Research Article

# Why Engineering Education is Losing Charm among Students in India? A Discussion

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**After a significant expansion in the number of engineering institutions and intake capacity in India for almost a quarter century, i.e., between 1991-2014, a deceleration has been experienced. At a time when technical intensity has increased, even for non-technical sector, and the primacy is to achieve Sustainable Development Goals by 2030 for which technology needs to play a central role, deceleration in enrolment may not be a good sign. In this background, the paper discusses probable reasons like existing high unemployment among engineers, high cost of private engineering education, and inability of institutions to impart employability skills which fade away their chances to get employed in future too, for this falling enrolment. Moreover, medical education has experienced expansion in the recent past. Generally, software, and IT firms impart their own training after recruiting fresh graduates so they tend to recruit engineers of any branch or even science graduates, where the cost of getting a degree is lower than engineering. Use of emerging technologies in business has made the engineering labour market quite dynamic and is changing the old paradigm of workplace, working hours, static employable skills, etc.**

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## 1. Background

Engineering is the application of scientific laws and principles to the production process in order to enhance efficiency and productivity (Singh, 2014). Solow (1957) has attributed only one-eighth of the increase in labour productivity to an increase in capital, but a major proportion of the unexplained productivity is consigned to 'technological innovation' (Johnson, P.A. 2010), which ultimately brings huge economic and social value to the engineering profession. So, investment in technical education may be regarded as one of the most rewarding channels of investment for both the family and nation, i.e., at the micro and the macro level. The Government of India since independence has realised the importance and taken care of the systematic development of the infrastructure. At the same time, engineering has remained a preferred discipline among the student fraternity. However, it has lost preference in recent years. The paper intends to provide a longitudinal perspective of the evolution of engineering education in India. The paper is divided in six sections. The second section discusses the growth of engineering education in India since independence. Probable reasons have been discussed in the third section for students' disillusionment from engineering education. The employability skills for engineers and the way forward have been discussed in the fourth and the fifth sections, respectively. The last section concludes the discussion and provides recommendations.

## 2. Tracing Growth of Engineering Education in India

Realising the importance of engineering education, the Government of India has taken care of its planned development since independence, which has been discussed below in three sections:

 doi.org/10.32388/HT1VGT 

### *2.1. The period before 1990s*

It is evident from Table 1 that the decade of the 1950s experienced a doubling in the number of engineering colleges which reflects the priority given to engineering education in the growth agenda of the then government. Four Indian Institutes of Technology, the apex engineering colleges, were established during the 1950s and 1960s in four different parts of the country i.e. east, west, north, and south. A network of seventeen Regional Engineering Colleges (RECs) (now renamed as National Institute of Technology), State Government Engineering Colleges along with some private colleges were established after Independence. However, they seemed insufficient at the time of liberalisation which started during the 1980s. The decade began with the telecommunication revolution, followed by the relaxation of policies and rules related to technology import. All these resulted in enhanced economic activity, which reflected in the increased gross domestic product (GDP) and an increase in the annual growth rate of export to 7.6 percent and 14.4 percent respectively during 1988–89 to 1990–91 (Panagariya, 2004). The decade of the 1980s also experienced fast growth of infrastructure in engineering education, which grew even faster in the consecutive decade.

| Year | Number of Engineering Institution | Intake Capacity (at undergraduate level) |
|---|---|---|
| 1950 | 53 | 3700 |
| 1960 | 102 | 16000 |
| 1970 | 145 | 18200 |
| 1980 | 158 | 28500 |
| 1990 | 302 | 66600 |
| 2000 | 880 | 228500 |
| 2012 | 3364 | 1548654 |
| 2013 | 3384 | 1634408 |
| 2014 | 3400 | 1705437 |
| 2015 | 3364 | 1631420 |
| 2016 | 3293 | 1557470 |
| 2017 | 3224 | 1476128 |
| 2018 | 3124 | 1404640 |
| 2019 | 3050 | 1329339 |
| 2020 | 2978 | 1286725 |
| 2021 | 2897 | 1253337 |
| 2022 | 2857 | 1270482 |

