a work schedule that allows time to spend with family was reported to be important (91 percent), although slightly more women than men "strongly agreed" that such a work schedule was important. Interestingly, the age group most likely to agree was those 55 years of age and older, suggesting that for them, smelling the flowers had become particularly important. The age group second most likely to agree were the 25 to 34 year-olds, who were the most likely to have young children. When asked whether, since September 11, 2001, they had spent more time with family, nearly half the women answered "yes" compared with less than one-third of the men.

One of our most surprising and disturbing findings was that, overall, well over half of women (56 percent) had no children or stepchildren (of any age — we did not confine our question only to those children still living at

home). Thirty-five percent of men had no children. Oddly, in the 25- to 34-year-old group, one-quarter of all were childless, while the percentage jumps to a whopping three-quarters in the 35- to 44-year-old group. More than one-third of those 55 and older, who have had the longest time to acquire children or stepchildren, remained childless (see Table 3).

Table 3. Children and stepchildren among survey respondents, by gender and age

Percentage of men and women with no children or stepchildren	
Women	56%
Men	35%
Percentage with no children, by age	
18-24	93%
25-34	24%
35-44	74%
45-54	12%
55 and up	35%

We can only speculate about why a minority of women, and a minority of both genders in some age groups, have children. The stresses of working life enumerated above may contribute to the decision not to have children. Engagement with work and a sense that work life would be hampered by children may also contribute. In interviews, many women expressed the opinion that being a mother was far more important than simply being female in limiting their work options and opportunities for advancement. While we saw many different strategies used by mothers to accommodate both a career and children, every strategy seemed to involve significant stresses and compromises.

Security

One of the most striking differences between the old economy and the new is that in this part of the new economy, the software and Internet sector, "job security" is not expected, and may not even be desired. Instead, "employment security" or "employability" are the important concepts. The age group that had switched employers most often in the last ten years was the 35- to 44-year-olds, of whom 57 percent had switched employers at least twice. The rate was lower among other age groups, with about half of all respondents saying they had changed employer two to four times in the preceding decade. About two-thirds of Project TechForce employees have been with their current employer for less than five years and fifteen percent have been attached for less than a year. This understates the rate of job hopping, however, as changes of job within a company are common and expected.

Seventy one percent of women and two-thirds of men felt their job was very or somewhat secure, but only 13 percent of men and 17 percent of women thought it "very secure." Forty-five- to 54-year-olds were the most pessimistic age group, with 46 percent thinking that their jobs were either somewhat insecure or not at all secure. A larger percentage of all respondents, however, were optimistic about their continued employment in the industry, with 76 percent of women and 80 percent of men believing that their employment was very or somewhat secure.

Changes of employer sometimes take place even when an employee stays put — nearly half of respondents report that at some time during their career, their company was acquired by another firm. A case study of 3Com corporation2 shows extreme volatility, particularly during the 1990s when multiple changes included mergers and acquisitions, replacement of top management, downsizing, and outsourcing initiatives. Changes of work contract for employees are also not uncommon; nearly a quarter reported changing from permanent to contract work and fifteen percent reported a reduction of working hours. All in all, an employee's experience in the software and Internet industry can be one of rapid and significant change.

One traditional source of security in technical professions is a technical degree. Nearly one-quarter of respondents report having a computer science (CS) degree, and 13 percent have a degree in mathematics. Chemical engineering is the third most commonly reported degree (see Table 1). The software and Internet industry is distinct from some other technology-intensive industries such as biotechnology in that a technical degree is not a requirement for significant participation in the professional ranks. It is interesting to speculate whether those hired without CS degrees in past decades would be hired today, now that there are more CS degree holders in the labor force. A look at the data by age, however, is puzzling, because the largest proportions of CS degree holders are at the two extremes of the age spectrum: 18- to 24-year-olds, one-third of whom have degrees, and those 55 and older, 31 percent of whom have degrees. Only 8 percent of 45- to 54-year-olds have CS degrees (see Table 4). This may reflect the existence of different "eras" in the life of the industry, when hiring was relatively more, or less, open to those without degrees; it may indicate that older workers have gone back to school in order to continue in the industry; or it might show that those with the commitment necessary to get a CS degree are also those most likely to remain in the industry until retirement.

