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Identifying Engineering Leadership Potential During the On-Campus Recruiting Process

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Identifying Engineering Leadership Potential During the On-Campus Recruiting Process

Abstract

Recruiters' perspectives are important in determining how students should best convey their leadership skills during the recruitment process. Recruiters are responsible for evaluating and identifying talent appropriate for today's dynamic global environment. This study aims to understand, from the recruiters' perspective, the important engineering leadership behaviors an engineering student needs to communicate during the on-campus recruiting process. Additionally, the study identifies what undergraduate activities or programs recruiters' value in demonstrating important engineering leadership behaviors. The study uses a qualitative interview approach to generate themes of engineering leadership behaviors that recruiters seek to understand during the on-campus recruiting process as well as strategies recruiters use to identify engineering leadership potential.

Recruiters were asked to complete a qualitative interview questionnaire during their participation in the 2015-2016 recruiting activities at a large public institution. Interview questions explored the strategies recruiters use to identify engineering leaders, what engineering leadership behaviors are important for students to communicate, and student experiences that alert a recruiter of engineering leadership potential. A list of themes was generated using the constant comparative method. Triangulation of data was achieved through an independent focus group consisting of experienced engineering recruiters to verify the themes identified in the qualitative questionnaire. Utilizing these steps provides a structure for precise and complete analysis of the data with validation through the triangulation process.

Results from this study inform engineering leadership educators on how recruiters perceive students' leadership potential in the early-stages of their careers relevant to the engineering industry. Results of this study also inform engineering undergraduate students on how best to convey engineering leadership competencies during the recruiting process. Findings can be added to the growing literature aimed at developing and assessing the engineering leadership competencies required by industry.

Introduction

Non-technical competencies make up the biggest skill gaps in entry-level workers industry wide and are listed as the most important attributes to demonstrate to employers for entry-level positions[1-10]. Engineering education shifted towards engineering leadership development programs to address gaps in non-technical competencies, but as of yet, lack evidence as to whether these programs meet industry identified needs. The first evaluation by employers of engineering students' non-technical competencies occurs during on-campus recruiting events such as career fairs by recruiting professionals.

This paper examines recruiter perspectives of student behaviors during career-fair interactions, which provide evidence of the important non-technical competencies related to engineering leadership. Findings from this qualitative analysis may provide insight into what

behaviors demonstrate effective knowledge, skill, and competency transfer from classroom to the workforce.

Background

Engineers top the list of new recruits in high demand by industry in 2016[10]. To identify entry-level talent, 96% of employers utilize on-campus activities such as career fairs and on-campus interviewing[10]. During this process, recruiters interact with students to determine fit within jobs and organizations for entry-level hires. Top candidates will effectively demonstrate non-technical and technical competencies during the on-campus recruiting process[10]. Students are expected to communicate these competencies through short interactions at the career fair and during 30-minute interviews, making up the major events for on-campus hiring activities. Student behaviors during these interactions form the basis of employer perception of leadership characteristics.

Recruiting, screening, and selecting are the three activities companies utilize for identifying talent[11]. These activities are carried out through university on-campus recruiting processes in the form of career fairs, networking sessions, and on-campus interviews. Central to identifying talent is the job description, which identifies the knowledge, skills, abilities, and other (KSAO) desired qualifications for entry-level positions[12]. Company representatives screen for entry-level potential through the lens of the KSAO's communicated through the job description[11]. The information in the job description ultimately describes the set of competencies needed to be successful in the job. Competencies are underlying characteristics of an individual that can indicate ways of behaving or thinking that are important to a specific job or situation[13]. A competency is built on behavioral indicators. Behavioral indicators are specific behavioral ways of demonstrating the competency needed for the job and are influenced by motives, traits, attitudes, knowledge, and skills[13]. Behaviors link a candidate to the competencies for a particular job description. Informed by the competencies in the job description, the recruiter has the difficult task of identifying and selecting potential hires based on behaviors during short interactions at a career fair[14].