**Table 1.** Number of Degree Level Engineering Institutions and their Intake Capacity

*Source: up to 2000- Ramachandran and Kumar' 2003;*

*data; AICTE 2023.b for 2012 onward data*

### *2.2. The Period between 1990 to 2014*

After globalisation and the use of ICT in business, a large number of production houses from developed countries started sending part of their production process to developing countries, including India, where good quality work could be performed at low cost. It opened a whole new market and very high demand for India's English-speaking engineering manpower. The regulatory bodies reciprocated positively and the Indian engineering education system experienced massive expansion during the decade of 1990s (Banad and Talwar, 2011). Altogether 578 new institutions were added during the 1990s—119 during 1991-95 and 459 during the period of 1996-2000 (Ramachandran and Kumar, 2003). The shortage of funds at the State level resulted in the mushrooming of private engineering colleges. As per the AICTE, the private engineering colleges, which constituted merely 15 per cent in 1980, rose to 86 per cent in 2019 (Singh and Singh, 2019). As most of the private colleges were unaided, education was viewed as a money-churning opportunity and this compromised the quality of teaching. By end of the 1990s, the murmur started creeping about the institutions which did not have proper infrastructure. There was a lack of qualified faculty, laboratory, library, etc. which ultimately, affected the quality of fresh engineers and resulted in their unemployment. Over the period, the whisper became so loud that ultimately, the Government of India took a loan, named, "Technical Education Quality Improvement Programme (TEQIP)" in 2003 from the World Bank to improve academic conditions to make technical institutions competitive (AICTE, 2023). So far, three rounds of TEQIP have been implemented with a focus to make the students employable as there was an observation that fresh engineers were good at technical skills but not so good at 'soft skills' (Shekhawat, 2020). The matter was taken very seriously and a network of institutions were assigned the responsibility by the Ministry of Human Resource Development (now renamed as Ministry of Education) to systematically work to improve the situation. Finishing courses were started to groom them in soft skills. Students were striving to better themselves through all these methods. Brand IIT was used as a tool to pacify youth unrest in Assam by establishing the fifth IIT at Guwahati, one of the results of the peace accord signed between the Government of India and a local group, '*Assam Gan Parishad*' (Assam Peoples Council). Nine more IITs were established in different parts of the country as a response to the quality issues in engineering education. In the spree of establishing IITs, a well-known college like Thomson College of Civil Engineering (established in 1847) was upgraded to IIT Roorkee.

### *2.3. Beyond 2014*

Globalisation did not propel engineering. The slowdown of 2000, popularly called as the burst of the dotcom bubble, erased most of the gains earned due to speculation in internet-based businesses from 1995 to 2000. The NASDAQ Composite Index, which rose by 582% from 751.49 to 5,132.52 between January 1995 and March 2000, fell by 75% from March 2000 to October 2002 (Loo, 2023). During these two-three years, many engineering students who were campus placed from better institutions of Delhi and were waiting to join companies after their final examination, faced postponement of joining till the month of January-February and ultimately, was cancelled. Although these students, being from good institutions of Delhi, were able to get jobs with lower salaries or at inferior organisations, but it must have had a cascading impact on students from not-so-good institutions. Nevertheless, these incidences did not impact the intake which remained exhibiting an increasing trend. Eight more IITs were established. Two of the already well-established organisations, i.e., the Engineering College of Banaras Hindu University (BHU), Varanasi established in 1919 and the Indian School of Mines, located at Dhanbad Jharkhand, established in 1926 (Raman, 2023), were rebranded as IITs. However, all the efforts to enhance efficiency and quality of engineering education could not retain the faith of engineering aspirants. The recession of 2008 and the market afterwards, which resulted in huge unemployment, shook engineering aspirants' willingness as has been discussed below:

### *2.3.1. Large Unused Capacity*

Even during the period of mass expansion of intake capacity during the 1990s, which started from the southern states at the same time, there was significant unused capacity/ wastage also. Ramachandran and Kumar (2003) investigated the degree level intake capacity and corresponding out-turn for the state of Karnataka. The sanctioned intake capacity has been considered from 1991 to 1998 and out-turn from 1995 to 2002 as an engineering degree is a four years programme. The analysis shows that through the years, the difference between intake and corresponding outturn has increased, but the gap between intake and outturn was also growing over the years. In the year 1991, the sanctioned intake capacity was 18,047 and the corresponding outturn in 1995 was 11,611—the gap between intake capacity and the outturn was 36 percent. However, for the year of 1998, the intake of 24,384 had only 14,195 outturns in the year 2002, the gap was of 42 percent. Here the All India data of the All India Council for Technical Education (AICTE) has been analysed. The enrolment-unused capacity data shows that since 2015-16, there is a continuous decrease in the intake capacity but the actual enrolment also is decreased leaving an unused capacity of 41.6 (in 2021-22) -49.5 (in 2016-17) percent (Graph-2).

