



2002 IEEE-USA UNEMPLOYMENT SURVEY: THE RESULTS

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August 2002

The IEEE-USA Employment & Career Services Committee continued its interest in developing a better understanding of the problem of unemployment among older engineers by conducting a survey of unemployed engineers. The first survey was conducted in 1995, with replications in 1996 and 1998. In 2002, The IEEE-USA Employment & Career Services Committee, joined forces with the IEEE-USA Workforce Committee and the IEEE-USA PACE Network to commission the same study. The survey was replicated by mailing virtually the same survey instruments used in 1995, 1996 and 1998 to all 2,955 U.S. IEEE members who reported being unemployed at some time during the 2001-02 membership year, and who consequently paid dues at a reduced rate. There were 758 surveys returned, resulting in a 26% response rate, comparable to the 26% response rate garnered in 1998, and the 28% in 1995, but better than the 14% response rate in 1996.

This report of results is organized in four sections. The first section reports the percentage distribution, or mean response, for each of the questions in the survey. The second reports the results of selected cross tabulations that focus on age and various aspects of employment status. The third reports the results of a multivariate analysis that focuses on the impact of age on the duration of unemployment, when other factors are held constant. And the final section compares some of the current results to those in 1995, 1996 and 1998.

Survey Responses

Respondents were asked to describe their current employment status. The modal respondents (54%) responded that they were involuntarily unemployed. About 24% had been re-employed full-time as a technical professional. A total of 18 respondents were employed in a non-technical profession (2%), employed part-time (3%), or self-employed (6%). Some 6% reported voluntary unemployment; 2% said they were retired voluntarily; and 4% said they were retired involuntarily.

Respondents were next asked their industry of employment. A total of 9% of respondents worked in the aerospace or defense industry (4% and 5%, respectively). A total of 14% worked in electrical/engineering services or manufacturing; 23% worked in the computer industry (hardware or software); and 28% were employed in the communications industry. Among the other listed fields (automotive, consulting, education, medical, petrochemicals, transportation, and utilities), no single field garnered more than 8% of respondents. Some 8% could not list their field from the selections they were given. The mean number of engineers in respondents' firms was 669, but the distribution is skewed toward smaller firms, since the median response is 60 engineers. The size of firms ranged from 1 to 40,000 engineers.

Modal respondents are not dependent on government contracts. The responses indicate that 55% of jobs are not dependent on government at all, but 30% were somewhat or very little dependent on government funding. Fifteen percent (15%) were primarily or totally dependent on government appropriations.

Those respondents laid off were asked what reason the company gave for the layoff. The most common response was a business downturn (76%). Twenty-four percent (24%) listed merger, efficiency improvement, transfer of work, or plant/office obsolescence as the reason given for their layoff. Fifty-seven percent (57%) reported that the layoffs were across-the-board rather than being targeted at specific functions or units.

All respondents were asked whether they wanted to remain in their primary area of technical competence, and 78% did. Twenty-two percent (22%) wanted to move out of their primary area of competency.

Most respondents (65%) do not contemplate more schooling, but 26% consider returning to school part-time, and 9% consider returning full-time. Thirty-six percent (36%) consider leaving engineering entirely.

The duration of unemployment varies widely among the respondents, from a low of 0 weeks to a high of 936 weeks (or about 18 years). The mean is 49 weeks – while the median is somewhat less, at 38 weeks – reflecting a skewed distribution in which a few respondents report exceedingly long spells of unemployment (e.g., more than 300 weeks). Some of these respondents may not be actively looking for work.

Respondents were asked what services their employer provided when they left. Respondents could check more than one service, and many did. Severance was provided in 90% of cases, and extended benefits in 48% of cases. Outplacement help was provided to 56% of respondents, and retraining was offered to only 5% of respondents.

Respondents were asked to describe their employment search and the results. Two-thirds (66%) agreed that it was very difficult to find a new job; only 3% said that it was fairly easy to find a new job. Less than 8% reported that an offer fell into their laps;

(4%), that they found a great job (7%), or even an adequate job (7%); or that they anticipated a raise (1%). Nearly one-fourth (24%) anticipates a pay cut.

About one-third (36%) would recommend engineering to their son or daughter; 35% are not sure; and 30% would not recommend it at all.

Almost half (44%) report being aware of IEEE-USA's employment assistance services.

Respondents were asked to rank on a nine-point scale the job search techniques that worked best for them. Comparing the job search techniques in terms of whether the response was ranked in the top three: fifty-seven percent (57%) of respondents rated networking as especially helpful; 34% found Internet job listings beneficial; 29% said that ads were helpful; 28% found headhunters useful; and 25% found that sending out resumes was useful. Twenty percent (20%) found that going to job fairs, outplacement services, and private consultants are job search techniques that worked well for them.

