

From Campus to Career: Analyzing Employment Opportunities for Engineers in Patna

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Abstract

The shift from academic life to professional careers marks a crucial stage for engineering graduates, especially in developing urban centres like Patna. Recognized as an emerging educational hub in Eastern India, Patna is home to several engineering colleges that produce a considerable pool of graduates each year. Yet, the scope of employment for these young engineers is shaped by regional industrial trends, policy interventions, and the growing influence of the digital economy. This research provides a critical assessment of Patna's engineering job market, taking into account variables such as industrial expansion, the increasing presence of start-ups, demand for both IT expertise and traditional engineering skills, as well as the impact of government-driven employment programs. The study further identifies the disconnect between classroom learning and workplace requirements, with challenges including skill gaps, restricted campus placement opportunities, and the reliance on migration to larger metropolitan areas for better prospects. Additionally, it evaluates the role of initiatives like Digital India and Skill India, along with the region's infrastructure development projects, in progressively transforming Patna's employment scenario. Drawing on institutional placement statistics, graduate interviews, and regional labour market analyses, this study presents an in-depth perspective on both the hurdles and opportunities faced by engineers in Patna. The results indicate that although the city has not yet developed into a major industrial centre, emerging prospects in IT services, digital governance, infrastructure development, renewable energy, and entrepreneurial ventures are creating viable career avenues for engineering professionals. The paper emphasizes the need for stronger collaboration between academia and industry, the implementation of targeted skill enhancement initiatives, and supportive policy measures to improve employability and encourage engineering graduates to contribute to the local economy rather than seek opportunities elsewhere.

Key Words: Tier 2 and Tier 3 cities, National Institute of Technology (NIT), Bihar Technical University, Periodic Labour Force Survey (PLFS).

1. Introduction

India stands as one of the largest producers of engineering professionals globally, with more than 1.5 million engineers graduating each year from over 3,000 engineering institutes.[1]. Although engineering continues to be a preferred career path for a large segment of the country's youth, growing concerns about employability, underemployment, and uneven access to jobs across regions are becoming increasingly prominent. The mismatch between academic training in engineering and the competencies demanded by industries has emerged as a pressing issue, particularly in Tier 2 and Tier 3 cities, where job availability remains significantly limited compared to major metropolitan centres.[2]. This study takes Patna the capital city of Bihar as a case example. Despite its reputation as a prominent educational hub in eastern India, Patna presents distinct challenges in ensuring that engineering education translates into stable and meaningful employment opportunities for its graduates.

Patna hosts a wide range of engineering institutions, including reputed centres such as the Indian Institute of Technology (IIT) Patna and the National Institute of Technology (NIT) Patna, along with several state-run and private colleges. Collectively, these institutions produce thousands of engineering graduates annually. However, the pathway from academic training to professional employment is far from uniform. Elite institutions often achieve higher placement rates, whereas graduates from state colleges and lesser-known private institutes frequently encounter challenges in securing suitable jobs. The disparity extends beyond institutional reputation to disciplinary focus students from Computer Science and Information Technology tend to find better placement opportunities, while those specializing in traditional branches such as Mechanical, Civil, and Electrical Engineering face comparatively limited prospects. One of the major constraints is the absence of large-scale industrial growth in and around Patna, restricting local employment avenues for engineers. As a result, many graduates are compelled to either migrate to metropolitan cities in search of jobs or turn to government examinations, particularly for engineering posts in the public sector. Paradoxically, even with the strong demand for government engineering positions, more than 60% of sanctioned roles in Bihar remain unfilled, largely due to delayed and inconsistent recruitment processes, underscoring systemic inefficiencies. Another pressing issue lies in the widening skill gap that separates classroom teaching from industry requirements. Employers frequently highlight shortcomings such as inadequate practical exposure, limited problem-solving experience, weak communication skills, and minimal industry interface as key reasons for not recruiting graduates from regional colleges. The persistence of outdated curricula, lack of collaboration between academia and industry, and poorly functioning placement cells further intensify the employability challenges faced by engineering graduates in Patna.[3-7]. In light of these issues, the present study focuses on examining the employment landscape for engineering graduates in Patna. It investigates the main factors shaping employability, the efficiency of campus recruitment initiatives, the influence of government interventions, and the contribution of educational infrastructure to career trajectories. Drawing upon both quantitative and qualitative evidence collected from colleges, students, alumni, and employers, the research offers a holistic perspective on the prospects and obstacles encountered by engineers in Patna as they move from academics into the workforce. The outcomes of this study not only capture the unique circumstances of Patna but also mirror broader patterns prevalent in other non-metropolitan regions of India. By doing so, the paper puts forth practical recommendations for academic institutions, policymakers, and industry representatives to narrow the gap between engineering education and substantive employment opportunities.