Accreditation Board for Engineering and Technology (ABET), responded to the non-technical skill-gap through accreditation changes implemented in 2000[15]. These changes require engineering educational institutions to incorporate key non-technical competencies into their curriculum, based on industry needs. Recent studies have also utilized industry experts to determine important competencies and themes related to engineering leadership and are working to create an evaluative tool for undergraduate engineering leadership development[16-17].

On-campus recruiting is important for industry identification of entry-level talent as seen with the number of companies participating in on-campus recruiting activities[10]. During these short and busy events, recruiters are looking for certain behavioral indicators to alert them to potential talent based on the needs of various open positions. Engineering leadership programs, created to address industry identified non-technical skill deficits, should produce students with behavioral indicators that meet the non-technical competencies for entry-level employment. By understanding from the recruiters' perspective, the behavioral indicators relevant for engineering leaders, engineering leadership development programs can better prepare and evaluate students completing their programs.

The purpose of this study is to explore recruiters' perspectives of which engineering leadership behaviors are important for students to communicate during the on-campus recruiting process. The research questions for this study are:

1. What activities during college do recruiters value or perceive as building engineering leadership competence?
2. What behaviors during the recruiting process demonstrate the potential for engineering leadership competence?

Answering these questions from the recruiters' perspective will assist engineering leadership educators in helping students understand how to effectively communicate their leadership experiences during the on-campus recruiting process. Recruiter perspective will give insight as to the behavioral indicators relevant for entry-level engineering leadership, which is important for building competency models specific to engineering leaders.

Methods:

This study seeks to understand how a recruiter perceives engineering leadership characteristics and how these behaviors are best demonstrated during on-campus recruiting interactions. Behaviors elicited during interactions such as these can be evaluated through qualitative analysis to capture these complex social interactions. Qualitative methodologies are an interpretive approach to a research problem that situates the researcher in the world in which the problem resides and uses both inductive and deductive analysis to determine patterns and themes[18-19]. Qualitative research is used most effectively when a problem or issue needs to be explored from the lived experiences of individuals[19]. Additionally, the concept of engineering leadership is not fully developed and the themes identified through this study will add to the emerging literature defining engineering leadership.

The study design is a basic qualitative approach using open-ended interview questions emailed to interview participants to determine themes and perspectives addressing the research questions. Participants were recruiters participating in on-campus recruiting activities at a large northeastern educational institution. Recruiters were selected who were targeting undergraduate engineers for internship, co-op, or entry-level opportunities. Recruiters targeted undergraduate engineers through positions posted in an undergraduate engineering job-posting system, participated in an engineering job fair, or conducted interviews on campus for entry-level engineering positions. To increase the likelihood of multiple engineering disciplines being represented in the population, the data were filtered to include only large public companies resulting in an 'n' of 33 for data analysis. Recruiters were given a qualitative questionnaire during the fall 2015 career fair or were emailed the questionnaire through an engineering career services database of a large northeastern institution. Recruiters completed five qualitative open-ended questions and three demographic questions. Using Nvivo software, the responses from the open-ended questionnaire were coded using analytic strategies such as questioning, open coding, and the constant comparative approach[20]. As data analysis began, a qualitative technique, 'questioning the data' was used to help the researcher evaluate the data from the perspective of the respondent and allow codes to emerge that may be conceptually interesting[20-21]. During the open coding phase, concepts were recorded in structural categories with the same properties[20-21].

Using constant comparison, elements of the structural codes were combined to elaborate on deeper concepts and provide for variation[20]. Once this first phase of data analysis was complete, themes were generated to provide interpretations of recruiters' perspectives. "A theme functions as a way to categorize a set of data into an implicit topic that organizes of group of repeating ideas"[21]. Triangulation is the process of using multiple methodologies to study the phenomena in question and is a means by which a study's internal validity is achieved[22-23]. Triangulation of the data was achieved through a focus group consisting of six recruiters participating in a spring 2016 career fair event.

Results

The purpose of this study was to explore recruiters' perspective of what engineering leadership behaviors are important for students to communicate during the on-campus recruiting process. Themes generated from this study aim to help engineering students understand how to best communicate leadership activities, which behaviors communicate leadership potential, and to inform choices for involvement in engineering leadership development activities.

