aspiringminds
Employability Quantified

NATIONAL EMPLOYABILITY REPORT

ENGINEERS

Annual Report 2014

ENGINEERS







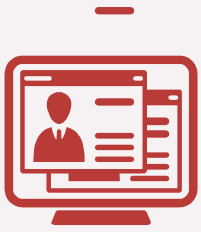
Aspiring Minds is India's leading employability solutions company, headquartered in Gurgaon. Aspiring Minds offers scientific assessments with an innovative large-scale sourcing model analogous to a GRE-for-job concept. The state-of-the-art assessment tools developed by Aspiring Minds have been used across industry verticals to help recruit the right people, develop profile-wise employability benchmarks and assess workforce health.

Aspiring Minds' intelligent adaptive assessments span across Language, Cognitive skills, Domain knowledge and Personality. A strong in-house research and development team with alumni from IITs and MIT form the development backbone of the patent pending assessment tools.

AMCAT® - the flagship product is India's Largest Employability Test. Conducted across the country throughout the year, AMCAT has been taken by over 1,000,000 candidates in 3500+ campuses, spread across 23 states. Tens of thousands of candidates secure their dream jobs every year through AMCAT.

Powered by a highly dedicated management team of over 350+ full-time employees, drawn from the IITs and IIMs and a pan-India operational presence, Aspiring Minds has helped leading brands across verticals to improve their recruitment process efficiency and the quality of talent they hire. Aspiring Minds' products and solutions have been adopted by more than 650+ clients in sectors as diverse as BFSI, IT, ITeS, Hospitality, Retail, etc.

The client list comprises Daimler, Tally, Axis Bank, L&T Finance, SBI Life, Genpact, Stock Holding Corporation of India, The Oberoi Group, Sapient, Taj, HDFC Asset Management, Citibank, Bharti AXA Life, HCL, Microsoft, Tata Motors, MphasiS, ZS Associates and more.







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NATIONAL EMPLOYABILITY REPORT

INTRODUCTION

It is our pleasure to present the third edition of the National Employability Report for Engineers. Since we started publishing, this report has become an authoritative source for employability statistics for engineers and an auditory mechanism for higher education. In the last report, we showed how the focus on quantity, i.e. number of colleges, became the very reason for the low employability of engineers in the country. It is pleasing to know, the same opinion has now been echoed by several stake holders including several states requesting AICTE to reject proposals for actively championing the cause of better education rather than more number of engineering colleges. Colleges are showing deep interest in employability improvement and are adopting the idea of employability assessment from the first year onward to identify gaps and fill them. Over 500 big or small companies have adopted the use of standardized assessments for hiring irrespective of college tier, location or reputation.

Colleges are showing deep interest in employability improvement and are adopting the idea of employability assessments

On the other hand, our report led to more questions being debated. Whereas we commented on employability, various stakeholders wanted to know, rightly so, about the kind of jobs students aspire for and percent of those actually end up getting jobs. Are there inefficiencies in this process? Also many industry and academic stakeholders expressed the need to look beyond the software industry at other engineering sectors and also the new kind of careers becoming available for engineers.

Keeping the same in mind, backed by an year of tireless work by Aspiring Minds' research cell, we have come up with a comprehensive report which looks at all these aspects. We now look at what students want, what they are capable of getting and what they end up getting. This rounds the whole education-employment ecosystem. We have looked at not just jobs in the software sector but those in mechanical, electrical and civil engineering sectors, among others. We have worked to draw skill map, through theoretical and empirical evidence, for alternate careers for engineers such as sales engineer, technical content developer and report employability for these. Finally, to identify biases in recruitment, the gap between employability and employment outcome, we do a careful study, using regression analysis, to see what factors, apart from merit (signaled by AMCAT score) influence employability outcome.

Over 500 big or small companies have adopted the use of standardized assessments for hiring irrespective of college tier, location or reputation.

I hope you will find these analysis and the resultant findings thought provoking. You, like me, will recognize the need for new methods for guiding the budding engineers in this country, helping them become employable and finally help each one get job just by merit. I look forward in engaging with you in such discussions to take our efforts for a better India forward.

Varun Aggarwal,
Director, Aspiring Minds Assessment Pvt. Ltd.

EXECUTIVE SUMMARY

The key findings of the present study are as follows:

Less than 20% engineers are employable for software jobs, 7.49% are employable for core engineering jobs, even though more than 90% aspire for such jobs

Of the six hundred thousand engineers that graduate annually, only 18.43% of them are employable for the Software Engineer-IT services role, while a dismal 3.95% are appropriately trained to be directly deployed on projects. For core jobs in mechanical, electronics/electrical and civil engineering only a mere 7.49% are employable. In contrast, 53% engineers have software role as the most preferred job, whereas 44% prefer core engineering jobs. This means 97% engineers want jobs either in software or core engineering. Firstly, an economy with a large percent of unemployable qualified candidates is not only inefficient, but socially unstable. Secondly, there is a large mismatch in the aspirations of graduating engineers and their job readiness, which can create large-scale dissatisfaction and disillusionment.

Whereas employability varies drastically by location and tier of campuses, 70% of employable pool in lesser known colleges is being missed by corporations

Employability varies tremendously across colleges. For instance, colleges in tier 1 cities have 18.26% employable software engineers, whereas for those in tier 2 cities, it goes down to 14.17%. Similarly, the states at the top have employability as high as 40.42%; those at the bottom have it at 12.03%. Despite this variation we find that 53% of employable candidates for IT services companies and 25% of employable candidates for IT product companies are studying beyond the top 750 colleges, and thus end up being invisible to most employers. This signals that potentially a large proportion of employable engineers are ending up without any opportunity - a dangerous trend for higher education. There is a need for methods to drive meritocracy in the employment ecosystem to get jobs to all employable students irrespective of their college, city, gender, etc.

Lack of adequate domain knowledge key reason for low employability in core job roles in both software and non-software domains

Employability of Computer/IT engineers in Software Engineer- IT Product role is a meager 3.21% while it is 7.49% for design engineer role in fields such as mechanical, electrical/electronic and civil engineering. The key reason behind such paltry employability percentages is inadequate preparation in the domain area, i.e. the ability to apply basic principles of say, computer engineering or mechanical engineering to real world problems. 91.82% computer/IT engineers and 60% engineers from other engineering branches fall short of the desired domain knowledge required for such roles. These concepts and principles are there in college curriculum, however there is a gap in teaching and learning pedagogy being followed in majority of colleges.

Very few engineers, even though equal percent of males and females, want to work for startups

Only around 6% of engineers have startup companies as their first job preference. If we consider those who are both employable and aspire to work with startups, the number decreases to 1.9%. Hence startup companies shall have a very hard time attracting and hiring students for their organization. Whereas males and females equally prefer working in startups, students from colleges in lower tier cities prefer startups even less (4%).

While merit, as signaled by AMCAT, counts in the job market in determining employment outcomes, the tier of colleges creates the largest bias

A candidate from a tier-3 college with equal merit as a tier-1 student (as signaled by AMCAT and school/college percentages), has 24% lower odds to get a job!. If the student from a tier 3 college gets a job, he/she will get Rs. 66,000 per annum less than a student of equal merit from a tier 1 college. This shows that a tier 3 college student is much disadvantaged, even though he/she has equal proficiency and employability. This can be attributed to the current entry-level hiring practices, where companies only visit certain high-ranking colleges for their hiring program. Also, there is evidence that in the typical resume shortlisting process, the college name is a key signal, and resumes from unknown colleges aren't shortlisted. It is understandable that corporations do this to increase efficiency of their recruitment process and to enable higher interview/test convert rates. However, this is leading to lack of equality in the employment market and also, preventing companies to access a large set of meritorious students

METHODOLOGY

The report is based on a sample of more than 1,20,000 engineering students from 520+ engineering colleges across multiple Indian states. All these candidates graduated in 2013[1]. The analysis and findings of this report are based on the results of these students on AMCAT: Aspiring Minds Computer Adaptive Test, which is India's largest and only standardized employability test. AMCAT covers all objective parameters such as English communication, Quantitative aptitude, problem-solving skills, knowledge of domain areas such as Computer Science and Programming, mechanical engineering, electrical engineering etc. for determining employability in the IT/ITeS & other core engineering roles. The test was conducted under a proctored and credible environment ensured by Aspiring Minds.

Employability has been quantified based on the benchmarking studies done at various companies in different sectors by Aspiring Minds. Currently, AMCAT is used by more than 650 companies, including six of the top-ten IT services companies in India, for their assessment and recruitment solutions. The benchmark for employability in a profile and sector is defined by a theoretical understanding and empirical validation of the knowledge, cognitive skills and domain expertise required. The benchmarks established for different profiles ensure both elimination of unsuccessful candidates for a job (elimination of type I error) and inclusion of all candidates who will be successful in the given job (elimination of type II error). The same has been validated among multiple companies in various sectors.

This report also covers a section on aspirations of engineers and a study which attempts to understand the factors which lead to an engineer getting a job in India. The data for the same was captured by means of a scientific survey on a stratified sample of about 15000 engineers.

Together with the AMCAT scores, the various demographic details of the candidates are also captured by Aspiring Minds' testing platform, which has enabled a comprehensive and meaningful analysis provided in the report.

1. The sample was statistically balanced across various parameters to be representative of the true technical graduate population. A carefully chosen stratified sample was used for the study.

1 EMPLOYABILITY BY ROLES

Engineers are absorbed in many different job profiles and sectors in the industry. Other than IT and core engineering profiles, we also look at alternate careers which are available to engineers. These include roles such as technical content developer, analyst and sales engineers. Given that IT jobs are not growing at the same pace as before, engineers are pursuing different kinds of roles that draw on their analytical/technical skills. The employment of engineers in these roles will only grow with time and it is important to capture the employability trends in them.

The criteria for employability are based on the studies conducted with various corporations in these sectors, benchmarking their current employees in various profiles through objective assessment based on AMCAT and establishing feedback through on-job performance data. These benchmarks serve as a standard for several large-sized companies across the nation.

ROLE	EMPLOYABILITY
IT ROLES	
Software Engineer – IT Product	3.21%
Software Engineer – IT Services	18.43%
Associate – ITeS Operations (Hardware and Networking)	35.37%
ENGINEERING ROLES	
Design Engineer – Non IT	7.49%
Sales Engineer – Non IT	16.54%
NON-TECH ROLES	
Business Analyst – KPO	11.53%
Associate – ITeS/BPO	39.84%
Creative Content Developer	15.36%
Technical Content Developer	10.81%

Table 1: Employability Percentage of Engineering Graduates in Different Roles

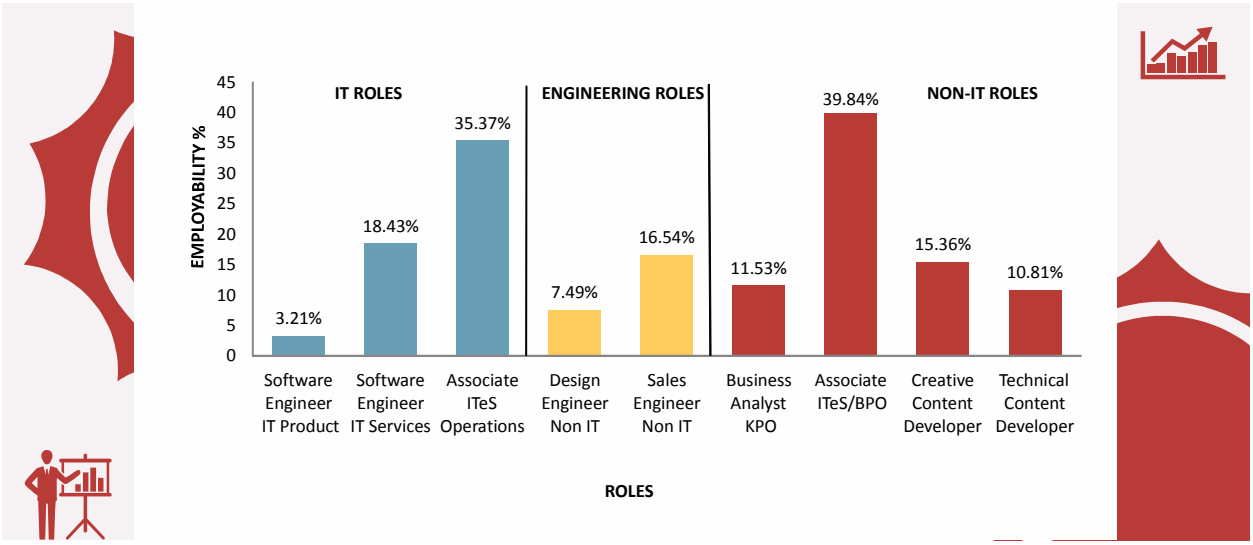


Figure 1: Employability Percentage of Engineering Graduates in Different Roles

The employability of engineering graduates in different roles is shown in Figure 1. The following observations can be made:

Software Engineer - IT Product: The employability of engineers in IT product companies is exceptionally low, to the order of 3.21%[2]. This is because jobs in IT product companies require a strong understanding of computer programming and algorithms. The study found that the candidates strongly lacked the required skills: around 91.82% of graduating engineers do not have the required programming and algorithm skills required for IT product companies, whereas 76.23% show lack of soft-skills and cognitive skills. There have been new innovations to test programming and algorithms using compiler-integrated programming assessment[3] to find the right candidates quickly and effortlessly. Other than finding whether a program is correct or not, these tools can automatically find code complexity and programming practices used. One may note that the skills required by the IT product companies at the entry-level are very much a part of the curriculum of engineering colleges, which is a worrying sign for higher education. Using assessment tools as mentioned can also serve as a boon for students to start assessing their programming skills early-on in their engineering education.

Software Engineer - IT Services: The employability of engineers in IT services companies is 18.43%. It should be noted that this has been calculated according to the current hiring philosophy of IT services companies, where the candidate is not expected to already possess the required software skills or soft skills, but is imparted the training over a period of 3 to 6 months. The hiring criterion for this industry, thus, is that the candidate should be trainable in technical and soft skills. This requires both a basic command of language and technical skills, together with requisite cognitive skills to respond to training in a short period of time. Considering these rather lax requirements, the fact that only 18.43% of the graduates are trainable into software engineers within a period of 3 to 6 months, is alarming to say the least.

2.Calculated across only those branches that have computer programming as a subject.
3.http://www.aspiringminds.in/researchcell/articles/aspiringminds_launches_automata_pro_the_worlds_most_advanced_simulated_programming_assessment.html

The research further shows that approximately 51.15% engineers are rejected because they are not soft-skill trainable in a short period of time, whereas around 56.47% lose on technical trainability.

The IT services industry is not growing at the same pace as before and the growth of entry-level jobs is diminishing. Given that companies have lower number of requirements and want to reduce training cost, there is a slow but definite trend towards hiring candidates who already have decent expertise in programming. At least three out of the top ten IT services companies in India have already started using programming assessment in their entry-level process. Secondly, IT services companies today realize that within two years of the job, the candidate will have to communicate with international customers. This makes English a much more important parameter right at the time of entry-level hiring. As these trends catch up across industry, the employability for IT services sector, which is the largest hirer in engineering will diminish further. To remain competitive in the job market, colleges and students need to have a fresh focus towards programming and English (both written and spoken).

