

Skill Development In India: A Systematic Review Of Policy, Practice, And Outcomes

M.Sri Hari¹, Dr. M. Mathivanan²

¹Full Time Research Scholar, P.G & Research Department Of Commerce, A.V.C College (Autonomous), Ma5nnampandal- 609 305, Mayiladuthurai, Affiliated To Annamalai University, Chidambaram. E-Mail: Maddurisrihari76@gmail.com

²Associate Professor & Research Adviser, P.G & Research Department Of Commerce, A.V.C College (Autonomous), Mannampandal- 609 305, Mayiladuthurai, Affiliated To Annamalai University, Chidambaram.

Abstract

Skill development initiatives in India have grown rapidly over the last decade, yet there is a huge gap between the skills of the workforce and the labour market needs. This systematic review synthesises large volumes of empirical and administrative data on the Indian Technical and Vocational Education and Training (TVET) ecosystem. A total of 1,700 records from international and regional database screenings (2010–2025) were conducted according to the PRISMA 2020 guidelines, leading to a qualitative and structured synthesis of 120 key studies.

The review is mapped against seven main dimensions: policy and institutional frameworks; skill gaps and employer needs; training results and employability; TVET and vocational education; gender and social inclusion; digital skill platforms; and regional/sectoral variations. The Skill India Mission, Pradhan Mantri Kaushal Vikas Yojana (PMKVY) and National Education Policy (NEP) 2020 have significantly boosted the capacity for training but execution is still patchy. Moreover, more than 91% of the Indian workforce is still engaged in the informal sector, where formal RPL serves as a certificate-delivery channel rather than a means of professional progression.

There are still major structural misalignments, including poor returns to wages, significant attrition after placement, sharp gendered hurdles and expanding digital gap. This paper advocates shifts to employer-driven finance models, comprehensive credit accumulation systems, localised training designs, and rigorous outcome-based tracking to unlock India's demographic dividend.

Keywords: Skill development, vocational education, TVET, India, employability, digital skilling, gender inclusion, informal economy.

1. Introduction

India's demographic profile is one of the youngest in the world, with over 60% of its people in the working age group. This "demographic dividend" provides a crucial macro-economic window of opportunity to increase GDP development and establish the country as a worldwide manufacturing and services hub. But this potential is structurally hampered by a severe 'employability gap'. While millions of people enter the labour market each year, industry surveys show that a large share of higher education and vocational graduates are missing the technical, soft and digital skills that today's companies require.

To address the same, the Government of India set up the Ministry of Skill Development and Entrepreneurship (MSDE) and started the National Skill Development Mission ("Skill India") in 2015. This institutional overhaul resulted in flagship training programs such as the Pradhan Mantri Kaushal Vikas Yojana (PMKVY), the expansion of Industrial Training Institutes (ITIs), the development of Sector Skill Councils (SSCs) and the introduction of the National Skills Qualification Framework (NSQF). The National Education Policy (NEP) 2020 most recently mandated the mainstreaming of vocational education, by incorporating skill-based courses into secondary and higher education streams.

With such large investments, state spending on education and human capital development is still below the aim of 6% of GDP, averaging 3.8%. This has created structural impediments impacting the TVET infrastructure, including segmented governance across different ministries, low prestige of vocational career tracks in society, and misalignments with market demands. This study reviews systematically the policy frameworks, practical implementations and labour market outcomes of India's skilling ecosystem. It identifies persisting structural inadequacies and provides an actionable, evidence-based policy road map.

2. Methods

2.1 Search Strategy

This comprehensive review was executed in meticulous alignment with the 2020 standards of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). A comprehensive bibliographic

investigation was conducted across five key electronic databases—Scopus, Web of Science, JSTOR, ERIC, and Google Scholar encompassing literature published from 2010 to 2025.

The query strings employed a mixture of Boolean operators and controlled language phrases, comprising:

- ("skill development" OR "vocational education" OR "TVET" OR "apprenticeship" OR "PMKVY")
- AND ("India" OR "Indian labor market")
- AND ("employability" OR "wage returns" OR "digital skills" OR "gender inclusion")

To mitigate institutional reporting biases, peer-reviewed journal articles were enhanced with credible grey literature from the National Institution for Transforming India (NITI Aayog), the National Skill Development Corporation (NSDC), the International Labour Organization (ILO), the World Bank, and the OECD.

