

Employability of Indian Engineering Graduates

DT113 - Qualitative Research Methods

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Abstract

In this paper, we present a qualitative study of the factors impacting the employability of Indian engineering graduates in the IT sector. We interviewed 12 participants in the age group of 21 to 25 years with less than 1 year of work experience. The study focused on understanding how the college curricula enabled students to gain skills impacting employability. We also explore how other factors such as family and geographic background, early schooling, extra-curricular activities, non-course external technical resources, and guidance from peers, seniors, and professors impact employability skills.

1 Introduction

The evolution in the job markets worldwide due to rapid globalization and technical progress has increased the demands that employers have from employees. Because of this, employees in the 21st century have to constantly evolve their skills to the requirements of the job market. Since technical skills are extremely industry-specific, they alone have become insufficient as a criterion to ensure career success. There is instead a growing acceptance amongst the international community that broader characteristics such as communication skills and creativity should be given more weightage in the decision-making process while hiring. In this context, the construct of employability has been created. While there are many definitions of Employability in different contexts, the definition we will work with is as follows: “A set of achievements, understandings, and personal attributes that make individuals more likely to gain employment and be successful in their chosen occupations” (Little, 2004). Employability is understood to be a function of two basic factors: (a) the academic qualification of an individual, and (b) the learning environment that helps him build certain generic skills (Khare, 2014)[3].

Engineering education in India has not kept pace with industry requirements. Course curricula include

irrelevant and outdated content which neither adds value to the students or the hiring organizations. Demand for highly skilled resources, especially in the Information Technology (IT) sector, is increasing. This unfulfilled demand leads to severe hiring pressure and companies end up poaching skilled resources from each other. This, in turn, drives up employment costs and reduces industry competitiveness as a whole.

The 2019 National Employability Report states that 80% of engineers are not employable for any job in the knowledge economy (National Employability Report, 2019)[9]. It further goes on to state that while engineers learn by doing, only 40% of the engineering students do any kind of internship and only 36% take up projects outside of their course curricula.

This study focused on the factors influencing the employability of Indian engineering graduates. We focused on employability for the Information Technology industry.

Our paper is structured as follows. First, we present a review of existing work studying employability. This is followed by a description of the methodology we followed for the study and an analysis of the collected data. We then present the findings of the study by elaborating on the factors considered important for employability. The conclusion describes our critical analysis of the results and how colleges and students themselves can improve employability under the present constraints. In the end, we present further areas to improve upon this study.

2 Literature Review

A study on identifying and measuring employability in a quantitative manner was published in 2001, in the context of higher educational institutions in the UK (Harvey, 2001)[2]. This paper has become the foundation of multiple other quantitative employability studies across the world, in different sectors, and at different education levels. This study was able to define and identify multiple factors that influence employability at different levels and was able to deduce methodological problems within higher education in-

stitutions that would hurt their employment rates, such as having an emphasis on job attainment skills rather than generic employability attributes.

A 2014 study highlighted the changing structure of the Indian higher education sector as a response to employability trends and suggested a broad pathway to tackle it (Khare, 2014)[3]. It presented data on the composition of Indian job seekers, categorizing them by education level and discipline. It analyzed quantitative data from all streams of professional education to identify gaps in employability and find the causal factors for those gaps. Through data on sector-specific employability, enrollment percentages in Indian universities, and growth data for various programs in Technical institutions across the country, this paper concluded factors such as skewed professionalism and poor student-to-faculty ratios as potential causes for degrading employability of certain sectors. The study further presented a suggestive roadmap for universities to boost employability. While this paper presents definitive results on this topic, the study is largely based on quantitative data and is unable to provide verification to the identified problems and solutions through qualitative findings.

In terms of qualitative explorations of employability, work has been done to understand the employability of German freelancers (Suß, Becker, 2012)[11]. Through conducting 23 semi-structured interviews with German freelancers working in different domains, they were able to conclude that niche technical competence, social competence, and networking competence significantly contributed to employability. Their study also concluded that in comparison to other sectors, freelancers in the IT sector had to undergo training and develop relevant competencies much more frequently, thus further emphasizing the point of rapidly changing requirements for employability.

