Intersections of Engineering and Management:

What Do the Data Show?

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The opinions and findings in this paper are solely those of the authors and not necessarily those of the National Science Foundation.

The National Science Foundation's (NSF) Engineering Workforce Project is a set of studies to identify, examine, and describe important dynamics of the portion of the U.S. workforce that includes (1) engineering degree recipients at the baccalaureate or higher degree level, and (2) people in engineering occupations with and without engineering degrees. The Project addresses a wide range of topics, including those related to educational backgrounds, occupations, job activities, and mid-career training. (See Appendix A for more information on the Project, including data sources and how to order publications.) It will also examine changes in the profession of engineering in the latter half of this century.

This paper is based on Project analyses that examine a pervasive theme in engineering practice: the intersections of engineering and management. The relationship between engineering and management is discussed in three ways. First, the complete educational histories of persons with a degree in engineering—in terms of degrees obtained at the baccalaureate level or above—are discussed with emphasis on combinations of engineering and degrees in business or management. Second, patterns between different educational histories and movement into management occupations are described. Finally, the involvement of practicing engineers in management activities is estimated.¹

¹ Findings in this paper are based on interviews with 37,000 persons with at least a baccalaureate degree and at least one degree in engineering at the baccalaureate or higher level. Data throughout have been weighted to national population estimates as of the appropriate reference date, i.e., April 1993 or April 1995, depending on which survey year is being discussed.

In NSF's coding of occupations, senior managers—i.e., managers of managers—are coded as non-engineering occupations. Thus in this paper “engineers” and “managers” are discrete groups of employees. However, in the second section of this paper the authors present an estimate of “technical managers” with educational backgrounds in engineering and jobs that require technical backgrounds.

Educational Histories

The first intersection between engineering and management that we examine occurs when the recipient of one or more engineering degrees at the baccalaureate level or higher also earns a degree in business or management².

As shown in Table 1, most persons—about 63 percent—with an engineering degree have only the baccalaureate. A full four/fifths of the 2.6 million engineering degree earners have only engineering degrees.

Table 1 Degree Combinations of Persons with Engineering Degrees	
<u>Engineering only</u>	2,090,405
BS is highest degree	1,631,686
Master's is highest degree	383,166
Ph.D. is highest degree	75,338
Other professional is highest degree	215
<u>Engineering and non-Engineering</u>	472,442
Engineering and business	210,509
Engineering and science	150,305
Engineering and other	111,628
Total:	2,562,847
Note: Combinations do not imply degree order. Table omits 33,629 engineering degrees that could not be classified into these groups.	

This section of the paper is concerned with the one-fifth who have added a non-engineering degree in their educational portfolios, especially those who have obtained a business degree. A close inspection of the educational histories of every respondent underlying the national estimates discussed in this paper revealed that for every imaginable combination of engineering with other degree fields, at least one of the 2.6 million persons had followed just such an educational pathway. Engineering degrees have been combined with degrees in divinity, fine arts, the humanities, and with all the fields of science. In order to study these persons as a group, the authors of this paper had to reduce the amount of data on degree histories to manageable proportions. The resulting groups of degree mixes are displayed in Table 1.

Over 98% of the all engineering degree recipients can be placed in one of four categories of degree combinations: Engineering Only, Engineering and Business (or Management), Engineering and Science, and Engineering and Other. (It is important to note that these labels begin with engineering, but *do not reflect actual degree order*. However, the last degree earned is shown in Table 2, discussed later in this section.) Within the categories,

² Throughout this paper management fields have been subsumed into the “business” category.

individuals may have taken multiple degrees at the same level in the same domain, e.g., two engineering bachelors degrees, or multiple degrees at successively higher levels, or even both. In no case did any of these people take degrees in reverse order – e.g., a masters after a doctorate.