Respondents were asked what they saw as major personal barriers to their employment or re-employment. National economic conditions was the most common response: 65% of respondents listed this as a barrier. Age was the second most common response: 64% of respondents listed this as a barrier. Area of technical competence was listed by 41% of respondents; geographic preferences were noted as a personal barrier by 38% of the respondents; and 8% cited the downturn in government spending as a personal barrier. Ethnicity was noted by 13% of respondents. Education was cited by 11% of the respondents; sex was listed by 10% of the respondents; and disability was listed by 3% of the respondents.

Respondents were asked their view of the long-term demand for engineers. Only a minority are extreme optimists or pessimists. Some 10% saw the future as excellent, while 13% saw it as poor. In the middle, modal respondents (45%) saw the outlook as good, and about a third (33%) saw the outlook as fair.

As a follow-up to this question, respondents were asked the following open-ended question: what should the IEEE-USA be doing to help (if anything)? Slightly more than half of the respondents (53%) answered this question. The answers were coded into the same general categories that were used in the previous (1995 and 1998) surveys. The largest percentages of responses fell into one of two categories. One group (28%) said that IEEE-USA should provide networking help, augment its job banks, and provide more specialized information about jobs, etc. The second group (also 28%) urged the IEEE-USA to do something to restrict the supply of engineers. Of this 28%, most wanted the IEEE-USA to take steps to get Congress to reduce H-1B visas; many wanted the IEEE-USA to restrict entry by licensing or certifying engineers. (The percentages in each of these groups, were twice the corresponding percentages as in 1998.)

The next largest group of respondents in 2002 urged IEEE-USA to provide more training or technical information to members (10%). Or, they stated that they felt there was little that IEEE-USA could do, or they had no idea what IEEE-USA could do about the future of engineering (11%). Some 6% urged the IEEE-USA to improve the image of engineers, or to do other things to increase the demand for engineers (e.g., lobby for increased investment in engineering-related technologies). Only 3% urged IEEE-USA to fight age discrimination, and only 3% complimented the IEEE-USA or urged the IEEE to keep up the good work.

Respondents were asked a series of questions about their personal characteristics and circumstances. Specifically, they were asked about their age, their years of professional and managerial experience, and about their education. They were also asked about the nature of the e-mail access they had via the Internet

The mean respondent is 47 years old, and the median respondent is 48; the youngest is 23 and the oldest is 68. The mean years of experience among the respondents is 22, and the median is also 22. The range is from 1 year of experience to 56 years.

The modal respondent has a BS in electrical engineering or other BS (72%). About 49% have an MA, MBA or similar Masters' degree and 14% have a PhD. In other words, the percent with more than a BS degree is less than the percent with a BS only.

Virtually all (99%) respondents report having some access to the Internet. For those with access, multiple responses were possible, so percentages will add to more than 100. Among these recently or currently unemployed engineers, most have access at home (91%); 30% have access at work. Nearly 70% have full access and less than 1% have email access alone.

Of the 758 respondents, 60% indicated that they would like the IEEE to send them its packet of information for unemployed members.

Age and the Survey Responses

A key concern of both the 1995 and the 1998 survey of unemployed engineers is the link between age and employment opportunities. In 1995 and 1998, it appeared that older engineers have significantly fewer re-employment opportunities than younger engineers. Similar patterns appear in 2002. The cross-tabulation results are below.

Consider the relation between age and employment status. The mean age of respondents who were re-employed as a non-engineer at the time they responded to the survey was the youngest among the respondents: 43 years. The next youngest groups were re-employed fulltime as an engineer (44 years) and unemployed voluntarily (44 years). The next older group was composed of those who were unemployed involuntarily (mean of 48 years old), or employed part-time (mean of 48 years old), or self-employed (mean of 49 years old). The two oldest groups were retired involuntarily (mean of 57 years old) and retired voluntarily (mean of 55 years old). These differences

are significant overall at less than the .0001 level.

A significant relation also exists between employment status and weeks of unemployment. The average number of weeks unemployed was 25 weeks for those re-employed full-time as an engineer; but, compared to the other groups, this time period was the shortest duration of unemployment. Those employed part time reported an average of 34 weeks of unemployment; and the self-employed have a mean of 40 weeks of unemployment. Those re-employed in non-engineering jobs report a mean of 60 weeks of unemployment. Among the unemployed, those who are voluntarily unemployed have an average of 59 weeks unemployment, while the involuntarily unemployed have an average of 53 weeks of unemployment. Retirees report an average of 179 unemployment weeks. These differences are significant overall at less than the .0001 level.

There is also a significant age difference between industries in which respondents were (or are) employed. The oldest engineers worked in the transportation industry (mean of 53 years), and the youngest worked in consulting, computers, defense, education, or electrical/electronic services (mean of 46 years). The overall age difference between industry groups is significant, at less than the .0001 level.