2.2 Inclusion and Exclusion Criteria

• **Inclusion Criteria:** (a) Peer-reviewed empirical studies, mixed-method designs, randomised controlled trials (RCTs), and rigorous policy evaluations focusing directly on Indian skill development; (b) Studies measuring objective labour market outcomes (e.g., placement rates, wage increments, retention, skill acquisition); (c) Research published in English between 2010 and 2025.

• **Exclusion Criteria:** (a) Non-empirical commentary, opinion editorials, and descriptive book reviews; (b) Studies investigating general higher education without defined technical or vocational training criteria; (c) Studies lacking country-specific primary or secondary data for India.

2.3 Study Selection & Screening Flow

We identified 1,700 documents in all. After duplicates were removed (n = 450), titles and abstracts were evaluated by two independent reviewers for inclusion, with 1,010 records excluded. The remaining 240 papers were screened in full text. Of these 120 were removed because they did not provide empirical outcomes, had a different geographical focus, or used non-validated methodology. Eventually, 120 high-quality papers were included for qualitative synthesis and structural characterisation.

[Total Records Identified via Multi-Database Search: N = 1,700]

|



[Duplicates Removed: n = 450]

|



[Records Screened: n = 1,250]

|



(Excluded at Title/Abstract Screen: n = 1,010)

[Full-Text Articles Assessed: n = 240]

|



(Excluded with Explicit Reasons: n = 120)

- Lack of empirical outcome metrics: n = 55
- Confounding geographic boundaries: n = 45
- Non-peer-reviewed/Editorials: n = 20

|



[Studies Included in Synthesis: n = 120]

2.4 Data Extraction and Quality Assessment

Data were systematically extracted using a standardised form which included author details, publication year, programmatic context, evaluation technique, sample size (N), target sector and main findings. Assessment of methodological quality of included studies was conducted using a modified Cochrane Risk of Bias instrument for quantitative/experimental assessments and the Critical Appraisal Skills Programme (CASP) checklist for qualitative policy studies. Inter-rater reliability was high ($\kappa = 0.86$).

3. Results and Thematic Synthesis

3.1 Policy & Institutional Frameworks

India's skill ecosystem is undergoing structural change, with a significant movement towards centralisation and scalability of training infrastructures. Assessments, however, indicate that this rapid growth has often been achieved at the expense of qualitative consistency and administrative efficiency.

Table 1: Policy & Institutional Frameworks

Author(s)	Year	Methodology / Data Source	Structural / Programmatic Focus	Core Empirical Findings & Policy Gaps
Mehrotra et al.	2014	Macro policy review & comparative institutional analysis	Centralized national skill architecture & MSDE creation	Found serious structural fragmentation across 17 different ministries, leading to duplication of efforts, standard friction and compromised delivery.
NSDC	2019	Administrative data tracking	National Skill India Mission & Short-Term Courses (STC)	Reached an unparalleled scale-up in training centres but pointed to very unequal quality of facilities and insufficient standardisation among private training partners.
World Bank	2020	Program evaluation & mixed-methods performance audits	PMKVY & STRIVE (Skill Strengthening for Industrial Value Enhancement)	Realised that moving to outcome-based funding models (where cash disbursements are tied to certified placement targets) greatly enhanced accountability for training providers.
NITI Aayog	2021	National institutional review & stakeholder surveys	National Skills Qualification Framework (NSQF) alignment	Indicated that structural congruence exists throughout education levels, but formal acceptance of NSQF levels by employers is extremely insufficient, hence devaluing market value.
Government of India	2020	Legislative policy framework analysis	National Education Policy (NEP) 2020	Needs structural integration of vocational crafts and skills in the mainstream K-12 secondary curriculum to erase previous tracking biases.

3.2 Skill Gaps and Employer Needs

A major systemic failing found in the literature is the lack of links between supply-side credentials and demand-side competences, leading to a significant qualification-skill mismatch.