### *2.3.2. Decreasing Engineering Enrolment*

The recession of 2008 and the following slowdown in the market had a profound impact on the engineering intake. The students' enrolment which has been decomposed by gender in Figure 2, shows a decreasing trend for both male and female. It started with female students and followed by male with some fluctuation.

Not only a decreasing trend in enrolment, significant share of the enrolled students could not pass the final examination and thus, could not get degrees. When 2014-15 enrolment data is compared with its corresponding out-turn data for 2017-18 and so on. In 2017-18, 27.1 percent of students could not pass. In 2018-19, this share was a little less at 24.9 but again at 31.9 percent in 2019-20 and further increased to 41.8 percent in 2021-22. The 2020-21 data has not been considered as it was a COVID-19 period and the AICTE data is not clear for that year. So, not only enrolment is decreasing, the share of the 'could-not-pass' category is also increasing.*2.3.3. Large number of Private Institution with Good Track Record*

Private (Unaided and self-financing) have played an important role in expansion of engineering education.

Generally private institutions are considered as they will take care of their profit and not concerned about the quality. However, placement data is an indicator of quality, it shows that their performance is at par with average of all institution taken together. In fact, their performance is slightly better than all institutions considered together.

## 3. Probable Reasons for Disillusionment

Even though, the share of students in STEM (36.5 to 38 percent) has remained more or less the same during the last decade, it is clear from Table 2 that there is a decrease in participation in engineering education. This corresponds with an increase in medical and science education enrolments. The probable reasons have been discussed below:

| Year | Science | Engg. &Tech | Medicine | Computer & IT |
|---|---|---|---|---|
| 2012-13 | 12.6 | 17.3 | 2.9 | 3 |
| 2014-15 | 15.4 | 15.9 | 3.1 | 2.6 |
| 2016-17 | 16.8 | 14.7 | 3.5 | 2.4 |
| 2017-18 | 17.1 | 14.1 | 3.9 | 2.5 |
| 2018-19 | 16.5 | 13.5 | 4.2 | 2.6 |
| 2019-20 | 16.1 | 12.6 | 4.6 | 2.6 |
| 2020-21 | 15.5 | 11.9 | 4.9 | 2.8 |

**Table 2.** Share of Enrolled Students

*Source: Report of All India Survey on Higher Education for these years*

### *3.1. Increase in Avenues of Medical Education*

As many as 93 medical colleges have been set up with special central aid in the past eight years. The number of medical colleges which was 381 in 2014, increased to 562 in 2020 with an increase of around 56% in the intake capacity—from 54,348 to 84,649 (GoI, 2022). It may be one of the reasons for decreasing share of engineering enrolment as students were opting for engineering in absence of sufficient medical seats.

### *3.2. Unemployment among Fresh Engineers*

In engineering, students are placed even before getting their final degree. Figure 3 shows that though there is an increasing trend in the share of students being placed over the years, as per the All India Council for Technical Education data even now (before COVID-19) almost 40 percent of students could not be placed.

However, other studies claim employment among engineers to be even lower than what the AICTE data reveals. The rate of hiring of engineers has declined from 28 percent in 2014 to 22 percent in 2018, After a small increase in the following year to 23 percent, it rose by 8 points to 31 percent in 2020. According to this, nearly 70 percent of engineers are unemployed in 2020; the figure was nearly 28 percent in 2018 (Statista, 2022). As per another survey, nearly 80 percent of engineering graduates in India are not employable. Most of them are forced to take up jobs in non-engineering fields or remain unemployed (edWisor, 2018) and only 2.5% of them have tech skills related to Artificial Intelligence (AI), which the industry requires (Business Today, 2019).

### *3.2. Impact of Recession and Industrial Revolution 4.0*

Engineers' employment is directly affected by the market condition. During all the recessionary trends of the past two decades including the latest one of COVID-19, Tier-2 and Tier-3 colleges are most affected as most of the students of Tier-1 colleges are any way employed. Even less than 40% of the graduating students get jobs in industry. 60% of engineering graduates remain unemployed (Gohaini, 2017). Along with the continuing recession, the industrial revolution 4.0 has also started impacting demand for engineers. As the salary is so inflated, big companies always compare hiring an engineer to installing a machine. Unemployment is up, jobs are scarce, and layoffs are quite frequent across organizations. Even Software engineers fear the loss of jobs due to artificial intelligence

(Rainie Lee and Anderson Janna, 2017; Thaibodean Patrie, 2016). The backhand work for which engineers were recruited during 1990s and early 2000s, is being done today by an app powered by artificial intelligence.