A few very broad observations may be made from Table 1. Of the one-third or so of all engineering degree recipients who proceed beyond the baccalaureate, this group splits fairly evenly between (1) those who stay within the educational domain of engineering and earn a higher degree in engineering and (2) those who combine engineering with a degree outside of engineering (engineering is not necessarily first). Of the latter group, combinations of engineering with business degrees are more numerous than combinations involving engineering

and science and engineering and all other non-engineering fields.

When degree sequence is taken into account, further patterns emerge. For example, about a quarter of all engineering degree recipients whose last degree was at the masters level had received a business degree. As Figure 1 shows, 96 percent of these people most recently received an MBA or its equivalent, that is, the engineering degree was almost always followed by the business degree.³ The vast majority of engineering and business degree mixers stop at the master's level; very few receive a doctorate.⁴

Masters-level degree recipients with degrees in both engineering and business are aggressive degree-earners; close examination of their degree sequences reveals that 15 percent have multiple degrees at the same level. Often two masters degrees were earned, usually one in business and one in engineering, though double bachelors degrees also occur. The occupational outcomes related to these sequences are discussed in the following section.

³ "Most recent" and "last" degree are used synonymously, though further degrees may have been earned after the surveys were conducted.

⁴ Data not shown here indicate the same basic trend at the doctoral level, but engineering was last somewhat more frequently. Similarly, only 3% of all doctorate-earning engineering degree recipients had received a business degree. Keeping in mind that no one in this degree combination received degrees in a reverse order, those ending with a business degree necessarily received it at the doctoral level following one or more engineering degrees. Conversely, those with this combination whose last degree was an engineering doctorate most likely received a masters-level business degree before-hand.

Table 2
Degree Combination and Last Degree of All Employed Persons with a Bachelor's or Higher Degree
in Engineering, by Occupational Group, 1993¹

Degree combination Last degree	Occupational group				Total
	Engineers	Scientists	Managers	Other	
Engineering only					
Bachelor's in engineering	57%	4%	15%	25%	1,320,910
Master's in engineering	65%	5%	17%	13%	335,302
Doctorate in engineering	66%	7%	19%	9%	69,516
Engineering & science					
Bachelor's in engineering	68%	3%	11%	18%	16,744
Master's in engineering	56%	14%	16%	13%	41,345
Doctorate in engineering	52%	18%	20%	10%	11,692
Bachelor's in science	52%	14%	20%	14%	12,876
Master's in science	37%	23%	21%	19%	38,104
Doctorate in science	22%	53%	15%	9%	11,481
Engineering & business					
Bachelor's in engineering	37%	7%	29%	27%	4,742
Master's in engineering	44%	3%	37%	16%	6,663
Doctorate in engineering	s	s	s	s	733
Bachelor's in business	34%	1%	38%	28%	7,084
Master's in business	31%	3%	34%	32%	166,789
Doctorate in business	s	s	s	s	1,793
Engineering & other					
Bachelor's in engineering	67%	3%	8%	21%	8,631
Master's in engineering	38%	7%	26%	29%	10,628
Doctorate in engineering	48%	14%	17%	20%	1,569
Bachelor's in other	17%	9%	17%	58%	8,867
Master's in other	23%	2%	30%	45%	25,699
Doctorate in other	9%	8%	13%	69%	3,870
Total	55%	5%	17%	23%	2,105,038

s = suppressed

In summary, while the data show that adding a business degree to an engineering degree does not necessarily result in eventual attainment of a senior management position, it does increase the odds of becoming a senior manager, especially over other degree “packages” including engineering only—a topic explored further in the next section. Table 2 shows that almost the same number of people with the Engineering and Business degree combination are engineers as are senior managers (59,000 versus 63,000). In addition, having both engineering and business degrees increases the likelihood of working outside of engineering, management, and science altogether.