Study participants represented large public corporations and were recruiting for a number of engineering disciplines (Table 1), with mechanical, electrical, and industrial engineers being the most sought after engineering disciplines. On average, study participants recruited for five different engineering disciplines. Half of the study respondents recruited between one and four engineering disciplines and half recruited for five to 16 different engineering disciplines.

Table 1: Percentage of study participants recruiting for each engineering discipline.

Engineering Discipline	**Percentage (%)***
Mechanical	88
Electrical	73
Industrial	67
Computer Science	39
Chemical	36
Computer Engineering	36
Aerospace	24
Engineering Science	24
Biological	21
Other	18
Mining	12
Architectural	9
Civil	9
Energy Engineering	9
Nuclear	9
Petroleum & Natural Gas	9

Research Question #1: What activities during college do recruiters value or perceive as building engineering leadership competence?

Activities and Involvement Pique Interest for Engineering Leadership Potential

The most valued activities cited by recruiters were relevant student organization involvement, internship/co-ops, and engineering projects. These experiences alerted recruiters to the potential of engineering leadership because students obtained experience that may translate to the real world.

"I do find that I gravitate to candidates with Eagle Scout backgrounds, and those who have been involved with extra-curriculars like Lion Tech or Lunar Lion that closely simulate our working environment. Students tend to work their way from a rank and file contributor to leadership roles in those experiences which might translate in our world."

Additionally, these experiences, especially engineering specific experiences, "piqued interest" in recruiters because, of the increased likelihood of a student "making it through" the rest of the recruiting process, such as the interview stage. As one recruiter noted:

"These activities provide the student with a variety of built-in examples that they can use to showcase what they did and how well they led….this provides me with some knowledge that the student will have an easier time responding to my behavioral-based questions."

After a career fair, typically, the next phase in the process is the behavioral description interview, or BDI. BDIs use questions that elicit critical incidents from an applicant's past that are relevant to the job[24]. In other words, BDIs use past experiences to predict future success in the particular entry-level position. Previous involvement in relevant engineering student organizations, internships/co-ops, or projects alert a recruiter to the potential ability for a student to demonstrate the relevant competencies as they move forward in the on-campus recruiting process.

Fifteen percent of recruiters mentioned student participation in engineering leadership programs as a valuable activity that demonstrates the potential for engineering leadership, though not as heavily cited as the three discussed above (student organization involvement, internship/co-ops, and engineering projects). Recruiter comments on students who mention being a part of the leadership development program included "always being impressed", "piques interest", "are more prepared than other students", "get more attention immediately". Deeper information into why they react to hearing engineering leadership programs was not found in the data. The small number of recruiters mentioning engineering leadership programs may imply that more efforts to build awareness of these types of programs are needed.

Research Question #2: What behaviors demonstrate the potential for engineering leadership competence during the recruiting process?

Activities and involvement are important but….

As noted above, activities and leadership experience are important to alert recruiters of potential for success through the remaining portions of the recruiting process. The behavioral themes emerging from the data related to the actual career fair event reveal that activities and leadership experience alone do not leave an impression of engineering leadership. However, three overarching themes emerged: Communicating, Connecting, and Confidence.

Communicating

Based on the data, effective articulation of leadership experiences demonstrated the potential for engineering leadership behavior. A student who demonstrates engineering leadership behaviors during the career fair will communicate in ways that show a reflection and understanding of their personal leadership development. Experiences are important to have, but an ability to translate those experiences from merely an action to a learning experience demonstrates potential for engineering leadership during a career fair.

"Engineering students that are able to articulate these experiences as positive and beneficial in their development and how or why is a plus."

"Potential engineering leaders often present those experiences in a way that often times reflects their thirst for more."

"Hands-on senior design projects are important. My industry is very hardware-design-centric. I need individuals that have real world experience that can be leveraged. The candidate also must show that they were a driving contributor to these projects, rather than an individual that leached onto the group and contributed little."