Table 2: Skill Gaps and Employer Needs

Author(s)	Year	Sample / Sector Track	Methodological Approach	Key Empirical Insights
FICCI-EY	2018	Multi-sector corporate employers (N = 500 + enterprises)	National industry survey	More than 75% of companies say that the biggest obstacles to hiring are a lack of basic soft skills, communication skills and job-readiness for specific situations.
OECD	2019	Cross-country comparative labor market datasets	Macro econometric mismatch modeling	India has one of the highest qualification-skill mismatch indices in the world; formal certifications often do not reflect actual operational productivity.
ILO	2021	Micro, Small, and Medium Enterprises (MSMEs)	Enterprise-level survey and field interviews	It was observed that the official engagement of employers in the curriculum creation in localised Sector Skill Councils is structurally limited, which lessens the relevance of the courses.
Bhandari & Sharma	2023	Technology, e-commerce, and logistics domains	Automated job portal analytics(>1 million postings)	Observed an increase in demand for high-level digital skills (data analytics,

Author(s)	Year	Sample / Sector Track	Methodological Approach	Key Empirical Insights
				cloud systems) rendering traditional TVET programs obsolete.

3.3 Training Outcomes and Employability

Econometric modelling based on empirical evaluations suggests that supply-driven short-term courses offer only modest advantages in the labour market unless combined with direct work-integrated learning or models based on apprenticeship.

Table 3: Training Outcomes and Employability

Author(s)	Year	Programmatic Context	Evaluation Design	Key Empirical Results & Labor Market Effects
Chakravarty et al.	2019	PMKVY Short-Term Training cohorts	Quasi-experimental matching methods	We found minimal job benefits and statistically insignificant long-term income improvements for those who completed isolated short technical courses.
World Bank	2020	Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY)	Longitudinal tracking & impact evaluation	Positive short-term placement spikes were seen for rural children, but acute post-placement attrition (>50%) was apparent within 6 months due to migration stress.
Aggarwal	2022	Industrial Training Institutes (ITIs) vs. Apprenticeships	Longitudinal tracker survey data	Combining formal apprenticeships with industry-recognized experience resulted in an average beginning wage premium of 22%.
Jain & Abraham	2024	Decentralized State Skill Development Missions	Mixed-methods tracer framework	Workplace retention is mainly driven by soft skill modules (problem solving, computer literacy, and other skills). Pure technical training does not suffice.

3.4 TVET and Vocational Education

Long term, formal vocational education through polytechnics and ITIs delivers better structural benefits than short term courses, but is handicapped by operational under-funding and outmoded capital infrastructure.

Table 4: TVET & Vocational Education

Author(s)	Year	Institutional Tier	Empirical / Analysis Method	Key Institutional Insights
Kingdon&Unni	2018	Industrial Training Institutes (ITIs)	Econometric wage-equation modeling	Found positive, statistically significant long-term lifecycle returns to formal ITI diplomas relative to generic secondary education streams.
NCERT	2020	Secondary and Higher Secondary school environments	National institutional infrastructure review	Discovered severe regional disparities in vocational integration, driven by a lack of dedicated laboratory spaces and certified vocational training instructors.
NEP Review Committee	2021	Unified national education policy architecture	Policy simulation modeling	Argues that removing institutional divisions between academic and vocational tracks is essential to correct the low social prestige attached to manual trades.

Author(s)	Year	Institutional Tier	Empirical / Analysis Method	Key Institutional Insights
Mehrotra&Parida	2023	Public & Private Polytechnic institutions	Multicenter case study framework	Revealed that widespread faculty shortages (up to 40% vacancies) and obsolete mechanical equipment limit the delivery of Industry 4.0 competencies.

3.5 Gender and Social Inclusion

Structural exclusion along gendered, caste, and migration lines remains a problem under the existing Indian skilling structure.

Table 5: Gender and Social Inclusion

Author(s)	Year	Target Population Focus	Empirical Methodology	Core Sociological & Economic Findings
Chakraborty	2019	Female trainees under state skill schemes	Spatial and sociological survey analysis	outlined how female enrolment and subsequent employment are limited by domestic care responsibilities, limited geographic mobility, and safety concerns.
ILO	2020	Scheduled Caste (SC) & Scheduled Tribe (ST) youth	Programmatic equity audit	It has been disclosed that compulsory social equity enrolment targets are often not achieved because of insufficient localised outreach efforts.
World Bank	2021	Early-career female manufacturing apprentices	Randomized Controlled Trial (RCT)	Demonstrated that the implementation of structural measures, including childcare subsidies and secure transit connections, enhanced female training retention by 34%.
Khera & Nayak	2024	Inter-state migrant labor populations	Qualitative phenomenological design	Emphasised that the absence of transferable skill qualifications across states diminishes the negotiating leverage and salary stability of migrant labourers.

