Transitioning from University to Employment in Engineering: The Role of Curricular and Co-curricular Activities

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Introduction

The passage from university to employment represents a major transition with personal, economic, and societal implications. In recent years, the study of transitions has attracted renewed interest from policy makers and researchers in the light of changing labor market patterns, the diverse transition pathways of young people, the transformation of professional knowledge, and an increasing disjuncture between students' academic training and the specific skillsets sought by employers [1, 2, 3]. Yet very little is known about this transition in the field of engineering [4]. Most studies concentrate on the job readiness of engineering graduates [5, 6]. Fewer studies have explored how the knowledge, skills, and experience that engineering students gain in university facilitate their transition to employment, including the job search and workplace adjustment. As a consequence, little is known about how such knowledge, skills, and experience assist with the job search, how useful they are in adjusting to the workplace, and how they are applied on the job. Drawing on Bourdieu's concept of capital, this paper explores the ways in which curricular (academic studies) and co-curricular (internships, cooperatives, and extra-curriculars) activities influence the transition of engineering graduates by creating opportunities for accumulating knowledge, skills, and experience, and how these facilitate their transition.[1]

Literature review: The role of curricular and co-curricular activities in the transition

Available empirical research shows that the knowledge, skills, and experience obtained through curricular and co-curricular activities can facilitate the transition from university to employment to varying degrees and suggests a number of trends.

First, the studies show that academic studies provide students with foundational knowledge, learning strategies, and management skills, and that graduates utilize their education to varying degrees on the job. In their study of the transition experience of Swedish engineering students, Stiwne and Jungert found that the students considered their education to be broad and viewed the skills they acquired as lacking depth, except for those in mathematics and physics [3]. Nevertheless, they believed that their university education helped them to attain content knowledge, as well as skills in problem-solving, time management, learning, and managing stress and heavy workloads. Similarly, English computer science and information systems students in a study by Clark, Zukas and Lent thought that their university education was generally valuable and relevant, though some of them found the computing aspect of their education peripheral to the tasks that they had to perform in their jobs [7]. Graduates seemed to utilize their learning about business and management to a greater extent than their knowledge of computing.

Second, academic credentials are important but insufficient to procure employment, and graduates draw on a wide range of resources to obtain a job. Stiwne and Jungert found that a good thesis

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[1] For the purposes of this paper, we refer to co-curricular activities as learning opportunities that take place outside the classroom and we limit ourselves to three co-curricular activities such as internships, cooperatives, and extra-curriculars. We decided to focus both on curricular and co-curricular activities because, in addition to their academic studies (technical coursework, design projects and labs), engineering students undertake internships and cooperatives and engage in extra-curriculars (e.g., design competitions, student government, athletics, and social identity clubs) during their undergraduate studies; thus potentially gaining valuable knowledge and skills that they can utilize during their transition to employment (see Rottmann, Sacks, Klassen, & Reeve; 24).

project, a diploma from a prestigious program, self-confidence, a broad knowledge base, and industry placement were the resources that students considered valuable during their job search [3]. Of these, industry placements where students completed their thesis projects were thought to be the most valuable resource. Students used placements to get their foot into a company and to build networks which would eventually help them to secure employment there. Professional work experience and extra-curriculars are other resources on which students draw during their job search. In their study of unemployed engineering graduates, Atkinson and colleagues note that many employers look for candidates with professional work experience; that many of them value extra-curriculars, and that academic credentials alone cannot explain success or failure in the labor market [8]. The study found that those who were unemployed had less professional work experience and lower levels of engagement in extra-curriculars than those who were employed.

Third, internships, cooperatives (henceforth co-ops), and extra-curriculars help to make a successful transition. Students in Stiwne and Jungert's study believed that soft skills were better learned through industry placements and extra-curriculars than through academic studies [3]. Industry placements helped them to gain insights into workplace practice and values and to understand the differences between university and the working life. Participants in Vinson and Stevens' study reported that industry-based internships helped them to clarify their career pathways [9]. Their study found that students who completed multiple internships had a better understanding of the sectors and environments in which they would like to work and were able to secure more desirable jobs than those who lacked such experience. Extra-curriculars, as Tomlinson notes, help students to build so-called 'soft credentials,' which they use to differentiate themselves in the labor market [10]. Employers in Atkinson and colleagues' study believed that extra-curriculars facilitate the formation of leadership, teamwork, and interpersonal skills and that students who participate in them are better able to get along with a wide range of people in the workplace than those without such experience [8].

