Engineers and Tech Careers: A Match Made on LinkedIn

I.   Introduction

With the intense pressure now placed on engineering students to seek internships in their 1st, 2nd, and 3rd years of undergraduate schooling, engineering and tech companies looking to hire their next batch of potential employees have found new ways to reach undergraduate engineers. Internships set future graduates up for permanent positions with the potential to act as long-standing careers in their industry of choice and are incredibly important to obtaining future jobs. Through online recruiting, alumni outreach, and even classic approaches of recruiting through word-of-mouth connections, the question of *how and where* to search for internships is often an important question for students to ask themselves if they are planning on pursuing a career building on their college engineering degree.

Where do Princeton University engineering students seek these internships and job opportunities to launch their careers? In this paper, I will be researching the unique ways by which Princeton University engineering students *search* for summer internships in STEM sectors in the modern era. Just as internships have taken on a greater importance in post-undergraduate career prospects, the process by which students seek these internships is also becoming more nuanced. This is especially true of Princeton University students, where an extensive network of alumni exists in addition to a variety of strong science and technology recruiting efforts made by various companies and firms such as Facebook and Google. The same sentiment can be applied to other elite universities producing highly qualified engineering students.

I hypothesize that Princeton University engineering students employ the use of online job and career platforms (such as Handshake and LinkedIn) the most to discover internships/jobs due to the technological nature of the positions they pursue. Additionally, I believe online/job career

platforms are used most often by engineering students at Princeton even when compared to alumni referrals to positions that are often associated with prestigious networks found at Princeton University. Currently, there are a variety of routes by which Princeton engineering students can search for internships and jobs but there is little effort to consolidate those resources or gather any data on the most-used resources. Note that this hypothesis also relies on the hypothesis that engineering students will pursue internships or jobs related to their field of study.

Despite the importance of social networks to searching for jobs (successfully or unsuccessfully), there is potential for a job search environment to be founded on social networks while continuing to use different platforms that enable these social networks (in the case of online job search platforms). This paper builds on and challenges the sociological perspective towards job searching that is founded on weak ties of social networks. I argue that engineering students at Princeton University now prioritize the use of online platforms over traditional social ties to search for open positions due to the specialized nature of their positions in addition to the ability to search through a large pool of available positions.

II.   Literature Review

Mark Granovetter's famous 1974 book on the use of informal networks and social networks entitled *Getting a Job: A Study of Contacts and Careers* addressed the ways in which jobseekers search for and receive jobs. Granovetter demonstrated that, "respondents prefer to find jobs through personal contacts" (16). Granovetter believes that one of the reasons social networks emerged as the preferred job search method is due to the inability to collect systematic data on job opportunities. He writes, "Complete and systematic data on job opportunities is extremely hard to collect; even trained investigators with government grants encounter difficult obstacles" (3). It is difficult to see how this argument holds in the internet and data-driven 21st century

where many job posting aggregators are found online. Likewise, he questions why not *all* individuals use their contacts to find jobs and comes to a simple answer: "Some individuals have the right contacts, while others do not. If one lacks the appropriate contact, there is little he can do about it" (16). This assumption cannot be applied to our research due to the extremely well-developed alumni network and many opportunities for networking at Princeton. Granovetter's argument supporting the use of social networks cannot be *fully* applied to an engineering job market at Princeton University but can shed light on the influences of weak ties.

Instead, our research is grounded in a society where data on engineering internships and jobs *can* be consolidated in ways that were not possible in 1974. In *Internet Recruiting 2.0: Shifting Paradigms*, Brian Dineen and David Allen suggest that internet-based job platforms have done more than make job posting efficient. These platforms also incentivize healthier recruiting practices that "provide greater actor control" to the jobseekers (Dineen 4). They also note that the basis of online job platforms relies on strong and weak ties through employer outreach that occurs through websites like LinkedIn. Though it is not the traditional method of using networks as suggested by Granovetter, it is a modern interpretation by which weak ties are used in online platforms. They write, "Weak ties seem to be borne out by the growing use of social network technology for recruitment purposes" (22). The primary ways online job platforms transform the recruitment/job search process are through, "media richness, customization, push-pull communications, and decentralization of the recruitment function" (4). They argue that online job platforms provide an unparalleled view at a great volume of jobs specialized to the user's criteria (that the user can independently decide to view) in an environment where *anybody* can act as a company recruiter — essentially transforming an entire social network into a recruiting behemoth. Dineen and Allen conclude that the general, modern job market has greater benefits

by moving towards job searching focused on online platforms and that these benefits *extend* upon Granovetter's ideas from 1974 (although the social aspect of the online platforms is not the primary incentive). Though they address the ability to search for more specialized job qualifications, explicit references to technical sectors like engineering never appear. There is also little effort to establish the prevalence of online job search compared to traditional social networking.