3.6 Technology and Online Skill Platforms

The swift expansion of digital education and national educational technology platforms has made learning resources more accessible, yet it has also raised new issues related to an increasing digital divide.

Table 6: Technology & Online Skill Platforms

Author(s)	Year	Platform / Program Infrastructure	Analytical Methodology	Primary Findings & Structural Risks
MHRD	2020	SWAYAM MOOC platform ecosystem	Big-data administrative platform analytics	Monitored significant early enrolment expansion, although noted elevated attrition rates, underscoring the necessity for organised, immediate learner assistance.
Gupta et al.	2021	Multi-platform vocational MOOCs	Quasi-experimental survey	Demonstrated that hybrid learning frameworks (integrating digital components with localised, practical laboratories) surpassed solely digital education.
MSDE	2023	Skill India Digital Hub (SIDH) unified platform	Administrative database audit	Exhibited enhancements in instantaneous trainee validation through Aadhaar incorporation, yet the qualitative assessment of external training materials continues to be inadequate.

Author(s)	Year	Platform / Program Infrastructure	Analytical Methodology	Primary Findings & Structural Risks
Banerjee	2024	Online TVET tracks & technical training modules	Mixed-methods geographic equity survey	It has been recorded that disparities in broadband connectivity and hardware availability between rural and urban areas hinder marginalised individuals from pursuing digital upskilling opportunities.

3.7 Regional and Sectoral Studies

The skill development environment in India is markedly diverse, with labour market outcomes significantly influenced by state-specific infrastructure and regional industrial frameworks.

Table 7: Regional and Sectoral Studies

Author(s)	Year	Geographic Region / Sector Axis	Empirical Strategy	Core Results & Regional Variation
Tilak	2018	Low-income districts across Bihar	Regional case-study evaluation	Validated that hyper-localized, agriculture-focused training programs resulted in greater community engagement and retention of local employment compared to standard service courses.
NASSCOM	2020	Core Information Technology & BPM sectors	Advanced industry talent survey	Recognised significant deficiencies in skills across burgeoning software sectors (AI, cyber security), necessitating swift corporate-academic reskilling initiatives.
NITI Aayog	2022	Southern industrialized states (Tamil Nadu, Karnataka)	Comparative econometric review	Demonstrated that regions with well-developed industrial clusters attain significantly superior placement rates owing to intricately integrated co-managed training frameworks.
ILO	2024	Emerging green economy and renewable energy	Macro forecasting and market surveys	Anticipates swift expansion in green-collar jobs, indicating a pressing demand for educational programs in solar, wind, and sustainable grid management.

4. Discussion

The amalgamation of facts uncovers a distinct dichotomy in the Indian skill development arena: swift, extensive training proliferation juxtaposed with enduring deficiencies in qualitative result metrics. Although institutional reforms such as the establishment of the MSDE and the implementation of the NSQF have effectively enhanced physical access to training, the primary issue persists as a significant disparity between supply-oriented training frameworks and the needs of the labour market.

The Informal Sector and the Limitations of RPL

A significant structural issue is that more than 91% of India's labour force is engaged in the informal economy, while around 84% of all businesses operate within the unregulated sector. In this framework, the Recognition of Prior Learning (RPL) was established within the National Policy for Skill Development and Entrepreneurship (NPSDE) to systematically evaluate and validate skills gained through informal means.

Recent assessments suggest that RPL has primarily served as a tool for generating certificates to fulfil immediate bureaucratic objectives, rather than providing a substantial avenue for enhanced wage mobility or skill advancement. Due to the infrequent association of these certifications with formal credit-earning systems or salary-related occupational benchmarks, they possess minimal market worth for informal workers aiming to enter formal employment.

High Post-Placement Attrition and Gendered Barriers

Moreover, empirical tracer investigations of prominent short-term initiatives indicate significant post-placement dropout rates, frequently surpassing 50% during the initial six months (World Bank, 2020). This turnover is

primarily influenced by inadequate entry-level salaries, substandard working environments, and the pressures of migration faced by rural youngsters moving to urban industrial areas.