Small and Medium Sized Enterprises (IT): Whereas large companies invest considerably in trainings, small and medium sized enterprises (SMEs) do not find it viable to build training facilities or invest time in it. They want to hire ready-to-deploy manpower. For them, the engineering graduates should be able to learn on the job and start contributing effectively as soon as possible, typically in a month's time. This requires substantial competence in domain skills. Whereas these companies do not expect the person to bring in in-depth knowledge of computer science, the minimum expectation is to be able to write a decent piece of code for a given problem, and the ability to debug and submit a working program. Such candidates, who are software-industry ready, are just 3.95%. This explains why SMEs find it so hard and time-consuming to hire.
SMEs in the IT domain have been growing considerably fast which is also because of the recent boom in e-commerce companies. This has also led to an improvement in the salary provided by SMEs. Secondly, as observed above, the positions in large IT-services companies are not growing like before. Thus, SMEs today form an extremely important component of entry-level hiring, which candidates should not miss. On the other hand, it won't be long when the SME sector growth shall be impeded by lack of talent available, if the employability problem isn't addressed.

Design Engineer-Non IT: We use the term design engineer for all core engineering roles, such as those in the semiconductor industry or the automotive industry. In these roles, the candidate basically applies his or her core engineering knowledge towards solving real world problems, for e.g., an electronics engineer designing digital library of components for a new chip technology or an automotive engineer designing an automobile or its engineering sub system. Design engineers may even be involved in the entire lifecycle of a product/service and can be responsible for making corrections and requested changes, and for providing support and maintenance services.

These roles require high analytical skills and good command over the domain. It is important that the candidate has more than rote learning and can actually apply the domain knowledge to solve problems. Good English is required so as to understand instructions and be able to respond to them, but not as high as the IT services role which requires communicating with international clients. The need of such a diverse skill set makes the employability in this role one of the lowest (7.49%).

On an average, 60% candidates lose out because of not having requisite domain skills, something they should learn in college. There is a general argument that this is because of outdated courses. This is a misnomer since the basic concepts in most of these fields have remained same over years and industry can quickly train candidates to emerging technologies if their basic concepts are clear. Industry has no further expectation from the candidate than a clear understanding of the fundamentals of the topic. Unfortunately, most students do not know the same, which is very much a part of their curriculum.

Sales Engineer-Non IT: In this profile, a candidate has to sell, market or assist in selling a technical product. Here, buying decisions are based more on technical information and rational analysis rather than style, fashion, or impulse. Therefore, selling in these markets relies heavily on technical information and problem-solving to convince buyers that they should spend money on the seller's products or services, in order to meet a business need. A sales engineer is hence both a salesperson who understands and can apply engineering and an engineer who understands how to sell engineered systems. The Sales engineer thus not only sells but also provides advice and support. Such a role requires an individual to have technical understanding of the complexities of what his/her company supplies together with excellent communication skills. Besides these the role requires an individual to have a pleasing personality, an ability to build trust with the client and be dependable at work. Sales being a customer oriented skill directly correlates with agreeableness and conscientiousness – two of the five big five personality traits. Only 16.54% of candidates are employable in this role given the role requires great English communication, reasonable analytical skills and domain skills together with a sales oriented personality.

Business Analyst - KPO: As revealed by the research, the Knowledge Process Outsourcing industry is likely to find 12 out of every 100 engineers employable for analytics roles. Highly developed written communication and analytical skills are a must for this sector. Though most engineers do not exhibit the required competence in English communication (73.63% do not), a considerable number (57.96%) miss out on analytical and quantitative skills.The analytics sector is growing and getting fresh impetus with the success of companies such as Mu-Sigma. To continue to remain competitive in this new emerging industry, a fundamental shift in college instruction and assessment methodology is required, which should be more inclined to developing analytical thinking and critical reasoning than learning by rote.

Associate – ITeS Operations (Hardware and Networking): The Hardware and Networking sector comprises roles involving technical support and network management. Candidates employed in this sector manage ITeS operations within corporations, or carry out servicing roles providing support to consumers. A good 35.37% candidates are employable in roles in hardware and networking sector, according to the study. A person trainable in this role should exhibit basic understanding and usage of computers—both hardware and software—as well as be comfortable in English and exhibit a problem-solving approach.

Associate – ITeS/BPO: A large proportion of candidates (39.84%) are eligible for the BPO industry, both in tele-calling and backend processes. However, graduate engineers do not form the preferred employable group for these companies due to the belief that these roles cannot match their expectations, both in terms of remuneration and job satisfaction.

Creative Content Developer: Creative content developers deal with the non-technical or creatively challenging aspects of content. Depending on the company and requirements, a creative content developer is expected to create new content from scratch, re-write existing content or proof read content. He/she might also be required to manage content on social media and develop new ideas for web content. The role requires a person to have exceptional command over written English, basic analytical skills, an eye for details and to be high on Openness to experience- personality trait associated with being broad-minded, unconventional, curious and imaginative. With just about 22.7% engineers exhibiting the required competence in English, an employability percentage of 15.36% in this role is not surprising.

Technical Content Developer: A technical content developer is responsible for managing the technical aspects of content. He/she may be responsible for writing manuals that explain the technical complexities of products, technical terminology or training content in the technical domain. A technical content developer is required to possess reasonably good technical knowledge of his/her domain subjects and a flair for writing. With just under 60% engineers possessing the required domain knowledge and about 20% possessing the required English skills, the employability in this role stands low at 10.81%.

For most roles, there is only a slight change in the employability as compared to that reported last year. This is as per expectation since one would not expect employability to vary largely in a single year.

In summary, there is a long way to go before engineering graduates in India become employable for various industries and job profiles. Such an economy, with candidates possessing appropriate qualification but unable to exhibit the right competence, is not only inefficient but socially dangerous. More focused trainings and feedback through employability assessments at various times will help improve the scenario.

2 EMPLOYABILITY BY GENDER

In India, there are 106 males for every 100 females, making the male-to-female ratio (MFR) 1.06. In contrast, the MFR in engineering colleges is 1.72. This shows that a lower proportion of females make it to engineering courses as compared to males. This ratio is better as compared to last year's MFR of 1.98. Interestingly, India fares much better in gender ratio as compared to the United States. A 2011 study suggested that the ratio of male to female engineers in USA was as drastic as 4.43[4]! Recently, Aspiring Minds did a detailed research study[5] on what causes this difference between US and India.

Though the gap between the number of males and females studying in engineering colleges is considerable, it would be interesting to see whether this gap exists in their employability as well. The table below answers the same.

ROLES	MALE	FEMALE
IT ROLES		
Software Engineer – IT Product	3.66%	2.63%
Software Engineer – IT Services	18.79%	17.82%
Associate – ITeS Operations (Hardware and Networking)	35.14%	35.76%
ENGINEERING ROLES		
Design Engineer – Non IT	7.88%	6.63%
Sales Engineer – Non IT	16.36%	16.93%
NON-TECH ROLES		
Business Analyst – KPO	11.87%	10.95%
Associate – ITeS/BPO	39.56%	40.30%
Creative Content Developer	14.74%	16.42%
Technical Content Developer	10.54%	11.24%

Table 2: Employability Percentage – Males vs. Females

4. http://www.asee.org/papers-and-publications/publications/college-profiles/2011-profile-engineering-statistics.pdf
5. https://www.aspiringminds.in/docs/women_in_engineering_a_comparative_study_of_barriers_across_nations.pdf

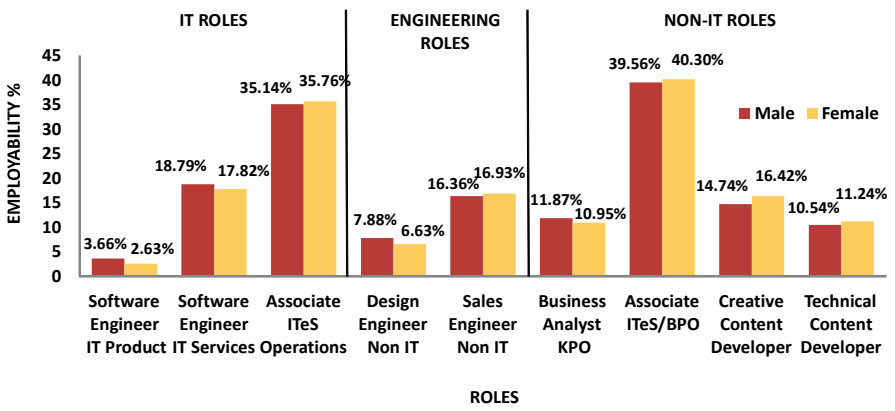


Figure 2: Employability Percentage – Males vs. Females

The analysis shows that employability for males and females is almost equal, with the maximum difference being a 1.68 percentage point for Creative Content Developer.

This slight difference in the employability of males vs. females is majorly due to the difference in Quantitative Ability scores (see Table 3 below for average AMCAT scores of males vs. females). The 35-point difference in scores corresponds to 12 points of percentile difference. Though these results show the same trends as observed globally, they need to be interpreted from a nuanced perspective, given the debate on the bias of standardized testing scores with regard to gender. Note that no significant difference in scores is observed in any other modules.

GENDER	MALE	FEMALE	DIFFERENCE
English	479	485	-6
Quantitative Ability	504	469	35
Logical Ability	463	461	2
Computer Programming	397	404	-7
Mechanical Engineering	416	405	11
Electronics & Semiconductor	328	315	13
Telecommunications	340	337	3
Civil Engineering	367	369	-2
Electrical Engineering	422	412	10

Table 3: Average AMCAT Scores – Males vs. Females

Inspite of the equal employability of males and females, the ratio of males and females in the national workforce is about 2.57[6]. This is higher in comparison to the ratio found in engineering campuses. While the MFR in IT Services companies is about 3.54 (Data Quest's Best Employer Survey 2012[7]) it ranges between 9 to 12[8] for workforce in many core industries. This shows that fewer proportion of female engineers are employed in the IT as well as core industry as compared to males with the difference being many folds higher in core industry. The reasons for this—an analysis of which is beyond the scope of the report—could be many, such as lower proportion of females opting for a professional career; females not being comfortable with relocation; preference of males by corporations; biases in hiring processes etc.

In summary, we find that the ratio of male-to-female engineers is 1.72, which is almost 1.6 times the population ratio (1.06), but much lower than that of other countries such as United States of America (4.43). And, though the employability of male and female engineers is similar, the current ratio of employed males to females in the workforce is higher than that of the engineering population.

6. http://www.telegraphindia.com/1130716/jsp/jobs/story_17120499.jsp#.UiuQSH8saSo
7. http://www.dqindia.com/dataquest/news/121130/gender-inclusivity-key-challenge
8. http://www.telegraphindia.com/1130716/jsp/jobs/story_17120499.jsp#.UiuQSH8saSo

3 EMPLOYABILITY BY REGION

It is important to understand how employability varies by region. Do the demographic factors of a region influence its employability? Do certain cities exhibit very different employability patterns than their state? This section looks at employability percentages by grouping campuses (and students' permanent address) by their region, the regions being defined according to different demographic parameters. In cases where significant differences emerge, an attempt is made to understand the causes. Very likely, the observation of these differences will prompt other studies to find the causes for these differences, leading to proposals of intervention.

Herein is studied the employability by tier of city, across states, and the employability variation between metros and non-metros and some key large cities.

a. Employability by Tier of Cities

It may be argued that colleges located in Tier 1 cities provide better exposure to students. They may also be the preferred destination for students who have the luxury of choice (and are hence academically superior) and probably the first choice for candidates permanently residing in Tier 1 cities. Tiers were allocated to cities according to population, with the following benchmark (Table 4):

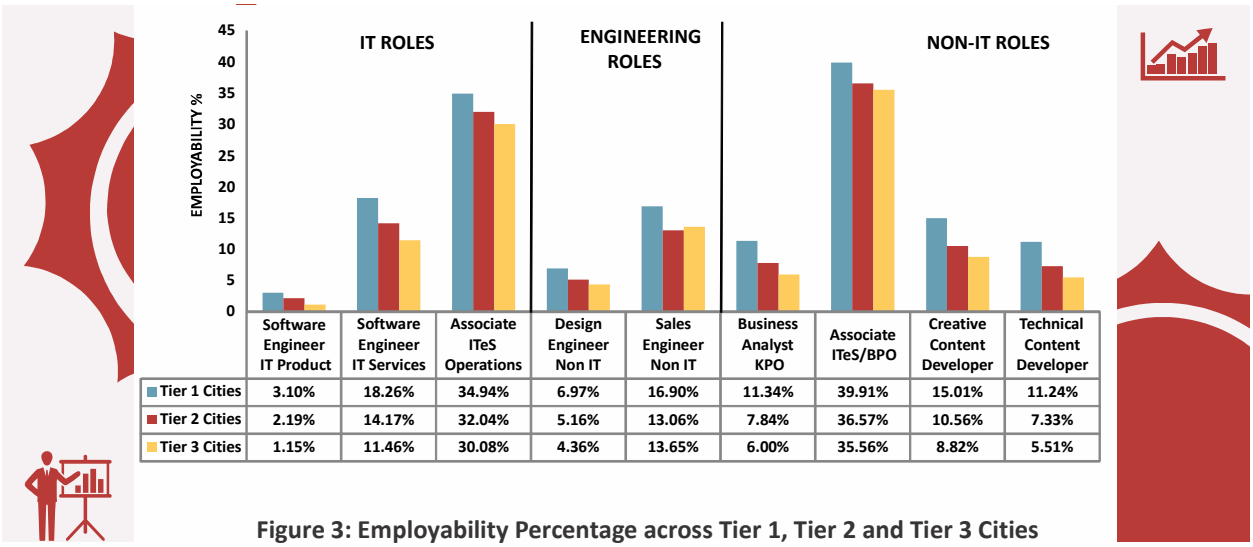
TIER	POPULATION
1	Greater than 25 lakh
2	5-25 lakh
3	0-5 lakh

Table 4: Tier of Cities

For the analysis, the top 100 campuses were removed from the data set, since these have their own brand presence attractingstudents from across the country, and are therefore outliers in their respective cities. Most of these colleges are the IITs and the NITs, which source candidates through a nationwide exam.