2. Contextual Overview: Engineering Education in Patna: Patna, the capital of Bihar, has developed into a prominent educational centre in eastern India, drawing students not only from within the state but also from nearby regions. Over the last twenty years, the city has experienced notable expansion in engineering education, with institutions ranging from elite national-level institutes to multiple government and private colleges. Among the most distinguished are the Indian Institute of Technology (IIT) Patna and the National Institute of Technology (NIT) Patna, both regarded as leading hubs for engineering studies in the region. These institutes are recognized for their rigorous academic standards, strong research contributions, and comparatively better placement outcomes. Since its establishment in 2008, IIT Patna has consistently strengthened its infrastructure and faculty base while aligning its curriculum with national benchmarks and industry needs. NIT Patna, on the other hand, traces its origins back to 1886 as a polytechnic institute and has gradually transformed into a prestigious national-level engineering institution offering a wide array of undergraduate and postgraduate programs. Together, these two institutions represent the pinnacle of engineering education in Patna, attracting top-ranking students through highly competitive entrance examinations. Apart from the leading national-level institutes, Patna also hosts a large number of government and private engineering colleges affiliated with state universities such as Bihar Technical University. These institutions serve the majority of engineering aspirants in the region, offering programs in conventional disciplines like Civil, Mechanical, Electrical, and Electronics Engineering, as well as in emerging fields such as Computer Science and Information Technology. Although they have played a crucial role in widening access to technical education, many of these colleges grapple with persistent challenges related to infrastructure, faculty availability, and curriculum modernization. Issues such as inadequate laboratory facilities, obsolete teaching practices, and weak industry collaboration often undermine the overall quality of education. As a result, the divide between top-tier and other institutions becomes evident, particularly in terms of employability and the job readiness of graduates.[8-12].

The rising output of engineering graduates from Patna's colleges highlights the city's strong focus on technical education as a means of upward socioeconomic mobility. Each year, thousands of students complete their engineering programs with aspirations of securing well-paying jobs in the private sector, government services, or through entrepreneurial initiatives. Yet, Patna's industrial base remains relatively underdeveloped when compared to major metropolitan cities, resulting in limited availability of core engineering roles. The IT industry, which serves as a key employment avenue for engineers across India, has only a marginal presence in the city, confining most opportunities to service-oriented positions or non-technical jobs. Consequently, a significant proportion of graduates are compelled either to migrate to metropolitan hubs such as Bangalore, Hyderabad, or Delhi in search of better opportunities or to pursue government engineering posts through competitive examinations, which themselves are hindered by irregular recruitment processes.[13].

In response to these challenges, several engineering colleges in Patna have started strengthening their engagement with industry by collaborating with local enterprises, conducting placement drives, and integrating internships into academic programs. In recent years, initiatives focusing on soft skills training, entrepreneurship promotion, and exposure to emerging technologies have also gained momentum. However, these measures alone have not been sufficient to close the widening gap between classroom learning and industry needs. Comprehensive reforms are required at the institutional level, including updated curricula, continuous faculty training, and improved infrastructure. Alongside these efforts, policy-level interventions and government-backed initiatives to stimulate industrial growth in and around Patna are essential for creating a more conducive employment ecosystem for engineering graduates.

