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The Paradox of Skilled Unemployment: Understanding Underemployment among Engineering Graduates

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ABSTRACT

Underemployment among engineering graduates remains a critical challenge in India, where the rapid expansion of technical education has not been matched by sufficient job opportunities. This study employs a survey-based approach, analyzing responses from 100 engineering graduates in Kerala and using Chi-Square tests to identify key factors influencing underemployment. The findings indicate that demographic factors, academic performance, and institution type do not significantly impact underemployment. However, participation in internships and skill development programs significantly reduces underemployment, highlighting the importance of practical experience and industry-aligned training. Major challenges include skill mismatches, weak industry-academia collaboration, outdated curricula, and inadequate career guidance. To address these issues, the study recommends mandatory internships, expanded skill development programs, improved career counseling, and stronger industry partnerships. Additionally, government interventions such as hiring incentives and structured employer-academia collaboration are essential to bridging the education-employment gap. These insights contribute to ongoing discussions on education reform and employability, emphasizing the need for systemic changes to ensure engineering education leads to meaningful careers.

Keywords: Employability, Engineering Graduates, Industry Collaboration, Skill Mismatch, Skill Development, Underemployment.

1. INTRODUCTION

Unemployment and underemployment are major economic challenges globally, particularly in developing nations like India, where rapid population growth exerts pressure on the labor market. Unemployment refers to the lack of job opportunities for individuals, whereas underemployment occurs when individuals are employed in positions that do not fully utilize their skills, qualifications, or potential. In India, underemployment has become an increasing concern, particularly among the educated youth.

Over the last two decades, India has witnessed a steady rise in the number of engineering graduates. According to the All India Survey on Higher Education (AISHE) 2023, India produces over 1.5 million engineering graduates annually. However, a significant proportion of these graduates remain either underemployed or unemployed. The Centre for Monitoring Indian Economy (CMIE) reported that the youth unemployment rate in India stood at 23.4% in 2023, with notable underemployment among individuals with professional degrees.

Kerala, despite its high literacy rate and strong emphasis on education, has been grappling with educated unemployment, particularly among engineering graduates. The state boasts a robust infrastructure for engineering education, with a substantial number of colleges and an increasing intake of students. However, this growth in educational institutions has not been mirrored by corresponding employment opportunities, resulting in a significant unemployment rate among engineering graduates. Despite having a large number of engineering colleges and institutions, the state faces considerable underemployment, particularly in traditional engineering fields such as civil,

mechanical, and electrical engineering. The Kerala State Planning Board's 2023 report revealed that around 40% to 50% of engineering graduates in the state are either unemployed or working in jobs unrelated to their qualifications.

Between 2010 and 2024, Kerala witnessed a remarkable expansion in engineering education. In 2010, the state had approximately 100–120 engineering colleges with a modest intake capacity that maintained a balance between the number of graduates and job opportunities. However, by 2024, the number of engineering colleges surged to 169, with an annual intake capacity of 73,000 students. Each year, nearly 40,000 engineering graduates enter the job market, creating an oversupply that has significantly outpaced the availability of relevant employment opportunities. While newer fields such as Artificial Intelligence (AI), Machine Learning (ML), and Data Science are emerging as promising career paths, graduates from traditional disciplines struggle with employability. The Kerala Development Report (2022) highlighted that only 20% of engineering graduates were considered "job-ready" by recruiters, further exacerbating the underemployment issue.

The underemployment crisis in Kerala is driven by multiple factors, including a mismatch between industry requirements and academic curricula, insufficient practical training, limited collaboration between academia and industry, and a lack of substantial job opportunities within the state. Many graduates resort to low-paying, contract-based work or migrate to other states and countries in search of better prospects. Emigration, once primarily directed toward Gulf nations, has expanded to include Europe and North America, contributing to a significant skill drain.