### *3.3. High Cost of Private Engineering Education*

There was always a high return from engineering education and high social value of the engineering profession in India and as opportunities enhanced due to liberalisation and globalisation, high intake capacities were created. However, most of the opportunities were created in the unaided private sector where students' contribution is the main source of funding. The private institution that accounted for merely 15% of enrolment in 1960 rose to 80% in 2022 (AICTE, 2023). Choudhury and Kumar in their study based on 75th education round unit-level data, NSO has discussed that households spend 4.8% more for a student in professional higher education than general higher education. Students in Private aided institutions spend 1.6 times more than students in the government sector and 1.7 times if the student is in a private unaided institution. Due to employment uncertainty and the higher cost aspect, students are preferring science in place of engineering graduation. For the companies also, there is not much difference between science and engineering graduates as anyway they provide some training to fresh graduates after recruitment.

### *3.4. Younger engineers are preferred for coding*

Most of the fresh engineers who are being employed for coding, continue doing so for three-four years. Get annual increments and other benefits but beyond that, they may be replaced by a fresh graduate at a lower salary as a young brain is preferred for coding. Several big tech giants like Amazon, Google, Microsoft, Meta, and others have announced mass layoffs. Reports have shown that around a hundred companies have laid off engineering professionals in large numbers which are coming out on average, over 1,500 engineers are being fired on each day of 2023 globally which includes India too (Sarkar, 2023;Bhaimiya, 2023) and on the other hand, as per the latest Manpower Group Employment Outlook Survey, about 64% of Indian employers intend to recruit more people in the coming quarter (Raghuvanshi, 2023). In an interview with Indian Express (December 13, 2017), the then Vice Chairman of NITI Aayog, Dr. Rajiv Kumar opined that there may be a sectoral shift in the Indian economy – a shift from traditional manufacturing jobs to jobs in platform sectors such as e-commerce which may have resulted into a decline of the demand for engineering graduates. However, there are also problems associated with the kind and nature of graduates and the quality of the engineering education they receive. This takes the discussion to the issue of employability (Tilak & Choudhury, 2020) in the changing nature of work even in the same industry.

## 4. Employability Skills for Engineers

As there is substantial involvement of individuals as well as public investment in higher education, it is expected that graduates are employable (Tomlinson, M. 2012). It is more so for engineers as an individual investment is one of the highest for them. However, the rapid expansion of engineering education without the careful mapping of labour market requirements has resulted in a lack of employability skills among fresh engineers which has resulted in underemployment and unemployment among them. Employability refers to the potential of a graduate for successfully completing all courses prescribed by the college and the ability to transition successfully to the job market. These skills are crucial for both individual labour market outcomes and social outcomes. The continuous murmur from the industry that institutions are not producing employable engineers culminated into a strong concern about graduates' ability to work in the industry. So far, many researchers have worked on the issue which is explained by signalling theory (Spencer, 1973) rather than human capital theory (Becker, 1962). The human capital theory discusses wage differentials as based on an individual's productivity level, which the person has acquired through investment in formal education, and training. As per the signalling theory, the wage differentials are the product of an individual's innate abilities, which are signalled by an individual's characteristics, which, in turn, is developed through educational attainment of one or more subject disciplines along with

a combination of ‘soft skills’. So, a combination of cognitive, non-cognitive, and applied technical knowledge are required to integrate together for the proper development of employability skills. So, marking subjects as ‘core’ or ‘key’ skills may be a simplistic portrayal, and both, ‘academic intelligence’ and ‘practical intelligence’ is equally important (Clough S and Duff MC, 2020). Another theory that better explains employability is the Schultz/Nelson-Phelps theory of human capital which discusses employability as the capacity to adapt. In a changing environment, human capital is useful in dealing with “disequilibrium” situations by adapting to the changed scenario. Those engineers who are capable enough to change themselves more are paid higher wages (Acemoglu and Autor, 2016). Even, students’ performance in the co- and extra-curricular activities contributes to a graduate’s employability. In fact, Billett (2002) has gone a step ahead and argued that differentiating, ‘learning in educational programs’ as formal and ‘learning at the workplace’ as informal is misleading which reinforces social structures and inequities. Both are complementary and are important employability skills as workplace learning experiences are shaped by structural factors related to work practices. These are regulated and reproduced by the division of labour and by the distribution of opportunities or participation in work, which imparts a skill for the transition from college to company.

