

## Understanding Engineering Student Motivating Factors for Job Application and Selection

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### **Abstract**

There are over 100,000 engineering graduates from undergraduate programs annually within the United States. Students graduating from these programs pursue a variety of jobs, with only a subset being engineering positions. Why might an engineering student, after investing considerable resources in their engineering education, select a non-engineering job? What are the specific factors at work for engineering graduates in selecting their first professional position? This study seeks to identify recently graduated engineering students' motivations in *job applications* and *job selection*, particularly as these motives vary by academic and demographic backgrounds.

The data for this study come from survey responses of 315 currently employed individuals who were within one year post-graduation from their undergraduate engineering program at one of 27 different institutions across the United States. A mixed methods approach was used to understand the factors influencing their career decisions based on their open- and closed- ended responses to related survey questions. First, using emergent coding, respondents' self-reported, open-ended descriptions of their job search process that led them to accept the offer for their current employed position were categorized. Then, their open-ended responses were compared to a close-ended, ranking question of the same type, with items that were derived from a question in the National Survey of Recent College Graduates (sponsored by NSF's Division of Science Resources Studies). Finally, respondents' background characteristics (e.g., socioeconomic status) and undergraduate experiences (e.g., participation in an internship) were analyzed in relation to their job search and job selection processes.

Our findings reinforce that job selection is a complex process that often can be a source of anxiety and stress to students. The motivating factors for deciding which jobs to apply to, and which job to ultimately accept, vary for different students. By improving our understanding of student motivations during the job search process, employers can make adjustments to their offers in order to strengthen and diversify the engineering workforce. By knowing what motivates students, advisors can design services to support students in a successful transition from school-to-work. These findings also may be of use to students themselves, helping them see the variety of ways that engineering students pursue and consider job options.

### **Introduction**

It is widely recognized that a strong engineering workforce is needed to tackle the grand challenges facing our world today.<sup>1</sup> And it has been the focus of much investigation to identify innovative strategies for engineering education to ensure 'that the U. S. engineering profession has the right people with the right talent for a global society'.<sup>2</sup> To that end, since 2007 there has been a continual annual trend of increasing numbers of engineering graduates, with around 107,000 students graduating with engineering degrees

in the United States in 2015.<sup>3</sup> However, only a subset of these new engineering graduates go on to careers in the engineering field. Based on the 2006 National Survey of Recent College Graduates (NSRCG), 60% of those who graduated with engineering degrees between 2002 and 2005 were employed in engineering positions (based on self-reported job type classification).<sup>4</sup> Reasons for working in a field unrelated to one's degree included "job in highest degree field not available," "change in professional/career interests," and "pay/promotion opportunities," keeping in mind that these are broad categories with little visibility into what precisely happened, for example, when a job in one's field was not available, or what about pay or promotion led a graduate to land in an "unrelated" occupation. Moreover, these data do not give a sense of how many such graduates may have been eyeing different (engineering and non-engineering) possibilities from the get-go.

Sheppard et al.'s work on career decision-making among prospective engineering graduates suggests that in fact the *majority* of students are unsure and/or considering options that span engineering and non-engineering work on the "eve" of graduation.<sup>4,5</sup> About one-third of students were exclusively focused on engineering options, and a much smaller fraction of students were exclusively focused on non-engineering work and/or graduate study options. And while there may be reliable set of characteristics that predict the likelihood of targeting non-engineering work versus engineering work among engineering students soon to graduate, there may be fewer differentiators between students with engineering-focused plans and those with more unsettled plans. This means that there are many contingencies to investigate in terms of how students ultimately land in their first and subsequent jobs within the first few years of graduating. Providing some granularity to the picture, Brunhaver's study of recent engineering graduates indicates that while the majority of graduates were working in engineering-focused positions four years after graduation, about 20% of graduates were working in non-engineering focused positions.<sup>6</sup> We note that although demographic factors did not seem to differentiate pathways at this stage, co-ops and internships during college and level of technical interests did.<sup>6</sup>

Still, the intricacies of applying for and selecting a first job—where the "rubber meets the road", in some respects, in identifying who goes where and why—are not well understood. Recent work highlights the role of personal contacts, for example, in creating job opportunities for graduates (i.e., firms making offer to candidates who have friends employed there), but this work is not specific to engineering.<sup>7</sup> Accordingly, this current study is a beginning exploration of how engineering students are approaching and deciding on their first post-graduation job. The study uses a mixed-methods approach, and highlights the strengths and limitations of each method, in identifying factors salient to engineering students as they decide which jobs to apply for and which offers to ultimately accept. Drawing from aforementioned studies of engineering student internships and early career outcomes for engineers, this study investigates three specific sets of factors in job search processes: 1) receiving only a single offer; 2) internship and co-op experience; and 3) skills required to perform the job. Findings will inform mechanisms to support students as they prepare for and enter the engineering workforce.