Finally, in addition to technical knowledge, engineering students require soft skills to successfully secure employment and transition into the workplace. In their study of the changing nature of professional knowledge in engineering and nursing, Adams, Livingstone, and Sawchuk note that communication, interpersonal, teamwork and presentation skills are gaining prominence in engineering and are more essential to success on the job for new graduates than they were for their predecessors [1]. Participants in Winters and colleagues' study, who were asked to rate the importance of skills in math, science, business, communication, and teamwork as they were progressing through their studies and transitioning into their careers, placed stronger emphasis on communication than math skills, especially in their upper university years and early career stages [11]. Practicing engineers viewed these as being among the most important abilities on the job, as they had not only to work on the technical details of projects but also to communicate their ideas and interact with people from diverse backgrounds. Studies beyond the field of engineering show that employers increasingly assign importance to personal attributes and skills rather than to academic credentials and are looking for a wide range of personal, performative and organizational abilities among graduates in the context of a competitive labor market and changing organizational cultures (Brown and Hesketh, as cited in Tomlinson; 10, 12).

Collectively, these studies reveal how curricular and co-curricular activities can serve as means for the accumulation of knowledge, skills, and experience that engineering graduates can turn into useful resources during their transition. Our paper extends the existing research by further examining how both curricular (academic studies) and co-curricular (internships, co-ops, and extra-curriculars) activities help engineering students, especially during their job search and workplace

adjustment. We focus on multiple rather than one learning activity, demonstrating how they facilitate different stages of the transition process. We also discuss the factors that impede or enable the accumulation of the knowledge, skills, and experience through curricular and co-curricular activities.

Theoretical framework: Bourdieu's forms of capital

This paper draws on the conceptual framework of a larger qualitative study which examined the transition of engineering students from university to the workplace. That study adopted an interactionist approach, which holds that both individuals and contextual factors influence the transition process [13, 14, 15]. In this paper, we draw on Bourdieu's concept of capital. Capital is any resource effective in a given social field which individuals inherit within or beyond the family, accumulate over time, and use to reap social rewards and maintain social class privileges [7, 16]. Bourdieu differentiated between three forms of capital: economic (material and financial assets), cultural (knowledge, behaviours, skills, tastes, styles, and educational qualifications), and social capital (social connections and group memberships) [17]. He posited that economic capital is at the root of all types of capital. However, other forms of capital are not necessarily reducible to economic capital and have their own particular effects [17, p. 54].

The accumulation of cultural capital takes place over the whole process of individual socialization. In the context of this paper, undergraduate education, including both curricular and co-curricular activities, can be viewed as a socialization period wherein engineering students acquire disciplinary knowledge, professional skills, and educational credentials. Cultural capital exists in three forms: embodied state (long-lasting dispositions of mind and body acquired over time), objectified state (books, paintings, and instruments transmissible as material objects), and institutionalized state (educational qualifications) [17]. Cultural capital in its institutionalized state can also be referred to as educational capital. As several studies demonstrate, students complement their educational capital with other aspects of cultural capital such as soft skills, professional work experience, and extra-curriculars, as well as social capital, both during the job search and on the job [10,18].

Social capital is the aggregate of social relationships that derive from memberships in formal and informal groups [17]. The network of relationships is the product of conscious and unconscious strategies that individuals and groups use to establish or reproduce social relations that can be used to derive benefits. These networks include connections associated with an individual's family, cultural groups, and professional groups. They may be informal, as with acquaintances made through faith-based organizations, or more institutionalized, as membership in a professional association or community of practice. The formation of social capital requires an investment of time and energy. Its impact depends on the density of social connections as well as the proximity to key decision makers in the network. In the context of this paper, family connections, academic networks, and internships and co-op placements can enable students to develop and expand social capital which they can utilize during their job search or on the job.

Bourdieu posited that the three forms of capital are inter-convertible [17]. For instance, both cultural and social capital can be converted into economic capital and vice versa. In the context of this paper, educational qualifications, along with personal qualities, internship and co-op experience, and extra-curricular activities, can be converted into employment, which is an example of economic capital. Similarly, social capital can be converted into economic capital when networks lead to new contracts, job offers, and internships. This framework assumes that the transition from university to employment is not solely a function of natural aptitude but is based largely on the endowments of

capital and dispositions that individuals accumulate during their socialization, including university education [19]. Accordingly, this paper demonstrates how curricular and co-curricular activities constitute sites for acquiring and transforming forms of capital, which affect the transition experience of engineering graduates.