Senior Managers

The second intersection between engineering and management involves engineering degree recipients who describe their occupation as senior management. Senior executives—managers of managers—are described in two ways: as engineering or technical managers, and as managers regardless of the use of their technical backgrounds.⁵

Technical managers. As part of an exercise to estimate the total U.S. working population of engineers, the authors derived an estimate of technical engineering managers from NSF data on senior managers overall. The following conditions had to be met:

- The respondent had to be employed
- The respondent's last degree had to be in an engineering field
- The respondent had to state that his or her work was closely or somewhat related to the last degree, *or*
- The respondent stated that his or her work required at least a baccalaureate in the natural sciences or engineering.

The results of these estimates are shown in Table 3.

Table 3
An estimate of all engineering occupations in the U.S., 1993 and 1995

Category	1993	1995	Percent change 1993-1995
Had an engineering degree and occupation	1,161,000	1,205,000	4%
Had engineering occupation, no engineering degree	410,000	355,000	-13%
Unemployed, with engineering degree	82,000	60,000	-27%
Engineer as second job, with any degree	18,000	18,000	0%
Technical engineering managers	318,000	291,000	-8%
Total	1,989,000	1,929,000	-3%

Note: All persons in the table have a bachelor's or higher degree

Definitions: Unemployed had looked for work in the 4 weeks prior to April 15 of each year.

Engineer as second job excludes persons in engineering occupations with a second job in engineering.

Technical engineering managers include persons in management whose last degree was engineering and who stated that their work was closely or somewhat related to their last degree, *or* who stated that their work required at least a baccalaureate in the natural sciences.

⁵ The base population in the previous section was all persons who had earned an engineering degree at the baccalaureate or higher level, whether or not employed. This section focuses on employed persons with various degree combinations that include engineering.

Of the 2.6 million persons in the population in 1995 with an engineering degree at the bachelor's level or higher, 1.2 million persons identified themselves as engineers by occupation. Another 355,000 stated that they were working as engineers and had at least a baccalaureate degree, but not in engineering. Total engineering employment decreased somewhat between 1993 and 1995. Within this slight decline overall, the largest change was a sharp decrease in unemployment of persons with an engineering baccalaureate or higher. Despite growth in occupational fields like environmental engineering and computer software engineering, which attract persons *without* an engineering degree, overall the number of persons working in engineering without a 4-year degree in engineering fell in magnitude and as a percent of the total, from 21 percent to 18 percent. The number of technical managers also declined over the same period.

Figure 2
Who is an Engineer?

Senior Management Positions. Figure 2 shows that, of the 2.6 million engineering degree recipients, 2.3 million were in the US workforce in 1993 and 52% had engineering occupations for their primary job. Table 4 shows the most frequent non-engineering occupations they held. Executive or senior management and management-related occupations with business or “front office” functions appear prominently.

Table 4
Top Ten Non-Engineering Jobs of Persons with Engineering

Executives	374,822
Sales & marketing	111,520
Computer and mathematical	80,840
Construction, production,	70,616
Other management-related	66,374
Technologists	38,344
Finance & personnel	31,990
Computer programmers	31,323
Architects	25,094
Physical & related sciences	22,554

Note that the number of executives in Table 4 is larger than the number of technical managers in Table 3. While most executives still retain a certain connection with technical work, some moved to non-technical management positions.

Without regard to degree combinations, the overall trend toward working in non-engineering jobs as one's career advances and degrees are added has corresponded directly with a rapid increase in the number of people who have executive (senior management) or management-related positions. (Figure 3) Moving into senior management and related jobs is clearly a long-standing career path for many with engineering degrees – with or without *non-engineering* degrees.

Turning now to senior managers (or executives) only, considering levels and fields of degrees received and the occupations that people with the particular mixes tend to have, patterns are evident. First, executives (“managers of managers”) have earned degrees outside engineering—not just business degrees—substantially more frequently than have engineering degree recipients working in engineering jobs. In other words, adding a non-engineering degree seems to increase the likelihood of movement into senior management. For example, among master’s-level executives, over 40 percent have taken a business degree and almost another 20 percent have a second degree in some other non-engineering field. In contrast, at the Ph.D. level senior managers are much less likely to have obtained a degree outside of engineering, as shown in Figure 4.