## Methods

### *Study Sample*

Data for this study come from research conducted as part of the Fostering Innovation Studies research program within the National Center for Engineering Pathways to Innovation (Epicenter) supported by the National Science Foundation from 2011-2016.<sup>8,9</sup> The aims of this research program were to better understand engineering students' innovation and entrepreneurship interests, abilities, and achievements. Data were collected in two phases of student surveys, Engineering Majors Survey 1.0 (EMS 1.0) and Engineering Majors Survey 2.0 (EMS 2.0). EMS 1.0 survey respondents were junior and senior engineering students at 27 different institutions across the United States selected to be representative of national engineering programs.<sup>9</sup>

Approximately one year after EMS 1.0, respondents who agreed to participate in further surveys were contacted to participate in EMS 2.0; in total some 1,460 individuals responded. Of those, the subset of respondents who were currently employed in a full-time or part-time job and also not currently enrolled as a student in a bachelor's degree program were asked a series of job search related questions, including two open-ended questions and one closed-ended question related to factors influencing their decisions in job application and job selection. Respondents who provided sufficient responses (i.e., at least a response to one open-ended question) to these series of question were included in the final analysis for this study (n=315).

### *Survey Instruments: Focal Survey Questions from EMS 1.0 and EMS 2.0*

The two survey instruments, EMS 1.0 and EMS 2.0, collected information regarding respondent educational background and experiences, socioeconomic status, and demographics. From EMS 1.0, demographic data (gender, URM-status, GPA, first generation college student) and college activities (e.g., internships, research experience) were collected. EMS 2.0 asked a series of job search questions that are the focal point for the analysis in this study. There were three primary questions:

#### Job application factors (open-ended)

*Please describe your thought process in deciding which jobs to apply for. What were salient factors for you? What made certain jobs more or less appealing to you?*

#### Job selection factors (open-ended)

*What were the deciding factors for accepting the offer for your current position? Please list and/or provide as much detail as you would like.*

#### Job selection factors (ranking, closed-ended)

*How did you select the job you are currently in? Please rank the following reasons from most (1) to least (8) important by clicking and dragging each item to create the desired order.*

- \_\_\_\_\_ *Only job available*
- \_\_\_\_\_ *Professional/career interests*
- \_\_\_\_\_ *Compensation*
- \_\_\_\_\_ *Promotion opportunities*
- \_\_\_\_\_ *Working conditions*
- \_\_\_\_\_ *Job location*
- \_\_\_\_\_ *Family*
- \_\_\_\_\_ *Other reason*

The two open-ended questions above were developed expressly for the EMS 2.0 survey to explore motivating factors related to engineering student job application and selection. The closed-ended ranking question was informed by a question in NSRCG.<sup>4</sup> Namely we used an edited list of answer choice options for reasons for having a job unrelated to highest degree. We added ‘only job available’ as an option, and also split the reason ‘Compensation and Promotion Opportunities’ into two separate factors for our ranking question.

In addition, in EMS 2.0, questions were asked regarding job satisfaction, classification of job as ‘engineering’, and concerns they had in the past year related to finding a job.

### *Respondents*

The respondents in the sample come from a variety of institutions (Table 1), a variety of majors (Table 2), and a variety of demographic backgrounds (Table 3).

**Table 1.** Respondent Bachelor’s Institutions<sup>9</sup> (N=315)

Institution Type	n	%
Research institutions with large engineering programs	215	68.3
Research institutions with small engineering programs	35	11.1
Non-research institutions with large engineering programs	21	6.7
Non-research institutions with small engineering programs	45	14.2

**Table 2.** Respondent Majors (N=315)

Engineering Major	n	%
Aerospace	12	3.8
Material Science	12	3.8
Industrial	15	4.8
Civil	26	8.3
Chemical	27	8.6

Electrical	42	13.3
Mechanical	82	26
Other <sup>a</sup>	99	31.4

<sup>a</sup>Other majors include bioengineering, systems engineering, robotics engineering, and general engineering.