Methodology

Data for this paper come from individual semi-structured interviews conducted with 21 engineering graduates as part of the larger qualitative study. The study deployed a multi-site case study methodology and was conducted across four engineering companies in Ontario, Canada.[2] Although the study was administered across different companies, the primary units of analysis were not the companies but the selected engineering graduates working within them. These graduates constituted individual nested cases. In this paper, we use individual cases to illustrate patterns observed in the data collected. In interviews, we focused on four main topics: university education experience, job search, workplace adjustment, and leadership development and practice in the workplace. In this paper, we draw on the responses of the graduates to questions about the utilization of their university education, internship and co-op experience, and extra-curricular activities during the job search and workplace adjustment.

We recruited the 21 engineering graduates with the help of human resources personnel at four selected companies. We interviewed from three to seven graduates at each company. We used two sampling criteria to select study participants: (1) they should have completed their studies within the last five years and worked at the selected company for at least six months but no longer than four years; and (2) they should be of different gender, racial and ethnic backgrounds, from different departments, and have worked at the company for different periods of time.[3] We conducted one in-person semi-structured interview with each study participant, with each interview lasting between 60 and 90 minutes. All interviews were recorded and transcribed. We analyzed the data deploying both inductive and deductive coding strategies and used a method of constant comparison searching for similarities and differences in the interview data.

The study has two major limitations. Given that engineering graduates pursue engineering, engineering-related, and non-engineering careers [20], one limitation of this study is that it focuses only on the transition of those who sought engineering jobs. Another limitation is that our sample was limited only to those graduates who can be deemed to have made a successful transition. All our study participants secured employment before or immediately after their graduation and did not encounter any major issues adjusting to the workplace. We did not interview individuals who experienced difficulties to secure employment or who were unemployed or underemployed for more than six months after graduation. Nor did we interview those who struggled upon entering the workplace.

Case studies

In what follows, we present three case studies which show how engineering students accumulate educational, cultural, and social capital through curricular and co-curricular activities and deploy it

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[2] We selected four engineering companies to participate in the study in order to examine similarities and differences in the transition experience of engineering graduates across different organizational contexts. However, we do not discuss this topic in this paper due to its focus.
[3] We interviewed 8 females and 13 males from diverse racial and ethnic backgrounds. In this paper, we do not discuss similarities and differences in their transition experience based on gender, race or ethnicity due to space limitations.

during their transition, especially in the job search and workplace adjustment stages. In each case, we identify the knowledge, skills, and experience that students acquire through academic studies, internships and co-ops, and extra-curriculars and highlight the factors that enable or impede their acquisition. The selected cases represent distinct transition trajectories, showing how engineering students can grow, mobilize and transform their capital in different ways that make the transition either seamless, almost effortless, or, at minimum, manageable. To varying degrees, the three cases capture the overall transition experience of the 21 engineering graduates interviewed as part of the larger study.

Case 1: Martha

The case of Martha (civil engineering) illustrates a seamless university-to-work transition. Although her transition experience was not necessarily typical of the selected graduates, her case reflects one pole along a wide spectrum of experiences. She represents high achieving students with a plethora of opportunities derived partly from their native abilities and partly from social connections. Martha was well-prepared for her transition, having started her job search in the summer before graduating. She compiled a list of 25 companies aligned with her interests, and submitted 15 applications that resulted in ten interviews and eight job offers. But the offer she ultimately accepted was not among these: "I had good rapport with my professors to start with … One of my professors, he's friends with [manager's name], who is really high up in [company's name]. He actually recommended me to [company's name] for the interview to start with … That's kind of how I got an interview with [company's name]. I didn't actually apply online." The social capital of her professor and her access to it helped her to obtain employment at a prestigious consulting company.

During her undergraduate studies, Martha interned each summer at a different engineering company. These opportunities honed her educational and career plans, strengthened her technical knowledge and skills, and introduced her to workplace conventions. When Martha was wavering between civil and chemical engineering, summer internships helped her to find resolution. After conducting bridge inspections one summer, she discovered her niche: "I loved that one year of the summer where I got to go out on the bridges, and I really got super into bridges and all I want to do in my life is design a bridge." That internship also exposed her to complex, real-world problems she had not experienced at university, which better prepared her for the job: "I feel in university … they give you a very basic structure … 'Calculate the force here, calculate the force there' …" She continued, "When you get out in the real world, you don't have a simple frame. It's never simple. It's something complicated and you're using the program to work on it. I feel like having the summer job experience to actually work through those programs and have a more complex thing that you're trying to analyze really helped in the real world when you got out." Yet, as Martha indicated, not all her internships afforded meaningful opportunities, especially for technical learning. She described one internship as "a bit of a boring job but I learned how to count steel."