A similar study was conducted in Malaysia to qualitatively determine correlations between employability skills and job performance, specifically for Electric and Electronic Polytechnic graduates (Normala et al., 2016)[8]. This study involved interviews with Human Resources personnel in order to validate the existing employability metrics in the domain and identify gaps in the measurement processes in reference to the real-world performance of employees. Another mixed-method study out of Indonesia focused on the employability of the graduates of the Public Health Study Program (Qomariyah et al, 2016)[7]. This study involved data collection in the form of surveys from employed graduates and structured interviews with employers. The paper identified a marked difference in perceived employability skills for graduates and employers. It was also able to define and order competencies in their order of impact on grad-

uate employability.

A large number of fresh engineering graduates are considered to be unemployable due to low job skills. However, employer expectations, perceptions, and (dis)confirmation influence their satisfaction with the job skills (Sinha et al, 2020)[10]. Sinha and his team applied the Expectation Confirmation Theory (ECT) (Oliver, 1980)[6], which states that satisfaction from using a product or a service is influenced by prior perception, expectation, and (dis)confirmation, to analyze the employability of fresh engineering graduates.

Engineering graduates need to have “21st Century Skills” comprised broadly of Learning and Innovation Skills and Life and Career Skills (Mekala et al, 2020)[5]. Mekala and team recommend the need for an engineering curriculum to consist of a module on 21st Century skills. They further go on to state that English teachers in Engineering colleges can help build these skills by using different pedagogical approaches and methods.

Learning and Innovation Skills consist of:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication
- Collaboration

Life and Career Skills consist of:

- Adaptability and Flexibility
- Initiative and Self Direction
- Social and Cross-Cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

Khurana and Misra have developed a 26-item measurement scale of nine skills and attributes of employability (Khurana and Misra, 2021)[4]. The measurement tool will be helpful for both recruiters and managers. Recruiters can use results to make hiring decisions and managers can use the results to focus on improvement areas. They measure employability on nine dimensions: leadership, critical thinking, numeracy, sociability, using technology, planning and organizing, problem-solving, teamwork, and emotional intelligence. The measurement tool can be used by students to know their employability level, understand the gaps and fill them to move successfully from college life to work life.

Ni Tun and Naing describe the importance of internship for providing practical skills to engineering graduates in Myanmar (Ni Tun and Naing, n.d.)(1]. They propose a practical internship model for ICT engineering students using a combination of on-campus and off-campus internship programs. Graduates with internship experience are confident and improved on their employability.

Existing research, as mentioned above lends context to the larger problem of employability and defines, identifies, and ranks employability criteria in specific job markets. The qualitative analysis papers provide valuable insights into the interview and data collection processes that are effective in conducting such research. The problem of employability has been explored at different education levels in different sectors, however, there has been no work in defining better identifying what constitutes employability specifically for engineering graduates in India. While quantitative work in this domain extrapolates conclusions from survey data, our research aims to identify and validate the employability criterion through structured interviews of students and early-career employees.

3 Methodology

3.1 Positionality and Reflexivity

The three authors of this paper are males and come from upper-middle-class families with no financial pressures. They have not faced discrimination due to class or caste at any point in their lives. The authors have received early education in English-medium convent schools. Authors 1 and 2 have lived in North India for a large part of their lives whereas Author 3 has lived in both North India and South India for many years and around 8 years in the US, Canada, Australia, and Germany. All three authors speak English and Hindi. Author 1 speaks Punjabi and Author 3 speaks Kannada.

Age and Background

- Author 1 is in his early twenties and is pursuing an integrated engineering master's course from a Tier-1 college.
- Author 2 is in his early twenties and is pursuing a master's education in a Tier-1 college after completing engineering from a Tier-3 college.
- Author 3 is in his late forties and has completed engineering from a Tier-2 college, an online MBA from a top US school, and is pursuing doctoral studies from a Tier-1 college.

Positionality

- Author 1's parents are academicians and his views of India's education system are shaped by their experiences. He will be in the job market in the next 2-3 years and hence he is motivated to be part of this research team. His Tier-1 college has a 100% placement record and wouldn't have the first-hand experience of students from Tier-2 and Tier-3 colleges facing employment

difficulties. His urban upbringing would make it difficult to understand the experiences of students coming from rural backgrounds. His age puts him in an advantageous position to communicate with similarly aged research subjects.

