

Are Current Engineering Graduates in the US Being Treated as Commodities by Employers?

Russel C. Jones
World Expertise LLC
and
Bethany S. Oberst
James Madison University

Abstract

The employment scene for professionals of all sorts becomes more volatile with each decade. In engineering, graduates of past generations could reasonably look forward to a linear career trajectory characterized by upward mobility and advancement. A typical career back then might allow the graduate to move from strict technical work to creative design work, then on to technical management, and perhaps to general management – often within one firm. In contrast, today’s engineering graduate is being told that a typical work pattern will likely involve six or eight or more major job changes during the working lifetime. What is not being said is that such job changes will often be lateral moves, not career progressions. The hiring of engineering graduates by non-traditional employers, seeking their problem solving and analytical skills for resale to consulting clients, exacerbates the problem. This paper examines the causes of such changes in the engineering employment pattern, and offers suggestions for dealing with the troubling aspects of the current employment market place.

The problem as seen by the profession

Engineering publications, as well as the popular press, have been discussing the perils of the job scene for at least fifteen years. Bitter titles such as “The age of expendability”⁵, “Job security is an oxymoron”³, and “What happened to the great American job?”⁴ underscore the painful realization among experienced professionals that the world of engineering employment has changed in the recent past, and not for the better. What is new today is that the problem is seen as affecting many professions in the United States, and that some of the causes are linked with powerful international economic trends that cannot be countered easily.

Symptoms of the problem

Engineering school enrollments in the United States have been dropping for the past several years, and are down some twenty percent from their high points in the 1980's. Several elements have contributed to this decline. One factor is that engineering curricula have been increasingly seen by prospective students as very difficult and not very student friendly. Bright math and science oriented high school students often have found alternative paths to the employment market that are less demanding – such as computer science, integrated technology programs, and business programs. Another major factor is that the technology job market for engineering graduates has been far less attractive in recent years, compared with the hot market during the big growth years of the electronic and telecommunications fields.

The first of these factors, difficulty of the course of study in engineering, has been addressed somewhat effectively by many engineering schools. Having been criticized by several major reports a decade ago, the engineering curriculum has been modified at many schools to make it more attractive, effective, and student-friendly. Changes such as inversion of the curriculum to put some engineering subjects in the first two years, design projects throughout the curriculum often including the freshman year, diversity in math coverage to include probability/statistics and finite math, integration of math and science materials with the engineering curriculum, use of educational technology on the classroom, broadening of the subject matter to include non-technical courses, and teamwork opportunities have enhanced the undergraduate curriculum significantly at many schools. In many cases these changes were led by Coalitions of engineering schools funded by the National Science Foundation. These changes have not been universal across engineering education in the United States, however, and have not been sufficient to reverse the enrollment decline.

The second factor, less attractive job and career opportunities in technical fields, has led to more complex situations. Several fields other than technical careers have opened up for engineering graduates, as employers such as major international general consulting firms, Wall Street houses, and others have increasingly found the quantitative and problem solving skills of engineering graduates attractive in their markets. In recent years as many as forty percent of engineering graduates are reported to have taken such positions outside of the traditional technical career paths.

As a result of increased job choices and volatility, engineering graduates are being told by placement officers that they should expect to have as many as six or eight different jobs during their working years, due to instability in the technical marketplace. What may be unsaid is that such a succession of positions is likely to be characterized by periods of unemployment between them, and that new positions are likely to be lateral moves rather than the upward advancement of past generations. Further aggravating the situation is the irrational basis for job loss and unemployment. In many cases it appears that companies discard experienced engineers after a few years when their knowledge may not be as timely across the board as that of recent graduates, and replace them with recent engineering graduates at starting salary levels. Seniority and experience seem to count for little, and good work offers no protection in such a climate.

These changes have become the mantra for recent curriculum reform and caused tension within engineering education. The need to prepare engineering students to be flexible, versatile and entrepreneurial in order to survive in the current employment environment, when added on top of the need to continue to graduate students with high-level technical competencies, creates real dilemmas for engineering faculty charged with curriculum design and delivery.

The instability of employment for engineers as well as other professionals is a defining characteristic of the breakdown of the implied 'contract' between employees and employers. Current day employers seem to feel no compulsion to protect the positions of their skilled and experienced employees when quarterly indices are down, and employees seem to feel no allegiance to their companies, and if even a marginally better job offer comes along, they are inclined to jump ship. This instability in employment continuity appears to be equally true for engineers employed in traditional technical fields, as well as those employed by the broad consulting firms and other non-traditional employers.

Taken together, engineering appears less and less attractive as a career path for many qualified students.

The new face of job insecurity

A few decades ago, during the years of major defense system spending in the United States, the aerospace industry was characterized as an unstable job market for engineers. Major aerospace companies would compete for very large government contracts, and would build up technical staffs to prepare preliminary designs and to show readiness to carry out the work if selected as the prime contractor. Once a purchase decision was made by the procurement agency, the losing bidders would quickly shed the employees involved in preparing the losing bid. But the winning bidder, needing to staff up to carry out the contract, generally provided employment opportunities for such displaced technical personnel. In essence, the 'pool' of engineers in the aerospace industry in those years – particularly on the West coast of the US – had reasonably steady employment, albeit with a succession of companies.

That pattern of reasonable continuity of employment even in times of individual company downturns is not so prevalent today. Often the competition among technically oriented companies is international, and companies employing US engineers may find it expedient to move technical operations off shore after shedding US employees. One well known case in point is the situation with software engineers in India, where major US and international companies find it profitable to utilize software houses there – where talented software engineers are available in large numbers and at significantly lower salaries than in the US.