Internships also introduced Martha to workplace conventions and the parameters of a professional work environment: "[You get] a better sense of the actual working world, what's expected of you. You have to be in at a certain time, you have to be out at a certain time. You're expected to perform a certain amount [of work during] that time period. Whereas in a [student] club, if you waste a day, maybe you'll pick it up some other day. At work, you have to get things done and there are people depending on you. I think it really gets you ready for the working world that you're going to be in. It gives you those professional skills: how to act around your supervisors or mentors and how to get help from them." She reported learning how to be part of a team, to communicate with people from other disciplines, to send clear and concise emails, to write reports, and to organize data.

When it came to the job search, Martha drew heavily on her internship experience: "I think those summer experiences really helped me. The good marks at university helped. [Company's name], for example, puts a lot of weight on your transcript. Some other companies don't mind so much but having those high marks going into the interviews definitely helped ... Some of my extra-curricular involvements, I pushed those as well … Since I had all that summer experience, I led with my summer experience on my resume versus my academic experience." Martha assigned a higher weight to her internship experience than to her educational qualifications, using it as a means to differentiate herself in the labor market. Although she viewed her good grades as an asset, she placed less emphasis on them, believing them to be necessary but not sufficient for gaining employment.

During her studies, Martha was active in two design clubs, holding both participant and leadership roles. As an executive committee member she learned "how to lead people, how to work as a team that may not always be focused, so how to keep people on track, even though you're in an extra-curricular club. You're just trying to get something done and people can be very unfocused on the task at hand, so how to keep people focused and how to work through that." Her executive role created opportunities for acquiring teamwork and leadership skills that she later used on the job. Her extra-curricular involvement also created opportunities for gaining time management skills. She drew parallels between juggling multiple commitments during her studies and managing multiple projects on the job: "[At university], most of your time is spent studying and trying to get your work done. You have to schedule yourself out some time specifically to do the club that you want to do." In much the same way, "being able to stay focused on one project and then quickly switch your thoughts onto a different project that you're working on and maintain that focus to try and get all your tasks done on time and organizing schedules."

After more than four years at the engineering consulting company, where she performs mainly design work, Martha still finds the knowledge and skills obtained through her academic studies to be relevant to the job: "There are always things that I am working on, and I think back, 'Oh yeah, we did something like this in a university.' You will look through the book and you're like, 'There's that equation.' I keep my university notes at my desk all the time." However, she spoke about experiencing the difficulty of applying theory to practice upon entry in the workplace: "I felt there was technical knowledge that I didn't have … I felt there was a huge gap between where I was supposed to be technically and where I actually was coming out of university. I learned the basic equations but I didn't know how to apply those to the real world and what I was actually working on." Her academic studies impeded her transition to some extent by not helping her to bridge the gap between theory and practice. Martha also valued the "learning-how-to-learn aspect" of her academic studies. As she explained, "Just working through the problems on your own, figuring things out, learning how best you understand something. Do you understand it from reading a book? Do you understand it from talking to someone and having them explain it to you?"

Martha presents the profile of a graduate with abundant cultural and social capital accumulated as part of her university education. She is self-directed and highly motivated. Yet, despite these qualities and her eight job offers, she relied on her social capital to secure her first full-time job, which shows that even 'ideal' candidates supplement their educational capital with other forms of capital to find employment.

Case 2: Aaron

Aaron (civil engineering) returned to his co-op placement to work full-time after completing his graduate studies. Having a secure job offer from his host company, where he enjoyed his job and the environment, he chose not to look further. His case shows how co-op experience can assist in a soft landing by clarifying career preferences and providing a path into full-time employment.