Research surrounding the internship or job search habits of engineering students is sparse, but there is supplementary research that establishes the characteristics of jobseekers that may push them towards online job platforms rather than searching for jobs through traditional networks. Daniel Feldman and Brian Klaas in *Internet Job Hunting* describe the sets of conditions that incentivize jobseekers to search for jobs online. They write, "Professionals are more likely to use the Internet for job hunting when the geographical scope of the job hunt is wide, when a major salary increase is desired, and when both small and large firms are being considered" (Feldman 175). Essentially, online platforms are designed for jobseekers with flexible conditions and a specific skillset they are seeking to use. Considering the demographics of college students, it is likely that students are more flexible with working conditions compared to individuals that have been in the workforce for an extended period. In fact, they state, "65% of new college graduates now view the Internet as a major source for help in locating job opportunities" (175). College students fall into the set of people that are likelier to consult online job searches as a primary searching tool. Ricardo Buettner pushes back against Granovetter's theories of weak ties and social networks as they apply to online job networks. Though Buettner does find that having contacts helps jobseekers on online job platforms increase their chances of searching for more jobs, he finds that there is an upper limit on the number of contacts somebody

can have in the context of online job platforms. He observes, "A substantial negative relationship between the number of contacts for an amount of contacts above 157 and job search use" (Buettner 381). He goes on to suggest that users of online job platforms do not utilize weak ties to their fullest extent compared to traditional jobseekers that do not employ online job platforms: "People are using online social networking to connect, in particular, with some new contacts but mostly with other known contacts" (379). Buettner acknowledges the job search power that comes with weak ties but argues that online job platforms become unproductive because users do not utilize them correctly and that the platforms then become less desirable compared to traditional word-of-mouth methods. So where do engineering students fit in these frameworks?

Despite many characteristics that support the fact that college students increasingly use online job platforms to search for internships and jobs (Dineen and Feldman), many of the referenced papers provide a generalized view of the job market that neither focus on engineering students nor elite university students. Some even argue that online job platforms are less desirable because of misuse that causes users to eventually migrate back to traditional, offline social networks. The level of specificity in existing research attempts cannot be fully applied to Princeton engineering students but provide a host of reasons why online platforms may be more desirable. Therefore, this paper aims to explore the job search preferences of engineering students at Princeton that are stepping into the job market for the first time in a world where online job platforms have fundamentally changed the way jobseekers seek quality careers.

III.   Data and Methods

To determine the mediums through which Princeton University engineering students discover or search for available job and internship positions, I conducted a voluntary online survey distributed amongst the email listservs of the School of Engineering and Applied Sciences (SEAS) in addition to the Department of Computer Science (as some Computer Science students are not associated with the SEAS).

The survey's full contents can be viewed in Section VII. I asked a variety of questions focusing on how the student searched for internships and jobs during the school year while at Princeton University. I began by asking students for their major and graduating year to ensure that they were current Princeton University students associated with the SEAS. I then asked the students to list all the engineering and tech internships/jobs that they *applied* to. This was followed by a question that would be the focus of my data asking how the student discovered these internships and jobs. A variety of possible resources through which the student could discover internships and jobs (specific to Princeton but also generally as an American university student) were listed. The student could check a box corresponding to each route that they personally used to search for internships and jobs.

To avoid bias in this critical section of the survey, I included another option for students to input other means by which they searched for internships. This would solve the problem of possibly influencing their choice set by only offering pre-written options by allowing them to input their own answers that may not have been listed. Finally, students were asked to rank each of the options they checked in the last question from most used to least used during their internship/job search along with a brief explanation of why they chose these specific resources as a way of collecting qualitative data that could explain the reasoning behind their answers.

IV.   Results and Discussion

There were 52 respondents to the survey, each of which were eligible Princeton University engineering students that pursued internships or jobs related to their field of study or related to engineering and technology. A survey with 52 respondents is prone to bias and the general downsides that come with online surveys (respondent rate, dishonesty, etc.) but the results can still give a telling view of the search habits of Princeton's engineering students.

The results of the demographic questions (Major and Year) are summarized in Tables 1 and 2 below. For a list of engineering major abbreviations, consult Section VII Part I for an abbreviation guide.