To address these challenges, the Kerala government has introduced several initiatives, such as the Kerala Startup Mission (KSUM) to promote entrepreneurship, the Additional Skill Acquisition Programme (ASAP) to bridge the gap between academia and industry, and Industry-Academia Linkages to enhance practical training and research collaborations. However, the success of these initiatives has been limited due to inadequate reach, poor implementation, and insufficient industry participation. Addressing the issue of underemployment among engineering graduates requires a strategic approach, including curriculum reforms, industry partnerships, and policy interventions aimed at improving employability and retention of skilled professionals within the state.

This paper aims to analyze the patterns, causes, and consequences of underemployment among engineering graduates in Kerala from 2010 to 2024. By examining key trends in education, employment, skill demands, and government initiatives, this study seeks to provide insights into the systemic challenges faced by graduates and propose policy recommendations to bridge the gap between academic qualifications and labor market demands.

2. LITERATURE REVIEW

Underemployment among engineering graduates in India is a persistent issue driven by a mismatch between education and industry needs (Majumder & Mukherjee, 2018). Despite the country producing a large number of technically skilled youth, many graduates struggle to secure relevant employment due to a lack of practical knowledge, industry exposure, and evolving skill requirements (Rajesh & Murali, 2016). Employers increasingly seek interdisciplinary expertise, such as coding for mechanical engineers and AI for civil engineers, but most engineering programs fail to integrate these modern demands, leaving graduates underprepared (Saji, 2017). Additionally, the absence of structured internships significantly contributes to underemployment, as students without hands-on experience find it harder to transition into the workforce (Varghese & Pillai, 2018). While government initiatives like the Additional Skill Acquisition Programme (ASAP) and the Kerala Startup Mission (KSUM) aim to bridge skill gaps, their impact remains limited due to inadequate industry collaboration and poor implementation (Kerala State Economics Review, 2020). The problem is further exacerbated by regional disparities, as employment opportunities are concentrated in urban areas, disadvantaging rural graduates with limited networking and skill development resources (Sasidharan & Menon, 2019). Societal and parental expectations also play a role, pushing students into engineering without genuine interest, leading to career mismatches and dissatisfaction (Thomas & Mathew, 2021). Many graduates set high salary expectations and prefer to remain unemployed rather than accept lower-paying entry-level roles (Benny, 2017). Addressing these challenges requires compulsory industry internships, enhanced skill development programs, better career counseling, and stronger employer participation in curriculum design (Saji, 2017). Encouraging entrepreneurship and expanding job creation initiatives can further help align engineering education with market demands, ensuring that graduates are not just educated but employable (Nair, 2019).

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3. HYPOTHESES

H_0: There is no significant relationship between demographic factors (age, gender, marital status) and underemployment.

H_1: Demographic factors significantly influence underemployment.

H_0: Internship and practical experience does not significantly affect underemployment.

H_1: Graduates with internship and practical experience lower underemployment.

H_0: Level of education and institution type do not influence underemployment.

H_1: Level of education and institution type do influence underemployment.

H_0: Participation in skill development programs does not significantly impact underemployment.

H_1: Graduates who participated in skill development programs have lower underemployment.

4. METHODOLOGY

The study employs a cross-sectional research design to analyze the underemployment of engineering graduates at a specific point in time. A mixed-method approach is adopted, incorporating both primary and secondary data to ensure a comprehensive understanding of the issue.

Primary data is collected through a structured online survey questionnaire, targeting engineering graduates with Bachelor's or Master's degrees from recognized institutions in Kerala. The sample consists of 100 respondents, selected using convenience sampling and snowball sampling techniques to capture a diverse range of experiences. The survey gathers insights into the factors influencing underemployment, including skill gaps, industry-academia collaboration, and the impact of internships and skill development programs.

Secondary data is utilized to analyze long-term trends in underemployment among engineering graduates from 2010 to 2024. Data sources include peer-reviewed journals, government reports, articles, and credible online databases. This helps contextualize the primary data findings by identifying broader patterns in employment, policy interventions, and structural challenges.

5. RESULTS AND DISCUSSION

Hypothesis 1: Demographic Factors and Underemployment

- H_0: There is no significant relationship between demographic factors (age, gender, marital status) and underemployment.
- H_1: Demographic factors significantly influence underemployment.