ROLE	TIER 1 CITIES	TIER 2 CITIES	% DECREASE (T1 to T2)	TIER 3 CITIES	% DECREASE (T2 to T3)
IT ROLES					
Software Engineer – IT Product	3.10%	2.19%	29.49%	1.15%	47.34%
Software Engineer – IT Services	18.26%	14.17%	22.42%	11.46%	19.14%
Associate – ITeS Operations	34.94%	32.04%	8.30%	30.08%	6.12%
ENGINEERING ROLES					
Design Engineer – Non IT	6.97%	5.16%	25.95%	4.36%	15.45%
Sales Engineer – Non IT	16.90%	13.06%	22.73%	13.65%	-4.54%
NON-TECH ROLES					
Business Analyst – KPO	11.34%	7.84%	30.87%	6.00%	23.47%
Associate – ITeS/BPO	39.91%	36.57%	8.37%	35.56%	2.75%
Creative Content Developer	15.01%	10.56%	29.63%	8.82%	16.44%
Technical Content Developer	11.24%	7.33%	34.80%	5.51%	24.81%

Table 5: Employability across Tier I, Tier II and Tier III Cities



	Software Engineer IT Product	Software Engineer IT Services	Associate ITeS Operations	Design Engineer Non IT	Sales Engineer Non IT	Business Analyst KPO	Associate ITeS/BPO	Creative Content Developer	Technical Content Developer
Tier 1 Cities	3.10%	18.26%	34.94%	6.97%	16.90%	11.34%	39.91%	15.01%	11.24%
Tier 2 Cities	2.19%	14.17%	32.04%	5.16%	13.06%	7.84%	36.57%	10.56%	7.33%
Tier 3 Cities	1.15%	11.46%	30.08%	4.36%	13.65%	6.00%	35.56%	8.82%	5.51%

Figure 3: Employability Percentage across Tier 1, Tier 2 and Tier 3 Cities

One may observe a drop in employability in all roles according to the tier of city of the campus location from Tier 1 to Tier 2 cities whereas employability drops for almost all the roles except sales engineer from Tier 2 to Tier 3 city of campus location. Oddly the difference in employability is generally low from Tier 2 to Tier 3 city

colleges whereas the decrease from Tier 1 to Tier 2 city colleges is drastic.Compared to last year the employability in Tier 1 city colleges has marginally increased in all roles except ITeS/BPO and Hardware and Networking, and has increased in all roles except IT product among tier 2 city colleges.The employability in different roles apart from IT Product is quite similar in absolute terms across cities. This clearly shows that Tier 3 cities cannot be neglected from a recruitment perspective. The data shows that at least one out of every six engineering colleges is in a Tier 3 city. This means that at least 12% of engineers employable in IT Services are in Tier 3 cities – an absolute number of approximately 13,000. These candidates could possibly fill up entry-level hiring needs of several IT Services companies.

AVERAGE SCORES	TIER 1	TIER 2	TIER 3	DIFFERENCE BETWEEN TIER 1 & TIER 2	DIFFERENCE BETWEEN TIER 2 & TIER 3
English	481	463	461	18	2
Quantitative Ability	488	468	456	20	12
Logical Ability	461	446	441	15	5
Computer Programming	400	398	390	2	8
Mechanical Engineering	402	410	400	-8	10
Electronics & Semiconductor	325	316	313	9	3
Telecommunications	339	333	339	6	-6
Civil Engineering	357	359	362	-2	-3
Electrical Engineering	411	418	412	-7	6

Table 6: Average Scores across Tier I, Tier II and Tier III Cities

The table above shows mean scores in aptitude and domain modules across the three tiers of cities. The gap in English and cognitive skills (Quantitative ability and Logical Ability) is wider between tier 1 and tier 2 in comparison to tier 2 and tier 3 city students. This explains the pattern of gap in employability seen above.

The study also investigated the skills deficient among students in Tier 3 cities (see Table 6). Contrary to popular opinion, English language skills are not the area with the widest gap. It is rather quantitative ability which makes these students ineligible for employment. This point towards better teaching practices through problem solving and analysis. We find there is not much difference in the scores in IT/core engineering modules across cities. Given the low average scores in these modules across cities, it may be the case that none of the colleges are doing a good job in imparting these skills. The difference in the English and

cognitive skill modules may only be a function of the input quality of the students. When compared to the 2011 report, there is a consistent trend that the maximum gap (between tier 1 and tier 3 cities) is in cognitive skills, followed by English and least in domain skills. On the other hand, earlier we had observed that the drop in skills between tier 1 and tier 2 cities was lower than that between tier 2 and tier 3 cities. This trend has reversed this time. The reason for the same needs to be further investigated.

b. Employability across States

The research looked at the employability according to states where the different engineering campuses are located. The states were placed in four bins in the decreasing order of employability i.e. the states with highest employability percentages were placed in the Top 25 percentile bin while those with lower employability percentages were placed in following bins. We also wanted to see how the results compared vis-a-vis the findings of the previous study[9].

The observations are given in table 7.

SOFTWARE ENGINEER – IT SERVICES	2013*
Top 25 Percentile	Bihar+Jharkhand Delhi Punjab Uttarakhand
75 to 50 Percentile	Gujarat Madhya Pradesh Maharashtra West Bengal
50 to 25 Percentile	Haryana Karnataka Orissa Rajasthan
Bottom 25 Percentile	Andhra Pradesh Chhattisgarh Kerala Tamil Nadu Uttar Pradesh

*States in each quartile mentioned in alphabetical order

Table 7: States categorized in 25 percentile bins basis employability in Software Engineer - IT Services role

9. National Employability Report - Engineers 2011

As compared to the report of 2011, Delhi, Bihar-Jharkhand and Uttarakhand have managed to retain their positions; West Bengal has fallen to the 2nd Quartile (75 to 50 percentile bin). Punjab is the new entrant in Top 25 percentile bin. States of Tamil Nadu, Andhra Pradesh, Chhattisgarh continue to lurk in the bottom 25 percentile bin, given the sheer number of engineering colleges. While Karnataka has shifted from the bottom quartile to the 3rd Quartile (50 to 25 percentile), Maharashtra has jumped upwards one quartile.

It may be observed, like the earlier employability reports, that the states with the highest number of colleges show the lowest percent employability. We find a correlation of 0.76 with the logarithm of number of colleges with the percent employability in the state. This is in sync with Arrow's hypothesis, that higher education acts as a filter and if everyone starts becoming an engineer, the percent employable candidates will sharply decrease.

Based on these observations, in 2011, we had recommended that there is a greater need for improvement of quality of education in colleges rather than concentrating on building new colleges. Whereas capacity building in engineering education with 3000+ colleges will pay long-term dividend, but only if there is healthy competition leading to improvement of education. Interestingly, in the last couple of years, the same opinion has been echoed by several stake holders. Whereas several states have requested AICTE to reject proposals[10] for new colleges, colleges have shut down in certain areas and media has actively championed the cause of better education rather than more number of engineering colleges. In our own interactions with colleges, they show deep interest in employability improvement and are adopting the idea of employability assessment from the first year onwards to identify gaps and fill them.

10. http://articles.timesofindia.indiatimes.com/2012-02-28/news/31107310_1_aicte-engineering-colleges-management-colleges

c. Employability in Metros vs. Non-Metros

The research analyzed employability of candidates coming out of colleges in metro cities, in comparison to those in non-metro cities. The general view remains that colleges in metros produce more employable candidates due to better exposure and education, which explains why parents often prefer colleges in metros as opposed to others in making an admission decision. The employability figures based on the analysis are reported in Table 8:

Metro non metro by college city

ROLE	METRO	NON METRO	% DECREASE FROM METRO TO NON-METRO
IT ROLES			
Software Engineer – IT Product	3.87%	3.28%	15.42%
Software Engineer – IT Services	21.86%	19.74%	9.69%
Associate – ITeS Operations	37.78%	34.93%	7.54%
ENGINEERING ROLES			
Design Engineer – Non IT	9.02%	7.29%	19.22%
Sales Engineer – Non IT	19.64%	17.15%	12.68%
NON-TECH ROLES			
Business Analyst – KPO	14.34%	11.43%	20.28%
Associate – ITeS/BPO	42.90%	40.41%	5.82%
Creative Content Developer	18.90%	15.14%	19.88%
Technical Content Developer	14.23%	10.92%	23.26%

Table 8: Employability Percentage:Metro vs. Non-Metro Colleges

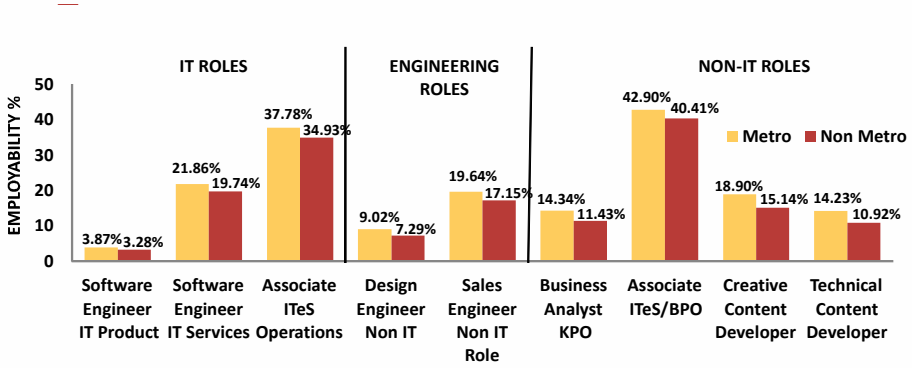


Figure 4: Employability percentage: Metros Vs. Non-Metro Colleges

As it may be noted, even though colleges in non-metro cities have lower employability, the difference is not too much. Only the decrease in employability in KPOs, Content developer and Design engineer roles is much higher. We investigate the reason for this in the table below which shows the difference in mean AMCAT scores between Metros and Non-Metros.

	METRO	NON-METRO	DIFFERENCE
English	503	473	30
Quantitative Ability	508	485	23
Logical Ability	473	458	15
Computer Programming	405	398	7
Mechanical Engineering	422	416	6
Electronics & Semiconductor	330	320	10
Telecommunications	347	338	9
Civil Engineering	377	364	13
Electrical Engineering	428	420	8

Table 9: Metros vs. Non-Metros: Mean AMCAT scores by city of college

From the table we can see that students studying in Metro cities have higher scores in all modules than students studying in Non-Metro cities. We can also observe that the widest gap is in English scores whereas the gap in other modules is very small. This can be attributed to the fact that the campuses in Metros have better exposure to English. Since English comprehension and writing skills are very important for KPO, Technical and Creative Content developer roles, difference in English scores explains for the gap in employability. Strong hold on Domain knowledge along with basic to advanced English are a must for those in Design Engineering roles. Employability gaps in these roles can be attributed to the differences in English scores as well as small but existent difference in domain modules.

Metro non metro by permanent residence

ROLE	METRO	NON-METRO	% DECREASE FROM METRO TO NON-METRO
IT ROLES			
Software Engineer – IT Product	4.20%	2.93%	30.32%
Software Engineer – IT Services	22.51%	19.17%	14.84%
Associate – ITeS Operations	39.29%	36.28%	7.65%
ENGINEERING ROLES			
Design Engineer – Non IT	9.22%	7.17%	22.21%
Sales Engineer – Non IT	19.49%	16.95%	13.05%
NON-TECH ROLES			
Business Analyst – KPO	15.25%	11.70%	23.25%
Associate – ITeS/BPO	44.56%	40.89%	8.23%
Creative Content Developer	21.03%	16.25%	22.75%
Technical Content Developer	15.52%	11.11%	28.40%

Table 10: Metros vs. Non-Metros: Employability by city of permanent residence

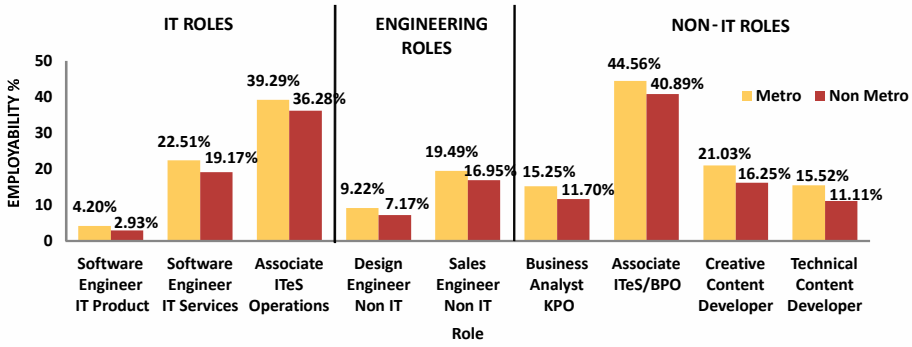


Figure 5: Metros Vs. Non-Metros: Employability by city of permanent residence

In contrast, when the employability of candidates with permanent residence in metros and non-metros was compared (see Table 11), the trends came out to be quite different. There is an appreciable gap in employability for IT product companies and the gap in employability for KPOs, Content Developers and Design Engineers increases further. On looking at the mean scores in the table below, it can be seen that difference in English and Computer Programming also go up.

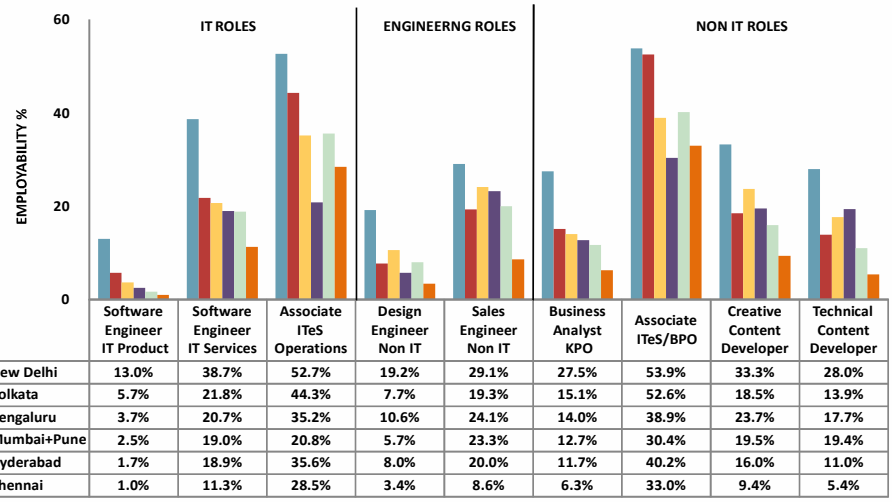
	METRO	NON-METRO	DIFFERENCE
English	518	473	45
Quantitative Ability	510	489	21
Logical Ability	474	458	16
Computer Programming	414	396	18
Mechanical Engineering	419	415	4
Electronics & Semiconductor	328	321	7
Telecommunications	346	337	9
Civil Engineering	376	369	7
Electrical Engineering	425	419	6

Table 11: Metros vs. Non-Metros: Mean AMCAT scores by city of permanent residence

There are two potential hypotheses to explain this. Firstly, candidates born and brought up in metros have better exposure to computers and in particular, computer programming, and thus they are more employable than their non-metro counterparts. If the colleges were imparting computer programming education adequately, this gap due to intake impact should have narrowed. Secondly, English language skills are very important for KPOs and Content Developers, and candidates born and brought up in metros seem to acquire better English skills due to day-to-day exposure to a larger English speaking population. This clearly shows that students coming from non-metros are disadvantaged to a certain extent.

d.Employability in Key Cities

The study also compared employability within students graduating out of different metro cities in the country. The results are reported in Table 12.



	Software Engineer IT Product	Software Engineer IT Services	Associate ITeS Operations	Design Engineer Non IT	Sales Engineer Non IT	Business Analyst KPO	Associate ITeS/BPO	Creative Content Developer	Technical Content Developer
New Delhi	13.0%	38.7%	52.7%	19.2%	29.1%	27.5%	53.9%	33.3%	28.0%
Kolkata	5.7%	21.8%	44.3%	7.7%	19.3%	15.1%	52.6%	18.5%	13.9%
Bengaluru	3.7%	20.7%	35.2%	10.6%	24.1%	14.0%	38.9%	23.7%	17.7%
Mumbai+Pune	2.5%	19.0%	20.8%	5.7%	23.3%	12.7%	30.4%	19.5%	19.4%
Hyderabad	1.7%	18.9%	35.6%	8.0%	20.0%	11.7%	40.2%	16.0%	11.0%
Chennai	1.0%	11.3%	28.5%	3.4%	8.6%	6.3%	33.0%	9.4%	5.4%

Figure 6: Employability Percentage in different Metro cities

The following observations are made:

The trends are similar to those with regard to employability in states. Delhi (North) shows the highest employability, followed by Kolkata (East) and cities in the West, while the lowest employability figures were observed among colleges in Southern cities. The skew in employability is quite high; for instance, the IT product employability in Delhi is as high as 1 in every 8 candidates and as low as 1 in every 100 in Chennai. Even though Bengaluru has similar IT services employability as compared to other Southern and Western cities, the city shows much higher employability for IT product companies. This indicates that candidates in Bengaluru do much better at computer programming and algorithms, even though they show similar English and cognitive skills. This could be due to better exposure to computer programming either at home, schools or colleges.

