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Bridging skill gaps in India's Labor Market: Evaluating vocational training and government initiatives

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Abstract
This paper examines India's evolving skill development ecosystem in the context of rapid technological change and shifting labor market demands. Drawing on secondary data primarily the Periodic Labour Force Survey (PLFS) 2023-24 and various government reports it assesses the educational composition of the workforce and identifies critical mismatches between education levels and occupational skills. Findings reveal that 90.2 percent of workers possess secondary education or less, with 88.2 percent engaged in elementary or semi-skilled roles. Moreover, 65.3 percent of the workforce has received no vocational training, underscoring a significant skills gap. The study highlights major government initiatives, including the Craftsmen Training Scheme (1.24 crore long-term trainees), Pradhan Mantri Kaushal Vikas Yojana (1.57 crore trained, 1.21 crore certified), and the PM Internship Scheme (1.27 lakh placements in pilot phase), which have expanded training access and improved female participation from 6.9 percent to 24.5 percent in vocational programs. Despite these gains, mismatches persist: only 4.2 percent of highly educated and skilled workers earn between ₹4 lakh and ₹8 lakh, while 46 percent of lower-skilled workers earn less than ₹1 lakh annually. The paper argues for deeper integration of Technical and Vocational Education and Training (TVET) into secondary and higher education, targeted upskilling through new-age courses, and strengthened industry-academia partnerships. It concludes that scaling digital platforms, dual training systems, and credit facilitation schemes (₹7.5 lakh loan limit under CGFSSD) will be vital to bridge skill mismatches, boost employability, and fully leverage India's demographic dividend in an AI-driven economy.

Keywords: PMKVY, skill development, vocational training, demographic dividend

1. Introduction
India's economic trajectory in the early 2020s has been characterized by robust growth alongside profound structural transformation (IMF, 2024). Central to this evolution is the nation's demographic dividend, marked by a young and expanding workforce poised to drive productivity gains (World Bank, 2023) [27]. However, the persistence of skill mismatches threatens to undermine these opportunities. According to the Periodic Labour Force Survey (PLFS) 2023-24, 90.2 per cent of India's workforce holds only secondary education or below, with 88.2 per cent engaged in elementary or semi-skilled occupations. Such a distribution constrains earnings potential only 4.2 per cent of those with advanced education earn between ₹4 lakh and ₹8 lakh annually, whereas 46 per cent of lower-skilled workers earn less than ₹1 lakh.

This incongruity between educational attainment and occupational requirements underscores the urgent need for comprehensive skill development frameworks. Technical and Vocational Education and Training (TVET) has been identified as a vital mechanism for bridging this gap by imparting hands-on, industry-relevant competencies (Betcherman *et al.*, 2002) [1]. Yet, PLFS data reveal that 65.3 per cent of the workforce lacks any formal vocational training, highlighting systemic shortfalls in training provision.

In response, the Government of India has launched a suite of initiatives aimed at upskilling, reskilling, and new-skilling the workforce. Programs such as the Craftsmen Training Scheme at Industrial Training Institutes (ITIs), which enrolled 1.24 crore trainees, and the Pradhan Mantri Kaushal Vikas Yojana (PMKVY), which trained 1.57 crore individuals and certified

1.21 crore, exemplify the scale of these efforts (MSDE, 2024). Complementary schemes Jan Shikshan Sansthan (27 lakh trained), PM Vishwakarma (11.79 lakh artisans), and the PM Internship Scheme (1.27 lakh placements in its pilot phase) further diversify training pathways.

Despite these gains, persistent disparities remain, particularly among rural populations and women. Female participation in TVET has risen from 6.9 per cent in 2018-19 to 24.5 per cent in 2023-24, yet remains below male levels. Moreover, geographic and socio-economic barriers limit access to quality training for many (OECD, 2023). To fully leverage India's demographic dividend and achieve inclusive growth, it is imperative to integrate foundational literacy initiatives under the National Education Policy 2020 with industry-aligned TVET programs, strengthen industry-academia partnerships, and deploy digital platforms such as the Skill India Digital Hub for broad-based outreach (MHRD, 2020; MSDE, 2024).