Blom and Saeki (2011) in their study for the World Bank have investigated three questions. i. While hiring, which skills are considered important by employers? ii. Levels of employers' satisfaction with the skill set of engineering graduates and (iii) what are the skills which engineers lack? The findings of the study confirm a widespread dissatisfaction with fresh engineers. Almost 64 percent of employers hiring fresh engineering graduates are ‘only somewhat satisfied’ or ‘not at all’ with their quality. Classifying all skills by factor analysis, the authors found communication skills as most demanded skill by employers. Skill gaps were most severe in the area of, ‘higher-order thinking’, ranked as per Bloom’s taxonomy, and smallest in, ‘communication in English’. Although the demand for soft skills by recruiters was the same across India, the demand for professional skills was different on the basis of region, company sizes, and area of activities. This was the time of highlighting shortcomings of the educational institutions. Blom and Saeki also suggested institutions recognise these skills and focus on curriculum and pedagogy to improve first the lower-order thinking skills as understanding and memorizing and then, move towards higher-order thinking skills as analysing, and solving engineering problems as well as innovation. Since 2011 when Blom and Saeki suggested to engineering institutions, a lot of water has been flown into Ganga. Stakeholders, such as the All India Council for Technical Education (AICTE) as well as institutions have taken many initiatives over the years to improve the quality. The National Board of Accreditation (NBA), has been established by the AICTE to regulate the performance of institutions and to give them direction for improving the qualitative competence of the programs. The Ministry of Education ranks engineering institutions as per the National Institutional Ranking Framework (NIRF) to improve healthy competition among institutions. Institutions themselves have their own Internal Quality Assurance Cell (IQAC), which keeps a watch over the performance of the institutions. The mandatory internship is part and parcel of the curriculum. When it was found that many institutions as well as students are not able to find out companies for internships, AICTE started helping students in finding internship opportunities (https://internship.aicte-india.org/). However, even after more than a decade of such initiatives, students are short of employability skills (Singh and Singh, 2019).

On the basis of review of literature on employability skills, these skills have been divided in three groups (Table 3). Skills of the first group (first column of Table 3) are expected from graduates of all disciplines but skills of the second column i.e. application of scientific theories and laws and computer/ software literacy is very crucial and specific to engineering graduates. Even software literacy for engineers will be of higher order than software literacy for any other graduates. Proficiency in specific skills for engineers leads to proficiency in skills given in the third column of Table 3.

| Basic Skills | Specific Skills for Engineers | Dependent on Specific Skills for Engineers |
|---|---|---|
| I | II | III |
| Oral Communication(Fajaryati N, Budiyono, Akhyar M and Wiiranto, 2020; Kaela et. Al. 2008) | Application of Engineering Concepts(Bloom & Saeki, 2010) | Managerial (Yoke and Ngang, 2015) |
| Writing(Moore & Morton, 2017; Heshketh 2000) | Computer/ Software Literacy(Yoke and Ngang, 2015) | Leadership (Yoke and Ngang, 2015) |
| Interpersonal(Humburg and van der Veldon, 2015) | Higher order thinking (Mishra and Khurana, 2017) | Decision Making (Metilda) and Neena, 2017) |
| Presentation(Shyamlee, Wickramsinghe and Dissanayake, 2014) | Problem solving (Fajaryati N, Budiyono, Akhyar M and Wiranto, 2020; Panse, 2014; Kaela et. Al. 2008) | Adaptability(Panse, 2014) |
| Time Management(Metilda and Neena, 2017; ) | Numerical ability(Bloom & Saeki, 2010) | Team Work (Fajaryati N, Budiyono, Akhyar M and Wiiranto, 2020; Kaela et. Al. 2008; Mishra and Khurana, 2017) |
| Creative Thinking (Bloom & Saeki, 2010; Panse, 2014) | Technology Utilisation (Fajaryati N, Budiyono, Akhyar M and Wiiranto, 2020; Munadi S, Widarto Yuniarti N, Jerusalem MA (2018) | Ability to Negotiate (Metilda) and Neena, 2017) |

**Table 3.** Skills Expected from an Engineers

*Source: Made by author on the basis of review discussed in Singh and Singh, 2019*