Despite the high proportion of executives with exclusively engineering degrees, combining an engineering degree with a degree in business or management has had a unique and strong effect on occupational outcomes in the current population. As shown in Table 2 in the previous section, at the bachelor’s or master’s level having a business degree has increased not only the probability of being a senior manager, but also of working in “other” occupations, i.e., outside engineering, management, and science.

Figure 4
Degree Backgrounds of Engineers, and of Executives With Engineering Degrees, by Highest Degree Level

As a general rule, having a graduate degree in any field increases the probability of the recipient becoming a senior manager at some point in his or her career, and the presence of a business degree can increase the probability even more. While at the masters level there are nearly as many managers with no business degree as with them, Figure 5 shows that a larger proportion of those with both engineering and business degrees are senior managers than is the case among their colleagues with exclusively engineering degrees. This is true at all age levels, suggesting that attainment of the master's in business can lead rather directly into senior management jobs. At the same time, fewer than 50 percent of those who combine engineering with management degrees of any age cohort had senior management positions in 1993.

Figure 5
Degree Combinations And Senior Management Status of Master's Degree Holders

Table 2 showed clearly that those whose highest degree is a baccalaureate are least likely to become a senior manager. However, *numerically*, baccalaureate-level managers almost always have a single engineering degree and comprise the single largest group of executives because their number far exceeds that of any other group. The size of this group of baccalaureate executives explains the prevalence of executives without business degrees, indeed without any non-engineering degree, in Table 5.

Table 5
Occupational Groups, by Educational Degree Combinations, 1993

Occupational groups ¹	Degree Combinations				Total ¹
	Engineering only	Engineering & Business	Engineering & Science	Engineering & other	
Engineers	88%	5%	6%	2%	1,151,237
Senior managers	73%	17%	6%	4%	367,325
Scientists	66%	6%	25%	3%	101,516
All other	79%	12%	4%	5%	482,409
Total	82%	9%	6%	3%	2,102,487

¹Table contains all persons employed full-time with a bachelor's degree or higher in engineering.

The comparatively large proportion of masters-level senior executives (39%, from Figure 6) is due, at least in part, to the distinctive degree combination patterns of the masters-level group that often include non-engineering degrees. Baccalaureate-level executives rarely have

any degrees outside engineering. In contrast, half of masters-level executives have at least one non-engineering degree – twice the rate for doctoral executives. Masters-level executives also have the broadest range of degree combinations, including the highest proportion of business degrees. These individuals appear to have turned to a broader range of degree field options as

they designed their educational programs than appears to be the case for those who stopped at the baccalaureate or continued on to the Ph.D.

Summary. Regardless of sequence and level of degrees earned, having a combination of engineering and business degrees increases the probability that an individual will hold a senior management or related position at some point in his or her career. Up until now, movement into these types of positions has not depended on having degrees in both fields. However, given that a higher proportion of those in younger cohorts have two or three degrees than do those aged 60 and above, the frequency of mature executives having a single engineering bachelors degree as their highest degree will likely decrease over time. This change will not occur overnight. The sheer number of senior managers with a single engineering baccalaureate will dwarf the number of masters-level managers, independent of field(s) of masters degree(s) for some time to come.

Management Activities of Engineers⁶

The third intersection between engineering and management examined in this paper is the work activity referred to as “management and administration” (shortened here to “management”) that occurs in engineering occupations. To do this, the analysis shifts from the 2.6 million engineering degree recipients in the U.S.—who the preceding section has shown may or may not be working as engineers—to the 1.6 million individuals who describe their occupation as one of 21 types of engineers and who therefore do *not* refer to themselves as managers.