This paper examines the interplay of education, skills, and employment in India's labor market, evaluates the effectiveness of existing training schemes, and proposes strategic pathways for establishing a future-ready, resilient skill ecosystem capable of meeting the demands of a rapidly evolving global economy.

2. Review of Literature

The increasing prevalence of skill-job mismatches in India's labor market has prompted extensive scholarly inquiry since 2018. Mehrotra and Parida (2019) [19] analysed PLFS microdata and found that over 60% of workers lacked job-relevant training, contributing to underemployment and wage stagnation. Building on this, Berman *et al*. (2020) [11] demonstrated that mismatches predominantly affect semi-skilled and high-competency roles, where only 2.8% of workers with secondary education fill high-competency positions, underscoring the need for targeted vocational interventions.

Technical and Vocational Education and Training (TVET) has emerged as a critical policy lever. Gupta and Roy (2021) [13] compared outcomes for ITI graduates versus general education peers, showing a 15% higher placement rate for ITI alumni when curricula are co-designed with industry. Similarly, Singh and Kaur (2022) [26] evaluated the Pradhan Mantri Kaushal Vikas Yojana, reporting that 70% of certified trainees secured wage employment within six months, although women and rural participants still lag behind urban counterparts.

Digital platforms and experiential learning models have gained prominence. Reddy *et al*. (2023) [22] assessed the Skill India Digital Hub's 200+ new-age courses and found a 30% increase in course completion and a 20% improvement in job-readiness scores compared to traditional classroom training. Kolb's Experiential Learning Theory (1984) and Dewey's foundational work (1938) underpin these findings, with recent adaptations by Patel and Sharma (2024) [20] demonstrating that blended online-on-site modules boost retention by 25%.

Internships and apprenticeships are increasingly recognised for bridging academia-industry gaps. Kumar and Verma (2025) [15] evaluated the PM Internship Scheme pilot and found that 78% of interns received job offers post-placement, with 65% from tier-2 and tier-3 cities evidence of the scheme's democratizing potential. Meanwhile, Chopra *et al*. (2021) [12] highlighted that apprenticeship uptake under the National Apprenticeship Promotion Scheme doubled between 2018 and 2023, yet quality and formal recognition remain challenges.

Collectively, recent literature underscores that an integrated approach combining industry-aligned TVET, digital experiential learning, and structured internships offers the most promising pathway to mitigate skill mismatches and enhance employability in India's rapidly evolving labor market.

3. Need for study

India's rapid economic growth in the early 2020s has not been matched by commensurate improvements in workforce skills, leading to pervasive mismatches between education levels and occupational requirements. Despite initiatives such as PMKVY and ITI training, PLFS 2023-24 data show that 65.3% of workers lack any vocational training and 88.2% remain confined to elementary and semi-skilled roles. This disconnect constrains earnings potential, perpetuates inequality, and undermines productivity gains critical to leveraging India's demographic dividend. A systematic assessment of these gaps and the effectiveness of existing skill-development programs is therefore essential to inform policy reforms.

4. Objective of the study

This study aims to assess and address the persistent mismatch between India's educational qualifications and occupational skill requirements, by leveraging recent PLFS 2023-24 data and evaluating the effectiveness of key government training schemes. It investigates how initiatives such as Industrial Training Institutes (ITIs), Pradhan Mantri Kaushal Vikas Yojana (PMKVY), Jan Shikshan Sansthan, and the PM Internship Scheme influence employability and income levels, with a particular focus on disparities across gender and urban-rural divides. Drawing on these insights, the paper develops strategic recommendations to enhance vocational education integration, expand digital learning channels, and fortify industry-academia collaboration for a more resilient and future-ready workforce.

Key Objectives

- Quantify the extent of mismatch between educational attainment and occupational skills using PLFS 2023-24 data.
- Evaluate the reach and impact of major government initiatives ITI training, PMKVY, Jan Shikshan Sansthan, and the PM Internship Scheme on employability and income outcomes.
- Analyse gender and urban-rural disparities in access to vocational training.
- Propose strategic recommendations for integrating TVET into secondary and higher education, expanding digital learning platforms, and strengthening industry academia partnerships.