Major	CBE	CEE	COS	ELE	MAE	ORFE
Total Count	3	2	19	4	8	16
Percent of Respondents	5.8%	3.8%	36.5%	7.7%	15.4%	30.8%

Table 1: Respondents Sorted by Engineering Major (by Count and Percentage)

Graduating Year	2018	2019	2020	2021
Total Count	12	11	15	14
Percent of Respondents	23.1%	21.2%	28.8%	26.9%

Table 2: Respondents Sorted by Graduating Year (by Count and Percentage)

From Table 1, I observed a strong representation of respondents that were COS and ORFE majors (67.3% total). However, this distribution of engineering majors within our survey is roughly representative of the major distribution across the SEAS. Table 2 also provides us with data to ensure that the students responding to the survey encompass all years that can give valuable info on the internship or job recruiting (as in the case of Seniors graduating in 2018)

processes targeted at their specific year. I expected a roughly uniform distribution across all class years and found that this was true with the lowest respondent percentage being only 21.1% from Class of 2019 respondents.

Respondents were then asked to mark the job search resources that they used to search for internships and jobs. Table 3 describes the data extracted from Question IV of the survey. Note that the respondents could choose multiple resources so the counts and percentages correctly do not sum to 52 (100%). From these results it appears that most of the respondents (75%) utilized online portals at some point during their job and internship search process. This method was a clear favorite among many respondents compared to the other methods available to them during the search process. From Granovetter's emphasis on the strength of weak ties, one might expect a larger utilization of weak, personal ties and referrals to find open positions. Though these methods weren't the clear resources of choice for the engineering respondents, they were still utilized heavily. The informal methods listed that would be a direct application of weak ties are the Princeton Alumni Network and Personal Referrals. In fact, 28.9% of respondents indicated that they utilized the Princeton Alumni Network while 34.6% of respondents utilized Personal Referrals. Though these results do not indicate that weak ties were the clear favorite way in searching for internships or jobs, they appear to occupy a large part of the search process for many engineers at Princeton perhaps because of the extensive network of connections that Princeton students enjoy due to esteemed alumni and faculty available to them.

Job Search Resource	Indep. Company Recruiter	Alumni Network	Princeton Recruiting Event	Princeton Job Fairs	Non-Princeton Job Fair	Online Portal	Princeton Email	Personal Referral	Direct App.	Other
User Count	3	15	6	18	1	39	12	18	2	0

Percent of Total Users	5.8%	28.9%	11.5%	34.6%	1.9%	75%	23.1%	34.6%	3.8%	0%

Table 3: Respondents Sorted by Search Resource Usage (by Count and Percentage)

To determine the rate at which respondents *used* each resource, respondents were also asked to rank the resources they utilized in terms of usage (defined as the number of applications sent) in Question V of the survey. If a respondent did not use a certain resource, they were asked to rank it against other unused resources in terms of *likeliness* to utilize a resource based on the same criteria of usage. The rankings of each user were entered into a Python script that determined the overall weighted ranking of each search resource and input into Table 4. The results in Table 4 nearly mirror the results Table 3 exactly. Again, respondents indicated the high usage of Online Portals when searching and applying for positions and it was most commonly ranked at the #1 position amongst other options. Resources focusing on network relationships and weak ties took the 2nd and 3rd ranks on the list, reflecting a high usage rate amongst other resources. From Table 3 and 4, respondents also placed a large emphasis on using Princeton Job Fairs as one of their search resources with 34.6% of respondents reportedly using it and listing it as the 4th most used resource overall. Though this formal application resource is prevalent, it appears that the informal methods of using the Alumni Network and Personal Referrals were used to apply to *more* jobs despite fewer numbers of users. This can likely be explained by the fact that there are only a handful of job fair events during a school year, whereas alumni can be contacted at any point during the year.

Job Search Resource	Indep. Company Recruiter	Alumni Network	Princeton Recruiting Event	Princeton Job Fairs	Non-Princeton Job Fair	Online Portal	Princeton Email	Personal Referral	Direct App.	Other

Weighted Rank 1=Most 10=Least	7	2	6	4	9	1	5	3	8	10

Table 4: Respondents Most and Least Used Search Resources (by Weighted Rank)

From the strong relationship observed in Table 3 and 4, many Princeton engineers utilize Online Portals to search for open positions but continue to utilize informal means to search for jobs through alumni and personal connections as predicted by Granovetter when applied towards general job markets. Up to 75% of respondents utilize online portals to search for jobs and internships and many also utilize it to apply to the greatest volume of positions compared to other methods. This follows the hypothesis stating that many Princeton engineers use Online methods of searching for internships jobs compared to traditional methods of job searching through weak ties as proposed by Granovetter. Instead, many Princeton engineers from this survey appear to search for and apply to internships and jobs through online portals that conglomerate many open listings.