Table 1: Demographic Factors and Underemployment

Demographic Factor	Chi-Square Value	df	p-value	Result
Age	2.013	3	0.570	No significant relationship
Gender	0.000	1	1.000	No significant relationship
Marital Status	0.157	1	0.692	No significant relationship

Source: Primary Data

The p-values for all three variables (Age, Gender, Marital Status) are greater than 0.05, meaning there is no statistically significant relationship between these demographic factors and underemployment.

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Thus, we fail to reject the null hypothesis (H_0), meaning that demographic factors do not significantly influence underemployment among engineering graduates in your sample.

These findings suggest that underemployment is not an individual problem tied to demographics but a structural issue affecting engineering graduates as a whole. Regardless of age or gender, most respondents reported difficulty finding jobs aligned with their qualifications. This aligns with prior research showing that job market saturation and skill mismatches play a larger role in underemployment than personal characteristics (Majumder & Mukherjee, 2018).

Moreover, the survey findings reveal that respondents felt their institutions did not adequately prepare them for the job market, regardless of gender or marital status. This suggests that policy interventions should focus less on demographic disparities and more on equipping all graduates with job-ready skills.

Hypothesis 2: Internship and Underemployment

- **H_0:** Internship and practical experience do not significantly affect underemployment.
- **H_1:** Graduates with internship experience have lower underemployment.

Table 2: Internship and Underemployment

Variable	Chi-Square Value	df	p-value	Result
Internship & Underemployment	3.94	1	0.047	There is significant relationship

Source: Primary Data

Since the p-value (0.047) is less than the significance level (0.05), we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1) that is, there is a statistically significant relationship between internship experience and underemployment.

Survey responses reinforce this result, as graduates who had completed internships reported feeling better prepared for the job market and had higher employment rates in their desired fields. In contrast, those without internships struggled to gain relevant employment and were often forced into non-engineering roles or underpaid jobs. Many respondents felt that their institutions did not emphasize practical training, leading to a disconnect between academic learning and industry expectations. The findings suggest that mandatory internships and hands-on experience could significantly improve employment outcomes for engineering graduates.

These findings are consistent with previous research indicating that internships bridge the gap between theoretical learning and practical skills (Varghese & Pillai, 2018). The lack of structured internship programs in many institutions results in graduates entering the workforce unprepared, contributing to underemployment. Policymakers must mandate practical training as a part of engineering curricula to improve job readiness.

Hypothesis 3: Institution Type, Education Level and Underemployment

- **H_0:** Institution type and education level do not influence underemployment.
- **H_1:** Institution type and education level significantly influence underemployment.

Table 3: Institution Type, Education Level and Underemployment

Variable	Chi-Square Value	df	p-value	Result
Institution Type & Underemployment	5.83	2	0.119	No significant relationship

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Education Level & Underemployment	3.27	2	0.351	No significant relationship

Source: Primary Data

Both education level and institution type do not show a statistically significant relationship with underemployment in this sample.

Graduates who were surveyed from both government and private institutions reported similar challenges in securing relevant jobs. Similarly, Master's degree holders did not show a significantly lower underemployment rate than Bachelor's degree holders, suggesting that simply obtaining a higher qualification does not guarantee better employment prospects. This reinforces the findings of prior research showing that industry-relevant skills and work experience are more critical to employment than institutional prestige (Saji, 2017).

Hypothesis 4: Skill Development and Underemployment

- **H_0:** Participation in skill development programs does not significantly impact underemployment.
- **H_1:** Graduates who participated in skill development programs have lower underemployment.

Table 4: Skill Development and Underemployment

Variable	Chi-Square Value	df	p-value	Result
Skill Development & Underemployment	11.38	1	0.00074	There is significant relationship

Source: Primary Data

Since the p-value (0.00074) is much lower than the standard significance level (0.05), we reject the null hypothesis (H_0). This suggests a statistically significant relationship between participation in skill development programs and underemployment. Graduates who participated in skill development programs are less likely to be underemployed.