On the basis of a survey of twenty IT/ Software companies and 98 private engineering institutions located at Delhi NCR, Singh and Singh (2019) have ranked employability skills for the IT sector from employers' and institutions' points of view. There are similarities in the perspective of employer and institutions for some skills as oral communication was ranked first by both of them but have found discrepancies as well i.e. team work, analytical & problem-solving, managerial and adaptability skills were ranked as 3, 4, 7 and 8 respectively by employers but 11, 8 13 and 14 by institutions. The institutions need to refocus their perception and align with employers' expectations. For this purpose, they periodically revise their curriculum, organise practical lecture series from industry experts, organise industry tours, undertake short-term projects with industry, try to make industry-specific curriculum, organise workshops as well as consultative sessions with industry experts at the college level. Institutions also give specific attention to each of their students by conducting demo tests as well as mock interviews and last but not the least, assisting them in writing resumes.

## 5. Way Forward

Out of the seventeen Sustainable Development Goals of the UN, the majority of them need the direct involvement of engineers for their success. At the same time, the world is undergoing the Fourth Industrial Revolution, stemming from automation, artificial intelligence, the Internet of Things, etc. The technological intensity of the products and production process has aggravated in recent years. Engineers are supposed to contribute not only in technical sectors but even in non-technical sectors. In a nutshell, engineers

have come to the core of the developmental framework (Singh, 2018). In such a scenario, decreasing engineering enrolment is not a good sign in spite of several initiatives taken by various stakeholders including establishment of more IITs.

Demand for engineers depends on the gross domestic product (GDP) growth rate. So, if there is a recession, it will have a cascading effect on the employment of engineers also but there are other factors as well that may be a cause of decreasing enrolment and lack of employability, skilling is the most significant of them. However, the market today is very dynamic, so employability skills cannot be a fixed set of skills. They are changing; even within the set, the rank of a particular skill is also changing over the period of time. Even required employability skills vary across the sector, the scale of operation, and the level of adoption of technology. So, interacting with employers will provide institutions an insight to understand the skill set specific to the sector and the region as ultimately, they have to groom students. Not only understanding the differences in skill sets between sectors and regions is crucial but how it is going to change over the years, is also important. The McKinsey Global Institute Report, 2018 has already forecasted the rise in not only the demand for technological skills but in social and emotional skills as well by 2030 (Business Today, 2019). Institutions need to focus on imparting higher cognitive skills to reap maximum advantage of it's English-speaking manpower

The institutions as well as regulatory bodies have taken many measures and students are also working hard and even learning beyond their syllabus to be employable. In such effort, the subjects that need to be learnt have become very vast resulting into 'not-able-to-get-degree', 'students' suicide' etc. However, in such a dynamic environment, there are two things that are inevitable. First is the dynamism of the market, the shorter shelf life of technology, and the adoption of disruptive technology, and the second is consequent to the first, frequent spate of unemployment among engineers due to changes in the required skills. Apart from the negative economic, social, and emotional effects of unemployment, there is loss of technical knowledge also. Being protected through intellectual property rights, patents or/ and available at a very high price, they are beyond the reach of engineers during periods of unemployment. In such circumstances, providing soft wares, e-laboratories, and virtual machines at nominal charges to unemployed engineers is the duty of regulatory bodies to keep their technical skills intact. Developing online laboratories i.e. Networked Control System Laboratory (NCSLab) may be a solution to take care of certain types of engineering experiments (Rábek, Matej, 2020; Lie et.al. 2022**),** and learning to learn may be the most appropriate employability skills. Actually, the modern higher education system was developed to train labour for development of modern industrial system, where the labour was employed for eight hours with one hour of lunch break. In fact, not only education system but the theories of organizational behavior are based also on the same assumption. Over the years, some cosmetic changes have been made here and there but even now, marks are the main basis of recruitment which is based on memorizing facts. Students and even the teachers are evaluated on the basis of how much marks have been scored by the student or student of a particular teacher. However, the brain which has been trained to work within a given contour would never innovate as innovation is thinking for something which does not exist. Not only that, in the era of Chat GPT, there is no need of memorizing facts.