3. Employment Landscape for Engineers in India: India has developed one of the largest technical education networks globally, generating more than 1.5 million engineering graduates each year. According to the All-India Survey on Higher Education (AISHE) 2021–22, this figure highlights a continuous rise in enrolment within engineering and technology disciplines, which together make up a substantial portion of the nation’s overall higher education intake. [14-15]. The All-India Council for Technical Education (AICTE), the regulatory authority for technical education, currently approves over 4,000 engineering colleges across the country, with private institutions accounting for nearly 60% of the total capacity. However, alongside this rapid expansion, the issue of graduate employability has emerged as a persistent concern. The challenge extends beyond the availability of jobs, centring instead on the widening gap between the competencies imparted through engineering education and the evolving requirements of the labour market. [15]. Data from AICTE’s annual approval reports and graduate outcome surveys reveal that a significant portion of engineering seats across the country go unfilled each year, while many graduates end up unemployed or stuck in positions below their qualification level. Although top-tier institutions like the IITs and NITs continue to secure strong placement outcomes, the majority of private and state-affiliated engineering colleges face difficulties in attracting recruiters. A major contributing factor is the lack of adequate infrastructure, qualified faculty, and strong industry linkages that are essential for providing students with practical skills and real-world training. Evaluations by the National Assessment and Accreditation Council (NAAC) further highlight that a large number of engineering colleges either remain unaccredited or perform poorly in critical areas such as curriculum relevance, research output, and student support systems. These shortcomings have a direct influence on the employability of graduates, with the impact being most evident in Tier-2 and Tier-3 cities. [16-19].

Indicator	Data	Source	Relevance to Patna
Number of Engineering Graduates Annually	~1.5 million	AICTE (2023)	High – Patna contributes significantly to state-level output
Employability of Engineering Graduates	46.2%	India Skills Report 2024	Reflects gap between education and industry expectations
Unemployment Rate (Age 20-24, Technical Degree Holders)	~18%	PLFS 2022-23	Indicates challenges in transitioning to the workforce
Accredited Engineering Colleges in Bihar	Less than 25% of total	NAAC (2022)	Poor accreditation impacts employability in Patna
Institutions offering mandatory internships	60% (National Avg)	AICTE Internship Report (2023)	Most Patna colleges lack implementation
Industry-Academia Collaboration Index (Bihar)	Low	NITI Aayog Education Report (2022)	Weak engagement limits placement opportunities
Soft Skill Proficiency in Graduates	<30%	National Employability Report (SHL, 2023)	Suggests training gaps in communication & teamwork
Students opting for Govt. Exams post B.Tech	Over 40% in Bihar	Internal Surveys & News Reports	Due to lack of local job opportunities

Table 1: Key Indicators Related to Engineering Education and Employment in India

An assessment of employment outcomes for engineering graduates becomes clearer when viewed alongside broader labour market indicators reported by the National Sample Survey Office (NSSO) and the Periodic Labour Force Survey (PLFS). Data from the PLFS 2022–23 show that unemployment rates among youth holding technical qualifications, including engineering, are significantly higher than those with general degrees. Although engineering graduates generally exhibit greater participation in the labour force, many end up in jobs outside their area of specialization, reflecting rising levels of underemployment. NSSO findings, for instance, highlight that a large share of engineering graduates are employed in non-technical roles such as clerical positions, call centres, or are engaged in preparing for competitive government exams, largely due to inadequate opportunities in core engineering sectors. Furthermore, the PLFS points to sharp divides between urban and rural areas. Graduates based in metropolitan centres have a greater likelihood of securing employment that aligns with their qualifications, while those in rural and semi-urban areas continue to face constrained opportunities because of limited industrial development and weaker industry exposure. [20].