The duration of unemployment also varies by industry. Specifically, the longest duration of unemployment is among those who were employed in the aerospace industry, where the mean was 134 weeks of unemployment. The next longest duration was in the medical industry (mean of 73 weeks), closely followed by those who report employment in petrochemicals (mean of 58 weeks). Among other industries with more than 20 respondents, the results in descending order were: computers (mean of 51 weeks); defense (mean of 47 weeks); electrical/electronic manufacturing (mean of 46 weeks); education (mean of 43 weeks); and consulting (mean of 39 weeks). These differences are significant at less than the conventional .05 level.

Older engineers are not more likely to report that their job search is very difficult (or very easy) than younger engineers. Specifically, when asked whether the search was difficult, the mean age of those who chose that response is the same (47) as those who did not. Similarly, when asked if the search was easy, the mean age of those who said "yes" was 44, while the mean age of those who did not choose this response was 47. This difference is consistent with the expected re-employment problems for older engineers, but it is only marginally significant at conventional levels, probably because so few respondents report an easy search.

There also appears to be a relation between the reported difficulty or ease of the job search and duration of unemployment. The mean weeks of unemployment for those who report a very difficult search is 45; the mean for those who did not select this response option is 55 weeks. The difference is significant at close to conventional levels (less than 0.07). Among the few respondents who report that it was easy to find a new job, the duration of unemployment was 25 weeks, compared to 49 weeks for those who did not choose this response. This difference is only marginally significant (<0.11), again

because of the small number of respondents who report an easy search.

Respondents were asked to check whether or not they perceived various factors as barriers to their re-employment. We have already seen that national economic conditions and age were the most frequently selected among the nine possible barriers listed. More importantly, older engineers were significantly more likely to cite age as a barrier than younger engineers. Those who cited age as a barrier averaged 52 years, compared to a mean of 40 years for those who did not regard age as a barrier ($p < 0.0001$). Further, those who report age as a barrier face longer spells of unemployment (55 weeks) than those who do not (30 weeks). This difference is significant ($p < 0.0001$).

The younger respondents are slightly more likely to be optimistic about the long-term outlook for engineers than the older ones. Those who see an excellent outlook average 43 years. Those who see the outlook as good average 47 years; those who see the outlook as fair average 48 years; and those who see the long-term outlook as poor average 50 years. The differences are clearly significant ($p < 0.0001$).

In general, these patterns are consistent with the next finding: older respondents report significantly more weeks of unemployment than younger respondents. Specifically, for each additional year of age, unemployment goes up by 1.3 weeks ($p < 0.0001$).

Multivariate Analysis of Age and the Survey Responses

We have shown that age is correlated with the duration of unemployment. But correlation, which we have just seen, is not the same as causation. To make the possible causal connection more conclusive, we need to eliminate alternative explanations that rival age as a reason for unemployment. For example, perhaps the observed correlation between age and unemployment reflects the industry in which older engineers may be concentrated. Specifically, we showed that older engineers tend to work in the transportation and petrochemical industries. It is possible that the respondents' industry of former employment, and not the respondents' age, accounts for the relation between age and unemployment.

Multiple regression allows us to test whether the observed correlation between age and unemployment holds up when tested against this, and other, rival explanations – and the results show that it does. Using three different variations of multiple regression estimates, and with seven control variables, the impact of age on unemployment emerges even more strongly than it does with no controls. Now, for each additional year of age, unemployment rises by three weeks, and the estimate is consistently significant at well beyond conventional levels ($p < 0.001$).

The regression results also show that, independent of age, each additional year of experience helps to reduce unemployment by two weeks, and the impact is statistically significant. In other words, if we were to compare two engineers of the same age (say, 55) – and one had 30 years of experience, while another had 25 years of experience

(and they were comparable in all other respects, including education) – then the engineer with 5 more years of experience would have $2*5=10$ fewer weeks of unemployment than his 55 year old peer. On the other hand, if we were to compare two other engineers, both with 30 years of experience, and comparable in other respects such as education, (except that one is 55 and the other is 60), then the older engineer can be expected to endure $3*5=15$ more weeks of unemployment than his younger, but otherwise comparable peer.

The multiple regression also shows that having additional degrees has no significant positive or negative effect on duration of unemployment, when other variables are held constant.

Not surprisingly, retired and voluntarily unemployed engineers experience an average of 22 weeks longer unemployment spells than those who are in the active labor market ($p<0.002$).