**Table 3.** Respondent demographic characteristics (N=315)

Characteristic	n	%
<b>Gender</b>		
Female	116	37
Male	197	63
<b>Ethnicity<sup>a</sup></b>		
URM	28	9
non-URM	282	91
<b>First Generation College Student<sup>b</sup></b>		
Yes	30	10
No	283	90
<b>Family Economic Background</b>		
Low-Income	57	18
Middle-Income	130	42
High-Income	124	40
<b>Average GPA</b>		
A	177	56
B or lower	138	44

<sup>a</sup>Underrepresented Minority (URM) respondents were defined as African American, Hispanic, Native America, & Pacific Islander

<sup>b</sup>First Generation= Neither Mother nor Father Entered College

### *Analysis*

Using an emergent coding scheme<sup>10</sup>, we categorized responses to the open-ended job search questions related to factors influencing their choices in applying to jobs and accepting a job offer. For a subset of codes, two researchers independently coded the data, and discrepancies were re-evaluated for the application of the appropriate code.

We then compared the codes from the open-ended responses to the responses of the job selection factors ranking (i.e., closed-ended) question. The goal of this comparison was to develop deeper insights into the limitations of any one measure—and to ultimately make recommendations for better stand-alone measures. In addition, comparisons were made between the job search factors responses and respondent characteristics (background experiences, socioeconomic and demographic classifications, and job-related perceptions). Chi-square tests were used to determine significant differences in proportions between groups of interest (significant associations if p-value is less than 0.05, considered marginally significant if p-value is less than 0.10).

## Results

### *Respondent job search concerns and work characteristics*

Characterization of the respondents' answers, as related to their financial concerns, prior work experience, and satisfaction in current job are shown in Table 4. A majority of respondents in the study sample were satisfied with their position and considered their work to be engineering. Considering experiences prior to graduating, most had conducted an internship while in college, and many had conducted research. Nearly half voiced concern about finding a job with a competitive package, and one-in-four expressed concern about finding a job to pay off student loads; this suggests strong financial motivations in some students' job decision-making processes.

**Table 4.** Respondent job search concerns and work-related experiences (N=315)

Description	n	%
Conducted an internship while a high school student <sup>a</sup>	36	11
Conducted an internship while an undergraduate student <sup>a</sup>	243	77
Conducted research while an undergraduate student <sup>a</sup>	128	41
Concerned about finding a job with competitive compensation package <sup>b</sup>	145	46
Concerned about finding a job to pay off student loan <sup>b</sup>	80	25
Considers current employed position 'engineering' <sup>b</sup>	249	79
Satisfied with current employed position <sup>b</sup>	252	80

<sup>a</sup>Data from closed-ended questions on EMS 1.0

<sup>b</sup>Data from closed-ended questions on EMS 2.0

### *Closed-ended Ranking of Job Search Factors*

Respondents ranked a list of factors in order of importance for selecting their current employed position. There are a total of 40,320 permutations for ranking these 8 factors. In our sample, there are multiple combinations of how students ranked these factors, highlighting the unique decision making processes of individuals. In total, there were 281 unique rankings of the factors. Eighty percent (257 out of 315) of the respondents did not share their ranking order with any other participant, whereas the remaining ranking orders were shared between 2 and 5 participants. Alternatively, looking at the rankings of the top three factors, the majority of respondents shared their ranking order of the top 3 factors with at least one other participant and up to 14 other participants (80%, 253 out of 315). There were some factors that were commonly ranked as most and least important (Table 5). 'Professional/Career Interests' was most commonly ranked as the 'most important' factor for selecting their job (48% of respondents). 'Only job available' and 'Job location' were the next factors commonly ranked as 'most important'. 'Only job available' was also the factor most commonly ranked as the 'least important' factor. The most common 'most important' factor-ranking pair was 'professional/career' interest followed by 'working conditions' (45 participants shared this ranking scheme).