## 6. Conclusion and Suggestion

Being one of the disciplines with the highest economic return and high social value, engineering has always remained the preferred option for students. However, a large number of students were able to fulfill their dreams after massive expansion in the infrastructure during post-globalisation period of the Indian economy. In fact, globalisation and the use of ICT in business has opened up altogether a new sector of opportunities. However, the last decade has experienced decreasing trend in student enrollment leaving large unused capacities. Large unemployment among engineers is one of the prominent reasons for such disillusionment. Actually, quite a few spat of recession during the last two decades as the burst of the dot-com bubble in 2000 and the global financial meltdown of 2008, and its aftermath had a devastating effect on the economy. Though the impact of the 2000 recession was not reflected in engineering enrollment it must have had a negative impact on the mindset. The IR4.0 around 2011 may be considered the last nail in the coffin which also impacted the employment of engineers. Some of the knowledge process outsourcing work which was done by

engineers in India for European or US firms around 2000, may be done by a chatbot now. So engineers need to have higher-order technical skills to remain employed. Nowadays, the technical intensity has increased not only in technical sectors but even in non-technical sectors. Market uncertainty, fast-changing technology, and changing lack of employability skills are some of the reasons for large-scale unemployment. High cost of engineering education coupled with unemployment has led to a decrease in engineering enrolment in favour of medical and science education.

In the meantime, stakeholders have also taken many affirmative actions to enhance employability skills as the e-Kumbh initiative of the All India Council of Technical Education (AICTE) (**https://ekumbh.aicte-india.org/**), which an initiative of writing technical books in 09 Indian languages as for innovation one needs to understand the scientific concept and not English language. On any campus of an engineering institution, one can find many bright students leaving with the inferiority complex of 'Do not know English properly'. All the stakeholders will have to understand that technology in the era of Industrial Revolution 4.0 is changing very fast and are disruptive in nature. It has the capability to make drastic changes in the production process and engineers need to have the ability to think and create out-of-the-box products and services. Even if, not capable to innovate then at least, they will have to learn 'to learn always' and the ability to 'adjust to a quickly changing environment'. At present, students are enrolled as per their preference for the branch of engineering or rank in the admission test but in the beginning itself, they must be told about different options/ career paths that they may follow in a particular branch. It will help students to inculcate those employability skills from the large pool of such skills which they require for following a certain career path. The financial institutions must develop different types of educational loans which may be used not only by young students but by grown and elders also.

## Figures

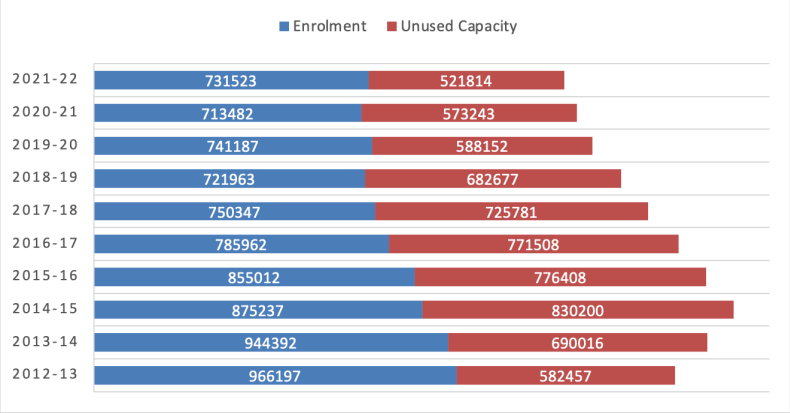


**Figure 1.** Enrolment and unused capacity at All India Level

*Source: AICTE 2023.b (https://facilities.aicte-india.org/dashboard/pages/dashboardaicte.php)*