- Author 2 comes from a Tier-3 college and understands the difficulties Tier-3 college students face in securing jobs. He considers that quality of education plays a very important role in employability and hence, his interest in participating in this study. His age puts him in an advantageous position to communicate with similarly aged research subjects.
- Author 3 has been in the IT industry for over 27 years working mostly in the enterprise software development space. He now runs a tech skills enablement company focusing on imparting practical skills to fresh engineering graduates. Coming from a middle-class family, he remembers that when he was a child, the family had enough for the daily necessities but not for the comforts and luxuries of life. From a young age, he was taught the importance of studying hard with the goal of getting a good job. He credits his relative success to good education, English communication, opportunities he got to exercise leadership skills in school and college, coding interest and practice, and the good 3-week foundational training in his first job.

3.2 Sampling and Data Collection Method

The study methodology consisted of interviews of final year engineering students and recent graduates. Convenience sampling was done to select the 12 participants. 6 of the participants were known friends of the researchers and the remaining 6 were participants of the Salesforce training conducted by Author 3's company.

The interviews were semi-formal using an interview guide. The interviews were conducted in English, but based on the participant's comfort level, Indian languages Hindi and Punjabi were also used briefly. The interviews lasted 40 minutes to 1 hour. The interviews were recorded, transcribed, and analyzed to understand the common patterns as well as differences.

3.3 Sample Interview Questions

The following is a subset of interview questions classified into three sections - background, college curriculum-related factors, and miscellaneous factors.

Establishing Background

- Name, Age, Gender

- What is the exact degree and field, and what is your college name?
- What is your current employment?
- How many interviews have you attended?

College Curriculum and Employability

- How important do you think a person's level of education is as a factor affecting their employability, especially in the context of India?
- Where would you rate your college among the colleges in India in the context of the quality of instruction of education?
- Do you think the things that were taught in the college courses eventually helped you in getting a job or building the skills that you needed for the same?
- What percentage of the courses do you think were useless to you in your college experience?
- Is it necessary for one to attend courses outside college online/offline provided by various companies?

Other Factors Affecting Employability

- What other factors do you think affect employability, especially for final year students, or fresh graduates, at least in India?
- How much of a role did your gender play in your getting a job?
- Do you think Base schooling (up to grade 10) can play a role in employability down the line?
- Do you think your family background affected the outcome of the interviews at all?
- How about your geographical background?
- Did you engage in any extracurricular in college? Does that affect employability?
- In your field, if you had to give a percentage division between education and technical skills vs. communication and social skills as factors for getting employability, what would it be?
- If you could repeat the last 4 years, what would you do differently?

3.4 Data Analysis

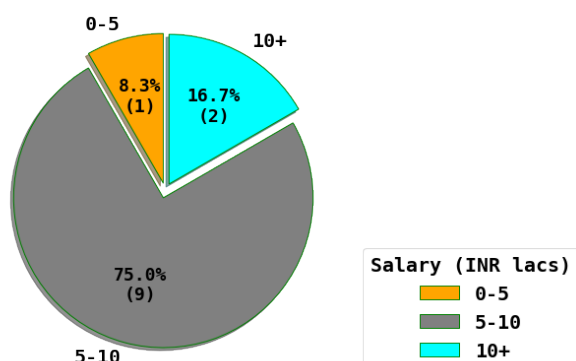


Figure 1: Salary distribution of our participants. Most participants fall have a salary between INR 5 lacs and INR 10 lacs