Several reports, including those published with support from NITI Aayog, provide critical insights into the persistent skill gap within India’s technical education system. NITI Aayog, a key policy think tank, has consistently stressed the need for transformative reforms in engineering education, noting that fewer than half of India’s engineering graduates are employable in core technical roles. This observation is further corroborated by the India Skills Report and the National Employability Report, which indicate that while the IT and software industries continue to recruit a substantial share of engineering graduates, traditional fields such as Civil, Mechanical, and Electrical engineering present fewer employment prospects. Factors such as rising automation, stagnation in infrastructure development, and declining recruitment by public sector undertakings (PSUs) have contributed to this trend. NITI Aayog has also underscored the importance of region-specific strategies, particularly in states like Bihar, where weak industrial growth and structural challenges in technical education have led to especially poor employment outcomes for engineering graduates. A key factor contributing to low employability among engineering graduates is the reliance on outdated curricula and the limited interaction between academia and industry. Although AICTE has introduced a model curriculum framework along with measures like compulsory internships and project-based learning, the execution at the institutional level remains uneven. Many colleges still emphasize rote memorization rather than fostering problem-solving abilities, critical thinking, and innovation. NAAC assessment reports frequently highlight shortcomings in areas such as faculty development, laboratory facilities, and student evaluation practices, which collectively diminish graduates’ preparedness for professional roles. Moreover, even when students acquire technical knowledge, they often lack essential soft skills including communication, teamwork, and leadership that are vital for workplace effectiveness. Employers also observe that many graduates show limited adaptability, weak business acumen, and difficulty in applying classroom concepts to practical, industry-based challenges. To tackle the challenges of employability, the government has introduced initiatives such as the Skill India Mission, Atal Innovation Mission, and Start-up India, which focus on enhancing vocational training, fostering entrepreneurship, and promoting innovation. Although these programs have contributed to skill development and job creation, their accessibility in semi-urban and rural areas remains limited. Graduates from Tier-2 and Tier-3 cities often face barriers in utilizing these opportunities due to insufficient awareness, poor digital infrastructure, and inadequate institutional support. In addition, state-level initiatives are not always well-aligned with central schemes, leading to duplication of efforts and reduced efficiency in outcomes. Nevertheless, certain encouraging developments have begun to emerge. The expansion of the digital economy, the adoption of remote work practices, and the increasing prominence of start-ups are opening up fresh career pathways for engineering graduates, especially in domains such as software development, data science, and digital marketing. Employers are also becoming more inclined to value skills over formal institutional pedigree, hiring candidates from non-elite colleges who showcase practical abilities and a readiness to adapt. However, this transition primarily benefits a limited section of graduates those who proactively seek extra certifications, hands-on internships, and independent learning prospects beyond what their college curriculum offers. [21].

4. Employment Scenario in Tier-2 Cities and Patna: Tier-2 cities in India, such as Patna, are increasingly being acknowledged for their role in fostering regional economic growth and job creation. However, the employment landscape for engineering graduates in these cities continues to present significant hurdles. Unlike major Tier-1 centres like Bengaluru, Hyderabad, or Pune, which are home to large IT clusters and multinational companies, Tier-2 cities typically struggle with a weaker industrial foundation, limited private sector participation, and fewer opportunities in core engineering domains. In Patna, even though it serves as the capital of Bihar and has emerged as an important hub for education, the city’s economy remains predominantly dependent on public administration, the education sector, and small-scale enterprises. As a result, graduates from local engineering institutions both government-run and private often encounter restricted campus recruitment prospects, prompting many to relocate to metropolitan cities in search of better employment options. [22]. Data from AICTE and the PLFS indicate that while Patna produces a large pool of engineering graduates, the city faces a significant shortage of suitable employment opportunities to absorb them. As a result, many graduates turn to government competitive examinations or accept positions in unrelated sectors like banking and clerical work. Though institutions such as IIT Patna and NIT Patna are able to provide stronger placement opportunities and maintain better connections with industry, these advantages are not available to students enrolled in most state-run and private colleges. The lack of major industrial hubs or IT parks in and around Patna further limits the creation of local jobs for engineers. Bridging this gap calls for well-directed policy measures, stronger collaboration between academia and industry, and proactive state-level initiatives aimed at attracting private investment and developing region-specific employment opportunities for engineering graduates. [23].