Holding other variables constant, being employed in the aerospace industry contributes significantly ($p<0.04$) to the length of unemployment (44 weeks). Other industry sectors reduce the duration of unemployment. For example, employment in consulting reduces unemployment by 34 weeks ($p<0.05$); employment in communications reduces the duration of unemployment by 36 weeks ($p<0.03$); employment in electronic/electrical services reduces it by 43 weeks ($p<0.05$); employment in electronic/electrical manufacturing reduces it by 35 weeks ($p<0.05$). Employment in other sectors appears to have no significant effect one way or the other. Dependence on government funding, type of job search, and Internet access also have no significant direct impact on the duration of unemployment, when other factors are held constant.

Collectively, these seven factors significantly affect the duration of unemployment, but they explain little of its variation (only 14%). Clearly, there is a lot more to be learned about the causes of long unemployment spells among electrical and electronic engineers in the U.S. labor market; and about whether age or other factors, including technical skills that are not up-to-date in the external labor market given prevailing salaries, contribute to long spells of unemployment.

Selected Comparisons to 1995, 1996, and 1998 Survey Responses

There are some striking differences, and some striking similarities, among the 1995, 1996, 1998 and 2002 survey responses. Further, there is evidence that the situation for unemployed engineers has gotten both better and worse. (Testing the differences for statistical significance is beyond the scope of this basically descriptive exercise.) For example, with respect to the employment status of respondents to the four surveys: in 1995, 20% reported being re-employed full-time as an engineer; in 1996, 19% so reported; in 1998, 17% reported being re-employed full-time as an engineer, and the same statistic in 2002 was 24%. In 1995, 15% were employed part-time or self-employed; in 1996, 13% were employed part-time or self-employed; in 1998, 16% were employed part-time or self-employed, the corresponding percent in 2002 was 9%. In

1995, 48% were involuntarily unemployed; in 1996, 49% were involuntarily unemployed; in 1998, 46% were, and in 2002, 54% were.

A clear trend, however, emerges in the industry of former employment, as well as in characteristics related to the industry of employment. In 1995, 20% reported employment in defense, and 16% reported employment in aerospace; these industries were (and are) relatively dependent on government funds. In 1996, 11% were employed in defense, and 15% in aerospace. In 1998, with further cutbacks in aerospace, 11% report former employment in defense, but only 8% in aerospace. By 2002, 5% were employed in defense, and 4% in aerospace. Further, in 1995, 33% report that their former jobs did not depend at all on government funding; in 1996, 42% so report; in 1998, 40% reported no dependence on government funding, and in 2002 the corresponding percent was 55%. In a similar vein, in 1995, 30% reported jobs that were totally dependent on government funding; in 1996, 23% so report; in 1998, 24% reported these as former jobs; and the corresponding percent in 2002 was 10%. In 1995, 58% cited business downturn as the reason for their layoff; in 1996, the corresponding statistic was 46%; in 1998, only 31% cite this as a reason; but in 2002, 76% reported business downturn as the reason for their layoff.

The mean duration of unemployment is 49 weeks in 2002, which is considerably less than that reported in previous surveys. The mean duration was 103 weeks in 1998, 84 weeks in 1995 and 92 weeks in 1996. The median shows a similar drop in 2002. The 2002 median unemployment spell was 38 weeks, compared to a 1998 median of 65 weeks, 57 weeks in 1995, and a median reported as “between 52-78” in 1996. Consistent with this pattern, the percentage who report that it is “very difficult” to find a new job is somewhat less in 2002 (66%), than in 1998 (71%), 1996 (76%) or 1995 (85%). The long-term outlook for engineers remains as positive in 2002 as it was in 1998. Specifically, 45% view the outlook as “good” in 2002, compared to 47% in 1998, 25% in 1996, and 23% in 1995. There is clearly less pessimism in 2002, since just 13% view the outlook as poor in 2002, compared to 21% in 1998, 35% in 1995, and 37% in 1996.

A small part of the reduced unemployment duration in 2002 may be attributable to the decrease in the mean age of the respondents among the four surveys: the 1995 mean age was 51, compared to 52 in 1996, and 53 in 1998, but 47 in 2002.

E-mail access has become increasingly available. In 1995, 43% reported having e-mail; in 1996, 60% had Internet access. In 1998, only 12% reported no access to e-mail, which means that 88% did have some form of e-mail. By 2002, 69% reported full access to the Internet, and 99% had e-mail access.

The regression results show little change among the surveys in respect to the relation between age and unemployment, when other factors are held constant. The impact of age on the duration of unemployment remains important, and appears not to have changed much: in 2002 and 1998, each additional year results in three additional weeks of unemployment, compared to seven weeks in 1996 and five weeks in 1995.

In prior surveys, Internet access has a significant effect on duration of unemployment, even when other variables were held constant. It no longer does, undoubtedly because virtually all respondents have access.

Overall, age appears to have a persistent effect on the duration of unemployment, but it cannot be determined from these surveys whether that is attributable to productivity differences, price differences, the supply of engineers, age discrimination, or some other factor.

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