The reason for this skew in employability is explained again by the trend in number of colleges in each of these cities (see Table 13). The proliferation of engineering colleges in Southern and Western India has brought down the employability figures. In comparison, there are far fewer engineering colleges both in Delhi and Kolkata. This is despite the fact that the population of Delhi is much more than Southern cities, being comparable to that of Mumbai (see Table 13).

CITY	APPROXIMATE NUMBER OF COLLEGES	POPULATION
Bengaluru	80	5,438,065
Chennai (including Thiruvallur)	87	4,616,639
Delhi	35	12,565,901
Hyderabad	90	4,068,611
Kolkata	58	5,138,208
Mumbai and Pune	151	17,277,214

Table 13: Number of colleges and population in major cities

In summary, the study found that employability trends show significant variation with respect to the location of the campus. The employability gap was found to be substantial between Tier 1 and Tier 2 cities (classified by population), whereas the gap between Tier 2 and Tier 3 cities is significantly less wide. The major gap in skills was observed in quantitative ability rather than logical reasoning skills and command of the English language. With regard to employability percent in different states, it was found that employability decreases logarithmically with the number of colleges in the state (in sync with Arrow's hypothesis). Also, whereas there was no appreciable difference in employability of students coming out of colleges in metros and non-metros,there was a significant difference between employability of candidates born or living in metros versus the rest. This clearly shows that candidates who have spent a significant part of their life time in metros get better exposure to English and computer education, helping them become more employable.

The key learning of this study is that as a Nation, we need to emphasize more on quality than number of colleges.

4 EMPLOYABILITY VARIANCE IN CAMPUSES

It is known that the quality of intake, education and outcome varies dramatically across the 3,000+ engineering campuses in India. It is pertinent to understand how much variation is there. Is it that most colleges have similar quality, with a few outliers, or whether there is a large variance? What are the reasons for these variations? This section looks into such questions.

a. Employability in top-tier campuses vs. the rest

The study analyzed employability of campuses according to their ranking (as reported in popular media). Campuses which fell among the top 100 on the list (according to various credible public surveys) were segregated and their employability was compared with the rest of the campuses. The results are depicted in Table 14.

ROLE	TOP 100 COLLEGES	REST OF THE COLLEGES
IT ROLES		
Software Engineer – IT Product	12.02%	2.56%
Software Engineer – IT Services	41.52%	16.10%
Associate – ITeS Operations	53.29%	33.57%
ENGINEERING ROLES		
Design Engineer – Non IT	21.17%	5.98%
Sales Engineer – Non IT	30.71%	14.97%
NON-TECH ROLES		
Business Analyst – KPO	32.23%	9.44%
Associate – ITeS/BPO	55.17%	38.30%
Creative Content Developer	42.31%	12.59%
Technical Content Developer	30.61%	9.08%

Table 14: Employability Percentage-Top 100 Colleges vs. Rest

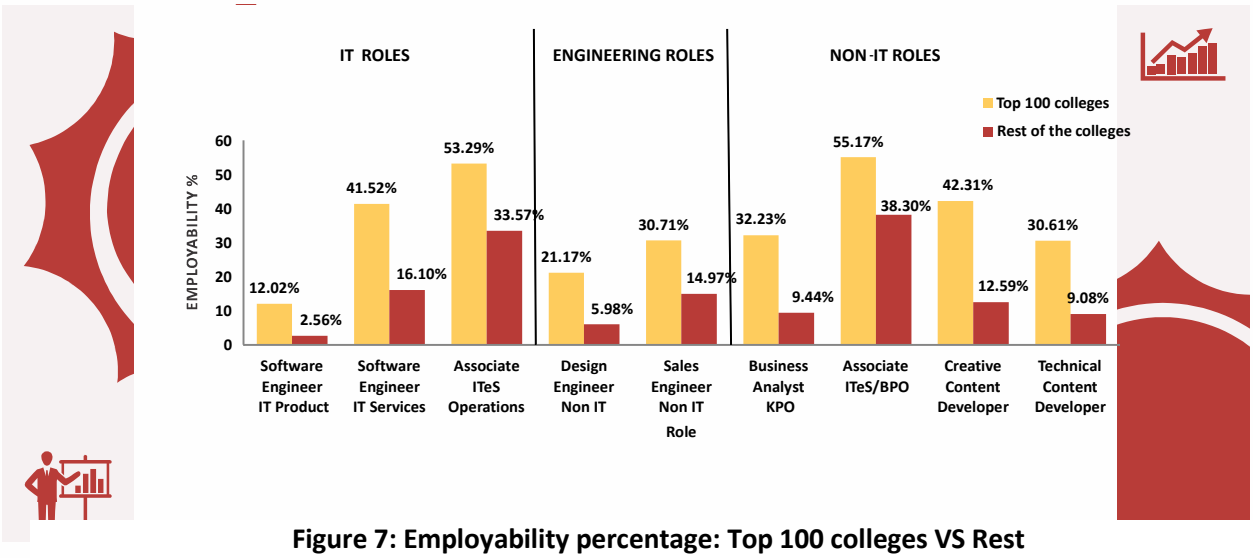


Figure 7: Employability percentage: Top 100 colleges VS Rest

The following trends were observed:

I). The employability for IT product companies falls by more than four and a half times from 12.02% to 2.56%,whereas the employability in IT services and Technical/Creative Content Development roles falls by more than two and a half times (41.52% to 16.10%),three times(30.61% to 9.08%) and ,three and a half times (42.31% to 12.59%) respectively. The fall is not so steep when it comes to BPO and Hardware Networking.

(ii). Given that the ratio of the number of top 100 campuses to the rest is almost 1 is to 10, one can conservatively estimate that more than 70% of the employable engineers for IT product role, and more than 80% for IT services and KPO, are in the so-called Tier 2 campuses. According to current trends, IT product and KPO companies do not source from Tier 2 campuses, which creates a large artificial dip in the supply of eligible candidates. This is in line with what was reported in the 2009 and 2011 national employability reports for engineers by Aspiring Minds[11].

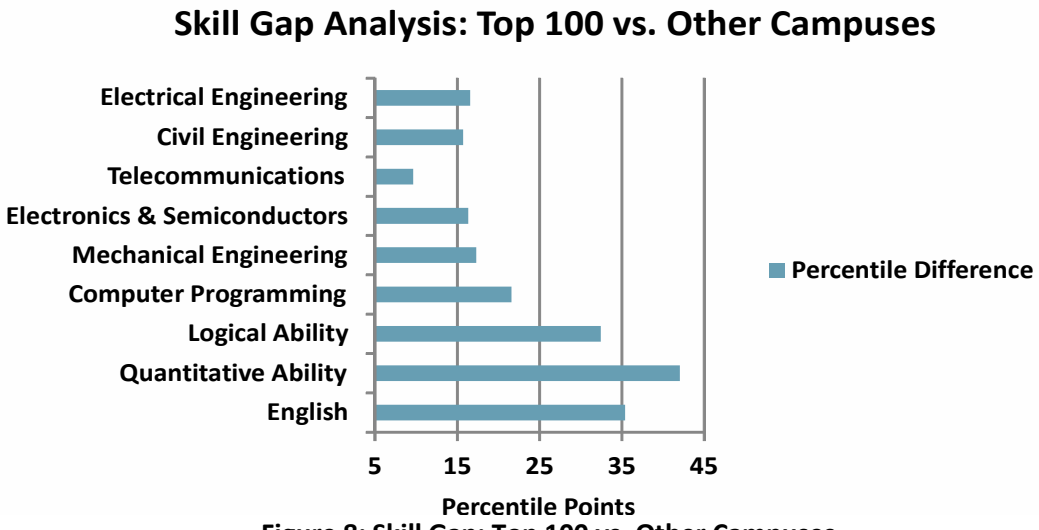


Figure 8: Skill Gap: Top 100 vs. Other Campuses

11. National Employability Report (Aspiring Minds), 2009; National Employability Report Engineers 2011

The study also investigated what skills are lacking in students of Tier 2 campuses (see Figure above). There is a gap of 35, 32 and 22 percentile points in English Communication, Logical Ability and Computer Programming, respectively, whereas the gap in Quantitative ability is 42 percentile points. In other domains like Civil, Electrical, Mechanical and Electronics the difference is of around 15-18 percentile points. This clearly shows that the maximum effort is required to hone mathematical skills of the students, whereas consistent effort is needed in other areas as well.

B. Employability Variance across Colleges

In this section, we study the distributional properties of employability across colleges.

IT Services

The employability of each college for the IT services industry was determined and arranged in order of its rank(See figure 9).

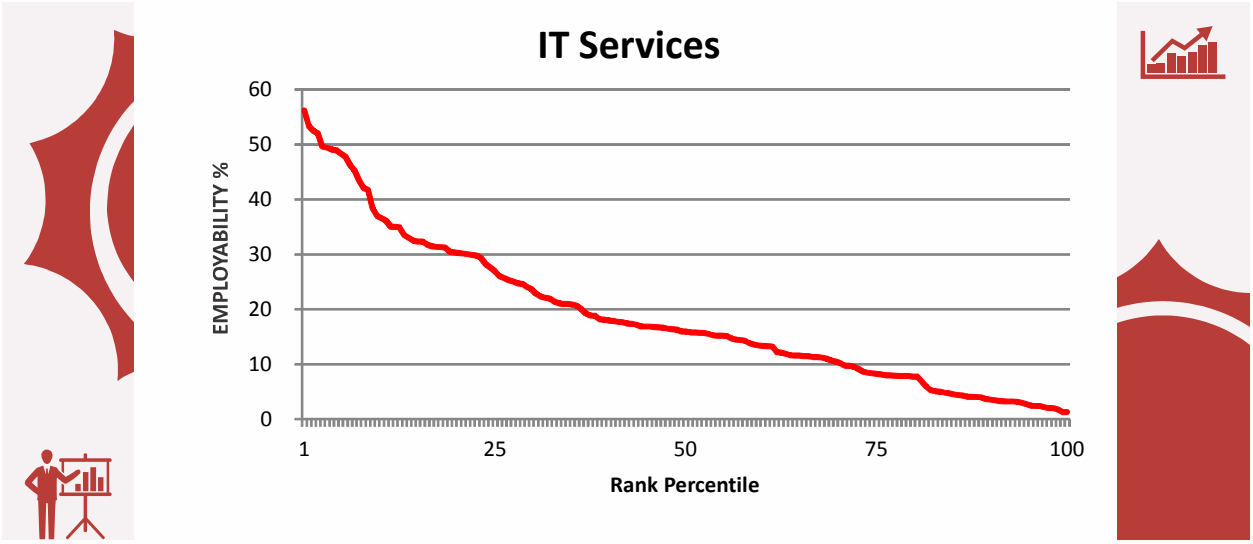


Figure 9: Employability Percentage of Students across Colleges for IT Services Companies

The following observations can be made:

The best of colleges have employability as high as 55%, whereas the bottom 30 percentile colleges have employability of less than 10%. Around only 36% colleges have employability more than the average figure of 18.43%, whereas the majority (64% colleges) has it close to or lower than 18.43%. This clearly shows that there are a small number of colleges with very high employability followed by a high number of colleges with very low employability. Thus, even though the mean employability is ~18%, the median employability is much lower.

Some simple calculations show that average employability in colleges in the top 30 percentile (around 750 colleges) is 35%, whereas it is around 10% for the rest of the colleges. This implies that almost an equal number of employable candidates are there in the top 750 campuses as compared to the rest. Consider that no IT company in India has a campus recruitment program beyond the top 750 campuses, which shows that almost half of the employable pool i.e., around 50,000 employable candidates in the country, is invisible to recruiters.

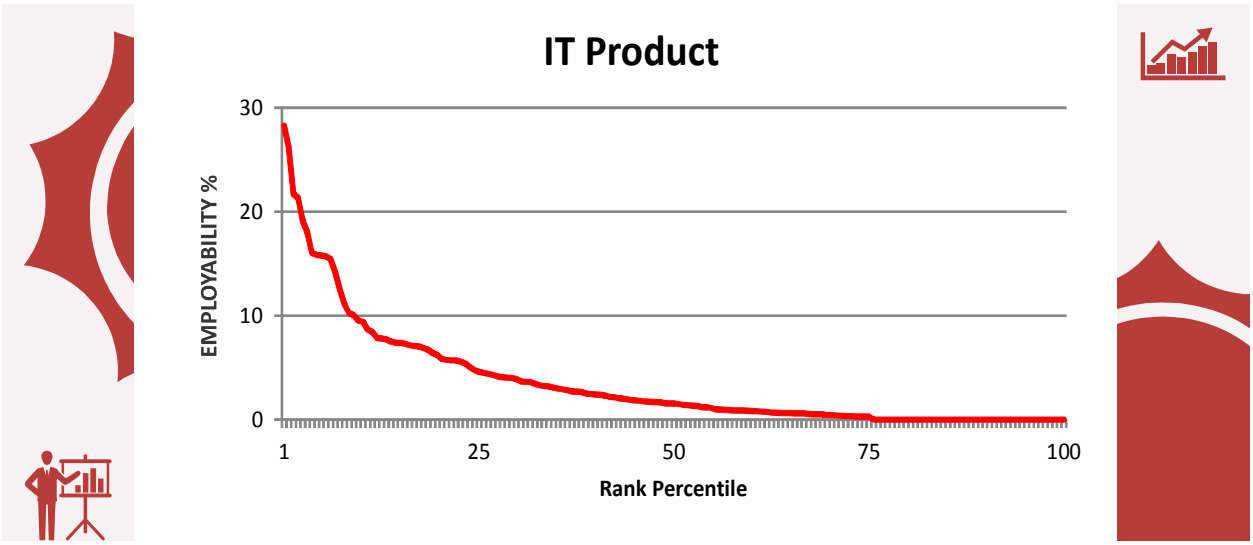


Figure 10: Employability Percentage of Students across Colleges for IT Product Companies

The best of colleges have employability as high as 28%, whereas the bottom 45 percentile colleges languish at less than 1%.This figure degrades to zero employable candidates for the bottom 25 percentile colleges. Around only 25% colleges have employability more than the average figure of 3.21%, whereas the majority (75%) colleges have it close to or lower than the average figure.

	TOP 30 PERCENTILE CAMPUSES (750)	REST OF THE CAMPUSES (2250)
IT Services Employability	35.38%	9.63%
Percent Employable Pool	53%	47%
IT Product Employability	13.44%	1.19%
Percent Employable Pool	75%	25%

Table 15: Top 30 percentile campuses vs. the rest

The following conclusions are drawn:

One may observe that the employability falls drastically toward the beginning, and more gracefully toward the middle. This clearly shows that there are certain colleges which have excellent employability; however, other colleges even close in ranking show a drastic drop in employability. This is in line with the perception that certain colleges, such as the IITs and state-run colleges, are much better than other colleges, which may be ranked just as highly. This is not a healthy trend, implying that deserving students in these other colleges find themselves cut off from better opportunities.