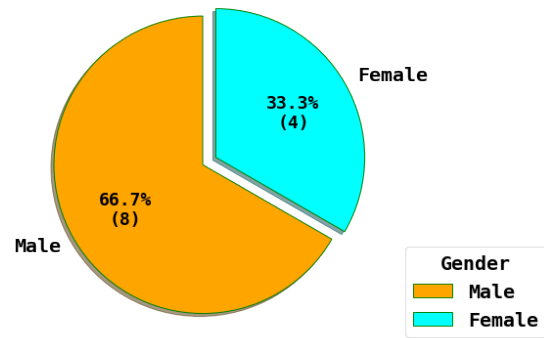


Figure 2: Gender distribution of our participants

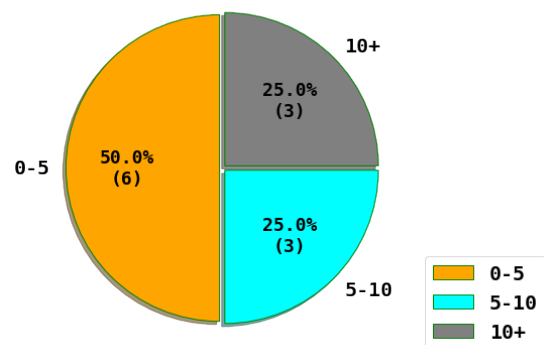


Figure 3: Total number of interviews given by each participant

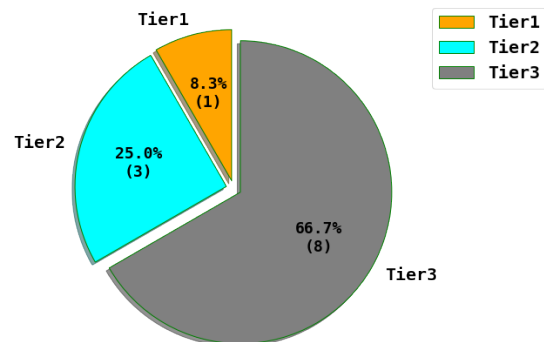


Figure 4: Tier distribution of the colleges/institutes of the participants

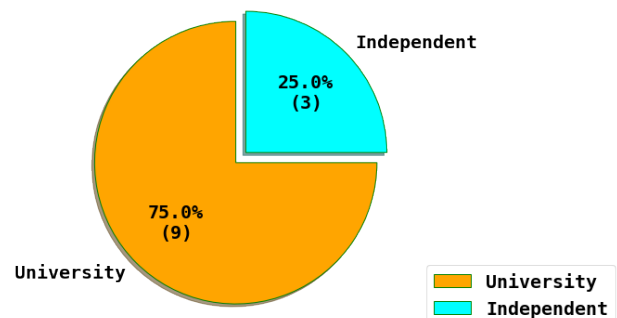


Figure 5: Affiliations of the institutions of our participants. 25% graduated from institutions having a ‘deemed university’ status from AICTE, whereas the rest graduated from colleges affiliated to larger universities

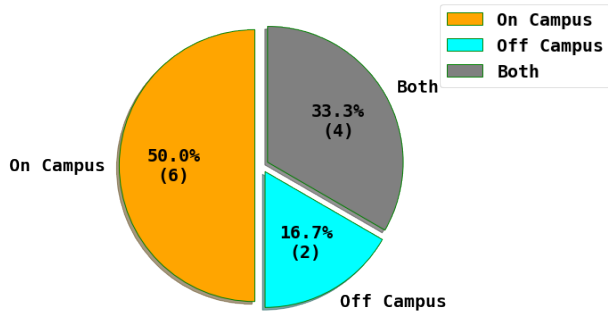


Figure 6: Mode of placement through which our participants were able to secure offers

4 Findings

Through our study, we are able to conclude a set of factors that were indicative of the employment success of at least some of our subjects. From our own background research on each of these factors, we have categorized them as follows:-

- Factors related to college curricula
- ‘Extra’ curricular factors which are influenced by colleges
- Factors that are directly connected to the choice of college
- Factors beyond the choice of college - Miscellaneous factors

4.1 College Curricula

As shown in Figure 5, for colleges affiliated with universities, they have to follow the curriculum as established by their university, keeping in mind certain guidelines from the University Grants Commission. The curricula in these colleges are fixed and usually modeled after sample curricula released by the AICTE. For institutions having a ‘deemed university’ status, the control over the curriculum is much more local, and hence changes are easier to implement. So in general, independent colleges have a more flexible curriculum focused around elective courses, whereas other colleges have a rigorous curriculum that offers no ‘choice’ to students.

That being said, every person we interviewed expressed some form of dissatisfaction with their college curriculum. To start off, out of the 30+ courses that are taught as a part of a standard 4-year engineering degree, only 5-6 at most are considered directly useful for success in job interviews. There are some other courses that are not directly related to

interviews but are important for the theoretical exploration of the field and hence potentially interesting/useful for some students. However, we can report that on average, graduates consider 50 to 60% of the courses they took as a part of their college curriculum as completely useless. This feeling towards these many courses comes primarily due to two reasons: professors fail to provide any justification as to why these courses are being studied, and colleges do not illuminate any avenues or opportunities where the knowledge of these courses may become useful.