5. Research Methodology

This study adopts a descriptive and evaluative approach using exclusively secondary sources. The secondary data are drawn from the Periodic Labour Force Survey (PLFS) 2023-24 and annual reports of the Ministry of Skill Development and Entrepreneurship & Indian Economics Survey 2025-26. Supplementary insights are obtained from government policy documents (e.g., NEP 2020), published evaluations

of major schemes, and relevant peer-reviewed literature. Quantitative indicators such as percentages of trained workers, income distributions, and gender participation rates are tabulated and compared across schemes and demographic groups. Qualitative analysis of program frameworks and policy provisions informs the discussion of strategic interventions.

Limitation

The study's reliance on secondary sources PLFS 2023-24 and government reports limits insight into the quality and long-term impacts of training programs, as informal or unregistered skill acquisition may be underreported and employer perspectives are not directly captured; moreover, rapidly evolving technologies and labour market conditions may render some findings outdated, necessitating ongoing data updates and field-based validation beyond the paper's scope.

6. Skill Development: Upskilling, Reskilling and New Skilling for a Changing World

India's skilling and employment ecosystem is continually evolving, shaped by economic policies, technological advancements, globalization, and shifting labor market demands. In the face of disruptive trends like automation, generative AI, digitalization, and climate change, it is vital for India's skill development initiatives to align with these transformations. Building a resilient and responsive skilled workforce is critical to meet future opportunities, especially focusing on how prepared the youth are for emerging sectors.

Data from the Periodic Labour Force Survey (PLFS) 2023-24 highlights that 90.2% of India's workforce has secondary education or less. This educational skill composition results in most workers (88.2%) engaging in low-competency roles such as elementary and semi-skilled occupations. This distribution has major implications for earnings and economic growth. For instance, only 4.2% of the workforce with advanced education and specialized skills earns between ₹4 lakh and ₹8 lakh annually, whereas about 46% earn less than ₹1 lakh, primarily in low or semi-skilled jobs such as agricultural laborers and clerical staff.

Given the substantial share of lower-skilled workers, there is a pressing need for upskilling initiatives to enhance both individual incomes and broader economic productivity. Unlike general education, Technical and Vocational Education and Training (TVET) in India imparts practical skills tailored to industry needs. However, the PLFS 2023-24 shows that 65.3% of the workforce has not received any form of vocational training, signaling a significant gap in job-relevant skill development.

Addressing these challenges calls for a coordinated effort to expand vocational training, promote upskilling and reskilling programs, and better integrate technical education with labor market demands. This will help India's workforce transition effectively into emerging and higher-skilled roles essential for future economic resilience and growth.

Table 1: Matrix of mismatch between education skills and occupations

Occupational skill of workers	Primary Education (10 years or informal)	Secondary Education (11-13 years)	Graduate Degree	Postgraduate degree or above
Elementary skill	32.13	19.25	3.22	0.96
Semi-skilled	66.3	72.18	50.3	28.12
High competency skill	0.29	2.79	8.25	7.67
Specialised skills	1.28	5.77	38.23	63.26

Source: Institute for Competitiveness

The presented table highlights the significant mismatch between education levels and occupational skills among India's workforce. It shows that the majority of workers with only primary or secondary education are concentrated in elementary and semi-skilled roles 32.13% and 66.3% for primary, and 19.25% and 72.18% for secondary education, respectively. Highly-skilled and specialized roles are largely filled by those possessing graduate or postgraduate degrees, with 38.23% and 63.26% for specialized skills in these categories, compared to minimal presence among those with lower educational qualifications.