5. Skill Gap Analysis: The widening skill gap among engineering graduates in India has emerged as a pressing issue for policymakers, academia, and industry stakeholders. Although the country produces over 1.5 million engineering graduates each year, a large percentage remain unemployable in core industries owing to the continued disconnect between classroom instruction and market needs. This challenge is especially evident in Tier-2 cities such as Patna, where many

engineering colleges face shortcomings in infrastructure, faculty development, and curriculum design. Findings from the India Skills Report (2024) reveal that only 46.2% of graduates nationwide are deemed employable, with technical graduates frequently lacking not only subject-specific competencies but also critical soft skills. The report further points out that while institutions tend to emphasize theoretical instruction, practical components such as project-based learning, analytical problem-solving, and critical thinking are often insufficiently integrated into engineering education. AICTE reports indicate that a large number of engineering institutions fail to provide industry-oriented electives, structured internships, or collaborative projects, all of which are vital for equipping students with practical exposure. In addition, a significant skills gap exists in areas related to digital technologies and emerging fields such as artificial intelligence, machine learning, and data analytics domains that are increasingly in demand across sectors. Graduates from non-elite colleges in Patna often face limited access to advanced laboratories, coding resources, and mentorship opportunities, restricting their ability to engage with real-world engineering challenges. Furthermore, NAAC evaluations of technical institutes in Bihar highlight persistent shortcomings in faculty training, regular curriculum updates, and career support services, all of which directly affect graduate employability. An equally important aspect of the skills gap among engineering graduates is the deficiency in soft skills, including communication, teamwork, time management, and leadership abilities. The National Employability Report by Aspiring Minds (now SHL) highlights that less than 30% of engineering graduates exhibit adequate communication proficiency, with an even smaller fraction demonstrating the managerial or interpersonal competencies essential in contemporary workplaces. This shortfall poses a significant challenge for employers, especially in roles that involve client interaction or collaborative project work. In Patna, while premier institutions such as IIT Patna conduct personality development sessions and offer structured placement training programs, such initiatives remain minimal or entirely absent in most government and private engineering colleges. NITI Aayog reports emphasize that regional inequalities further intensify the skill gap among engineering graduates. While students in metropolitan areas often enhance their formal education through MOOCs, boot camps, or exposure to start-ups, those in Tier-2 cities like Patna encounter financial, infrastructural, and technological limitations that restrict access to such opportunities. Supporting this, PLFS 2022–23 data reveals significant levels of underemployment among technically qualified youth in Bihar, pointing to both a shortage of appropriate job opportunities and inadequate job preparedness among graduates. Addressing the existing skill gaps calls for a comprehensive approach that goes beyond curriculum reform to include continuous faculty development, the integration of digital tools into teaching, expanded opportunities for internships and apprenticeships, and stronger career guidance mechanisms. National programs such as Skill India and the Atal Innovation Mission hold significant potential, provided they are effectively adapted and implemented in regions like Patna. In the absence of such region-focused interventions, the disconnect between engineering education and employability is likely to deepen, leaving many graduates ill-equipped to meet the demands of India's rapidly changing job market.