We will formally attribute the problems with existing college curricula to two factors: rigorousness, and redundancy.

4.1.1 Rigorousness

Most undergrad IT programs in colleges across India, as explained above, operate on a fixed curriculum, which according to graduates, is a major proponent of the fact that a significant chunk of the courses is considered useless. That is why the percentage of courses deemed useless was on average 20% lower for students who graduated from independent colleges. Quoting participant P1, ‘... in the ideal world, each student should be able to handcraft the curriculum according to their own needs’. Additionally, other aspects of rigorousness include the fact that many colleges require a certain percentage of attendance in order to pass. What compounds this problem is the strict CGPA requirements that are attached to interviews. As reported by all of our participants, most companies only allow students that have a CGPA higher than a certain threshold to even sit for interviews. Hence, in order to qualify for jobs, it becomes mandatory for students to study these ‘useless’ courses, which transforms them from being a passive nuisance to an active waste of time.

4.1.2 Redundancy

It’s not as if the courses considered useful were without their faults. 100% of participants report that college courses are not up to date with the industry standards. Even when they are, graduates report that many times, lack of interest and teaching ability from professors can make it hard to learn anything from a course. Furthermore, colleges tend to focus only on the theoretical aspects of these important subjects. However, from an employability standpoint, a major focus is given to practical knowledge during interviews. Due to these factors in combination, a majority of the graduates we interviewed report that they had to take online courses or use resources like tutorial websites and YouTube videos to not only prepare for interviews but sometimes also their semester

exams.

4.2 Extra-curricular factors

4.2.1 Guidance

The next important feedback we got was regarding guidance received by our participants, especially during their initial years at college, and even during the interview process. We can conclude from our findings that the work done and the path taken for the first two years of college can make a significant impact down the line on employability. Therefore, receiving the correct guidance during this time is incredibly important.

10 out of 12 graduates received little to no guidance from their professors, both during their initial years at college and during their placements. The guidance was instead received from peers and seniors. Shared experiences, approachability, and easy availability were the primary factors why seniors played the role of guidance counselors. 11 out of 12 participants claimed that interactions with their seniors and peers either directly or indirectly helped them in being able to procure a job, and 8 of them even said that seniors and peers had an overall greater role to play in their success than the college professors.

While age itself may not be a qualifying factor for good advice, the problem with receiving career guidance from one's contemporaries is that their opinions are often colored with their own biases and aspirations. While it worked out well for most of our participants, in some instances, as in the case of one of our participants, it can lead to them feeling lost or unsure of what to do even after 4 years of college. The sentiment as expressed by participant P10 was: *"I am supposed to know my career path after engineering, but even after 4 years of study, I felt blank"*.

Only 2 participants said that their college has an interview training program where guidance and training are given by professors and qualified professionals. These training programs cover all aspects of the interview process and hence were spoken of very highly by these participants.

4.2.2 Extra training for technical skills

Another more subtle point that was brought up in some cases was the role played by technical clubs, workshops, and competitions organized within colleges. In the colleges where these had a strong presence and were promoted, graduates brought them up as major proponents for them being able to identify their interests and build their resumes. Additionally, they were also cited as being responsible for them being able to find like-minded individuals, both peers,

and seniors, which as stated before, went on to play a major part in placement success.

4.2.3 Communication/soft skills

Our participants expressed that knowing the answers to questions become futile if you don't know how to communicate these answers effectively. For roles requiring customer interaction, or in interviews having Group discussions or HR rounds, being a poor communicator can become a major bottleneck. 8 participants gave higher importance to communication skills and overall confidence than technical skills for getting a job. They attributed factors like base schooling and belonging to urban areas as being partially responsible for developing good communication skills and self-confidence. participant P3 belonging to rural Punjab and speaking relatively poor English attributed her lackluster communication skills and underdeveloped personality as the primary reasons she was rejected from as many as 50 interviews. Notably, the importance of these skills was downplayed exclusively by participants that were excellent communicators.

5 out of 12 participants reported that they participated in extra-curricular events held in their college like fests, competitions, and hackathons. They expressed that getting on stage through these events and the leadership experience gained through organizing such events themselves helped them develop confidence and communication skill which eventually played a part in their interview success. 2 participants also reported that their college even organized professional workshops providing training in soft skills. These were brought up as being very helpful in their eventually being able to get through the discussions in the interviews they gave.