These sample quotes demonstrate that recruiters perceive engineering leadership potential through a student's ability to communicate the impact of an experience on their personal leadership development. Recruiters also noted that engineering leadership behaviors related to communication included an ability to talk about leadership outside of holding a position.

"I look for candidates who have leadership experience either in clubs, extra-curricular activities, projects, or through internship experiences. This does not necessarily mean being the "president" or "treasurer" of a club. In some cases, students have difficulty articulating their leadership qualities if they do not have a title. Certainly a clearly defined position title helps recruiters understand what particular leadership skills the candidate demonstrated. However, it would be valuable to help students learn how they can describe their leadership capabilities outside of having held a defined position."

This theme is important not because communication is a key skill for effective leadership, but because communication of self-awareness around leadership is key for potential leadership abilities. Self-awareness, a key skill within emotional intelligence, is part of a body of leadership literature that relates leadership performance to an ability to be accurately self-aware of leadership capabilities[25-26]. Engineering leadership programs are also noting the importance of incorporating self-awareness into program curriculum or training programs[27-28]. In a study to determine behavioral frameworks for highly effective technical executives in NASA, self-awareness emerged as an integral part of the relational competency category[29]. The importance

of self-awareness demonstrated in these studies is evidence of the need to ensure leadership development interventions intended to build self-awareness are incorporated into engineering leadership development programs[26]. Further, effective interventions should include practice in communicating self-awareness of engineering leadership development to impact perceptions of potential during the on-campus recruiting process.

Connecting

Connecting experiences and interest to the particular job opening or company was another indicator of engineering leadership. Students who could hold a comfortable conversation with the recruiter and demonstrate genuine interest in the company or opportunity available stood out for recruiters at the career fair. Recruiters built a perception of potential engineering leadership when they observed students that knew what they wanted and understood how their experiences connected to the company.

"I want students who know what they want and show that they have at least taken some time to understand what my company does/has to offer. To me, this shows initiative and demonstrates that the student will be able to build their own talent."

"An understanding of how their college education and experience will translate into a career [is] important. We are looking for people who understand how what they've done makes them more suitable for our business than someone else."

"The students who are able to tell me what they want and why they want it from my company are more likely to get to the next level."

"For me, I want to see how quickly they can establish a connection and pull me into their experiences. Get me interested in who they are not just what they do or have done. Are they [committed] and focused on a career or are they just looking for a job."

The importance of this theme lies in the students' ability to connect their interest and experiences directly to the company. To be successful at this behavior, students must research the company and the company's opportunities (both short and long term) to align with their interest and capabilities. The quotes above demonstrate that a recruiter wants the student to connect with the company at a career level, a higher level than just getting a job. This means knowing how the bigger picture of involvement with a particular company meets their career goals and subsequently, how the student's experience connects with the company's goals. Establishing this connection aligns with leadership skills related to big picture thinking. Recent engineering leadership studies and frameworks position big picture thinking as a key attribute and learning outcome for engineering leaders[28, 30-33]. NASA's behavioral study on highly effective technical executives includes understanding the big picture and interrelationships as an important behavior of effective technical executives[29]. This theme is important to consider to ensure that students understand the importance of big picture thinking and how it can be perceived initially from recruiters during the career fair process through effectively connecting career goals to company opportunities.

Confidence

Confidence emerged as a defining engineering leadership behavior through various supporting behaviors at the career fair. Eye contact, professional dress, calmness, and a firm handshake were behaviors that demonstrated the potential for engineering leadership related to confidence during the career fair. In addition to these items, recruiters noted the difficulty of performing in a career fair setting and used that backdrop to infer engineering leadership characteristics.

"I usually first evaluate how candidates present themselves. Leaders seem to have more confidence and practice in intimidating situations and come off more composed."

"I can get a good read on a candidate if they exhibit confidence when approaching my booth. That shows ambition and potential leadership skills."

"Leaders know how to act in various situations, and they carry themselves with a certain deportment that displays confidence without conceit. They have a firm handshake, look people in the eye, address colleagues by name, take pride in their appearance, speak up instead of mumbling, etc."

"I want the students to show full confidence to look me in the eye and tell me where their interests are, definitive answers are always best."