**Table 5.** Distribution of study sample for ranking of job selection factors from most important (1<sup>st</sup>) to least important (8<sup>th</sup>).

		1st	2nd	3rd	4th	5th	6th	7th	8th
<b>Professional/career interests</b>	n	151	66	31	28	25	6	3	5
	%	47.9	21	9.8	8.9	7.9	1.9	1	1.6
<b>Only job available</b>	n	51	22	16	15	11	26	60	114
	%	16.2	7	5.1	4.8	3.5	8.3	19	36.2
<b>Job location</b>	n	45	61	57	59	47	32	7	7
	%	14.3	19.4	18.1	18.7	14.9	10.2	2.2	2.2
<b>Compensation</b>	n	24	49	95	71	42	21	11	2
	%	7.6	15.6	30.2	22.5	13.3	6.7	3.5	0.6
<b>Working conditions</b>	n	23	59	44	61	68	46	13	1
	%	7.3	18.7	14	19.4	21.6	14.6	4.1	0.3
<b>Family</b>	n	9	20	22	23	38	86	96	21
	%	2.9	6.3	7	7.3	12.1	27.3	30.5	6.7
<b>Other reason</b>	n	8	6	6	9	15	24	88	159
	%	2.5	1.9	1.9	2.9	4.8	7.6	27.9	50.5
<b>Promotion opportunities</b>	n	4	32	44	49	69	74	37	6
	%	1.3	10.2	14	15.6	21.9	23.5	11.7	1.9

*Open-ended responses for factors influencing job application and job selection*

The open-ended responses for job application and job selection factors were combined because themes identified in the responses were consistent across both questions. The three broad themes identified in the open-ended responses for factors influencing job application and job selection were the following: perceptions and characteristics of workplace (78% of respondents mention), position benefits (57% mention), and characteristics of work activities (72% mention). Table 6 shows these themes and specific examples of factors mentioned by respondents under each theme. In addition to these categories of factors influencing job application and job selection, respondents also mentioned their approach to applying for jobs and making a decision about an offer. Examples of these categories of responses are also shown in Table 6.

For the purpose of this paper, the following sub-themes under approaches for applying for jobs and making offer decisions will be examined as salient dimensions of engineering student experiences: ‘only job available’, ‘considered skills required’, and ‘internships/co-ops’. These themes add to the literature<sup>4,6</sup> about the importance of internships, technical interests, and the competitive job market in the career decisions of engineering graduates. In addition, we focused on these themes because they would be relevant for faculty and student advisers as they assist students through making career-related decisions.

In particular, these themes highlight the job market realities faced by engineering students and how their prior work experiences influenced their decision-making. Additionally, exploration of ‘only job available’ allows for a comparison between



quantitative and qualitative data collection and analysis methods, while also serving as an example of how themes can represent both positive and negative experiences for students. The focus on internships allows us to see in more detail how these work experiences influence job decision-making and connects to our prior work demonstrating the relationship between internships and self-efficacy, and plans for staying in engineering. Finally, a deeper look into the ‘required skills’ theme provides insight to how students map their education to the job market.

**Table 6.** Coding categories and themes developed from the open-ended job search questions (themes in bold discussed in paper).

Categories	Themes	Sub-themes
Factors influencing job application and selection	Perceptions and characteristics of <i>workplace</i>	Culture (inclusiveness, positive/negative, competitive, supportive)
		Company reputation (prestige, integrity, forward-thinking)
		Size
		Location
		Security (start-up versus established)
		Promotion opportunities
	Position benefits	Salary
		Retirement
		Insurance
		Vacation
		Travel
		Visa
		Relocation allotment
	Characteristics of work activities	Pay for further education
		Industry
		Challenge
		Innovation (Creativity)
		Product
		Societal impact
		Problem solving
		Skill development
Develop network		
Strategies and pathways for job application and selection	Selectivity	Conducted a wide versus narrow search
	<b>Internship/Co-op</b>	<b>Full-time offer from previous employer</b>
		<b>Learned lessons from previous work experience</b>
	<b>Only job available</b>	<b>Positive (e.g. ideal job so stopped searching)</b>
		<b>Negative (e.g. concerned about not getting another one so accepted)</b>
<b>Considered</b>	<b>Involved skills they wanted to use in their job</b>	