doi.org/10.32388/HT1VGT

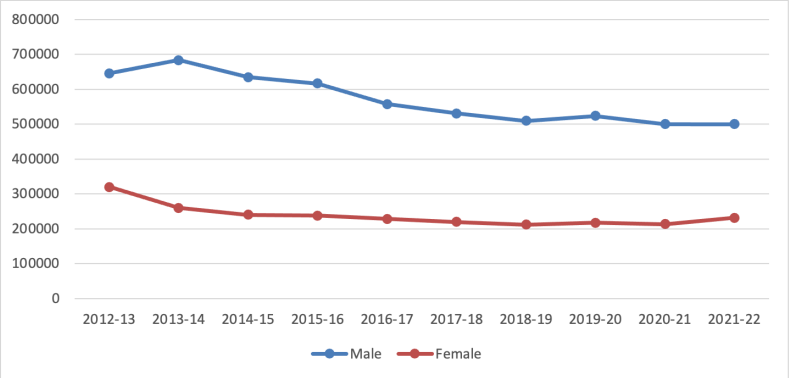


**Figure 2.** All India Enrolments by sex of students

*Source: AICTE2023.b*

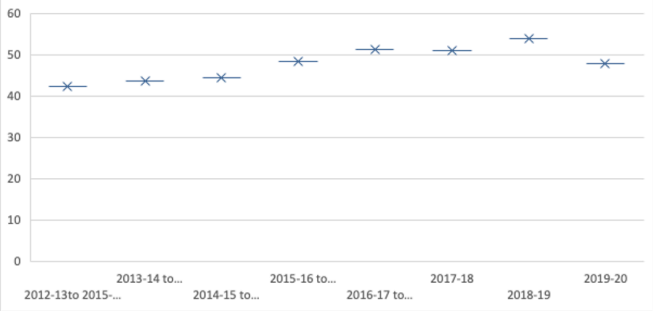


**Figure 3.** All India share of enrolled students who were awarded Degree

*Source: AICTE2023.bDegree*

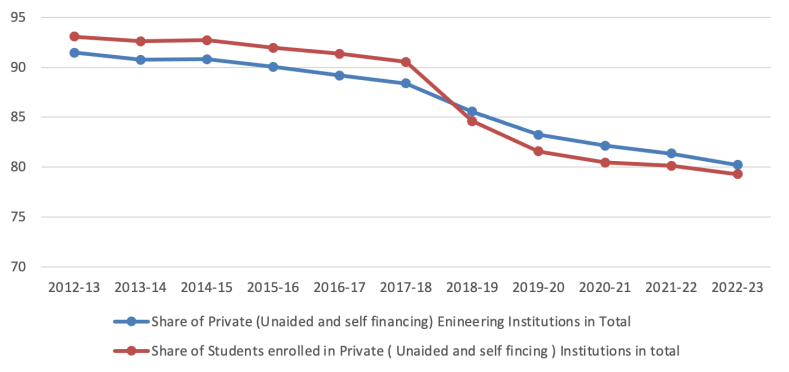


**Figure 4.** All India share of number of Institution and enrolled students in Private Institutions

Source: AICTE2023.b


doi.org/10.32388/HT1VGT

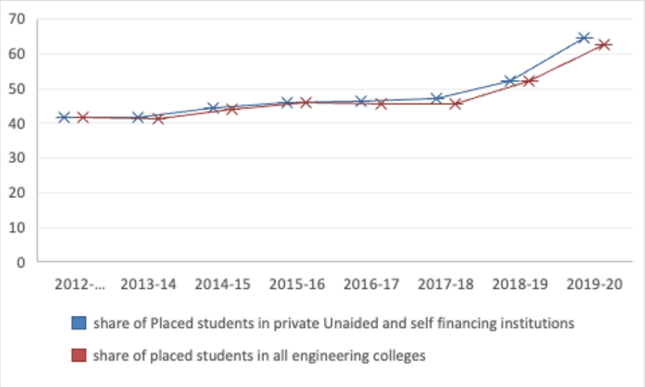


**Figure 5.** All India Share of Placed Students out of Passed Students

*Source: AICTE2023.b*

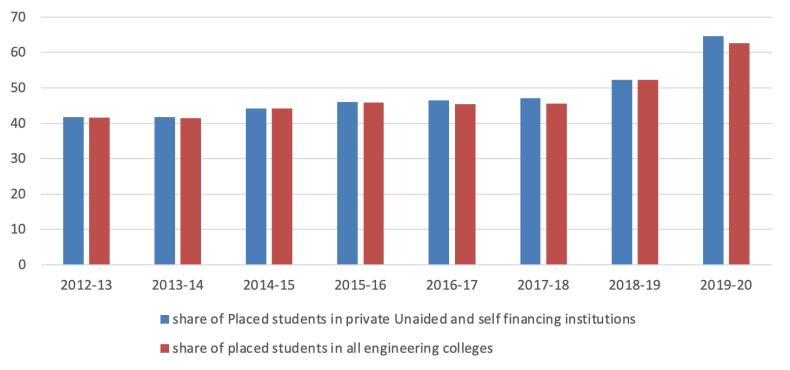


**Figure 6.** Share of place students out of enrolled and who ultimately got the Degree after Four years

*Source: AICTE 2023.b*

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## Declarations


**Funding:** No specific funding was received for this work.

**Potential competing interests:** No potential competing interests to declare.