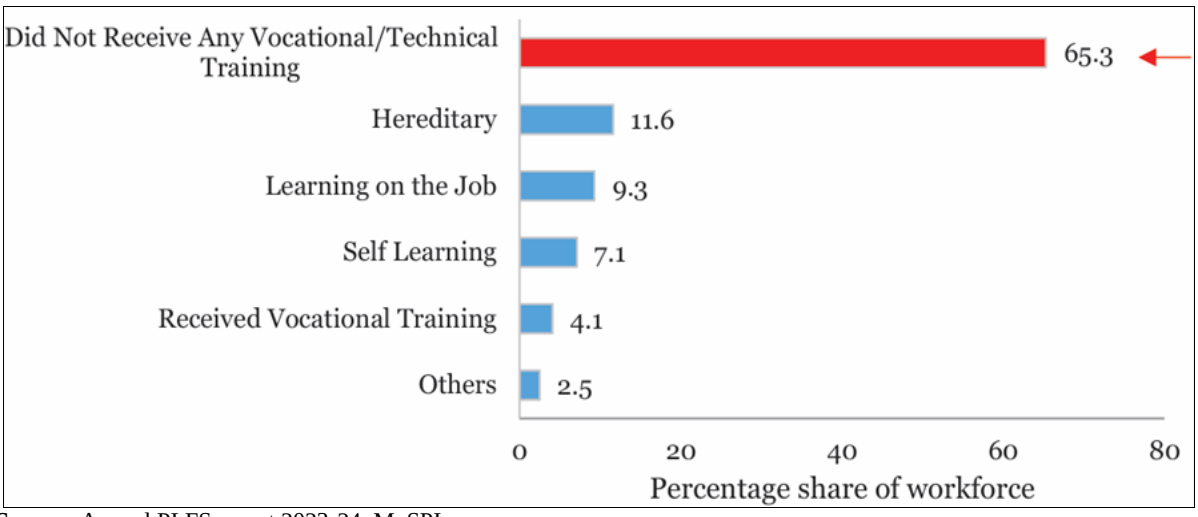
This distribution indicates that higher educational attainment correlates strongly with access to more advanced and specialized job roles, while limited education confines workers to lower-skilled occupations. Such disparities underscore the pressing need for targeted upskilling programs and vocational training, particularly for those with primary or secondary education, to enable broader participation in high-competency and specialized sectors, thereby improving both individual earning potential and overall economic resilience.

7. Skills, Education and Workforce Earnings in India

The composition of education and skills among India's workforce has a direct and significant impact on income levels and overall economic development. PLFS data reveals stark disparities: while a small proportion of the workforce (4.2 per cent) with higher education and specialised skills earns between ₹4 lakh to ₹8 lakh annually, nearly half (46 per cent) earn less than ₹1 lakh. This low-income group largely consists of agricultural labourers, factory workers, clerical staff, and small-scale service providers, reflecting the dominance of low to semi-skilled roles in India's employment structure. Such an imbalance underlines how limited access to education and skill specialisation restricts upward mobility and perpetuates inequality in the labour market.

A major concern highlighted by the PLFS 2023-24 is that 65.3 per cent of India's workforce has received no vocational training, despite the growing demand for industry-specific skills. Unlike general education, which is often theoretical, Technical and Vocational Education and Training (TVET) provides targeted, hands-on preparation for specific occupations. Expanding and strengthening TVET can increase employability, improve wage levels, and align the labour force with the needs of modern industries. Addressing this skills gap through comprehensive upskilling and reskilling initiatives remains critical for enhancing productivity, reducing income disparities, and fostering inclusive economic growth.

Status of vocational training in India for 2023-24 (age group 15-59 years)