Survey responses highlight that graduates who are engaged in skill development programs—such as coding boot camps, technical certifications, and soft skills training—reported better job prospects and were more likely to secure employment in their desired fields. Many respondents who did not participate in these programs expressed frustration with their lack of industry-relevant skills, poor communication abilities, and inadequate preparation for job interviews, which contributed to their underemployment.

Employers increasingly demand proficiency in industry-specific skills such as programming, AI, cybersecurity, and data analytics. However, traditional engineering programs often fail to equip graduates with these emerging competencies. This creates an employability gap where even highly educated candidates remain unemployed or forced into unrelated jobs due to a lack of job-ready skills (Rajesh & Nair, 2020).

To address this, universities should integrate skill development programs into the engineering curriculum, focusing on technical training, communication skills, and problem-solving abilities. Additionally, government policies should incentivize companies to collaborate with institutions to provide structured training programs.

6. RECOMMENDATIONS

- Educational institutions should establish formal partnerships with industries to ensure that engineering curricula are updated regularly to reflect job market demands. Universities should create advisory panels with industry experts to design courses, offer guest lectures, and provide insights into emerging skill requirements.
- Engineering programs must include mandatory, structured internships as part of the curriculum, requiring at least six months of industry training before graduation. Institutions should collaborate with leading

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companies, startups, and research labs to offer paid internships that provide hands-on experience in real-world projects.

- Universities should integrate technical, programming, and soft skills training into their courses. This includes hands-on workshops, coding bootcamps, and problem-solving exercises that prepare graduates for high-demand sectors like AI, data science, and cybersecurity.
- Introduce career counseling sessions starting from the second year of engineering programs. Establish alumni mentorship programs and industry job fairs to connect students with professionals, recruiters, and startup incubators, helping them explore diverse career opportunities.
- Universities should offer structured career guidance programs, covering resume building, job search strategies, interview preparation, and alternative career options beyond traditional engineering roles.
- Institutions should support entrepreneurship by setting up incubators, funding opportunities, and business mentorship programs for graduates interested in startups, freelancing, and self-employment. Government-backed schemes can further assist young entrepreneurs with financial support and policy incentives.
- Curricula should prioritize emerging fields like AI, renewable energy, robotics, and cloud computing, ensuring graduates acquire market-relevant skills that increase their employability in growing industries.
- Soft skills are critical for employability. Universities should offer specialized training in leadership, teamwork, adaptability, and communication, ensuring graduates excel in both technical and interpersonal competencies.
- The government should introduce incentives for companies hiring fresh graduates, promote public sector job expansion, and encourage private sector investment in engineering and technology-driven industries.
- Universities and government bodies should organize job fairs, create robust alumni networks, and launch mentorship programs to help graduates connect with employers and industry professionals.
- To reduce urban concentration of job opportunities, governments should promote job creation in smaller cities and develop infrastructure that supports regional employment growth. Tax incentives for businesses that set up operations outside major urban centers can also encourage job decentralization.

7. CONCLUSION

Underemployment among engineering graduates reflects a persistent gap between education and industry requirements. Despite holding degrees, many graduates struggle to secure relevant jobs, leading to dissatisfaction and economic inefficiencies. This study found that demographic factors, academic performance, and institution type have no significant impact on underemployment. However, participation in internships and skill development programs plays a crucial role in enhancing employability. Respondents highlighted a mismatch between academic training and industry demands, with overemphasis on theoretical knowledge and inadequate practical exposure. Many felt their institutions did not adequately prepare them for the job market, citing a lack of structured career guidance and limited placement opportunities. Job market competition, low recruitment rates for fresh candidates, and limited local job opportunities were among the primary reasons for underemployment. Additionally, a significant number of respondents planned to pursue postgraduate education or professional certifications to improve their employability, reflecting concerns about their current job prospects. Addressing these challenges requires mandatory internships, expanded skill development programs, structured career counseling, and stronger industry collaboration. Moving forward, a coordinated effort among educational institutions, policymakers, and industries is essential to align engineering education with market demands. By ensuring that graduates possess both theoretical knowledge and practical skills, underemployment can be reduced, fostering a more efficient and productive workforce.

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