Table 6		
Rank Order of Activities		
Rank	Activity	Percent Mentioning
1	Design	66%
2	Computer applications	58%
3	Management	49%
4	Development	47%
5	Accounting, etc.	42%
6	Applied research	39%
7	Quality or productivity	33%
8	Employee relations	23%
9	Sales	20%
10	Basic research	15%
11	Production	14%
12	Professional services	10%
13	Other work activity	8%
14	Teaching	8%

⁶ Since the surveys on which the following analysis is based were designed for the entire S&E workforce, not just engineers, the extent of detail describing work activities may not be as satisfactory as a study of engineers alone would have been. Further, the authors have purposefully decreased the level of detail for ease of analysis and reporting. Yet the large sample sizes throughout these analyses provide high reliability of estimates of these broad activity categories; standard errors for the collapsed activity estimates are approximately 0.4% for engineering.

A brief note about the data and analyses used in this section is in order. Data that describe the job activities of scientists and engineers were collected in two ways. First, they checked each of the activities in a list of 14 in which they engaged 10% or more of the time during a typical work week. Then they reviewed the list and indicated the two activities that accounted for most, and second-most, of their time in a typical work week. The rank order of any mention of an activity is shown in Table 6 for engineers employed in the private, for-profit sector excluding self-employment.

Table 6 shows clearly that the single most frequent work activity of engineers in a normal work week is Design, which is defined in the survey instruments as *designing equipment, processes, structures, or models*.

Factor analysis suggested the reduction of the 14-activity list to more manageable proportions, and post-interview studies showed relatively little reliability in distinctions between engineers' designations of their foremost and second-most activity. Thus, based on the factor analysis, the list was reduced to eight "clusters" of main activities, i.e., of activities engaged in most or second-most of the time. In this way each engineer reported up to two main activities.

Table 7
Main Activities of Engineers in the Private Sector, 1993

1. Design	40%
2. Computer applications	33%
3. Management & employee relations	28%
4. Development	25%
5. Research (basic and/or applied)	19%
6. Production & quality management	17%

The second approach indicated Design, again, as the dominant activity in engineering practice in the U.S. in 1993 and 1995, followed by Computer Applications. (Data in Table 7 are for 1993 only; 1995 activity patterns were exactly the same.) The activity mentioned third most often in the reduced list was the combination of Management and Employee Relations.⁷ Omitted from Table 6 are Teaching (virtually unmentioned in the private sector by engineers) and a residual category including professional services and accounting. The remainder of this section uses the reduced activity groups developed through the factor analysis, rather than the original 14.

⁷ Readers are reminded that "management" here is an activity, not a job classification as discussed earlier in this paper. Since NSF scores senior managers as non-S&E, their activities do not appear in the following discussion and tables. Thus, considering only engineering graduates working in engineering: 30% listed management, administration, and employee relations as their primary or secondary job activity. When engineering graduates in all occupations—including senior management—are included, that proportion increases to nearly half, or 46%; these latter data are not presented here. The second report of the Engineering Workforce Project will focus on engineering degree recipients in management occupations and management activities of engineering graduates in various occupations.

Across all engineering occupations in the private, for-profit sector⁸, the extent to which engineers engage in certain activities varies by their age. Figure 7 indicates that Management as a main job activity is done by relatively more engineers as they progress through their careers until approximately age 60. This contrasts with engineers' involvement in Design and Development, which is fairly stable across age cohorts.

It is impossible to determine whether the tapering off of Management responsibilities among engineers in their 60s is a normal career pattern or some characteristic of the population in the surveys upon which this paper is based. Since self-employment is treated as a distinct employment sector from the traditional private sector throughout this paper, the tendency of engineers to leave for-profit firms and go into self-employment toward the end of their careers does not explain this downturn in Management-related responsibilities. Some unknown factor within firms may also contribute to the downturn.