	<b>skills required</b>	<b>Felt they met the qualifications of the job posting</b>
	Used a network	Peers, mentors, previous employer
	Started their own company	
	Used career services or advisers	Career fair

*'Only job available'*

Forty-eight respondents (15%) mentioned their current position as the only job offer they received in their open-ended job factor responses. Some mentioned it positively (n=25) such as it 'was my top choice, that is why I did not apply for other positions.' Others mentioned it negatively (n=8) such as they 'jumped on the first offer I got since it was clear no others were coming'. Of those who mention 'only job offer' negatively in their response, 75% reported not being satisfied with current position, 63% reported concern in the last year about finding a job to pay off student loans, and 88% reported concern in the last year about finding a job with a competitive compensation package. This compared with 25%, 24%, and 45% of other respondents in the sample, respectively ( $p < 0.05$ ), suggesting that job drivers among those who expressed comments related to 'only job offer' may be different from those who end up negotiating multiple offers. Additionally, respondents who mentioned 'only job offer' negatively were half male, fairly distributed across income groups, majority not first-generation college students (7 out of 8), and majority non-URM (7 out of 8).

Table 7 shows the comparison of the open-ended responses mentioning 'only offer received' to the closed-ended ranking of the 'only job offer' factor. Almost half of the respondents who mentioned 'only job offer received' in their open-ended responses ranked the 'only job offer' factor as most important. Conversely, just 11% of respondents who did *not* mention 'only job offer received' in their open-ended responses ranked the 'only job offer' factor as most important (statistically significant difference in proportions, chi-square test,  $p < 0.01$ ). Thus, there appears to be a modest disconnect between how respondents talk about their job selection in their own words, and how they rank importance of factors in a fixed-choice/ranking format.

**Table 7.** Ranking compared to open-ended responses of job factors mentioning 'only job offer'

Close-ended Reponse: Ranking of 'Only job offer'	Open-Ended Response	
	Mentioned current position was the only offer received	Didn't mention that their position was the only offer received
<b>TOTAL</b>	<b>48</b>	<b>267</b>
Most important	23	38
2nd	8	14
3rd	0	16
4th	2	13

5th	3	8
6th	0	26
7th	4	56
Least important	8	106

In order to better understand persons whose job search decisions were heavily influenced by having only one job offer, we made comparisons between respondents who did and did not rank ‘only job offer’ as the most important reason for selecting their current job (Table 8). For those who ranked ‘Only job offer’ as most important (referred to from now on as ‘single-offer motivated’), a larger fraction (some 43% and 63%, respectively) were concerned in the last year about finding a job to pay off loans and to find a job with a competitive compensation package than those who are not single-offer motivated (some 22% and 43%, respectively). Additionally, respondents who were ‘single-offer motivated’ were less likely to be satisfied about their current position and also less likely to have interned while an undergraduate student. In terms of demographics, ‘single-offer motivated’ respondents were more likely to be female ( $p < 0.1$ ) and URM ( $p < 0.1$ ), though these differences need to be interpreted cautiously, given the relatively small size of the sample. We note that more first generation college students marked single-offer as a primary motivating factor than the other factors, and while the difference is not significant, it suggests further exploration ( $p > 0.1$ ).

**Table 8.** Comparison of single-offer motivated respondents who ranked ‘only job offer’ as the primary motivating factor (i.e., single-offer motivated) to those who did not.

	Among those who reported that their primary motivating factor was receiving only one job offer...	Among those who reported that their primary motivating factor was something else...		
Variable	Percentage marking:		Odds Ratio	p-value
Expressed: Concern in the last year about finding a job to pay off student loans (vs. Not concerned)	43%	22%	2.69	<0.01
Expressed: Concern in the last year about finding a job with a competitive compensation package (vs. Not concerned)	63%	43%	2.25	<0.01
Expressed: Not satisfied with job (vs. Satisfied)	39%	16%	3.38	<0.01
Did not intern while an undergraduate	35%	21%	2.12	0.02
Female (vs. Male)	47%	35%	1.64	0.07
URM (vs. non-URM)	16%	8%	2.22	0.07
First generation college	14%	9%	1.65	0.2

student (vs. non-First generation)				
Average GPA B or lower (vs. GPA A)	59%	41%	2.06	0.02

Single-offer motivated students exhibit differences from their non-single-offer motivated peers, suggesting that certain conditions may influence who experiences a job selection driver related to receiving a single-offer. Student support navigating the job market will need to take into account the diversity of pressures and backgrounds of students when searching for a job.