To further analyze this hypothesis, the study looked at the employability for the IT product role. One would expect to see a steeper trend, since IT product employability is more strongly influenced by college education quality (rather than just intake) as compared to employability for IT services companies. The variation is shown in Figure 10.

One can observe that IT product employability falls to less than 10% at Rank 10, down from 28% at Rank 1, which is a fall of three times. On the other hand, for IT services companies, this fall was only around 1.5 times. Similar trends continue throughout the graph and confirm the hypothesis that the quality of education falls steeply as one goes down the list of the so-called top colleges, with close neighbors having substantial differences in quality.

In summary, the study found that the ratio of employability in top 100 colleges versus the rest is between two to four times depending on the role. Inspite of this, more than 70% of employable candidates for any role are in campuses other than the top 100. With regard to employability distribution among campuses, the quality of education falls steeply among the top-ranked colleges, which implies that colleges that are neighbors in rank have very different quality of education. There are a large number of colleges with exceptionally low employability: bottom 45 percentile campuses have less than 1 in 100 candidates employable in IT product role, and the bottom 20 percentile campuses have no candidate employable in the IT product role. Finally, we find that almost 50% of employable candidates for IT services companies and 25% of employable candidates for IT product companies are enrolled in campuses ranked beyond the top 750, thus forming an invisible pool to most employers in India.

5 Job Aspirations of Engineers

In previous sections, we have studied what kind of roles and sectors, engineers are employable for. We also wish to understand the aspirations of engineers: what kind of job roles and companies they want to work in. To this end, we developed a scientific survey instrument to understand the kind of jobs students look forward to, the sectors, type of company and compensation. The survey was on a stratified sample of 15,000 engineering students across India who graduated in 2013 during May 2013 to July 2013. We further investigated how job aspirations of students change with their branch of study, gender and tier of city among others. These detailed findings are presented in the following sections.

Brief explanation of classifications used in the sections below

Branch of Study:

-Computer/IT includes engineers in Computer Science & IT branches

-Circuit Branches include Electronics Engineering, Electrical Engineering, and Instrumentation Engineering

-Core Engineering includes other branches like Mechanical Engineering, Civil Engineering etc.

Tier of City

Tiers were allocated to cities, where the colleges were located, according to their population with the following benchmark:

Tier	Population
1	Greater than 25 lakh
2	5-25 lakh
3	0-5 lakh

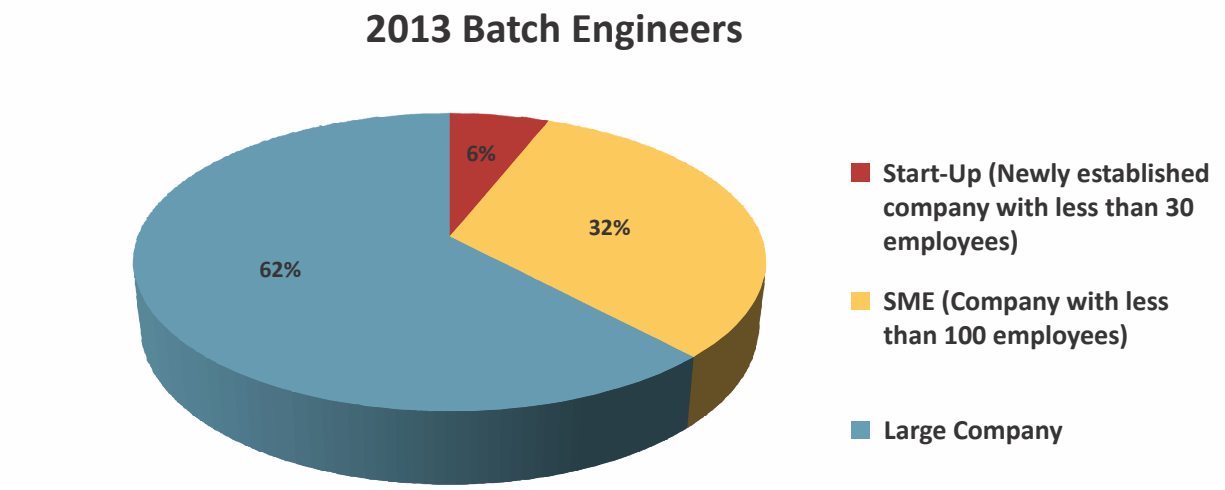
Table 16: Tier of Cities

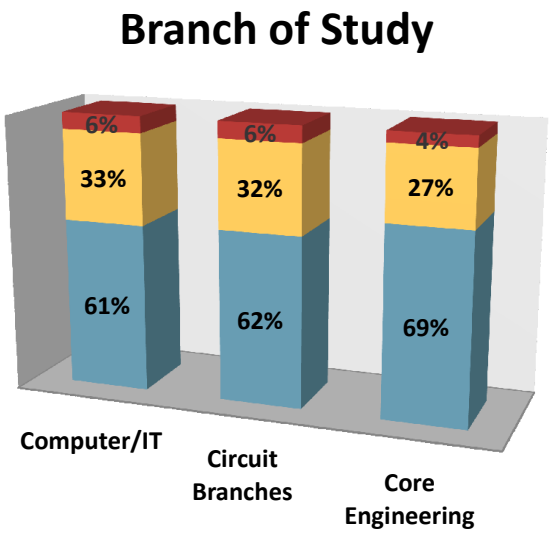
Tier of College

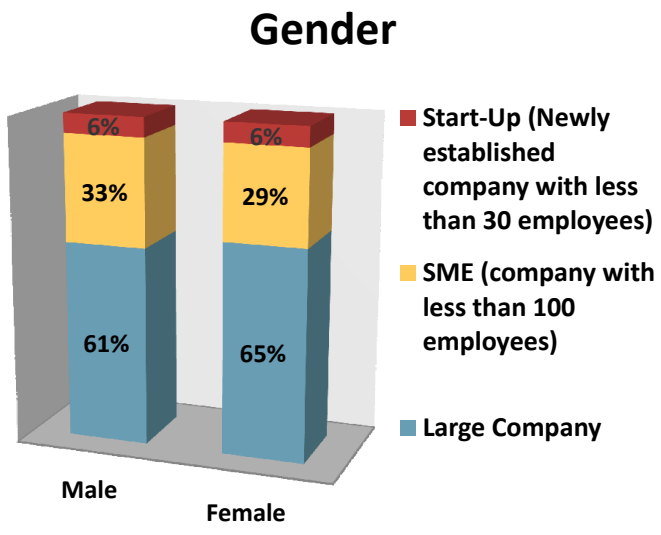
All the colleges were ranked basis the employability of their students. Those in top 33 percentile were considered as tier 1 colleges, those in mid 33 percentile range were considered as tier 2 colleges while those in bottom 33 percentile set were taken as tier 3 colleges.

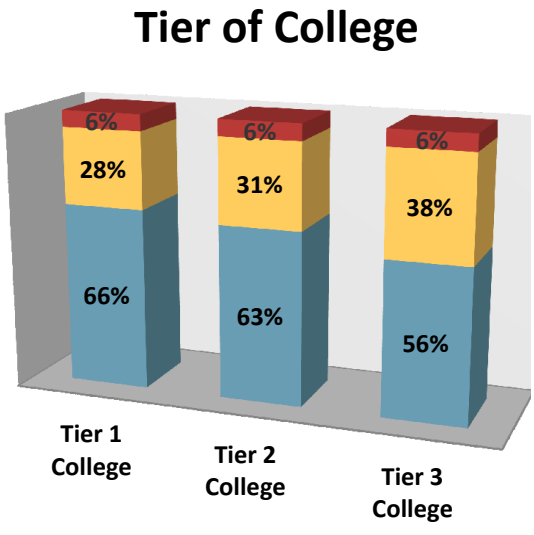
A. Kind of company

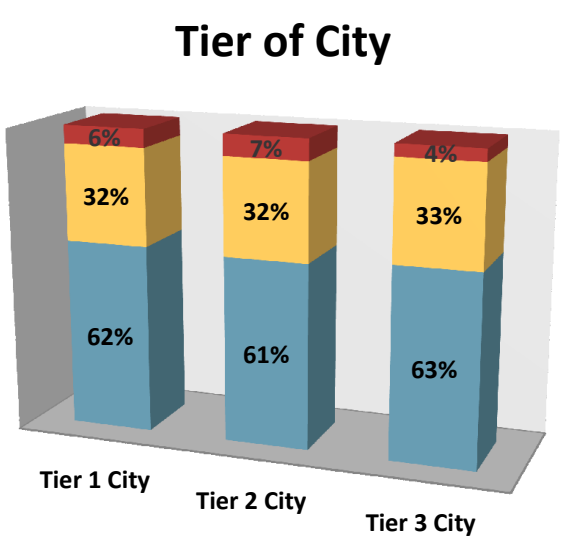
Here we asked students about their top preference among large company, an SME (less than 100 employees) and a start-up.











OBSERVATIONS

We find that more than 60% students want to work with a large company, whereas less than 10% are interested in startups. We also know by our employability study that startups need much higher capability due to lack of internal training facilities. If we find the intersection of people who opted for startups and the percent employable for them, a mere 1.9% is both interested and employable in startups. This means that startups have to work very hard to identify these individuals.

By Branch of Study: We find that the aspirations of computer engineers and those in circuit branches are similar, however core engineering students are even lesser inclined to work with SMEs and startups.

By Gender: Whereas we find that females prefer to work in larger companies more often than males, interestingly, females prefer startups as much as males do. Even though the total interest in startups is small, the equal interest of males and females is a very encouraging trend.

By Tier of College: We find that students from lower tier institutions are less interested to work in larger companies. Given that a job in large company is considered mostly a proxy for a 'good job', this trend is not directly understandable. Probably, because a good percent[12] of these students do not end up getting a job in a large company, they aspire for what they think is in their reach. This is akin to other studies, wherein survey of students in villages show their aspiration not leading to a doctor/engineer, since they haven't seen anyone around them become one.

By Tier of City: One finds that students from tier 3 cities want to work for startups less often than others.

12. See section on Employability Vs. Employment

B. Role Aspirations

We asked the student what is their top preference in the kind of job role: Software Development, Core engineering jobs (like mechanical, electrical, electronics or civil engineer) and management related jobs.

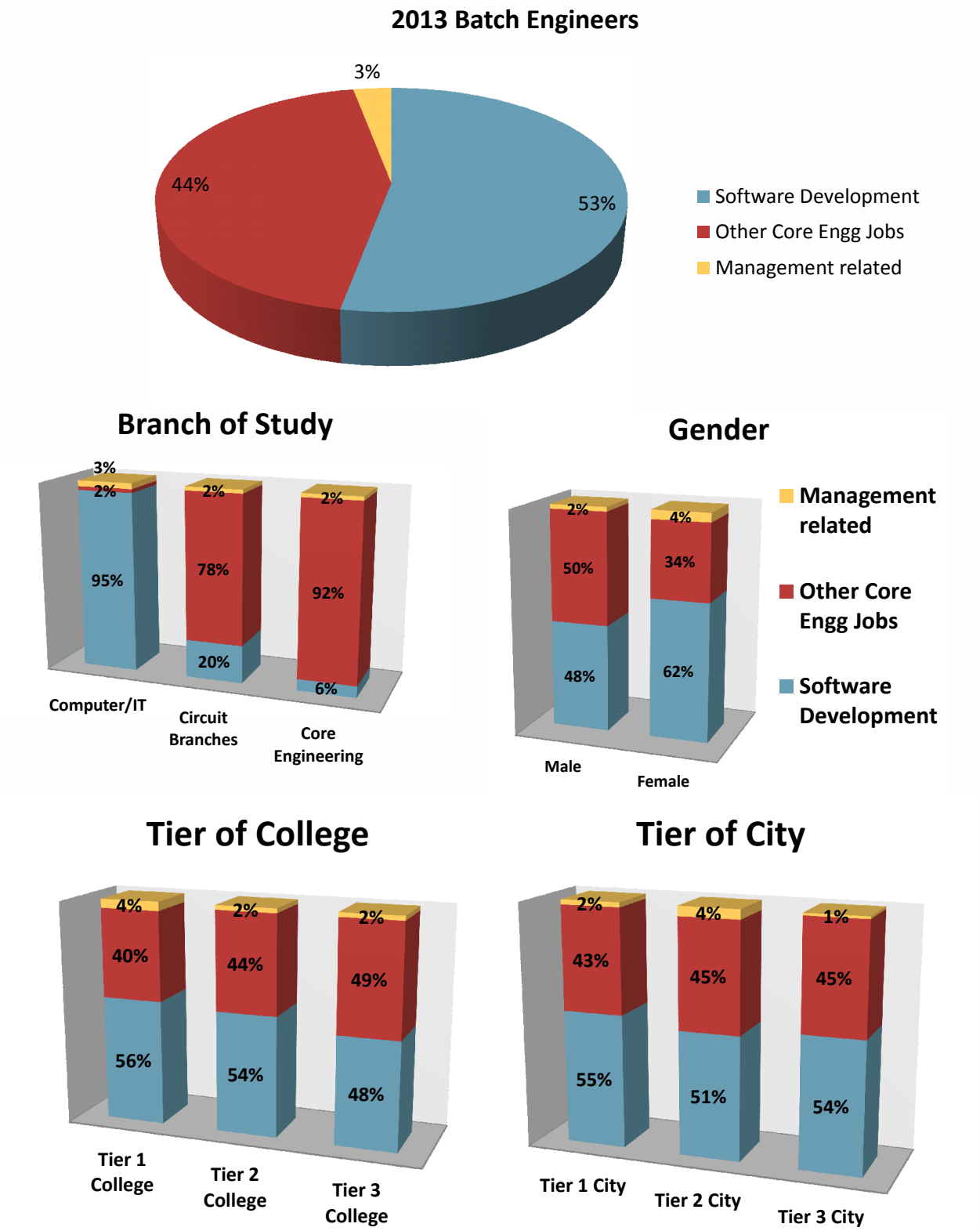


Figure 12: Job-role preference: job role- Software Development, Core engineering jobs (like mechanical, electrical, electronics or civil engineer) and management related jobs.

OBSERVATIONS

One main observation: An overwhelming percent of engineers want software jobs followed by engineering jobs. Even though a lot of jobs for engineers have opened up in technical sales, marketing and content development, engineers do not seem to prefer these jobs as yet.

By Branch of Study: Students within Computer/IT are mostly interested in a software job and not in alternate careers like Hardware-Networking, etc. On the other hand, more than 75% of students in circuit branches and 92% students in core engineering want a job in their domain as opposed to software engineering. This is concerning both due to low employability of students in these jobs (7.49%) and the lack of such jobs in the market.

By Gender: Males are equally open to roles in software development as well as other core engineering while females prefer software roles more to other core engineering roles. An interesting observation here is that a greater percentage of females aspire for a management related role in comparison to males.

By Tier of College: Overall more engineers aspire for a software role in comparison to other core engineering roles. While engineers from tier 1 colleges aspire for software development and management related roles more than those from tier 2 and tier 3 colleges a reverse trend is seen for core engineering roles which more tier 3 engineers are willing to take up followed by those from tier 2 and tier 1 colleges.