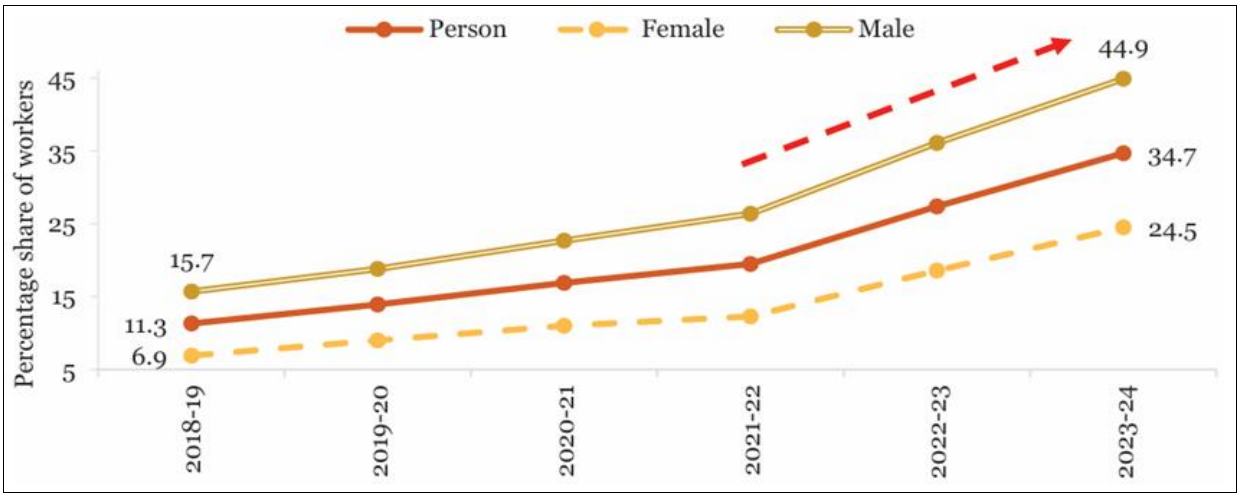
Source: Annual PLFS report 2023-24. MoSPI

The chart displays the status of vocational training among India's workforce aged 15-59 for the year 2023-24. It reveals that a striking 65.3% of the workforce did not receive any vocational or technical training, underscoring a major gap in job-relevant skill development. Among those who did gain some form of skill, 11.6% acquired skills through hereditary means, 9.3% learned on the job, and 7.1% engaged in self-learning, while only 4.1% had formal vocational training and 2.5% received skills through other sources.

This data highlights the overwhelming reliance on informal or non-institutional modes of acquiring skills in India, with formal vocational training contributing minimally. The predominance of untrained or informally trained workers suggests a critical need for expanding and strengthening formal vocational education and training initiatives to better prepare the workforce for modern labor market demands

According to the PLFS report 2023-24, there has been notable improvement in the proportion of skilled people across different socio-economic groups, including rural and urban areas and gender divisions. The data indicates that 4.9% of the youth aged 15-29 have received formal vocational or technical training, while an additional 21.2% acquired skills through informal sources. This demonstrates a significant positive trend in skill development from 2018-19 to 2023-24, reflecting enhanced efforts in expanding access to vocational training and improving workforce capabilities across all segments of society.

8. Increase in the share of workers receiving vocational/technical training (15 to 59 years of age)



Source: Annual PLFS Report, MoSPI

The chart illustrates a steady and marked increase in the overall share of Indian workers aged 15-59 receiving vocational or technical training between 2018-19 and 2023-24. In 2018-19, only 11.3 percent of all workers had received such training, rising gradually to about 15 percent in 2019-20, 18 percent in 2020-21, and 20 percent in 2021-22, before accelerating to 26 percent in 2022-23 and reaching 34.7 percent by 2023-24. This upward trajectory reflects enhanced access to training programs and growing recognition of skill development's importance for employability.

Gender-wise, men consistently exhibit higher participation in vocational training compared to women, but both groups show significant gains. Male participation climbed from 15.7 percent in 2018-19 to 18 percent in 2019-20, 23 percent in 2020-21, 26 percent in 2021-22, 36 percent in 2022-23, and 44.9 percent in 2023-24. Female participation, though lower, followed a similar pattern rising from 6.9

percent in 2018-19 to around 8 percent in 2019-20, 11 percent in 2020-21, 13 percent in 2021-22, 18 percent in 2022-23, and 24.5 percent in 2023-24. The convergence in growth rates underscores the expanding reach of training initiatives across all demographic segments.