As an undergraduate student, Aaron had good grades and he was not actively involved in extra-curriculars. With some forethought, he completed a summer internship at a public sector agency where his father worked and a year-long co-op at an engineering consulting company. He pursued these to gain some professional engineering experience in order to increase his employability: "I kind of envisioned in first, second and third year that as soon as I'm done school, no one is going to want to hire you right away. I had some friends that were struggling as soon as they finished and that was the reason that they did their masters because they finished, they couldn't really find what they were looking for … If I have even a little bit of experience when I finish school, I already have that step above half of my class, or perhaps three quarters of my class … I didn't want to sit at home during summer. I wanted to make sure I was working, doing something that would at least benefit me in the future ... I've always been self-driven, self-motivated."

Aaron's internship with the public agency introduced him to a professional environment and helped him to learn how to work alongside different people: "I had to adapt to an office environment. Working at the grocery store was completely different … this was my first office job working with professionals … People work in very different ways. All the way from the good end of spectrum to some of them being very difficult to work with. You had to really adapt to how they work." Although his internship provided a space for gaining soft skills, it offered few opportunities for technical learning. Describing the organizational culture as "slow at turning things out," he felt that he was not assigned enough tasks and had limited opportunities for learning: "I would finish [the assignment] in the afternoon, but they would tell me, 'Take two weeks to do it.' If I were done with something quickly, [I would simply spend time reviewing it]."

In contrast, Aaron's succeeding year-long co-op with the private consulting company provided more meaningful opportunities. There, he assisted in the development of project proposals, gained insights into consulting practice, built strong relationships with colleagues and managers, and sharpened his leadership, communication, and time management skills. Having worked in both sectors, Aaron concluded that he preferred work in the private over the public sector: "I kind of liked the private sector over the public side a little bit more. It is a little more accustomed to my taste and how I work."

Not only did his work experience help to match Aaron with a sector; it also led to a full-time job offer. He attributed the offer to a number of factors, but principally to his reliability, adaptability, initiative, and communication skills. Together, these qualities helped him to fit in with other team members. Speaking of the significance of communication skills, one of his main differentiators, he noted: "[They] are important but not very prevalent in engineering … [My peers] probably had the same marks as me but I was able to interview well and I can communicate even just having a simple conversation. A lot of people in my class weren't really good with that. There was either a language barrier or they were timid or they didn't know what to do in social situations."

Once on the job, Aaron found himself not drawing much on his education, though he did consider it useful. He attributed this to the nature of his position and to the consulting sector. Aaron described

his position as "a technical and project manager type role." In addition to doing technical work, he assisted with managing projects which included drafting proposals, doing budgeting, scheduling project meetings, and engaging with clients: "[My job is] technical but not technical in the same sense as at university. I'm not doing equations all the time. I'm not doing models on the computer … A couple of my friends, who were in civil and structural, ended up at a structural company. They're almost doing day-in day-out what they learned in school … a lot of their work is: 'I did this calculation in university. It's in the code book. I just need to follow the rules, etc.' For my job … I can say that the foundations of what I learned in university apply here, the concepts of transportation engineering apply. I would say 90% of the technical calculations stuff … I don't use them. The only calculations I do are for budgeting purposes … I think this is very different than what I learned in school … for this type of position."

The case of Aaron shows how internships and co-op placements can be mobilized to clarify preferences and secure full-time employment. His experience is evidence of the potential for engineering students to convert their cultural and social capital derived from co-op experience into economic capital.[4] His case also shows how graduates can capitalize on their soft skills to procure employment. Lastly, it reveals how the organizational cultures of internships and co-op placements can both constrain and facilitate the acquisition of knowledge and skills.

Case 3: Milan

Milan (electrical engineering) worked at a consulting company, mainly drafting drawings for senior engineers and working independently on small-scale design projects under the supervision of his manager. He differs from Martha and Aaron in several significant ways, and he is profiled here to illustrate the experience of a student who found undergraduate studies challenging, took a year off to decompress upon completing his studies, and mobilized his co-curricular activities and family contacts to make the transition into the workplace.

It took Milan six years to complete his degree, and the next 12 months were "a decompression period just because school took a lot out of me and … I needed some time to relax." During his undergraduate studies, Milan completed one summer academic internship and chose not to apply for further internships and co-ops because he "liked to relax during [his] summers." He got to know about the professor who was hiring people for the internship through a family friend, which shows the role that social networks can play in accessing internships and accumulating cultural capital. Even this limited internship experience facilitated Milan's transition to full-time employment by introducing him to workplace norms, rules, and practices: "It helped with going into a corporate environment. It was a regimented thing: you have the rules that you have to follow." It also provided him with an opportunity to work in a multidisciplinary environment consisting of engineering and medical professionals, which he found useful at his job, where he had to work with engineers from different disciplines and to understand their perspectives. It also strengthened his interpersonal skills: "I got to meet the whole wide range of people … I guess it was a networking opportunity."