4.3 Directly connected to Colleges

4.3.1 Placement Cell Connectedness

While for all 12 participants, the placement drives themselves were not a problem, our findings conclude that the connectivity of placement cells in industry and their degree of control over the process became factors that affect employability. 5 participants explicitly expressed some form of dissatisfaction with the number of or the quality of companies that came for on-campus recruitments. Dissatisfaction was also expressed with regards to the scheduling of these interviews. Participant P3 reported that a problem with her college's placement mechanism was that it didn't prioritize higher-paying companies over lower-paying ones. So people missed the opportunity of getting the jobs they really wanted because of the fact that those companies would come after some others,

and students weren't allowed to set for interviews after they had already gotten placed.

We can conclude that in general, on-campus interviews are perceived as being easier to clear in comparison to off-campus interviews, because of having structure and predictability, and also providing an easier route to reaching the in-person interview stage. This is further demonstrated by the fact that 10 out of 12 participants managed to obtain job offers from the on-campus placement drives itself. Therefore, having limited options, or less number of high-quality employers coming to college has a direct impact on the number of graduates that end up with jobs.

4.3.2 College Brand

Another important, and somewhat related factor here is the perceived image of the college in the industry, or simply put, the brand value of the college name. In general, 8 participants cited the fact that their college did not have a big name as being a factor that made it harder for them to get a job. 5 even explicitly stated that in big-name tier 1 college like IITs, the same companies offered higher packages for the same position than they did in their college. Essentially the sentiment was that while their college was good, since it didn't have the brand value of older or larger colleges in the country, the placements suffered.

4.3.3 Miscellaneous factors

Other Miscellaneous factors expressed by our participants are as follows:

- **Gender:** 5 out of 12 participants expressed that gender plays a role in employability, and in IT, women get more employment opportunities. They attribute this to the current political climate due to which companies don't come looking for just the most skilled candidates but also think about gender ratios in their offices.
- **Residence:** 6 candidates expressed how in some cases, companies are exclusively looking for candidates living in certain cities, or even certain parts of a city, which can make it harder to secure a job offer for those that do not live in IT hubs like Bangalore and Hyderabad and are not willing to relocate.
- **Persistence:** For securing jobs off campus, participants noted that awareness and persistence were very important. They attributed their success in getting a job off-campus to the fact that they kept applying and didn't give up.

5 Conclusion

Through this qualitative study, we aimed to determine the factors that are perceived to be the most impactful to the employability of Indian engineering graduates in IT. Initially, through both feedback from participants and a survey of existing literature in this field, we were led to believe that employability was completely subjective, and each person's employability would be determined by a sum total of their experiences throughout life. While this is definitely true, through our study, we conclude that factors like college curriculum and communication skills form the majority of what constitutes employment skills in India. Due to hiring in the IT sector having a very standardized process that has evolved over multiple decades, getting a job tends to boil down to knowing some core subjects that are a part of the college curriculum, and being able to effectively communicate that knowledge. In the process of discovering this, however, we also arrived upon the fact that even though the process of getting a job is so straightforward, the basic building blocks towards developing these very well known skills that employers are looking for are still largely missing from colleges. Through the interviews we conducted for this study, we can report that job seekers in most cases felt that there was a fundamental disconnect in the knowledge and skills they were acquiring through college, and those required to clear job interviews.

6 Future Work

While from the findings as presented, it would be possible to come up with a set of suggestive changes in college curricula that may have a positive impact on employability, any such suggestions would be incomplete due to the following drawbacks of our study:

- Our subject pool, while diverse in gender and social background, is notably relatively uniform in terms of the level of colleges. Graduates from well-known tier-1 colleges like IIT's, the inclusion of whom would enable us to arrive upon even more general findings.
- Additionally, all of our participants had secured jobs. Since most of our findings were concluded from participants recalling experiences of failure rather than success, having subjects that have failed to get jobs out of college may also be valuable.
- These conclusions and any suggestions would be from a very one-dimensional perspective since our study participants are exclusively college final-years and graduates. This has allowed us to identify only 'what' is happening. In order

to get to the ‘why’, and find out changes are even implementable, we would need to also interview representatives from colleges and hiring companies.

These drawbacks are opportunities for the future expansion of this study.

7 Acknowledgements

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