9. Strengthening and Future-Ready Roadmap for India's Skill Development

- **Digital Empowerment through the Skill India Digital Hub:** The Skill India Digital Hub (SIDH) has emerged as a transformative platform, leveraging India's expanding digital infrastructure to democratize access to skill development. By hosting a diverse catalogue of courses spanning traditional trades to emerging technologies SIDH enables learners from across urban and rural areas to enroll in training tailored to current industry needs. Its integration with industry partners ensures that course content remains responsive to evolving employer requirements, thereby strengthening the link between skill acquisition and job readiness.
- **Dual Training System and Industry Exposure:** Complementing the digital portal is the dual training model, which embeds trainees within real workplace environments. Under this system, students split their time between classroom instruction and on-the-job learning, fostering practical competence alongside theoretical understanding. This approach not only enhances employability at the point of graduation but also accelerates trainees' adaptability when confronted with dynamic work processes.
- **Addressing Technological Disruption:** Despite these advances, rapid technological change driven by automation, artificial intelligence, and digitalisation poses fresh challenges. New skill demands in areas such as machine learning, data analytics, and sustainable technologies require a forward-looking strategy. To this end, the Ministry of Skill Development and Entrepreneurship continually updates its flagship ensuring that training pipelines remain aligned with emerging industry trends.
- **Integrating Foundational Literacy and Industry-Relevant Curricula:** Improving learning outcomes begins at the foundational level. The National Education Policy (NEP) 2020's emphasis on Foundational Literacy and Numeracy (FLN) aims to secure basic competencies in language, mathematics, and science by 2025. Simultaneously, NEP mandates that at least 50 percent of students in secondary and higher education be exposed to skill-based curricula gradually embedding vocational education into all secondary schools. This dual emphasis ensures that learners build strong fundamentals while gaining exposure to Industry 4.0 competencies.
- **Strategic Vision and Targeted Incentives:** Realizing India's demographic dividend and the Viksit Bharat 2047 vision depends on a cohesive, multi-sectoral plan. Key elements include deepening industry-academia partnerships, promoting continuous upskilling, and adopting flexible learning models. Early vocationalisation of education through revamped ITI offerings and placement-driven course rationalization will address mismatches in supply and demand. The Union Budget 2024-25 further supports this agenda with five flagship schemes earmarked to benefit 4.1 crore youth over five years, backed by a central outlay of ₹2 lakh crore. These targeted investments and incentive structures aim to bridge the skill gap, catalyze employment generation, and build a globally competitive workforce.

10. Skill Development Initiatives in India

Initiative Category	Details
Re-skilling, Up-skilling and New-skilling of the workforce	• Craftsmen Training Scheme (ITIs): 1.24 crore enrolled for long-term training • PMKVY (STT, SP, RPL): 1.57 crore trained, 1.21 crore certified • Jan Shikshan Sansthan (JSS): 27 lakh trained, 26 lakh certified • PM Vishwakarma: 11.79 lakh artisans trained across 3,145 skill centres in 559 districts • NCVET: 200+ new-age courses approved • PMKVY new-age roles: 4.65 lakh enrolled, 3.02 lakh completed, 98,000 undergoing • CTS in ITIs: 29 new-age courses introduced
Skilling Initiatives for Women Workers	• PMKVY: Women's share rose from 42.7% (2015-16) to 58.0% (2024-25) • JSS: Women are 82% of beneficiaries • ITIs & NSTIs: women's participation increased from 9.8% (2015-16) to 13.3% (2023-24) • NAPS: women's participation rose from 7.7% (2016-17) to 22.8% (2024-25, up to Oct 2024)
Industry Collaboration to Meet Employer Demand	• NAPS establishments: from 17,608 (2016-17) to 2.38 lakh (Oct 2024) • Apprentices engaged: 37.94 lakh (2016-17 to Oct 2024)\ • ITI Upgradation Scheme (Budget 2024): upgrade 1,000 ITIs in hub-and-spoke model; training 20 lakh youth over five years aligned to industry needs
Credit Facilitation	• CGFSSD/Model Skill Loan Scheme (notified 9 July 2024): • Loan limit increased to ₹7.5 lakh (from ₹1.5 lakh) • Guarantee coverage: 75% for up to ₹4 lakh; 70% for ₹4-7.5 lakh • Eligible lenders: NBFCs, NBFC-MFIs, Small Finance Banks • Course coverage expanded to non-NSQF courses via SIDH
Entrepreneurship Training	• NIESBUD (Apr 2018-Mar 2024): 3,21,258 beneficiaries trained • Indian Institute of Entrepreneurship, Guwahati (Apr 2018-Mar 2024): 1,43,470 beneficiaries trained and hand-held