Milan acknowledged that his academic studies provided the technical foundation and analytical and learning skills that enable him to perform his job: "It gave me a context and grounded my knowledge in the background of how these numbers come to be in my current job." Yet he still considered that most of his coursework, with the exception of fundamentals of electrical systems,

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[4] A vast majority of engineering graduates in our study were able to secure a full-time employment with their co-op placements.

was only remotely relevant to his current job, which was partly due to the nature of the work: "We spec products. All the heavy engineering … the calculations, the circuits … is done by the vendor or manufacturer … [I] take disparate pieces and put them together." He also criticized his courses for their emphasis on linear, simple problems that failed to prepare him for dealing with the complex, open-ended, multiple-solution technical problems he has encountered on the job: "In school, every math problem has one answer. Here, there are no right answers … the right answer is what you design … you design [something] but then the client changes their mind. It is constantly a moving target." Despite his critique, Milan also recognized the value of his education: "You have experience on paper granted from courses which might or might not transfer well in an industry depending on the sector. For electronics, it'll transfer well because you learn the basics and then they teach you the more advanced stuff … For here, it's more like can you analyze, can you think? It's more … It's not a very specific skillset. It's a very general skillset."

When it came to the job search, Milan could not really capitalize on his grades, describing himself as "a pretty poor student … the average was around between 65 and 70." His thin record of professional work experience further hindered his job search: "[Job postings] required either a lot of experience or too little experience. [Some of them] were beneath my degree … There was nothing…. tailored at the entry-level. It took a while to find something." The handful of applications he submitted through online job boards were all unsuccessful. Yet his social connections helped to offset his inexperience. He eventually secured a job offer through a family friend who provided information on a company and manager recruiting for a position.

Milan also credited landing a job to his involvement in extra-curricular activities: "I would say the most valuable things were the extracurricular, [and] my summer co-op. I did put some courses, my [capstone] project because it showed that I managed a project, went through the entire design process. I don't think any of the courses or any of those things helped out too much." Extra-curriculars allowed him to demonstrate his personal side: "My extra-curricular helped me in showing that I could actually interact with people … and that I can't only crunch numbers and that's all that I can do … I would credit it with getting my job here because dealing with so many people, you learn how to speak with them … It helps me speak with people easier, analyze the situation, and flow through situations." As a member and leader of an electrical engineering club, Milan organized events, advocated for students' interests before faculty members, and dealt with the student body population. Identifying himself as "kind of introverted and shy," he maintained that extra-curriculars forced him to be in social situations and develop communication and interpersonal skills in particular, which he believed he had previously lacked. This demonstrates how extra-curriculars and the roles that students hold within them can help them to develop soft skills that they do not possess and how they can utilize these skills during their transition.

The case of Milan shows how engineering students can convert their extra-curricular experience into useful resources during the transition process and how these, in combination with social capital, can be used to offset deficits in other forms of capital, such as educational qualifications and professional work experience. Like other cases, his case also demonstrates that while some graduates may downplay the importance of their educational qualifications during the job search, they recognize their value once on the job.

Cross-case analysis and discussion

As the three cases show, in the context of expanding access to higher education, a competitive labor market, and the increasing emphasis placed by employers on personal qualities and attributes,

engineering students draw on multiple resources, including technical knowledge, professional work experience, extra-curricular records, soft skills, and social networks, to maneuver the transition from university to employment. These resources constitute different forms of capital that students acquire through curricular and co-curricular activities, as well as other means such as families, and mobilize in a number of ways during the transition process. Our findings suggest that curricular and co-curricular activities both enable and impede the accumulation of forms of capital; that different forms of capital play different roles at different stages of the transition process; that a successful transition is a result of a combination of forms of capital; and that students possess different forms and levels of capital and thus encounter different transition experience.