*Internships and co-ops*

As mentioned previously, 77% of respondents reported participating in an internship while an undergraduate student. Comparing those who report interning to those that do not, more have an A-average GPA and more have positions considered ‘engineering’, which is consistent with prior work.<sup>4,6</sup> No differences in participation in internships was found based on gender, URM-status, or first generation college student status.

Internships and co-ops were mentioned in the job search open-ended questions by 16% of the respondents. Internships and co-ops were discussed by respondents in a variety of capacities. In some cases, respondents accepted full-time offers from companies they had previously worked with (74% of those who mentioned internships/co-ops in their open-ended job search questions). In these instances, there were some respondents who highlighted getting the full-time offer early in their job search process so they either did not even start looking for positions or they immediately stopped. This may relate to prior work that has found a connection between internship experiences and graduates selecting jobs in engineering.<sup>4,6</sup> It was appealing for some because they could start their senior year with a job already lined up for after they graduate. Thirty-two percent of those who mentioned their current position arising from an internship or co-op also mentioned that it was their only job offer in the open-ended responses. Alternatively, some discussed their internship experience as a learning opportunity for what they want in a job and identified that they did not want to continue at the company where they did their internship.

There were no statistically significant differences between those who mentioned their full-time position stemming from their internship and those who did not based on demographic characteristics of respondents. In the broader category of mentioning internship or co-op at all in their open-ended response, URMs were more highly represented, fewer were concerned about job compensation, and more reported their position as engineering (as compared to those respondents who did not mention an internship or co-op in their open-ended response).

*‘Required skills’*

Thirty-seven respondents (12% of sample) mentioned consideration of the skills required for the position as they described their job search factors in the open-ended responses. These skills were mentioned in a variety of contexts. Some respondents mentioned wanting to *use* certain skills, such as using CAD or skills that are relevant to their major.

A subset of respondents mentioned ‘having the required skills’ or ‘meeting the qualifications’ of the job posting as an approach for making job application decisions (n=25, 8% of the sample). Some of these respondents mentioned considering positions that were entry level or required minimal experience. Others mentioned meeting qualifications in the context of feeling like they could do the job well or they were confident they could get the job, for example, ‘I was looking for a job that I could do confidently’. There was no difference between those who mentioned ‘meeting the qualifications’ and those who did not based on gender, URM status, and first generation college student status. However, there was a smaller fraction reporting satisfaction in their current employed position for those who mentioned ‘meeting the qualifications’ (56% compared to 82%, chi-square test,  $p < 0.01$ ). Also, a smaller fraction reported participating in undergraduate research (16% compared to 43%, chi-square test,  $p < 0.05$ ).

## **Discussion**

This study explored factors that new engineering graduates perceived as important when they applied for and selected their current employed position.

### *Complex decision-making*

Based on our exploratory analysis, we found that the career decision-making processes of engineering students are exceedingly complex. Based on quantitative data, we found that people had unique sets of priorities as they selected their first job after graduation. Regardless, professional/career interests and workplace characteristics do rise to the top as important factors in job selection decisions. Similarly, the qualitative data revealed that people considered a wide range of motivating factors for selecting which jobs to apply to and which offer to ultimately accept. Based on the analysis of the qualitative data, we found that motivating factors fell into 3 broad themes: perceptions and characteristics of workplace, position benefits, and characteristics of work activities. These themes relate to prior work investigating person-job and person-organization fit, and further exploration of these concepts in the engineering domain could be fruitful.<sup>11-13</sup> Many unique aspects of these broad themes were mentioned by respondents in our study, highlighting the more nuanced and detailed findings of the qualitative analysis.

Notably, we found that not all students approached the job market in the same ways. Our analysis reveal trends that URM, females, and first generation college students were more likely to have ‘only one job offer’ be an important factor in their job selection decision than their relative comparison groups. Did these groups of students have less support as they prepared for and searched for their first employed position after graduation? Did their educational experience vary in such a way to impact their career decision-making and approach to applying for and selecting a job? Interestingly, we did not find a difference with how URM, females, and first generation college students assessed job qualifications and having the required skills for a position. Further exploration of how demographics influence career decisions of engineering students is warranted.