Source: Indian Economic Survey 2025-26

11. PM Internship Scheme: Democratizing Learning

The PM Internship Scheme (PMIS), announced in the Union Budget 2024-25, aims to place one crore youth in 500 top companies over five years through 12-month paid internships. Targeting Indian nationals aged 21-24 with educational qualifications from matriculate to graduate, the

scheme excludes those already in full-time employment or education. Interns receive a monthly stipend of ₹5,000 (₹4,500 from government, ₹500 from host company) plus ₹6,000 for incidentals, funded jointly by the government and corporate partners.

- **Sector Coverage and Eligibility:** Internships span 24 sectors including oil and gas, energy, travel, hospitality, automotive, banking, and financial services ensuring diverse opportunities. Eligibility extends to graduates and non-graduates, except premier institution alumni (IITs, CAs, etc.), fostering inclusivity for youth in tier-2 and tier-3 cities.
- **Implementation and Pilot Phase:** Launched on 3 October 2024 via an online portal managed by the Ministry of Corporate Affairs, the pilot phase engaged 280 companies across 36 states and union territories, offering over 1.27 lakh internships in more than 740 districts. Companies were selected based on average CSR expenditure, and CSR funds can supplement scheme costs.
- **Democratizing Access and Impact:** By creating market-led, youth-driven internships, PMIS bridges academic learning and industry requirements, enhancing employability and economic growth. Interns gain real-world exposure, developing critical soft skills responsibility, problem-solving, teamwork, and time management while employers benefit from a talent pipeline aligned with CSR mandates. Early data shows over three lakh candidate profiles created and 6.5 lakh applications submitted, signaling strong demand and transformative potential.
- **Strategic Alignment and Future Prospects:** Aligned with NEP 2020 and the broader goal of reducing 'talent sans employability,' PMIS functions independently of existing skilling schemes to provide focused internship experiences. To fully harness India's demographic dividend, the scheme requires sustained publicity, industry collaboration, and adaptive implementation, positioning interns for success in an AI-driven, rapidly evolving labor market.

12. Conclusion

The analysis of India's skill development ecosystem underscores both the substantial progress and the persistent gaps in aligning education with employment. While initiatives such as the Craftsmen Training Scheme at ITIs (1.24 crore long-term trainees), PMKVY (1.57 crore trained, 1.21 crore certified), JSS (27 lakh trained), and PM Vishwakarma (11.79 lakh artisans) have significantly expanded access, 65.3 percent of the workforce still lacks any vocational training. Moreover, 90.2 percent of workers possess only secondary education or less, resulting in 88.2 percent employed in elementary or semi-skilled roles.

Recent gains in formal training rising from 11.3 percent in 2018-19 to 34.7 percent in 2023-24 and improved female participation (from 6.9 percent to 24.5 percent) demonstrate the impact of digital platforms like SIDH and dual training models. Nonetheless, rapid technological change demands deeper integration of TVET within secondary and higher education (targeting 50 percent exposure by 2025) and greater industry-academia collaboration. Strategic upskilling through new-age courses, credit facilitation (₹7.5 lakh loan limit under CGFSSD), and targeted internships (1.27 lakh PMIS placements) must be scaled to bridge remaining skill mismatches, boost employability, and fully harness India's demographic dividend in an AI-driven economy.

Nevertheless, persistent disparities in skill acquisition especially among rural, female, and early-career cohorts underscore the need for deeper integration of foundational literacy, vocational curricula, and industry-academia partnerships. Embedding skill education across secondary and higher levels under the National Education Policy, rationalizing ITI offerings based on placement outcomes, and scaling flexible, technology-enabled learning will be crucial. As automation, AI, and digitalization reshape job profiles, India's success in harnessing its demographic dividend hinges on a responsive, inclusive, and future-ready skilling ecosystem that equips every learner with the practical and adaptive capabilities required to thrive in a dynamic global economy.

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