Curricular and co-curricular activities provided the graduates with knowledge and skillsets that played different roles in their transition process. Academic studies furnished them with the technical foundation necessary to perform their jobs and helped them to develop analytical and learning skills that enabled them to adapt quickly to new tasks, master new technical knowledge, and design workable solutions. Internships and co-ops created opportunities for the graduates to acquire professional work experience that differentiated them from others with similar academic credentials in the labor market. They also helped them to learn workplace conventions, gain technical knowledge, sharpen their soft skills, and clarify educational and career plans, thus easing their entry into the workplace. Like internships and co-ops, extra-curriculars contributed mainly to the development of soft skills, especially leadership and time management skills. They also served as a means of differentiating the graduates in the labor market by projecting an image of a well-rounded, balanced individual. Overall, co-curricular activities helped the graduates to supplement their educational capital and to navigate, in particular, the social side of the transition process. Both curricular and co-curricular activities also provided access to academic and professional networks that proved to be an important source of referrals and recommendations. However, as the case of Milan demonstrates, some students complement the cultural and social capital accumulated through curricular and co-curricular activities with other resources such as family contacts in making their transition. This shows that students draw on a variety of resources during the transition process, which involves multiple actors beyond universities and employers, including families, friends, and others.

While curricular and co-curricular activities contributed to the transition process of the three graduates, they also constrained it. The curriculum content and approaches that the graduates experienced in their classes did not always facilitate the development of knowledge and skills that they could use during their transition. Both Martha and Milan believed that the linear, single-answer problems that they had to solve in their classes did not prepare them to deal with complex, open-ended, multiple-solution technical problems in the workplace. Martha also reported having limited opportunities to translate theory into practice in her classes and experienced a gap between theory and practice once on the job. Aaron pointed to the weakness of engineering programs in cultivating communication skills, which are essential to the profession. All three graduates reported developing communication, interpersonal, time management, and leadership skills through co-curricular rather than curricular activities, which suggests that the engineering curriculum might not be conducive to the formation of the soft skills necessary to make a successful transition to the workplace. As the cases of Martha and Aaron demonstrate, the organizational cultures of internship and co-op placements can also constrain learning opportunities. In the case of Aaron, his internship with a public sector agency, with a restrictive organizational culture, provided few opportunities for technical learning, while his co-op placement with a private consulting company, which featured a

more expansive environment, proved to be the opposite.[5] Thus, internship or co-op placements might not result in the acquisition of cultural and social capital, especially if students have limited or no opportunities to learn new knowledge and skills or to build relationships with managers and colleagues.

During the stages of the transition process, the graduates mobilized different aspects of their curricular and co-curricular activities and assigned different levels of importance to them. In their job search, all three graduates seemed to downplay their educational capital, which can be attributed to a broader trend towards the devaluation of academic credentials. Instead, they emphasized their soft skills, professional work experience, and extra-curricular engagement. While Martha considered her grades an asset, she put more weight on her summer internships than on her academic record when applying for jobs. Similarly, Aaron relied on his soft skills rather than educational qualifications, although he considered the latter important. Lastly, Milan, who could not capitalize on his grades because of his poor academic performance, drew on his limited professional work experience, as well as on his extra-curricular record and communication skills. Furthermore, all three graduates supplemented their cultural capital with social capital in the course of their job search. Martha's job offer was facilitated by a professor who was willing to endorse her because of her academic strengths. Thus, she converted her cultural capital into social capital and ultimately into economic capital. In the case of Aaron, his strong work performance and soft skills, combined with good relationships with his manager and colleagues, resulted in a full-time job offer. Because of his immediate access to a professional network and the close proximity to decision makers, he was able to convert his cultural and social capital into economic capital. Milan was able to partially offset his limited professional work experience and poor academic achievement with family contacts. For all three graduates, job search success was facilitated by a combination of educational, cultural, and social capital, which reinforces the findings of Atkinson and colleagues that academic credentials alone cannot explain the success or failure of engineering students in the labor market [8].

Although the graduates underemphasized their educational capital and curricular record during their job search, they actively drew on their technical knowledge, problem-solving skills, and learning strategies, along with their soft skills, once on the job. However, the extent to which their technical knowledge gained currency on the job depended on the sectors in which they worked, the positions they held, and the projects on which they were engaged. While Aaron and Milan viewed their education as useful but not fully applicable to their jobs, Martha considered her coursework to be directly relevant to hers. Although all of them were employed in the consulting sector, they held different positions within it. Aaron's job was more business oriented and he found the fundamentals of his civil engineering degree mostly sufficient to perform it. Milan's and Martha's positions were more technically focused, yet Milan, with just over a year on the job, was engaged mainly in drafting which did not require him to draw much on his technical preparation. Martha was involved in design work that required doing a wide range of calculations. Three of them deployed their learning and problem-solving skills to master new technical knowledge and discover appropriate technical solutions to issues arising in their work. All three graduates acknowledged that their education provided them with a foundation without which they would not be able to perform their jobs. These results are consistent with Nillson's study which found that engineering programs equip students with generic competences ranging from analytical skills to flexibility and that engineers learn the specifics of their profession on the job [21]. However, in regards to Nillson's assertion that

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[5] For the discussion of restrictive and expansive learning environments, see Evans, Hodkinson, Rainbird, and Unwin [25].