By Tier of City: Engineers from tier 1 city aspire for software development role more than those from tier 2 and tier 3 cities.

C. Salary Aspirations

We asked the students what salary they expect to get.

Expected Salary (in lakhs)	Mean	Standard Deviation	Maximum	Minimum
2013 Batch Engineers	3.10	1.02	12	0.6

Table 17: Salary expectation of students

A. By Branch of Study

Expected Salary (in lakhs)	Mean	Standard Deviation	Maximum	Minimum
Computer/IT	3.09	1.00	12.00	0.60
Circuit Branches	3.08	1.02	12.00	0.60
Core Engineering	3.22	1.07	10.00	1.00

Table 18: Salary expectation of students of different branches

Observation:

- On an average Core branch engineers aspire for a higher salary than other engineers which is a surprising finding, because generally software jobs pay the highest.

B. By Gender

Expected Salary (in lakhs)	Mean	Standard Deviation	Maximum	Minimum
Male	3.08	0.99	12	0.6
Female	3.14	1.07	12	0.6

Table 19: Salary expectations of males and females

Observation:

- On an average females aspire for a higher salary than males do. This shows females are ambitious, as opposed to other studies in the world [13]. It is also in contrast to our finding[14] that females on average get lower salaries.

13. http://www.telegraph.co.uk/women/womens-business/10116221/Female-grads-expect-to-earn-less-than-men-prompting-concerns-they-are-less-ambitious.html
14. See regression results in the next section on which engineer gets a job.

C. By Tier of College

Expected Salary (in lakhs)	Mean	Standard Deviation	Maximum	Minimum
Tier 1	3.49	1.18	12	1.25
Tier 2	3.02	0.90	12	0.60
Tier 3	2.79	0.83	11.8	0.60

Table 20: Salary expectations of students of different tier of colleges

Observations:

- Engineers from tier 1 colleges aspire for a much higher salary in comparison to tier 2 and tier 3 college engineers.
- While the difference between mean aspired salary of engineers from tier 1 colleges and tier 2 colleges is Rs. 47000, the difference between those from tier 1 and tier 3 is Rs. 70000.
- This is really interesting and similar to our larger company observation, students in lower tier colleges just don't think they can get higher salaries or large companies and thus limit their aspirations.

D. By Tier of City

Expected Salary (in lakhs)	Mean	Standard Deviation	Maximum	Minimum
Tier 1	3.10	0.95	12	0.6
Tier 2	3.13	1.12	12	1
Tier 3	3.03	0.87	7	1.44

Table 21: Salary expectations of students of different tier of cities

Observation:

- Mean salary which engineers from tier 1 and tier 2 cities aspire for are similar while it is Rs. 10000 lower for those from tier 3 cities.

6 Employability vs. Employment

Our previous National Employability Report for engineers in 2011, generated considerable curiosity and the question about employment outcomes of students. We know what percent of students are employable, but what percent of students actually end up getting jobs? For our current analysis we went a step further to get the numbers and put them besides employability percentages.

The percentages in the tables below are on a sample of about 15000 engineering students from across India who graduated with an engineering degree in 2013. All these students had taken AMCAT[15], a test of employability, while they were in their final year. They were surveyed during May to July 2013, at a time when bulk of entry-level employment has taken place. These students were surveyed on several parameters about their employment outcome.

In this section we look beyond employability. Besides discussing the percentage of engineers who are employable we study the percentage of engineers who get an interview opportunity, the percentage which made it to the final interview round and the percentage which got employed. We look at the gap between the employable and the employed percentages and see how they are affected by branch of study, gender, tier of college and tier of city of the candidate. In the next section, we look at the same data from a lens of regression to find out what biases are there in the employment ecosystem.

A. Employability vs. Employment Outcomes

	Employable[16]	Got an Interview Opportunity	Reached Final Round	Employed	Average Salary (in INR Lakhs)
Engineers	18.33%	75.14%	41.09%	18.09%	2.82

Table 22: Employability Vs. Employment Outcomes

Observations:

- Whereas 18.33% of the engineers are employable 18.09%actually get a job. The numbers are close, even though the number of candidates with jobs is lower than those employable, which may indicate a gap. On the other hand, if we assume that some placement would happen during the 6 months following our survey, the gap may be bridged.
- About 25% of the engineers did not even get an interview opportunity.

15. https://www.myamcat.com/engineer/
16. Employable here refers to the percentage of surveyed candidates who are employable in the Software Engineer-IT Services role. Employability in IT Services was chosen as the employability criteria as Large IT Services companies hire engineers for this role from all branches and hence, all engineers qualify to be placed under this category.

B. By Branch of Study

Branch of Study	Employable	Got an Interview Opportunity	Reached Final Round	Employed	Average Salary(in INR Lakhs)
Computer/IT	17.69%	79.90%	40.93%	19.98%	2.76
Circuit Branches	18.98%	73.34%	43.49%	16.58%	2.82
Core Engineering	18.46%	60.36%	30.77%	15.98%	3.11

Table 23: Branch-wise Employability Vs. Employment Outcomes

Observations:

- The employability of engineers from all branches is similar though computer/IT engineers get hired the most.
- Even though, core engineering students get interviewed less often, they convert them to offers with higher probability.
- Between circuit branch and core engineering students, while lesser core branch engineers get an interview opportunity the trend reverses when we look at the percentage getting employed.

C. By Gender

Gender	Employable	Got an Interview Opportunity	Reached Final Round	Employed	Average Salary (in INR Lakhs)
Male	18.86%	73.49%	40.59%	17.27%	2.86
Female	17.34%	78.25%	42.05%	19.64%	2.75

Table 24: Gender-wise Employability Vs. Employment outcomes

Observations:

- Males and females are equally employable though the hiring practices seem to be skewed against males. At each step, from getting an interview opportunity to finally getting a job, females are ahead.

C. By Tier of College

Tier of College	Employable	Got an Interview Opportunity	Reached Final Round	Employed	Average Salary(in INR Lakhs)
Tier 1	30.38%	82.27%	37.29%	29.98%	3.21
Tier 2	16.07%	73.74%	43.60%	12.42%	2.52
Tier 3	7.67%%	68.94%	41.41%	13.44%	2.22

Table 25: College tier-wise employability vs. employment outcomes

Observations:

Employability at Tier 1 colleges is more than that at tier 2 colleges which in turn is more than employability at tier 3 colleges. In terms of employment, similar job outcomes are seen for tier 2 and tier 3 colleges even with such distinct employability. One hypothesis for this could be that companies can't distinguish between tier 2 and tier 3 colleges. This makes sense also because there is no ranking beyond top 100 colleges. Thus the largest sufferers here seem to be tier 2 colleges.

E. By Tier of City

Tier of City	Employable	Got an Interview Opportunity	Reached Final Round	Employed	Average Salary(in INR Lakhs)
Tier 1	18.07%	76.90%	41.48%	18.26%	2.88
Tier 2	19.31%	74.04%	40.79%	18.94%	2.77
Tier 3	15.63%	71.88%	40.63%	14.06%	2.69

Table 26: Employability vs. employment outcomes as per tier of city

Observations:

- The difference in employability between tier 1 and tier 2 city students is less than 1% and the difference in percentage of candidates actually employed is again about 1%. It is anomalous that Tier 2 has a higher percentage of candidates actually employed.
- More percentage of tier 1 city candidates got an interview opportunity in comparison to the rest. This is because the number of opportunities available in tier 1 city is higher in general.
- Now, if we compare tier 3 city students with those from tier 1, we can see that the difference in employability is about 3% while the difference in percentage of candidates who actually got a job is 3.5%
- Broadly, we can conclude that tier of city does not cause much bias in the hiring process. This is in line with our results in the next section where we look at the factors which cause a bias in the chances of an engineer getting a job.

7 Which engineer gets a job?

The engineering degree has emerged in India as one of the most preferred higher education qualification to get a well-paying job leading to a life of dignity. The large demand for the degree has resulted in engineering seats growing by more than 200%[17] in the last 10 years. A number of large companies in the IT space hire from engineering colleges in several thousand every year. Other than these, companies in other engineering domains such as mechanical, electrical or electronics and a long tail of small and medium sized enterprises hire fresh engineers in reasonably large numbers.

Despite the large number of jobs, their numbers do not add up to the engineering graduating class each year, which exceeds 700,000. In such a scenario, it is important to find out which engineers get a job and which do not. Do the most meritorious students get a job? Do engineers face certain barriers and bias in the job selection process? These are important questions. Firstly, it helps us find out whether the engineering employment ecosystem is open and equitable, where the individual's employment outcome is just a function of his/her capability to do the job and not of other factors. Second, this provides an opportunity to recognize the biases and barriers, if any, and seriously look at interventions to correct them.

To study this, we surveyed a stratified sample of 15000 engineering students from across India who graduated with an engineering degree in 2013. All these students had taken AMCAT[18], a test of employability, while they were in their final year .They were surveyed May to July 2013, at a time when bulk of entry-level employment has taken place. These students were surveyed on several parameters about their employment outcome. The primary input relevant for the immediate study is whether they had a job and the salary they were drawing[19]. For the purpose of simplicity, salary was considered as the sole parameter to rank job offers.

A set of parameters about each candidate were identified which included the candidate AMCAT scores in various parameters and the relation of the employment outcome with these parameters was found by a regression analysis. Two regression analyses were performed. In the first, the dependent variable was whether the person got a job or not and logistic regression was used to find the relationship of candidate parameters with it. In the second, the set of candidates with a job were considered and a linear regression was performed to predict the salary of the individual.

It is important to note that every candidate in this study had taken a standardized test of employability called AMCAT, which measures their capability to succeed in jobs[20]. The parameters measured in AMCAT have been validated globally as highly predictive of job success and independently verified by Aspiring Minds through various validity studies within corporations. Interestingly, this provides us a way to control for merit, since

17. http://articles.timesofindia.indiatimes.com/2011-10-31/education/30341688_1_engineering-colleges-engineering-seats-aicte
18. https://www.myamcat.com/engineer/
19. Other outcomes like opportunity to face a company's selection process, interview opportunity, the kind of job profile and company made them offers was also captured and used in a separate analysis.
20. The possibility of any bias entering the sample because of AMCAT-uptake is discussed in section on data set below

AMCAT scores are used in the regression analysis. We can find out what other factors control job outcome when controlled for merit (AMCAT scores) of the candidates. This is extremely useful, since without such a control, any study pointing group differences in outcome get drowned in debates of differences that may exist in the ability of the group.

In the next section, we discuss the characteristics of the data set and the choice of independent and dependent variables. This is followed by the results of the regression analysis followed by observations and inferences.

I. Data set

The properties of the data set are provided in Table 27.

PARAMETER	STATISTICS
Gender ratio	Males: 65.23% Females: 34.76%
Mean AMCAT scores (standard deviation)	English:485 (99) Logical: 469 (91) Quantitative Ability: 504 (141)
% candidates in different tiers of college*	Tier 1: 30.81% Tier 2: 43.55% Tier 3: 25.64%
% candidates in different tier of cities (college location)*	Tier 1: 48.65% Tier 2: 42.51% Tier 3: 10.87%
Mean school and college percentages (standard deviation)	10th : 79.10% (9.64% points) 12th : 76.11%(11.61% points) College : 70.77%(8.04% Points)
% candidates with a job	18.08%
Mean salary of candidates with a job (standard deviation)	2.81 Lakhs (1.01 lakhs)
Jobs in different sectors	IT: 71.47% Core Engineering: 18.85% Others (analyst, sales, customer service): 9.69%

* The meaning of these terms is explained in text.

Table 27: Properties of Data Set

Each college in the sample set was assigned as tier 1, 2 or 3. The tier of the college is based on the mean score of its students in final year in AMCAT. All colleges that participated in AMCAT (with a participation rate of more than 75%) in 2012 and 2013 were ranked according to their mean scores. The colleges in the first 33% were assigned as tier 1, the next 33% as tier 2 and the rest as tier 3. The thresholds for different categories

remained stable across the two years. The tier of the college primarily captures the mean quality of the student from an employability perspective and is an amalgam of both the input quality of students and what they gain in college. The parameter strongly correlates to public perception of these colleges. The tier of city is allocated according to the population of the city. Cities with population above 25 Lakhs are qualified as tier 1, above 5 Lakhs and below 25 Lakhs are qualified as tier 2 and the rest as tier 3.

The male to female ratio is similar to engineering population male-to-female ratio (1.86). The mean AMCAT scores of the sample had no significant difference from the mean AMCAT scores of the engineering population.

Data limitations: Before we define the independent and dependent variables, we discuss the possible biases in the data by the virtue of it being of those who took AMCAT. There are two possible biases:

a. Is there a self-selected group that takes AMCAT whose nature is different from those who do not?
b. Do the employment outcomes of students who take AMCAT change from the rest of the group?

With regard to the first possibility of bias, it may be considered that AMCAT is today taken by more than 20% of the final-year engineering population annually. It has pan-India presence and penetrates across all tiers of cities and colleges. For more than 70% colleges where AMCAT is conducted, the test uptake rate is more than 75% of the final year students. There is hardly any self-selection at the college level. With regard to selection at the college/region level, a stratified sample of colleges was used for the purpose of the survey and this study.

We now consider the second possible source of bias. Corporations use AMCAT in two ways. In the first, they use AMCAT as an assessment service. They themselves pick colleges they want to recruit at, conduct AMCAT, prepare a shortlist according to scores, interview and hire. In the second, companies can directly use the database of students pre-assessed by AMCAT at campuses to shortlist, interview and hire. In such a case, the companies directly use the database of students who take AMCAT at college (a subset of same was surveyed in this study). Around 550 companies currently use this service.

From the standpoint of using AMCAT as an assessment service (former case), its effect on the employment outcome is a correct evaluation of the current situation. It is not a bias created by the experiment, but very much a part of the current recruitment system. What may only be objected to, is that a high correlation of AMCAT with job-outcome is a self-fulfilling hypothesis. Also, given that AMCAT scores are used to give jobs, people with AMCAT scores may be positively disposed to get more jobs and those of different types. This is not the case, since only13.4% of the jobs for the survey were by AMCAT customers, leaving a large number of them to other sources. This clearly shows that the current study captures the effect of the various ways jobs are provided in India, where AMCAT is a reasonable portion of the system.

II. Dependent and Independent variables

Two dependent variables were considered. The first is a categorical variable, which measures whether a person got a job or not. The second variable is the annual salary of the job offer as self-reported by the candidate. For simplicity, we use just the salary of the candidate as a measure of how good a job did the person get.

The following independent variables were considered:

a. AMCAT scores: The AMCAT scores of English, Logical ability and Quantitative Ability were considered. AMCAT is a standardized test of employability with a score range between 100-900. English is required for a majority of jobs after engineering, given the services nature of Indian economy. Logical ability and quantitative ability consistently show high correlation with job success in engineering jobs and tests on the same are used by majority of companies in their hiring process.