When respondents were asked why they chose their set of resources to search for jobs in Section VI of the survey, many responded by saying they preferred applying to internships and jobs online through Handshake and to a lesser degree, LinkedIn. This was often followed by statements explaining the ease at which one could find many jobs related to their specialized field of engineering as searching for jobs that matched their skills at job fairs was "hit or miss". Similarly, some saw job opportunities from colleagues emerge through their LinkedIn feeds. A respondent stated, "A connection of mine on LinkedIn (who I didn't know well to be honest) posted an opening at their company for their summer so I gave it a shot". This sentiment was repeated by respondents as well though it did not seem as though it was a primary reason for

using LinkedIn. More generally, others stated that the volume of positions found on online portals was unparalleled. One respondent wrote, "It's easier to make a single resume, upload it once, and send it out to 10 companies than it is to walk around the tech fair and spend 2 hours making small talk and handing your resume to 5 recruiters". It appeared that efficiency was a large factor according to these respondents. On the other hand, one student emphasized that they applied to many positions through Handshake but felt that they got higher quality internship opportunities through friends and alumni: "I didn't know the Princeton alum very well but it felt like they wanted me there more than any company did". This research does not consider internship and job application success but it appears that some students prioritize informal methods that require communication with social contacts due to the intimate experience that could be more likely to lead to an acceptance.

V.   Conclusion

The data described by Table 3 and 4 support the hypothesis that Princeton engineers use online platforms the most compared to any other search resource because of the high number of technical jobs that are advertised on these websites. However, I did not consider the high usage of these platforms because of the ease of applying to many jobs at a click of a button. It appears that Princeton engineers value many jobs that fit their skills over utilizing connections through their social network acquired through family and friends or alumni that may provide opportunities with a higher success rate or quality. However, many engineers found open positions through their social networks (but not as many as those found online) as predicted by Granovetter's theory on general job markets and many were also exposed to jobs through being "friends" with colleagues on online job platforms. Though traditional social networks from real

life acquaintances continue to exist, weak ties and social networks have found new life in online job platforms for engineering students.

Note that this data and the corresponding research does not make note of the usefulness of the internships/jobs found through each of the resources. It is possible that many people apply to jobs through online portals because of the ease of copyability at the expense of job quality. Further research in this area could be performed in a separate study.

This research is only the beginning of what can be an extensive look at the internship and job search strategies of engineering students at Princeton University. Beyond Princeton University, similar questions could be asked and applied to other elite universities in the United States. Of course, it is possible that these patterns are not only evident at Princeton and other elite universities, but of many types of universities boasting undergraduate engineering degrees. Career services departments at universities could use this info to gear the ways by which they help engineering students search for jobs by leading them towards internship and job opportunities not found on the most commonly searched online portals or companies that alumni represent. This information would be invaluable for engineering students hoping to discover as many open positions geared towards their career interests as possible.

VI.   Bibliography

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VII. Appendix – Survey

I. What is your major?
    1. Chemical and Biological Engineering (CBE)
    2. Civil and Environmental Engineering (CEE)
    3. Computer Science (COS)
    4. Electrical Engineering (ELE)
    5. Mechanical and Aerospace Engineering (MAE)
    6. Operations Research and Financial Engineering (ORFE)

II. What is your graduating year?
    1. Freshmen
    2. Sophomore
    3. Junior
    4. Senior

III. List the engineering and tech internships/jobs that you have *applied* to this year:

IV. How did you find these internships and jobs? Below is a list of possible places you found the internships and jobs, please check all boxes that correspond to places you used to search for internships and jobs:

- Independent (non-Princeton affiliated) Company Recruiter
- Princeton Alumni Network
- Princeton Recruiting Event
- Career Services Job Fair or Tech Fair
- Non-Princeton Job Fair or Tech Fair
- Online Portal (Handshake, LinkedIn, etc.)
- Princeton Emails from Department/SEAS/Keller Center
- Personal connection
- Direct Application to a company or program
- Other (please list)

V. Please rank each of the possible places from most used (applied to most internships/jobs through) to least used. If the resource was unused, consider if you would be more like to use it compared to other resources.
    1.
    2.
    3.
    4.
    5.
    6.
    7.
    8.
    9.
    10.

VI.   Briefly explain why you chose these possible places to search for jobs or internships.