Degree or no degree, skills are a very important source of employment security in the industry. Skills may be obtained on the job, through self-study, or through formal education or training. One-quarter of men and 18 percent of women strongly agreed that they have up-to-date technical (programming or other) skills. (The gender difference could simply reflect the fact that men are more likely than women to be in technical positions,

and men are far more likely than women to be programmers.) Most — 81 percent — agree that "I worry about keeping my skills current," with 41 percent strongly agreeing. The concern expressed underscores the importance of skills to employability, and the worry caused by the prospect of falling behind. Nevertheless, 39 percent of respondents strongly agree that "I consider myself very 'marketable' or employable," and half agree somewhat (see Table 5).

Table 4.
Degrees held by survey respondents, by degree and age

Age	*Computer Science*	*Mathematics*	*Chemical Engineering*	*Information Science*
18-24	33%	11%	4%	7%
25-34	22%	20%	9%	8%
35-44	19%	9%	12%	9%
45-54	8%	26%	12%	3%
55 and up	31%	9%	13%	12%

Table 5.
Survey responses to skills questions, by gender

	Strongly agree	*Somewhat agree*	*Somewhat disagree*	*Strongly disagree*	*Not applicable*
I worry about keeping my skills current					
Men	43%	40%	10%	6%	1%
Women	39%	40%	12%	9%	1%
I have up to date technical (programming or other) skills					
Men	25%	47%	19%	6%	4%
Women	18%	39%	27%	7%	9%
I consider myself very "marketable" or employable					
Men	40%	48%	10%	1%	0
Women	37%	53%	9%	1%	0

Professional and social networks can also be a source of employment security. When we asked men and women survey respondents which of a list of strategies had been most helpful when they search for new work, "friends" was the most popular selection, mentioned by 56 percent of both men and women. All other methods — Internet job postings, classified ads, employment agencies, and others — were more frequently mentioned by women than by men, suggesting that women cast a wider net in their job

searches than men in this industry. About half of all respondents are members of formal and/or informal professional associations or networks. An example of an informal network cited by some interviewees as important in seeking new work — or in hiring new employees — was a network of "alumni" of particular large or medium size companies, including defunct companies (the Data General "Grey Eagles" or the "Interleft" listserver maintained by those who worked at Interleaf). E-mail listservers allow former employees to keep in touch for both social and business purposes. One listserver we heard about supported political debate, free classified ads, and job postings.

While most employees in the industry seemed to be in relatively solid financial positions, a minority are clearly in distress. Seven percent of men, and half that percentage of women, say they do not earn enough to pay all the bills, let alone save for the future. The same percentage of survey respondents report having a spouse or partner who is not employed and who is looking for work. Forty-four percent report having had an involuntary job loss, although our survey, because it is for the most part a survey of those still employed in Spring 2002 after industry employment had peaked, likely understates the extent of involuntary job loss. Two-fifths of those with involuntary job loss did not get a severance package.

Work Motivation and Meaning

Software and Internet employees, like other groups of workers, exhibit both extrinsic and intrinsic motivations in their attitudes toward their work. On the extrinsic side — work as a means to an end, not as an end in itself — our survey respondents listed good pay most often as one of the top three reasons they would remain in the software/Internet field. Indeed, three-quarters of both men and women specified good pay as a top consideration. Furthermore, among men, the top reason why they would leave the field was also "better pay elsewhere" (see Tables 6 and 7). Nearly 80 percent of respondents reported being the primary income earners in their households — among men, the proportion was 89 percent, and although women trailed men at only 63 percent, this still means that nearly two-thirds of women are their household's primary earner (because 61 percent of our respondents report either being married or living with a partner, this number cannot only reflect women living alone.)