AMCAT also has domain modules such as computer programming, electronics and semiconductor, mechanical engineering, etc. Each candidate takes the AMCAT module according to his/her branch. To create a single variable, the percentile of the candidate in his/her respective module was considered. Thus, there were four variables linked with AMCAT scores of the student. These variables are important to control for merit when we look at the relation of other parameters with employment outcome.

b. School and college percentages: School and college percentages are visible signals related to students available to the recruiter. We wish to understand whether they have any significant bearing on the employment outcome. We have previously shown that some large companies use thresholds on these percentages to allow candidates for selection process, which systematically disenfranchises meritorious students from the employment ecosystem [Aspiring Minds 2009[21]].

c. Gender (Male=1, Female=0): We wish to investigate whether the gender of the person has any bearing on the employment outcome.

d. Tier of college (ordered categorical variable): We wish to investigate whether candidates with similar ability but different tiers of college have different employment outcome. Aspiring Minds has claimed for long that since companies only visit the top 33% colleges for recruitment and there is no other credible signal apart from college name in entry-level hiring, meritorious students from lower tier students are systematically disadvantaged.

e. Tier of city (ordered categorical variable): We wish to see whether the tier of city leads to the availability of different number and nature of jobs and eventually different job outcomes for colleges in these areas.

21. http://aspiringminds.in/researchcell/articles/IT-companies-missing-28-of-the-available-employable-pool.html

Also, given that lower tier of cities have lesser accessibility and visibility; they may also attract lower number of large recruiters.

f. Branch of study: The branch of study variable was set 1 if the candidate was from computer or electronics related branches and set to 0 otherwise. The largest recruiters in the market are IT companies and all the large IT recruiters only hire from computer or electronic branches. IT SMEs are generally more open, but automatically students from computer or electronic branches have high propensity of clearing their selection process. We wished to investigate whether candidates in other branches are systematically disadvantaged in the employment ecosystem despite having equal merit.

g. AMCAT personality scores: AMCAT personality scores [AMPI] were considered not as much to measure job-readiness (merit), but because they could influence a job search behavior. A candidate who is extroverted shows a stronger job search behavior. Agreeable and open candidates have higher chances of cracking a job interview. Candidate who could multi-task may continue job search behavior together with their studies. Are these personality traits helpful in getting a job? To test this hypothesis, we included the sum of extraversion and agreeableness scores, the openness to experience score and the polychronicity score as three variables in the analysis.

III: Results

A. Who gets a job: Logistic regression

A logistic regression was done with the output variable as 0/1 (no job offer/job offer) and independent variables as described in the previous section. The results are provided in Table 28. The total correlation coefficient was 0.32, which was significant.

VARIABLE	COEFFICIENT	P-VALUE	UNIT OF CHANGE*	ODDS e^(coefficient)
English score	0.0026	0.00	100	1.29
Quantitative Ability score	0.0003	0.38	100	1.03
Logical Ability score	0.0014	0.01	100	1.15
Domain Percentile	0.0037	0.04	10	1.04
10th class percentage	0.0083	0.16	10	1.09
12th class percentage	-0.0086	0.08	10	0.92
College Percentage	0.0151	0.01	10	1.16
Gender	-0.0442	0.60	1	0.96
Tier of college	-0.1270	0.03	1	0.88
Branch of study	0.1515	0.05	1	1.16
Tier of city	-0.0026	0.96	1	1.00
Openness to Experience score	-0.0253	0.58	1	0.98
Extraversion + Agreeableness	0.0001	1.00	1	1.00
Polychronicity score	0.0175	0.66	1	1.02
Constant	-4.1389	0.00		

* The unit of change has been taken according to what constitutes a reasonable change in the input variable to see the effect of this change on log odds.

Table 28: Who gets a job: Logistic regression

Understanding the table:

Coefficient: It is the weight of the variable (example English score, Quantitative Ability score etc.) in the regression equation which links all these variables to the probability of getting a job.

See Logistic Regression equation here equation here:

Logit(π) = (English score)*0.0026 + (Quant Ability score)*0.0003 + (Logical Ability score)*0.0014 + (Domain Percentile)*0.0037 + (10th class percentage)*0.0083 + (12th class percentage)*-0.0086 + (College Percentage)*0.0151 + (Gender)*-0.0442 + (Tier of college)*-0.127 + (Branch of study)*0.1515 + (Tier of city)*-0.0026 + (Openness to Experience score)*-0.0253 + (Extraversion+Agreeableness score)*0.0001 + (Polychronicity score)*0.0175 + -4.1389

P-Value[22]: It is a measure of significance which ranges between 0 to 1. The finding of a statistical calculation is considered to be significant if p-value is less than 0.05.

Odds: It is the ratio of probability of a candidate getting a job to the probability of a candidate not getting a job. For example, if the probability of getting a job is 30%, log odds are 0.42, i.e. 30/(100-30)

Unit of change: It is the amount by which we change the variable to see its effect on log odds.

One may observe the following:

a. AMCAT English score, Logical Ability score, domain percentile, College Percentage, tier of college and branch of Study are significant predictors of employment outcome. Among these English has the largest effect, followed by college percentage, branch of study and AMCAT logical ability, followed by tier of college and domain (small but significant contribution). Whereas AMCAT scores, college percentage and being from 'IT' branch of study have a positive impact on job outcome, coming from a lower tier college has a negative impact on the employment outcome.

b. Class 10th percentage and class 12th percentage (with the wrong sign) have a reasonable effect size. However, they do not come as significant on the current sample size.

c. AMCAT Quantitative ability scores, tier of city or the personality scores have no significant or large impact on employment outcomes.

We also did a regression with significant variables only which is provided in the Appendix.

22. http://en.wikipedia.org/wiki/P-value

One may understand these results better if we look at the effect of individual parameters and their combinations:

a. A candidate with an AMCAT English and Logical score higher by 100 points each and domain percentile up by 10 points has 54% higher odds to get a job. If the candidate also has his college percentage higher by 10%, then his odds to get a job increase by 79%. On the other hand, having higher 10th and 12th percentages, even though visible to corporate and recruiters, have no bearing on the employment outcome. This clearly shows that merit counts in the employment market, whether or not the signal is explicitly visible. Meritorious students get jobs more often than others.

If we assume that employment outcomes are efficient (or partially so), these results are a strongly testimony of the validity of AMCAT scores in predicting job success. It is important to note that there isn't much evidence that AMCAT scores were visible to recruiters, yet they come out as valid predictor of their employment decision. This provides added evidence to AMCAT's validity other than the various studies where AMCAT has shown to be a valid predictor of job success (Aspiring Minds 2012[23]). On the other hand, the visible high school percentages do not turn out as valid predictors, even though the college percentage does. This indicates that companies do provide a high weight to the college performance of the candidate in offering a job. One may not clearly discern whether college performance really predict job success from this analysis, but definitely the corporate or recruiters believe they do so.

b. The college tier comes as the most significant factor in determining employment outcome besides measures of merit. A candidate from a tier 2 campus has 12% lower odds and tier 3 campus has 24% lower odds to get a job even if he/she has the same AMCAT scores and academic percentages. Given that entry-level recruitment happens at campus, where companies select only particular campuses for their recruitment program, this bias is not totally unexpected [National Employability Report, Engineers 2011[24]]. There are also suggestions that submission of resumes/bio-data with high-ranked institutions more often leads to interview calls than others, given the lack of any other credible or standardized signal. One can clearly see that meritorious students in lower tier colleges have a systematic disadvantage and steps need to be initiated to correct the same.

c. A non-IT branch student has 14% lower odds to get a job even if he/she has the same AMCAT scores and academic percentages. This could be explained by the high availability of IT jobs in the market and a considerably low availability of jobs in other fields. It means that IT branches in engineering are a more lucrative education option than others to lead to gainful employment.

d. The college percentage may not be a valid predictor of job success, given its non-standardization and its lack of emergence of a significant correlate, over and above AMCAT scores, with job success in validity studies done at corporations [Aspiring Minds 2010[25]]. Also, AMCAT domain percentage captures the effect

23. http://www.aspiringminds.in/caseStudies_item/48_low_performers__cut_campus_hiring_yield_maintained_using_amcat_study.html
24. http://www.aspiringminds.in/docs/national_employability_report_engineers_2011.pdf
25. http://aspiringminds.in/researchcell/articles/IT-companies-missing-28-of-the-available-employable-pool.html

of domain skills required for job success. Yet we find that college percentage is a significant factor in predicting job outcome over and above AMCAT scores. A person with college percentage lower by 10 percentage points has 14% lower odds to get a job, even though with equal merit.

If we to draw the picture of the most disadvantaged student coming from a third tier campus and low percentage (by 10 points), he/she has 25% lower odds to get a job. If he/she comes from a non-IT branch, the odds decrease by 35%.

In conclusion, we find that AMCAT English, Logical Ability and domain scores are significant predictors of employment outcome indicating that merit indeed counts in employment outcome. Another visible measure of merit, college percentage, not necessary proven to be a valid job success measure, also has a large effect size on recruitment outcomes. On the other hand, we find the tier of the college of study as the strongest bias, which disadvantages a student of similar merit with his/her counterpart in a high tier school. We recommend that methods be found to reduce or remove this bias from the recruitment market. Finally, we find that students in IT branches of study have a higher likelihood of getting jobs than their counterparts in non-IT branches. This clearly indicates that studying in IT related jobs is more lucrative for students to ultimately get a job.

B. Who gets a better job?

An ordinary least squares regression was done with the output variable as salary (in lacs) and independent variables as described in the previous section. The results are provided in Table 29. The total correlation coefficient was 0.57, which was significant.

Variable	Coefficient	p-value	Unit of change*	Change in salary (in INR thousands)
English score	0.0013	0.01	100	13325
Quantitative Ability score	-0.0002	0.64	100	-1883
Logical Ability score	0.0014	0.04	100	14164
Domain Percentile	0.0013	0.57	10	1322
10th class percentage	0.0067	0.39	10	6709
12th class percentage	0.0007	0.91	10	732
College Percentage	0.0220	0.00	10	21979
Gender	0.1563	0.12	1	15631
Tier of college	-0.3326	0.00	1	-33257
Branch of study	-0.0376	0.69	1	-3762
Tier of city	0.0341	0.63	1	3407
Openness to Experience score	0.0157	0.78	1	1570
Extraversion + Agreeableness Score	-0.0393	0.28	1	-3934
Polychronicity score	0.0105	0.83	1	1049
Constant	-0.3968	0.52	1	

* The unit of change has been taken according to what constitutes a reasonable change in the input variable to see the effect of this change on salary.

Table 29: Who gets a better job?

Understanding the table:

Coefficient: It is the weight of the variable (example English score, Quant Ability score etc.) in the regression equation which links all these variables to the probability of getting a job.

See Regression equation here equation here:

Salary = (English score)*0.0013 + (Quant Ability score)*-0.0002 + (Logical Ability score)*0.0014 + (Domain Percentile)*0.0013 + (10th class percentage)*0.0067 + (12th class percentage)*0.0007 + (College Percentage)*0.0220 + (Gender)*0.1563 + (Tier of college)*-0.3326 + (Branch of study)*-0.0376 + (Tier of city)*0.0341 + (Openness to Experience score)*0.0157 + (Extraversion+Agreeableness score)*-0.0393 + (Polychronicity score)*0.0105 -0.3968

P-Value[26]: It is a measure of significance which ranges between 0 to 1. The finding of a statistical calculation is considered to be significant if p-value is less than 0.05.

Unit of change: It is the amount by which we change the variable to see its effect on the salary.

One may observe the following:

a. AMCAT English and Logical Ability scores, College Percentage and tier of college have a significant effect on an engineer's salary.
b. Gender and 10th class percentage have a reasonable effect on salary however they do not come as significant on the current sample.
c. Other variables like domain percentile, 12th class percentage, tier of city and branch of study have neither significant nor large effect on salary.

Regression was again done with significant variables only and results are provided in the Appendix.

On studying the above results we infer the following:

- Measures of merit, AMCAT English and Logical Ability scoresand college percentage are significant predictors of an engineer's salary.One may note that, the recruiter in general doesn't have access to AMCAT scores, whereas the high school and college percentages (GPA) are visible. Higher English & Logical Ability scores by 100 points each and higher college percentage by 10%, translate into a higher annual salary by Rs. 49500 approx. In case, we consider college percentage to not be a significant factor for job performance over and above AMCAT scores (as discussed in the previous section), this shows a bias.

26. http://en.wikipedia.org/wiki/P-value

- Tier of college of study, by far, has the highest effect on salary and thus creates a bias. A tier 3 college student with school, college percentages and AMCAT scores equal to his counterpart from a Tier 2 college gets an annual salary lower by Rs. 33000 approx. This difference in salary goes up to Rs. 66000 on comparing to an equally meritorious student from a tier 1 college. This means that not only does a comparable student of a lower tier college has a low chance of getting a job, but even if he/she gets a job, the salary is generally lower. This could be due to two reasons. Firstly, companies having job roles with higher salary may not be providing a job opportunity to lower tier students. Thus students at these college do not even get a chance to get evaluated for high-paying jobs. Secondly, companies may offer differential salary to candidates based on their college. Which of these two factors is dominant is beyond the scope of this study. Either way, this shows a bias in the recruitment process not healthy for either the student or corporations. In a healthy employment ecosystem, students with similar merit should get similar salary irrespective of other parameters.

- On comparing the findings to the previous analysis on who gets a job we see that same variables like AMCAT English & Logical Ability, College percentage and Tier of college come out as significant. On the other hand, we find that 10th and 12th percentages have no significant effect on employment outcomes.

Conclusion

We find that merit does count in the employment market both in determining whether one gets a job and the quality of job as signaled by salary. Both explicitly non-visible measures of merit (such as AMCAT scores) and those visible but not necessarily correlated to job success, are significant predictors of job outcomes. Interestingly, among visible measures of merit, college percentage comes as a consistent significant and high effect-size predictor as compared to high school percentages. If, in case, college percentage is not a valid predictor of job success beyond AMCAT scores, as shown by studies, this creates bias in the employment market.

On the other hand, the tier of college of study comes out as a major bias in the employment market. Equally meritorious students from lower tier campuses get jobs less often and with lower salaries compared to their counterparts in higher tier campuses. We understand this happens because companies use the tier of college as a primary signal in determining whom to interview. This manifests in forms of choosing only particular campuses for their campus recruitment programs and also only considering job applications of students from particular campuses for an interview opportunity. There is an urgent need to pluck out these differences from the employment market by making available more credible signals of merit on a large scale. It is also observed that students in IT branches are more likely to get a job and those of higher salaries than their counterparts in other branches. This is not surprising given the high availability of good quality jobs in the software domain.

We do not find any significant impact of gender, personality scores, tier of city of college, etc. on employment outcomes.