Leadership research reveals a positive relationship in a leader's self-confidence and successful leadership[34]. These findings also align with Hartman et. al.'s (2015) study where industry professionals identified initiative/confidence as a main competence for entry-level engineering leaders. The authors define the initiative/confidence theme as "stepping up, going the extra step, asking questions, having confidence and/or self-confidence" (pg. 6)[17]. Woollacott's engineering taxonomy, designed based on the competencies needed for engineering work, includes self-confidence as an advanced disposition defining it as "…expressing confidence in own judgment. Sees self as a causal agent, prime mover…" (pg. 558)[35]. Interestingly, one recruiter commented on confidence specifically within the engineering context:

"Confidence is the most important behavior, we need people that can consider the engineering data and confidently suggest a course of action."

The confidence theme identified in this study aligns with recent studies working to identify engineering competencies. Engineering leadership programs must provide opportunities to build confidence in all aspects of engineering competencies. Reviewing research on self-confidence and self-efficacy may provide further insights into building confidence in engineering leaders that can be easily demonstrated during a career fair event [34].

Study Limitations

The qualitative design of this study focused on generating themes from the perspective of recruiters regarding behaviors during a career fair that demonstrate the potential for engineering

leadership. The recruiters selected for this study were chosen based on their involvement in hiring engineers for entry-level positions and included large public companies. Collecting from this sample allowed for a greater diversity of engineering disciplines, but did not account for the needs of smaller organizations. The data collection method, hand written or emailed qualitative questionnaire, did not allow for further probing typically associated with in-person qualitative interview studies. Further, the value of qualitative research remains in the ability to generate themes and descriptors within various contexts; therefore because this study was based on the experiences at one institution, generalizability may be limited[36].

Conclusions

Corporate recruiting strategies continue to favor the use of on-campus recruiting for identifying entry-level talent and consistently report that top performers at career fairs will demonstrate non-technical skills associated with leadership[10]. Engineering leadership programs seek to ensure industry identified leadership competencies are developed through program offerings. Recruiter perspectives on behavioral indicators of engineering leadership during a career fair may provide insight as to what competencies engineering leadership programs should focus on for a student's initial interaction with a company. The key themes emerging from this study reveal that students should engage in activities outside the classroom such as student organizations, internships/co-ops, and engineering projects. However, these activities alone did not demonstrate the potential for engineering leadership to the recruiters in this study. Based on the recruiters interviewed in this study, communication, connection, and confidence were behavioral indicators of engineering leadership. The communication theme referred to students' abilities to articulate self-awareness of leadership, developed through activities such as student organizations, internship/co-ops, and engineering projects. The connection theme illustrated the importance of big-picture thinking through students' effective connection of experiences and interest to company opportunities. Finally, the confidence theme supported leadership findings in the connection between successful leaders and confidence. The context and descriptors of these themes related to the leadership literature in this article will help engineering leadership programs to consider a recruiter's perspective as the first external evaluator of the competency development of students emerging from engineering leadership programs.

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Appendix A

Recruiter Survey

The purpose of this study is to understand from a recruiter's perspective the important engineering leadership behaviors an engineering student needs to communicate during the on-campus recruiting process as well as what undergraduate activities or programs recruiters' value in developing important engineering leadership behaviors.

1. Describe what it is like to try to identify potential engineering leaders at the career fair? (Please describe in as much detail as possible)

2. What leadership behaviors are important for engineering students to communicate during the on-campus recruiting process?

3. Recall and briefly summarize one example of a student's 30-second pitch at the career fair or answer to an interview question, which demonstrated important engineering leadership behaviors. Please describe one answer where a student failed to demonstrate important engineering leadership behaviors.

4. Describe strategies you use to elicit an understanding of important engineering leadership behaviors during the recruiting process.

5. What experiences or programs peak your interest in working to identify potential engineering leaders during the recruiting process?
   How should these experiences or programs be described through the recruiting process?

6. How would you classify your company: public/private, large/medium/small?

7. May we contact you if we have any further questions?
   Please list email: _____