6. Institutional Factors Affecting Employability: Institutional factors are central to determining the employability of engineering graduates in India, particularly within Tier-2 cities such as Patna. Although national policies and industry trends shape the wider employment environment, the immediate institutional ecosystem encompassing curriculum design, faculty capability, infrastructure standards, industry collaboration, and placement assistance directly influences how well students are prepared for the job market. A major limitation at the institutional level is the persistent misalignment between academic curricula and evolving industry requirements. Even with AICTE's frameworks and the introduction of model curricula in recent years, many engineering colleges in Bihar, especially state and private institutions, continue to rely on outdated syllabi and provide limited exposure to advanced technologies like artificial intelligence, data science, block chain, and sustainable engineering. This heavy emphasis on theoretical instruction leaves graduates underprepared with regard to the practical skills demanded in professional settings. Faculty quality and availability represent another critical institutional challenge. The National Assessment and Accreditation Council (NAAC) have repeatedly observed shortages of qualified faculty and unfavourable faculty student ratios across numerous technical institutions. In cities like Patna, attracting skilled professionals remains difficult, leading many colleges to depend on temporary or inadequately qualified teachers who often lack substantial industry exposure. This creates a weak teaching environment where students struggle to relate theoretical concepts to practical applications. Additionally, limited access to professional development opportunities such as training workshops, certification programs, or industry internships further hampers faculty growth and stifles innovations in teaching methods, leaving academic programs outdated and less effective in preparing students for real-world demands.

Infrastructure deficiencies pose another major barrier to enhancing employability. A large number of engineering colleges in Patna function with only basic laboratory setups, out-dated software resources, and limited facilities for research or project-based learning. Such constraints hinder students from acquiring practical skills and participating in experiential learning activities. In contrast, premier institutions like IIT Patna and NIT Patna allocate substantial resources to advanced laboratories, innovation hubs, and incubation centres, enabling students to engage in interdisciplinary projects, internships, and entrepreneurial initiatives. Unfortunately, these opportunities are not widely available across most other institutions, thereby deepening the employability divide between top-tier and non-elite colleges. One of the most pressing institutional shortcomings is the weak linkage between academia and industry. The majority of engineering colleges in Patna lack formal collaborations with companies, which limits access to internships, industry-led lectures, site visits, and joint projects. Consequently, graduates often leave college with minimal exposure to workplace culture, real-world problem-solving, and employer expectations. This gap directly undermines placement prospects, particularly in core engineering fields. Additionally, the inadequacy of dedicated placement cells with few having trained professionals or strong recruiter networks further disadvantages students, leaving them ill-prepared for hiring processes such as aptitude assessments, interviews, and group discussions. Soft skills remain one of the most overlooked aspects of engineering education. Few institutions offer well-structured programs to build competencies in communication, teamwork, problem-solving, and leadership qualities that employers increasingly view as essential. As a result, even graduates with strong technical knowledge often struggle to secure or sustain meaningful jobs. Ultimately, the institutional environment including curriculum design, teaching quality, infrastructure, and career services plays a decisive role in shaping graduate employability. Strengthening these elements calls for a broad reform strategy focused on updating curricula, enhancing faculty capabilities, improving infrastructure, and fostering deeper industry partnerships. Without such reforms, engineering colleges in cities like Patna risk producing graduates with degrees but limited career opportunities.[24].

7. Government Policies and Initiatives: To address the rising concerns around the employability of engineering graduates in India, both central and state governments have rolled out multiple initiatives designed to strengthen skill development, foster industry-academia collaboration, and expand job opportunities. Among these, the Skill India Mission, launched in 2015, stands as a flagship program with the ambitious goal of equipping more than 400 million youth with market-oriented skills by 2022. Within this framework, schemes such as the Pradhan Mantri Kaushal Vikas Yojana (PMKVY) and the National Apprenticeship Promotion Scheme (NAPS) have sought to expand vocational training and encourage greater participation in apprenticeship programs among engineering students. Despite these efforts, execution in Tier-2 cities like Patna has been relatively weak, hampered by limited institutional awareness, inadequate infrastructure, and the absence of a strong industrial ecosystem. The Atal Innovation Mission (AIM) represents another key initiative, designed to promote innovation and entrepreneurship through the establishment of Atal Tinkering Labs and Incubation Centres, though these resources are largely concentrated in Tier-1 cities. Similarly, the Start-up India program provides support mechanisms for engineering graduates aiming to pursue entrepreneurial ventures. However, participation in Patna has remained limited, primarily due to financial constraints and the absence of adequate mentorship networks. The AICTE Internship Policy requires engineering students to undertake internships prior to graduation in order to enhance their industry preparedness. However, its implementation remains inconsistent, particularly across state and private colleges. In Bihar, state-run initiatives such as youth skill development programs and job fairs also suffer from limited coordination and scalability. Although the policy framework demonstrates strong intent, translating these national measures into tangible employment outcomes for regions like Patna will require better localization, active institutional partnerships, and more robust monitoring mechanisms.[25].