APPENDIX

a. Employability variance across campuses

I. ITeS/BPO

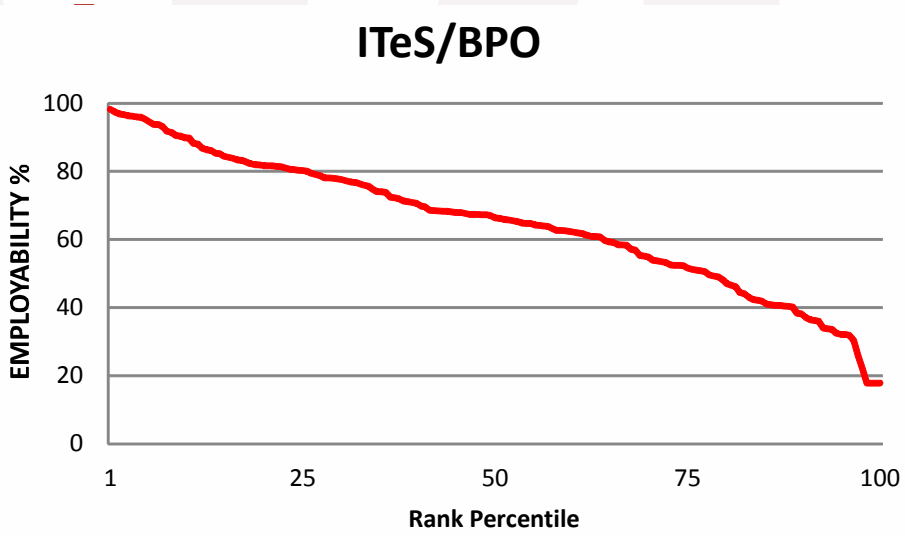


Figure 13: Employability variance in the ITeS/BPO sector

- The best colleges have employability as high as 98% and the bottom 20 percentile colleges have employability as low as 18%, more than 5 times lower than the top percentile colleges.
- About 20% colleges have employability lower than the average employability of 39.84%.
- Another statistically significant result arrived at through this study is that 70% colleges have employability less than the average employability of 2.4% (lowest of all!). To be more particular, the employability of bottom 30 percentile colleges is almost zero which is a matter of worry.

II. Business Analyst

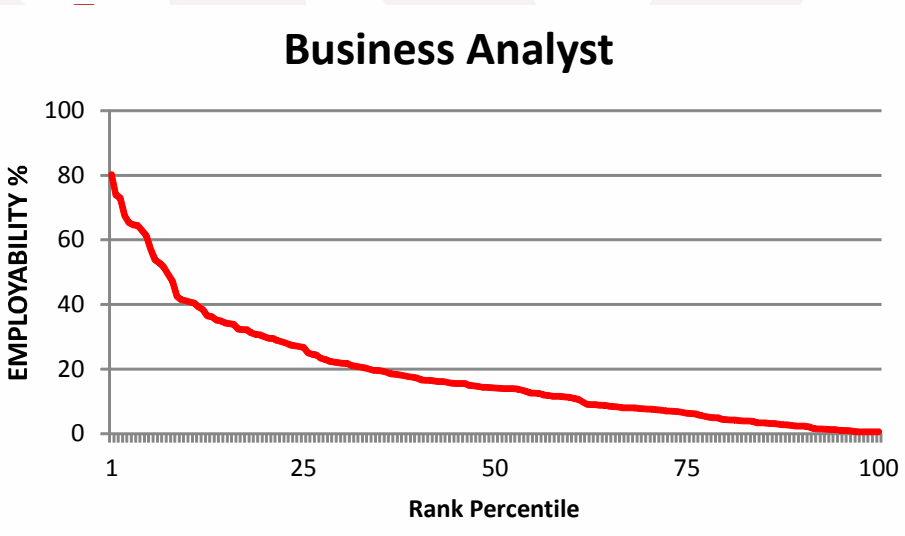


Figure 14: Employability variance for the role of Business Analyst

- The top colleges have employability as high as 80% whereas the bottom percentile colleges have it as low as 1-2% with some colleges having 0% employability as well.
- What is disheartening to see is that almost 40% colleges have employability lower than the average employability figure of 11.53%.
- The curve clearly shows the drastic drop in employability as we move from top ranked colleges toward the bottom ranked colleges, highlighting the employability variance among the campuses.

III. Design Engineer

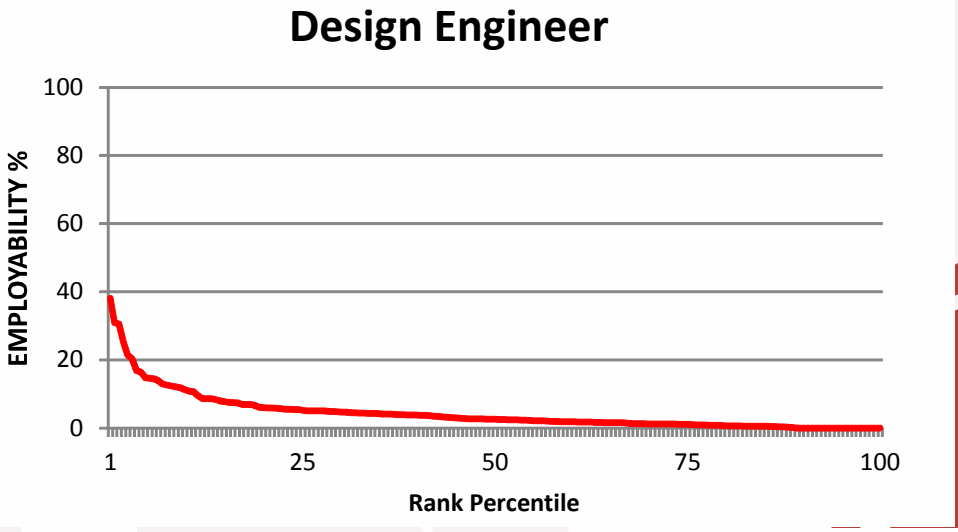


Figure 15: Employability variance for the role of Design Engineer

- The top percentile colleges have employability figures ranging between 30-38% whereas a major chunk of the bottom ranked colleges have employability figures of less than 2% with many colleges having 0% employability.
- The steepness of the curve is indicative of how varied the employability figures are among the various engineering campuses.
- The average employability is a dismal 7.49%, what is even more shocking and disheartening is that almost 75% of the campuses are below this average employability mark.

IV. Sales Engineer

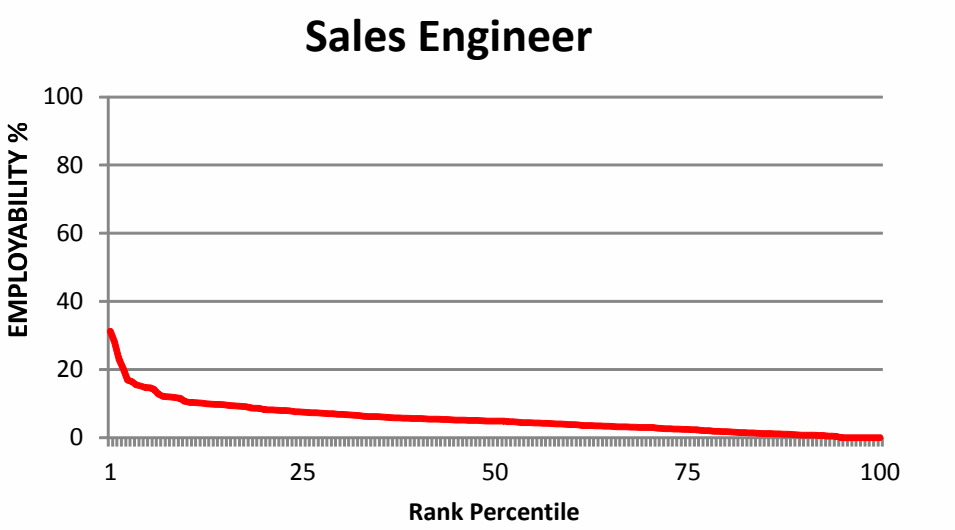


Figure 16: Employability variance for the role of Sales Engineer

- The top percentile colleges have employability figures around the 30% mark. The drastic drop in employability is clearly visible among the top campuses suggestive of how varied the campuses are in terms of employable candidates despite being closely ranked.
- The bottom ranked colleges have employability figures lower than 3% with many colleges having no employable candidates. The drop in employability for the lower ranked campuses is not as drastic as the top ranked campuses but this cannot be interpreted as a positive sign as almost all bottom ranked colleges have very low employability figures.
- More than 85% percent colleges have employability lower than the average figure of 16.54% which itself is a very low percentage.

V. Hardware & Networking

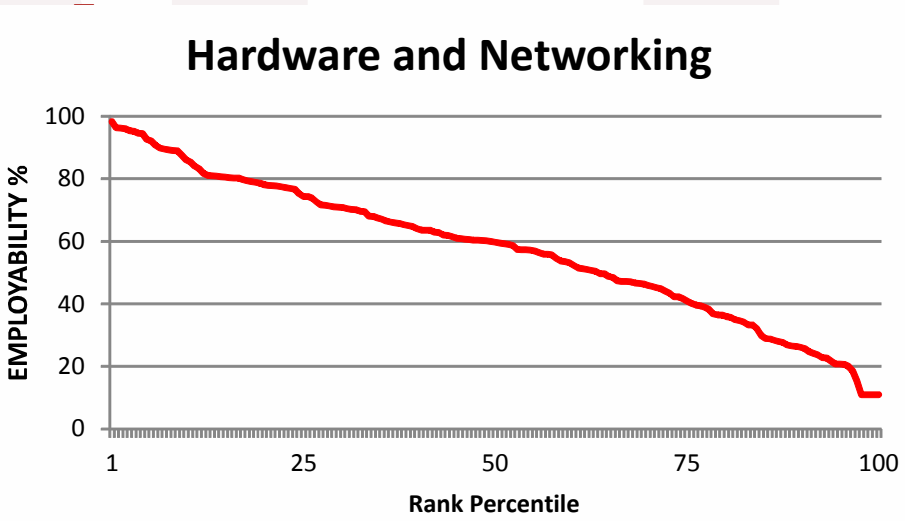


Figure 17: Employability variance for Hardware and Networking sector

- The top ranked colleges have employability figures as high as 98%. It can be observed that the drop in employability for the Hardware and Networking role is not as drastic as it is for other sectors. The figures fall gently as we move from the top percentile colleges toward the bottom percentile colleges.
- We can also observe that every college has at least 10% employable candidates including the bottom ranked campuses which is a positive sign for corporates looking to hire for this role.

VI. Creative Content Developer

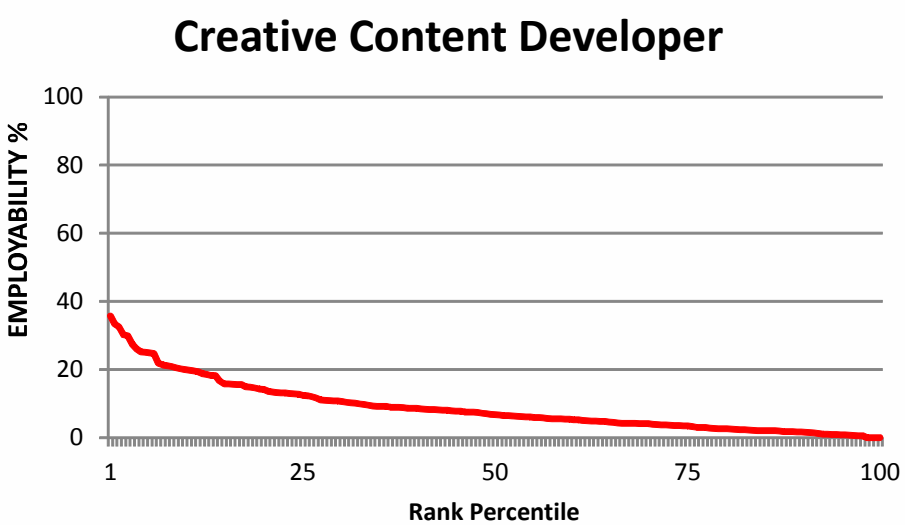
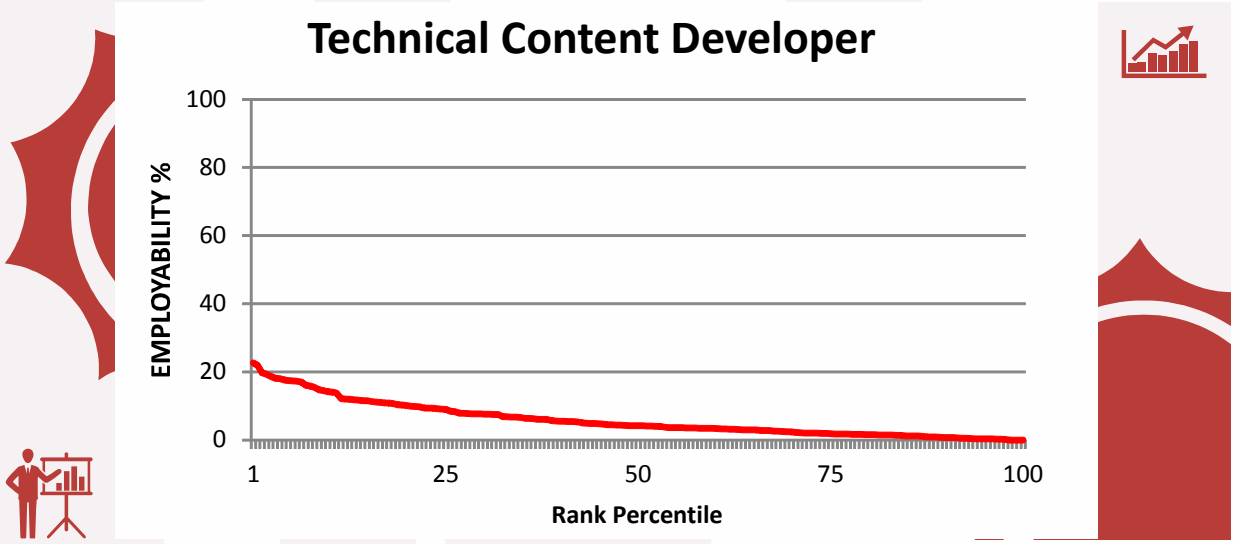


Figure 18: Employability variance for the role of Creative Content Developer

- For the top percentile colleges the employability lies between 35% and 38%, which itself is not very high. The employability figure drops drastically from 38% to less than 20% as soon as we go beyond the top 10 percentile colleges.
- The bottom percentile colleges have employability figures as low as 0%. More than 38% colleges have employability figures less than 5%. More than 80% colleges have employability lower than the average figure of 15.36%.

VII. Technical Content Developer



Figue 19: Employability variance for the role of Technical Content Developer

- The statistics for the technical content developer profile paint an even sorrier picture. The employability, even for the top percentile colleges, does not go beyond 23%. This figure falls drastically as we move towards the middle and the bottom percentile college.
- More than 75% colleges have employability lower than the average figure of 10.81%; with some colleges having 0% employability.

APPENDIX B:

I. Logistic Regression with significant variables only

VARIABLE	COEFFICIENT	P-VALUE	UNIT OF CHANGE	ODDS (e^(coefficient* unit))
English score	0.0027	0.00	100	1.31
Logical Ability score	0.0015	0.00	100	1.16
Domain Percentile	0.0040	0.02	10	1.04
College Percentage	0.0142	0.00	10	1.15
Tier of college	-0.1254	0.02	1	0.88
Branch of study	0.1604	0.03	1	1.17
Constant	-4.0857	0.00		

Table 30: Logical regression with significant variables only

2. Ordinary least squares regression with significant variables only

VARIABLE	COEFFICIENT	P-VALUE	UNIT OF CHANGE	CHANGE IN SALARY (in INR thousands)
English score	0.0015	0.00	100	14506
Logical Ability score	0.0015	0.02	100	14581
College Percentage	0.0228	0.00	10	22840
Tier of college	-0.3455	0.00	1	-34546
Intercept	0.1983	0.69	1	

Table 31: ordinary least squares regression with significant variables only

NOTES

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