More than half of our sample — 56 percent — reported to us an individual pre-tax income in 2001 of more than $75,000, with 10 percent reporting over $150,000. Men were two and a half times more likely than women to be in this top decile. Further, an overwhelming 94 percent of survey respondents indicated that their family earns "enough to be comfortable and to save for the future." These self-reported income data suggest that workers in the software and Internet industry are among the better

paid in the Commonwealth of Massachusetts, where per capita money income was $25,952 in 1999 (US Census Bureau, 2005). On the basis of pay alone, this industry is very attractive to potential employees, and there are indications in some of our data that a significant proportion of the workforce was drawn into the industry during times of rapid growth and high pay, lured not by an intrinsic interest in the work but by the availability of jobs that paid well.

Table 6. Top three reasons why survey respondents would remain in the software/Internet field

	M (%)	F (%)	Total (%)
Good pay	74.3	73.7	74.1
Exciting or challenging work	57.0	50.3	54.4
Always opportunities to learn something new	42.3	49.9	45.3
Opportunities to use my skills	48.7	39.1	45.0
Favorable work environment or workplace culture	16.8	22.3	18.9
Scheduling flexibility	14.2	18.8	16.1
My colleagues	10.3	10.9	10.5
Benefits and/or stock options	9.2	8.9	9.0
Opportunity to travel	7.0	7.8	7.3
Promotion opportunities	5.0	4.3	4.7
Other	2.5	0.6	1.8

Table 7. Top three reasons survey respondents would leave the software/Internet field

	M (%)	F (%)	Total (%)
Laid off/involuntary departure	34.9	39.8	36.7
Better pay elsewhere	36.6	27.8	33.0
Too many hours of work	26.5	31.5	28.4
Work is boring or lacks challenge	26.6	24.6	25.9
Unfavorable work environment or workplace culture	22.2	25.1	23.3
Stressful industry	19.3	22.2	20.5
Lack of promotion opportunities	17.9	19.7	18.7
Retirement	20.3	12.0	17.0
Poor match with my value system	12.9	16.3	14.3
Too much required travel	15.1	10.7	13.9
Limited opportunities to use my skills	13.9	11.8	13.2
Limited opportunities to learn something new	12.0	12.6	12.3
Too little scheduling flexibility	6.9	13.4	9.5
Return to school	8.1	9.3	8.6
Other	5.3	6.2	5.7

We see interesting evidence that many in this industry, including those in technical jobs, did not see themselves headed for technology careers early in their lives. We asked survey respondents whether they agreed that "when graduating high school, I considered a career in the technology field." Forty-one percent of men, but only 16 percent of women, considered it "very seriously," yielding one of the largest gender disparities in our survey. Even more striking, 53 percent of the women *who became technical employees* said they considered a career in technology "not seriously at all" (see Table 8). We can only speculate about the effect of this early lack of interest on the later careers of these women, but we also find it very hopeful to see that, contrary to today's conventional wisdom, women who do not catch the "technology bug" before high school graduation can still enter technical careers.

One would expect an age effect in the extent to which men and women considered technology careers at high school graduation, and that this gender discrepancy would narrow and perhaps disappear among younger workers, as the national consensus about encouraging women to enter technical fields grew. Interestingly, however, the 25- to 34-year-olds in our survey were by a wide margin (10 percent or more) least likely of any age group to agree that they had considered a technology career seriously when graduating high school (see Table 8). The fact that this age cohort ended up in a technology-based industry could reflect high demand during their college and early professional years, and/or the success of programs to recruit young women to technical careers. These workers, typified by an interviewee who said, "I never thought I would be in this field," were drawn into the industry, pulled by the presence of many well-paying jobs and pushed by the lack of similar opportunities in other fields. At times of high demand, IT employers have sometimes pursued a conscious strategy of hiring capable workers who were not planning to pursue computing, like the information systems manager at a large commercial bank in the mid-1980s who said that she sought out bright graduates from "starvation majors" and trained them to be information systems professionals.[3]

There is ample evidence of the intrinsic appeal of this work to those employed in the industry. The most popular reasons for staying in the industry, other than good pay, were "exciting or challenging work," "always opportunities to learn something new," and "opportunities to use my skills." (See Tables 6 and 7.) While all three of these responses have different nuances, they all point to an industry that offers stimulating work and opportunities to learn for many. Collectively, both men and women had these same four choices (including good pay) at the top of their lists, while factors such as "benefits and/or stock options," "opportunities to travel," and "promotion opportunities" ranked lowest. Clearly, the content of the work they do is second only to pay as a motivator for this workforce, and when taken collectively, challenging work, a chance to learn something

new, and a chance to use skills swamp even good pay as reasons for remaining in the industry.[4]

Table 8. Survey respondents' intentions to pursue a technology career on high school graduation, by gender and age

When graduating high school, I considered a career in the technology field.