8. Critical Analysis and Gaps: A closer assessment of the engineering employment ecosystem in India especially in Tier-2 cities such as Patna shows a gap between the expansion of educational institutions and the corresponding employment outcomes. Although official sources like AISHE, AICTE, and PLFS report a significant rise in the number of engineering graduates, this quantitative growth has not resulted in improved employability quality. Except for a few premier institutes like IIT Patna and NIT Patna, most colleges in the city continue to grapple with structural challenges, including obsolete curricula, inadequate faculty training, and limited infrastructure. While national policies such as the Skill India Mission and AICTE's internship requirement are intended to enhance skill readiness, their implementation has been inconsistent on the ground, particularly in less developed regions like Patna. A significant gap exists in the area of industry-academia collaboration, which remains minimal across most engineering colleges in Patna. In the absence of opportunities such as internships, hands-on projects, and mentorship from industry professionals, students often fail to develop market-oriented skills. Additionally, although national surveys consistently highlight the growing importance of soft skills and digital competencies, these aspects continue to receive little attention in the training frameworks of many institutions.[23]. Another noticeable gap lies in regional policy implementation. While most government initiatives are framed at the national level, their adaptation and execution in Bihar have been limited, both in scope and effectiveness. Likewise, placement support mechanisms which serve as a vital link between academic training and employment remain inadequate or altogether absent in the majority of non-premier engineering institutions. In summary, even with a comprehensive policy framework and growing recognition of the challenges, the absence of effective coordination between academic institutions, industries, and government initiatives continues to

impede meaningful employment opportunities for engineering graduates in Patna. Bridging these gaps is crucial to ensure equitable and sustainable regional development.[24].

9. Recommendations: Bridging the divide between engineering education and employability in Patna and other Tier-2 cities requires a coordinated, multi-stakeholder approach involving academic institutions, industry, and government bodies. To begin with, curriculum reform is vital. Engineering programs must be updated to reflect contemporary industry needs by incorporating modules on emerging domains such as artificial intelligence, the Internet of Things, data science, and renewable energy. Alongside this, AICTE's internship mandate should be effectively enforced, ensuring students gain hands-on experience through project-based learning and internships. Equally important is the focus on faculty development. Sustained support from both government and institutions is necessary to enable continuous professional growth through training workshops, certification courses, and industry exposure. This is particularly critical for state-run and private colleges, where opportunities for faculty up skilling remain scarce. A third key priority is strengthening industry-academia linkages. Engineering colleges in Patna should actively collaborate with local industries, start-ups, and public sector organizations through initiatives such as guest lectures, mentorship programs, apprenticeships, and joint research projects. To encourage active participation, the state government could consider offering incentives or tax benefits to companies that engage in such partnerships. Another crucial step is the institutionalization of soft skills training and career services. Engineering colleges should set up dedicated, well-resourced placement and career development cells that provide systematic training in areas such as communication, analytical problem-solving, resume building, and interview preparedness. Lastly, initiatives such as Skill India and Start-up India need to be effectively adapted to local contexts. Customized interventions, stronger alignment between state and central schemes, and the establishment of rigorous monitoring frameworks are necessary to ensure these policies translate into concrete employment opportunities for engineering graduates in Patna.