Just as an engineer's age influences the extent to which he or she engages in Management-related activities, the engineering field in which an individual works affects the extent to which he or she has these responsibilities. Ignoring the level of highest degree and sector of employment for the moment, Management-related tasks occupy the time of many engineers, with upwards of 40 percent of civil and nuclear engineers' work week being dominated by them. Table 8 shows the extent to which engineers in various engineering occupations differ in activity patterns, and in particular, in the extent to which Management-related activities are a major part of their jobs.

⁸ Excluding self-employment.

Figure 7
Main Job Activities of Engineers in the Private Sector,
by Age Group: 1993

SOURCE: NSF, Scientists and Engineers Statistical System, unpublished tabulations.

Table 8
Top Three Main¹ Work Activities in Selected Engineering Occupations

Occupation	Main Work Activities
Aeronautics/aerospace	Design--37% Computer applications—32% Development--29%
Bio/biomedical	Research--45% Development--34% Management--29%
Chemical	Design--39% Research--36% Development--34%
Civil/architectural	Management--45% Design--39% Computer applications—20%
Computer hardware	Computer applications—53% Design--35% Development--25%
Computer software	Computer applications—85% Design--23% Management--21%
Electrical/electronics	Design--43% Computer applications—34% Development--28%
Industrial	Production/Quality Management--51% Design--31% Management--31%
Mechanical	Design--58% Development--31% Management--27%
Nuclear	Management--40% Research--26% Design--23%
Engineering, total	Design—36% Computer applications—31% Management--29%

¹Main work activities are activities engaged in most or second-most of the time.

Though not the main purpose of this paper, a few comments about engineers with engineering doctorates should be made. Considering the present trend toward new recipients of engineering PhDs entering the private sector upon graduation, a brief look at the activity patterns of those in the private sector as compared with colleagues in academia is worthwhile. Table 9 shows substantial differences across these two sectors in their main activities. Differences across sectors pertain even to the pervasiveness of Research as a defining activity of recipients of engineering doctorates. While Management is very rarely dominant among engineering doctorates in either sector, the importance of Development for nearly half of those in industry is noteworthy. Finally, Design, the hallmark activity across the entire population of 1.6 million

engineers, is far more important to engineering doctorates in industry than it is for their colleagues in industry.

Table 9	
Main Job Activities of Doctorate Engineers, by Selected Sector	
<u>4-Year Colleges</u>	<u>Private Industry</u>
Research - 76%	Research - 49%
(Basic research: 27%)	(Basic research: 6%)
(Applied research: 58%)	(Applied research: 48%)
Teaching - 72%	Development - 42%
Computer applications - 11%	Computer applications - 34%
Management - 11%	Design - 32%
Development - 5%	Management - 14%

Conclusions

This paper has examined three different intersections of engineering and management. There are numerous others, such as the extent to which engineering degree recipients working outside engineering engage in Management-related activities more frequently than do colleagues in those occupations without engineering degrees, obtaining an Engineering Management degree, and receiving management training. Involvement in management by engineering degree recipients -- be it through obtaining a management or business degree, becoming a senior manager, or engaging in Management-related activities while working in engineering occupations -- pervades many aspects of the working lives of engineers. There is no single point in a career when it is not a factor. While at most a third of engineers ever spend most of their time with Management-related tasks, more do so in conjunction with their other responsibilities. Moving to a senior management position -- with or without a business or management degree -- and increasing management responsibility while in engineering positions appear to be stable patterns in the careers of engineers, rather than a recent development.

This ASEE session looks at a number of ways in which engineering schools are translating their understanding of the importance of the career-long intertwining of engineering and management into curricular design and materials. Findings in this paper, e.g., that engineering degree recipients continue to receive degrees well into their 50s, are only part of the picture of opportunity and need. Other results from the Engineering Workforce Project shows that approximately 20% of working engineers take management training in a given year and that progressively fewer people do so once they are in the 50-59 age group and that senior managers are substantially older than practicing engineers. Far more people in the engineering workforce have jobs that involve management in one form or another than receive training in management.