	Very seriously	*Somewhat seriously*	*Not very seriously*	*Not at all seriously*
Gender				
Men	41%	16%	16%	21%
Women	16%	12%	18%	43%
Age				
18-24	26%	19%	24%	24%
25-34	24%	9%	18%	39%
35-44	33%	17%	17%	28%
45-54	36%	14%	9%	26%
55 and up	33%	16%	18%	27%

When we conducted our two hundred follow-up interviews, we were struck by the number of interviewees who mentioned "puzzle solving" as an important attraction of their work. One interviewee said, "It's like getting paid to do the crossword puzzle." For some, IT work was an intellectual challenge, but one detached from the "real world" of social and business significance. For others, puzzles were seen as real-world problems whose solutions could benefit the business community or society as a whole. The interest this group had in solving puzzles, and the ability to see their work as a puzzle, was one of the most striking findings to emerge from our interviews.

In his book, *Why Work?* Michael Maccoby writes about the transition in the workforce from the dominance of "organization" men to a newer generation whom he calls "self-developers." Self-developers have no expectation of lifetime employment within a large bureaucracy, but derive their satisfaction and security from taking a variety of roles that utilize and enhance their skills. "Brought up in an environment of change, they have learned to adapt to new people and situations, and to trust their own abilities rather than parents or institutions. They value independence, and they accept responsibility for themselves."[5] Lazonick likewise describes the New Economy Business Model as "the end of organization man."[6]

The motivation to help others was expressed by a number of our interviewees, but did not seem to be deeply entwined with their self-perception as workers in the software and Internet industry. When asked about some factors that might have been important to them in choosing a career,

survey respondents rated "having a good relationship with co-workers" (which was very important to two-thirds of men and three-quarters of women) above "earning a high salary," and both of these rated higher than "doing work that makes a difference to my community or to society," which was very important to 29 percent of men and 33 percent of women. In interviews, many respondents, particularly women, contrasted themselves to friends or family members in the health care and teaching fields, whose work they felt made far more difference. Older male interviewees were the most optimistic about the social contribution made by their work.

The Future of Work

In this paper, we have focused on work at the leading edge of the new economy, as it is perceived by those on the front lines: workers in software and Internet workplaces. We have looked primarily at results from the survey responses of the 1,690 employees of Massachusetts software and Internet companies who participated in our survey. Before closing, however, we want to bring in the voices of a few of the 200 people whom we interviewed about their experiences working in the industry.

We asked our interviewees what advice they would give to someone considering a job in the software and Internet industry. Most couched their answer in the context of the times — recall that we were conducting our interviews during the summer of 2002, when significant layoffs, business failures, downsizing, and consolidation had already begun and would continue. Those we interviewed noted the industry's decline and said they did not believe that there would ever be a return to the red-hot market of the late 1990s, but all agreed that the industry would survive. Some even welcomed the retreat from the "irrational exuberance" of the pervious few years, and said that the industry was undergoing a much-needed shakeout of weak companies. Yet their advice to new entrants to the industry was framed by an awareness that the boom days were over.

Many, in their advice, pointed to the flux and insecurity characteristic of work in the industry. With comments like "be prepared for a lot of change" and "if you are looking for stability, it's not for you," and "have a Plan B," they cautioned that it takes a particular temperament to survive and thrive in such an environment. This was reinforced in our survey, where 85 percent of respondents agreed that "I am comfortable dealing with constant change." Many advised that prospective employees examine their motivation for entering the industry, and suggested that those who were mainly interested in the perceived high incomes should look elsewhere. "Be sure you like this kind of work" was a sentiment expressed by several. "You can't just be in it for the money." Their sentiments reflected the importance of having an intrinsic interest in the work, to offset the very real stresses,

and to carry one through the leaner times. "If you want a guaranteed job, be a nurse," said one.