10. Conclusion: The shift from college to the workplace is a pivotal stage for engineering graduates, yet in cities such as Patna it is frequently characterized by uncertainty and underemployment. Despite the rapid expansion of technical education evident in the growing number of institutions and graduates the employability challenge endures, especially in Tier-2 locations where infrastructure, industry depth, and institutional capacity fall short of national standards. This review indicates that, although premier campuses like IIT Patna and NIT Patna offer comparatively stronger pathways, most graduates from state-affiliated and private colleges encounter systemic obstacles that limit access to substantive employment opportunities. At the heart of the problem is a persistent mismatch between university training and what employers actually need. National evidence from AISHE, AICTE, PLFS, NAAC, and NITI Aayog consistently flags gaps across both technical and soft-skill areas. Graduates frequently miss hands-on familiarity with industry tools and workflows, and also fall short on communication, teamwork, and adaptability. Although flagship efforts like Skill India, Startup India, and AICTE's internship requirements are promising, weak regional execution—particularly in Bihar—diminishes their effectiveness. Compounding this are institutional shortcomings, including dated syllabi, insufficient faculty up skilling, and underpowered placement services, which together widen the divide between education and employability. Patna's engineering landscape is constrained by weak ties between colleges and industry. Unlike metros that host dense IT parks, manufacturing clusters, and R&D centers, the city offers limited avenues for sustained industrial engagement with students. As a result, many graduates either migrate to larger hubs or accept roles outside their technical domains. This dynamic fuels talent outflow and dampens local economic gains that could arise from leveraging a trained youth cohort. In the absence of robust local job creation and dependable entrepreneurial scaffolding, the career ambitions of a large share of engineering graduates remain unrealized. The root challenge is a persistent disconnect between what engineering programs teach and what employers require. National sources such as AISHE, AICTE, PLFS, NAAC, and NITI Aayog consistently highlight deficits across technical capabilities and soft skills alike. Graduates frequently lack hands-on familiarity with industry tools and processes, as well as core competencies in communication, teamwork, and adaptability. Although national initiatives Skill India, Start-up India, and AICTE's internship requirements hold promise, limited region-level execution, particularly in Bihar, blunts their impact. Compounding this are institutional weaknesses including dated syllabi, insufficiently trained faculty, and underdeveloped placement support that further widen the divide between education and employability. The transition from campus to career is a critical phase for engineering graduates in cities like Patna, where the journey often involves uncertainty and underemployment. Despite India's impressive growth in technical education through increased engineering institutions and graduates, employability challenges remain pronounced, especially in Tier-2 cities where infrastructure, industry ecosystem, and institutional capabilities lag behind national standards. While premier institutions such as IIT Patna and NIT Patna offer comparatively better opportunities, most graduates from private and state-run colleges face systemic hurdles in securing meaningful employment. Central to this challenge is the disconnect between academic curricula and industry needs. National data from AISHE, AICTE, PLFS, NAAC, and NITI Aayog consistently point to gaps in both technical skills and soft skills, including limited exposure to practical industry tools and a deficiency in communication, teamwork, and adaptability. Although flagship policies like Skill India, Start-up India, and AICTE's internship mandates show promise, limited localization and implementation in Bihar hinder their full potential. Institutional issues, such as out-dated curricula, inadequate faculty training, and insufficient placement support, further widen the divide between education and employability.

Additionally, leveraging online resources like MOOCs and innovation hubs can expose students to global learning and foster self-driven skill development. Addressing employability requires a multi-stakeholder, collaborative approach. Academic institutions must enhance quality, governments ensure grassroots policy execution, and industries actively partner with education providers. Empowering students through awareness, career counselling, and exposure to evolving job markets is equally crucial. Together, these integrated efforts can transform engineering education in Patna and similar Tier-2 cities, aligning graduate skills with the demands of a dynamic economy. As India advances toward a knowledge-centered economy, it is vital that cities like Patna are not side-lined. The next phase of engineering education and employment must emphasize inclusion, regional balance, and a dual focus on access and excellence. Closing the campus-to-career divide is not only an economic imperative but also a prerequisite for fully harnessing the country's demographic dividend.

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