These findings suggest that life-long learning needs to be thought of as more than keeping current in one's technical field. The more management is a part of an individual's job, the more he or she would likely benefit from specific skill development and related learning about managing, be it through a course, a degree program, or a minor degree or certificate program. The range of curricular options displayed in this session is equally relevant for those

preparing for careers as for those whose management responsibilities have already increased. Discussions which the authors have had with individuals attending Engineering Workforce Project presentations lead us to conclude that more people are interested in curricular materials that address the intersections of engineering and management than can find what they are looking for. Firms' own training programs do not necessarily extend to of the types of learning that mature employees seem to want and need; where provided, a firm's training opportunities are often exhausted by the ambitious employee. Thus, there appears to be a great opportunity for schools of engineering to develop and make available to corporate employees and training offices a broader range of effective curricular innovations that meet the knowledge and skill needs of employees who work or will work at the various intersections of engineering and management. Whether the results are closer to "education" or "training", or include parts of both, they would be important vehicles for life-long learning that would benefit many.

APPENDIX A ENGINEERING WORKFORCE PROJECT

An Overview

The National Science Foundation's (NSF) Engineering Workforce Project is an effort to describe and analyze important dynamics of the U.S. engineering workforce. The project will provide information on a wide range of topics related to engineering education, occupations, and work activities of people educated as engineers and working as engineers. The project will produce reports and other media of interest to employers, educators, human resource professionals, and students.

Project sponsorship: Four NSF Directorates support the project: Engineering (ENG); Social, Behavioral, and Economic Sciences (SBE); Education and Human Resources (EHR); and Computer and Information Sciences and Engineering (CISE). The Project is co-directed by Linda Parker (Division of Engineering Education and Centers, ENG) and Lawrence Burton (Division of Science Resources Studies, SBE).

Data: The Engineering Workforce Project will not collect original data; rather, existing national datasets will be mined for appropriate information. Primary data for all reports will derive from a series of related survey studies sponsored by the Division of Science Resources Studies. Conducted every two years throughout the decade of the 1990's, the three surveys are the National Survey of College Graduates, the National Survey of Recent College Graduates, and the Survey of Doctorate Recipients. All are sample surveys. The survey of College Graduates is linked to the 1990 Census of the Population, and the Survey of Doctorate Recipients is linked to the annual census of doctorate degree earners at U.S. institutions.

In the 1993 survey cycle, each contributed to the integrated national estimates as follows:

	Unweighted	Weighted	Survey Performer
Survey of College Graduates	148,298	29,021,457	U.S. Bureau of the Census
Survey of Recent College Graduates	19,426	973,437	Westat, Inc.
Survey of Doctorate Recipients	39,495	513,463	National Research Council/ National Opinion Research Center, Univ. of Chicago

The integrated data file contains 36,700 unweighted cases of persons with at least a bachelor's degree in engineering.

Project products: Four published reports are currently planned:

- *Educational Pathways, Occupations and Work Activities of Engineers*
- *Engineering and Management*
- *Mid-Career Training of Engineers*
- *Engineering in Industry and Government*

NSF will also establish a website for posting of the reports and of detailed statistical tables for reference by students and others involved in career planning.

Project staffing and other participants: In addition to Parker and Burton, the Engineering Workforce Project involves:

Abt Associates, Cambridge, MA	Analysis, research
Quantum Research Corp., Bethesda, MD	Analytical support
Mike Finn, Oak Ridge Associated Universities	Analysis and writing
William LeBold, Purdue University	Analysis and writing

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Denice Denton, Dean, University of Washington School of Engineering
Jerrier Haddad, formerly IBM
Robert Weatherall, formerly Director of Career Services, MIT

Ordering reports: Reports produced by the Engineering Workforce Project can be ordered by e-mail to lbarton@nsf.gov or by telephone 703-306-1774 ext. 6913. Please note anticipated publication dates above. E-mail is also welcome for suggestions, questions, and other matters relating to this or other matters. Linda Parker's e-mail is lparker@nsf.gov.