### *Internships, qualifications, skills*

Our study found that internship and co-op experiences for engineering undergraduates can be very influential in how students approach their job search and make decisions for

which offers to accept. Through these work experiences, students can learn about their interests and job preferences, gain work experience to build their resume, and gain insight about workplace climates and team dynamics. Notably, most employers prioritize converting students who have participated in internship or co-op programs into full-time employees. In 2016, the average offer rate and acceptance rate were both above pre-recession levels.<sup>14</sup>

We found that prior work experiences can be positive or negative for students, and thereby direct students to pursue certain employment opportunities or not. We found that engineering students who participated in internships or co-ops were more likely to pursue jobs in engineering. Interestingly, prior research has identified workplace climate as a main factor explaining women's intentions to continue in engineering.<sup>15</sup> Additionally, results from a recent study suggest that women's departure from the field of engineering may be related to the sexist professional culture that is revealed to students through informal interactions with peers, teamwork experiences, and internship experiences.<sup>16</sup> Undergraduate work experiences can be valuable experiential learning opportunities, but understanding how these experiences vary for students from different backgrounds will be important as we consider how to diversify the engineering workforce.

The qualitative analysis conducted in this study reveals that students approach their job search in different ways. Some students pursue a broad search, applying for a multitude of jobs, while others take a more selective approach. As students read the 'required skills' associated with a job posting, they make different interpretations and decisions based on their background, experiences, and advisory support. Further work could explore to what extent company statements of required skills systematically exclude or turn off groups of people who do not meet the stereotypical image of individuals who have those skills. And more broadly, what skills are being sought after from employers and do they ignore the broader range of engineering student experience and the needed engineering skills in the workplace?

#### *Options- feelings and finances*

Our study found that during the job search, many engineering students were concerned about finding a job to pay off loans or find a job with a competitive compensation package. There are financial realities faced by students as they approach their job search, and ultimately decide on which offers to accept. Depending on when offers are made, students may feel like they need to accept a single offer in case another one does not follow. We found that those who listed 'only job offer' as an important factor in their job decision were less likely to be satisfied with their employed position. On the other hand, some listed 'only job offer' more positively, often as a result of securing their ideal position early in their search process or receiving a full-time offer following a prior work experience. How are students being supported during the job search and negotiation process? A recent report from the Bureau of Labor Statistics projects that engineering and architecture jobs are projected to increase only 3% between 2014 and 2024, which is the lowest increase of any job sector.<sup>17</sup> Therefore, faculty and advisers can play an increasingly important role in lending support as students navigate the job market.

### *Limitations*

This study used a mixed-methods approach to explore salient factors influencing the career decisions of new engineering graduates. The study did have respondents coming from a variety of institutions and majors, however, the sample size was still relatively small, thus, caution must be used when generalizing more broadly to all engineering students. The small sample size also limits the statistical power when assessing differences between groups, especially as the sub-groups become smaller. Additionally, only a subset of the study population participated in the survey, so our work is also at risk for selection bias. Those who opted to not participate may vary systematically from our study sample. However, we did seem to capture a variety of experiences with our study sample, both positive and negative in nature.

### **Conclusions and Implications**

This work identified salient factors motivating students to apply for and select their first position after graduation with an engineering degree. We found that the priorities of students are complex and unique to individuals. Our work highlights the role of prior work experiences in the decision-making considerations of engineering students. In addition, the qualifications and required skills listed with job openings can play a major role in job application decisions of students, and this may vary by student background and experiences. Finally, the realities of the job market in combination with strategies employed by students in preparing and searching for their first job can have a significant influence for which job students ultimately end up in after graduating with an engineering degree. The support that faculty and other student advisers offer to students as they are approaching the job search and making job decisions can be instrumental in creating and sustaining a vibrant and diverse engineering workforce.

A goal of this exploratory study is to inform future data collection efforts of the EMS study population, so we can improve how we ask and analyze data related to understanding how job characteristics are prioritized for early career professionals who graduated with engineering degrees. The insights gleaned from the qualitative and quantitative methods reveal the benefits of how mixed method research can illuminate complex decision-making processes of students.

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