Other advice focused on the importance of continuous learning as a survival strategy. In many jobs, having a current skill set is essential, and workers must use numerous strategies to avoid obsolescence. Working on cutting-edge projects and learning on the job are primary strategies, but self-directed study is also important, as is seeking employment with companies using high-demand technology. One interviewee suggested that staying current on technologies valuable to all employers was important, while others suggested carving out a distinctive specialty. Overall, developing some breadth in technology, combined with depth in a specific area, seemed to be the consensus advice.

Finally, prospective employees were advised to vet their employers carefully, to be sure there was a fit in culture and management style. Acknowledging that not all companies are well managed, one interviewee said, "Have 'screw you' money [put aside] so you don't have to stay in a bad job."

Implications for Recruitment and Retention

Because this industry and IT work in general have been so important to economic growth and productivity, it has been a matter of concern to U.S. policymakers and employers to understand how to recruit, retain, and motivate this workforce. Implications from our study include:

- Enable employees to work and have a life. Our survey and interview results show that the pressures of long work hours, job insecurity, and high stress are not fully offset by the opportunity to have challenging work and a modicum of schedule flexibility. Policies — both employer policies and public policy — that support the ability to care for oneself, for the next generation, and for others in need will significantly increase the sustainability of work in this industry.

- Enhance employee security. Measures to enhance job security in the industry may well be counterproductive — employment security, not job security, is the goal of employees, and the churning of the labor market is often a positive force for the development of firms, as employees share knowledge and skills, and as resources are redeployed to new and promising areas. But a basic level of employment security, achieved by enhancing employee skills and by cushioning through policy the effects of layoffs and business failures, would help to attract and retain talented workers.

- Nurture intrinsic motivation. As advice from interviewees shows, those with an intrinsic interest in IT work are more likely to survive and

thrive in the industry. Encouraging an interest in "puzzle solving" in young people, as well as in incumbent employees, can help to promote attachment to the industry, as long as work content continues to use these skills. For example, "puzzle clubs" in middle and high school, not just computer clubs, might bring in talented young people. Also, emphasizing the importance of the human purposes technology serves, and not just the appeal of technology for its own sake, can help to motivate workers, particularly those presently underrepresented in the workforce.[7]

· Understand the U.S. niche. The U.S. technology workforce has encountered a series of threats over the decades, most recently the trend toward outsourcing of software production. In the late 1990s, the apparent threats included the large increase in temporary workers from abroad holding H1b visas. It is beyond our scope to address the prospects for survival of the industry in the United States, but clearly a technology policy that recognizes and supports the particular capabilities of the industry in the United States will help to address the macro issues of industry sustainability.

Implications for Organizing

Although some attempts have been made by labor organizations to organize this workforce, software and Internet employees do not fit the mold of organized labor in a number of ways. Our research suggests some avenues for approaching software and Internet workers, and IT workers in general.

· Respect the indigenous culture. The ethos of some software and Internet workers reflects computer culture in general — anti-authority, sometimes libertarian, independent. In our survey, this is reflected by the fact that technical employees are less likely than non-technical employees to say that they fit well into the company culture — even though the company is technically focused. Any attempt to organize this workforce must respect the tendency of some to take the Groucho Marx position: "I don't want to belong to any club that will accept me as a member."

· Understand the importance of employee networks. Despite the attitudes of some toward memberships in general, networks are important to software and Internet employees. They may be formal networks, such as the professional associations, or informal, such as groups of former employees of companies. In between are a host of groups like WITI and various user groups devoted to particular products or technologies. Our survey and interview results demonstrate the importance of these networks; for organizers they present an opportunity to reach industry employees and to take the pulse of the workforce.

· Address work/life issues. Outside organizations, including labor organizations, could help employees in their attempts to work and have a life. Measures to support working families in this industry, and to enhance economic security by providing continuity in various aspects of life, including health care, elder and child care, benefits, and community stability, could have significant appeal to workers on the cutting edge — and sometimes on the bleeding edge — of the new economy.

Notes

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