"the specialist competence [theoretical knowledge] learned and developed during the educational program [has] limited relevance to the engineers' professional practice" [21, p. 263], our findings indicate that the situation is more nuanced. Graduates consider the theoretical part of their education relevant to their jobs to different extents, which are mediated by factors ranging from the sector of employment to the tasks performed.

As the three cases demonstrate, students command different forms and levels of capital as they embark on the transition process, and this has implications for their job search and workplace adjustment. In comparison to Aaron and Milan, Martha's stock of capital was large and broad: she had good grades, diverse internship experience, strong personal qualities and attributes, a rich extra-curricular record, and an extensive social network. Milan, with his poor grades, limited internship experience, and lack of immediate access to professional networks, held a smaller stock of capital. Although he was able to find a job by utilizing his social capital, he was not as well positioned as Martha and Aaron, and underwent a more difficult transition process. Furthermore, as Aaron's comment about a lack of communication skills among his peers reveals, even when students have good grades and solid technical knowledge, they may be disadvantaged during both their job search and workplace adjustment if they lack strong soft skills, which are particularly important in the consulting sector in which Aaron worked. Cultural stock differences among students can be attributed largely to their capacity to grow, mobilize and transform their capital. As Clark and Zukas argue, this capacity is shaped not only by their university education but also by their class, gender, ethnicity, and previous education [19]. Thus, while curricular and co-curricular activities create opportunities for capital accumulation, structural forces beyond the control of the university mediate this process as well as the transition as a whole.

Conclusion

As our findings suggest, curricular and co-curricular activities contribute to endowments of educational, cultural, and social capital that engineering students can mobilize to make a successful transition from university to employment; thus, accessing economic capital. Each activity creates opportunities for gaining different knowledge, skills, and experience and plays a distinct role in the transition process. Thus, by engaging only in curricular activities, engineering students may disadvantage themselves during the transition process, as they might not be able to acquire aspects of cultural and social capital available to them primarily through co-curricular activities. Even though curricular and curricular activities facilitate the accumulation of different forms of capital, students do not acquire and possess the same forms and levels of capital because they do not experience the same learning opportunities; do not have access to the same resources such as social connections, and do not have the same capacities to grow, mobilize, and transform capital. As a result, they encounter different transition experience.

This study has three implications for engineering faculties and educators. First, there is a need for what Stevens refers to as "socio-technical engineering education" [22], which combines the social and technical development of engineering students, in order to better prepare them for the transition from university to employment. The three graduates were able to build their social knowledge and skills through co-curricular rather than curricular activities, which do not prioritize the social development among students and are, as Stevens, Johri, and O'Connor argue, "the bastion for the technical rationalist view of engineering" [23, p. 133]. By incorporating the social aspect into curricular activities, engineering educators can strengthen the stock of capital among all students and particularly among those who choose not to engage in co-curricular activities and thus have fewer opportunities to accumulate social knowledge and skills.

Second, there is a need to ensure the quality of internships and co-ops that engineering students undertake. These co-curricular activities, as our findings point out, play an important role in gaining technical knowledge and soft skills, clarifying educational and career pathways, learning workplace conventions, and accessing professional networks. However, not all internships and co-op placements facilitate the personal, educational, and professional growth of engineering students. Thus, engineering faculties and companies need to establish control mechanisms in order to ensure the quality and consistency of internship and co-op placements so that engineering students are not vulnerable to their uneven outcomes. Lastly, engineering faculties and educators need to recognize that students enter engineering programs with different forms and levels of capital and that this has implications for their educational experience and the subsequent passage to employment. They should therefore design programs that are mindful of issues of equity and equality. They need to ensure that all students can access high quality curricular and co-curricular opportunities, undergo both technical and social development through curricular activities, obtain educational support if needed, and hence strengthen their capacities to make a successful transition to the workplace.

Acknowledgements

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