Thus there are several disturbing trends in the engineering job market. Employment instability that may lead to a succession of lower level jobs with periods of unemployment between them, the movement of technical jobs offshore by companies that

are pressed by the need to reduce costs due to competition, and a lack of mutual commitment between employer and employee.

Prospects for the future

Does the future hold even more deterioration of the career scene for engineering graduates, where they are treated as even more of a commodity than they are today?

The professional engineering community has fought long and hard over several decades to keep engineering services procurement from being determined through a lowest cost bid procedure, arguing that quality of the engineering work and the qualifications of the engineering firm should be placed above cost as primary selection criteria. In most government procurement work this approach has been preserved, through massive lobbying efforts, so that price is only one of the criteria for selection of engineering firms. Can this stance be preserved into the future, given trends in the technical industrial sector?

One can imagine an even more internationally competitive situation for engineering services procurement in the near future. Major companies or agencies may begin posting their engineering services needs on the Internet, seeking bids within specified technical and timing parameters, then making selections from bids submitted back electronically primarily on the basis of price. Such a process, readily facilitated by current Internet technology, could lead to even more instability in engineering employment in the US, and more migration of engineering jobs off shore. If such a vision of the future is disturbing, some solutions have been offered to remedy it, including Thomas L. Friedman's popular book, *The Lexus and the Olive Tree: Understanding Globalization*¹. Friedman suggests that a balance can be kept between allegiance to the Lexus ("...the drive for sustenance, improvement, prosperity and modernization . . .") and the olive tree, (" . . . everything that roots us, anchors us, identifies us and locates us in this world . . ."). This leads us to concrete strategies for establishing and maintaining that balance.

Suggested approaches

It appears that the issue of 'engineer as commodity' must be addressed directly, and soon, but who should lead the effort? Corporations and government agencies are unlikely to address it, given pressures for accountability and profit. Individual engineers or small groups of them are not able to make any impact. So it is up to the engineering professional societies – individually or as a group – to provide leadership.

One approach may be for professional societies to provide a "Good Practices Seal of Approval" to companies that treat their engineers well as professionals. Good practices would be defined, such as support for continuing education for all employees, even the most recent graduates; a good track record of retaining experienced engineers in the face of economic pressures; etc. Such a status could be granted on the basis of application by companies, demonstrating compliance with standards put forth by the professional society. The approval seal would be re-evaluated periodically. Lists of companies earning

the seal could be posted on the Internet, for the benefit of engineers – both recent graduates and experienced engineers – looking for positions. Such a seal of approval program could be mounted profession wide by the American Association of Engineering Societies, or separately by each of the major disciplinary societies. A more targeted seal of approval program for the benefit of recent engineering graduates entering the job market for the first time, focused on hiring processes, might be conducted by the American Society for Engineering Education.

Information on the recent histories of engineering employment, based on media reports, could be maintained on a website available to all engineers. *The Washington Post* has a regularly updated, cumulative listing of layoffs on their website, by sector and by company name. This sort of listing could serve as a baseline for local engineers looking for employment. What would be useful would be an indication of what proportion of those jobs were engineering positions. Patterns of both good and bad corporate treatment of engineers would become apparent.

Another strategy would be for top engineering employers to be singled out for awards of merit. The National Society of Professional Engineers currently conducts an annual award program in each of its divisions of professional engineers, and societies concerned with other areas of engineering employment could mount similar programs.

Conclusion

There are voices that are saying that long-term employment relationships are not dead, and that lifetime, secure jobs have not permanently disappeared, but that shifts in the corporate world in the 1990s have caused temporary shifts away from these traditional relationships. Economist David Neumark, quoted in an article called “Whither job security?”², argues this case effectively. But even he fails to make the case for corrections in these trends in a timeframe that is at all reassuring.

It is clear to the authors of this paper that employed engineers in the United States have no immunity among all the professions from treatment as a commodity in the job marketplace, even in our technology-driven society. The situation is serious enough that the engineering profession must address it, by positive measures such as awards for meritorious employment practices, or by negative measures, by setting up overt mechanisms to steer engineers away from companies which treat their employees in a non-professional way – hopefully getting their attention and helping them to change their ways on the basis of enlightened self interest. The major engineering societies in the United States are the only voices, which can effectively take on this task on behalf of the profession, and they should do it with deliberate speed.

BIBLIOGRAPHY

- 1) Friedman, Thomas J., The Lexus and the Olive Tree: Understanding Globalization, Anchor Books, New York NY, 2000.
 - 2) Wagner, Cynthia G., “Wither Job Security?”, *The Futurist*, v. 35 no. 5, (Sept/Oct 2001), p. 10-11
 - 3) Walesh, Stuart G., “Job Security is an Oxymoron”, *Civil Engineering*, ASCE, v. 67 no. 2, (February 1997), p. 62-63.
 - 4) Wilkenfeld, Morse J., “What Happened to the Great American Job?”, *Plastics Engineering*, v. 54 no. 8 (August '98), p. 77-8.
 - 5) Winner, Langdon, “The Age of Expendability”, *Technology Review*, v. 98, (Aug/Sept '95), p. 82
-

RUSSEL C. JONES

Russel C. Jones is a private consultant, working through World Expertise LLC to offer services in engineering education in the international arena. He previously served as Executive Director of the National Society of Professional Engineers. Prior to that, he had a long career in education: faculty member at MIT, department chair in civil engineering at Ohio State University, dean of engineering at University of Massachusetts, academic vice president at Boston University, and President at University of Delaware.

BETHANY S. OBERST

Bethany S. Oberst is Executive Director of International Education at James Madison University. She previously served as Vice President for Academic Affairs at James Madison University, Dean of the College of Arts and Letters at Southwest Missouri State University, Special Assistant to the President for Strategic Planning at University of Delaware, and Department Chair of Modern Languages at Cleveland State University.