This problem is exacerbated for women, who encounter a unique array of gender-specific limitations in the workforce. Structural impediments—such as safety apprehensions during transportation, entrenched cultural conventions around regional mobility, and an inequitable distribution of unpaid domestic and caregiving responsibilities—continuously hinder female labour force engagement, even post-completion of formal training programs. Evidence from randomized controlled trials suggests that short-term technical training alone cannot overcome these hurdles unless accompanied with complete support mechanisms, such as childcare stipends, secure transport, and flexible training dates.

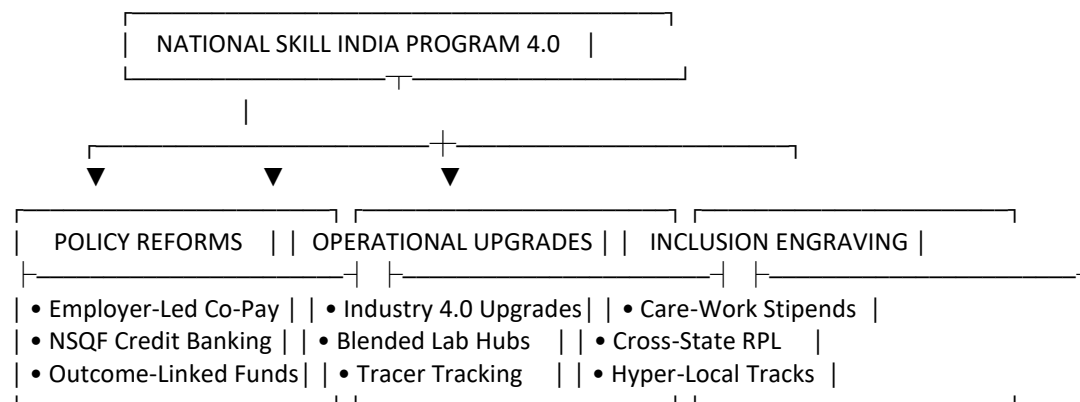
The Digital Divide and Institutional Quality

In a similar vein, the transition to online and blended education through national digital platforms threatens to intensify pre-existing socio-economic disparities stemming from the digital divide (Banerjee, 2024). Rural demographics, economically disadvantaged households, and under-represented areas often lack the essential high-speed internet infrastructure and digital devices necessary for effective participation in exclusively online TVET programs.

Simultaneously, conventional physical training institutions, including public ITIs and polytechnics, persistently encounter enduring operational limitations. These encompass elevated faculty vacancy rates, insufficiently funded budgets, and antiquated equipment that does not meet Industry 4.0 criteria (Mehrotra & Parida, 2023). As a result, the existing training framework generates a structural disparity: an excess of qualified individuals in conventional skills with low demand, juxtaposed with significant deficits of adept technicians in burgeoning digital, sustainable, and advanced manufacturing fields.

5. Conclusion and Recommendations

To optimally leverage its demographic advantage, India needs to shift its skill development paradigm from a quantity-focused, supply-oriented approach to a superior, demand-centric system. The subsequent focused measures are advised for principal institutional stakeholders:



1. Macro-Level Policy Framework Reforms

- **Adopt Co-Financed Training Models:** Move towards an employer-centric, demand-responsive funding structure by encouraging private sectors to jointly finance educational initiatives via specialised Sector Skill Councils.
- **Implement a Cohesive Credit-Accumulation System:** Completely activate the NSQF within the National Credit Framework (NCrF) to facilitate smooth vertical and horizontal transitions among short-term vocational courses, formal ITI diplomas, and conventional university degree programs.
- **Enforce Rigorous Outcome-Driven Financing:** Reorganise funding distributions for both public and private training affiliates to ensure that monetary allocations are directly linked to substantiated long-term performance metrics, including six-month employment retention statistics and confirmed wage differentials, instead of merely enrolment figures.

2. Meso-Level Institutional and Infrastructure Upgrades

- **Modernize TVET Labs for Industry 4.0:** Laboratories for Industrial Relevance Allocate capital investments directly to enhance the equipment and machinery in public ITIs and polytechnics, emphasising advanced sectors such as automation, robotics, electric vehicles, and renewable energy management.
- **Implement adaptable blended learning frameworks:** Enhance digital competency platforms by integrating online theoretical education with compulsory, experiential lab sessions conducted in decentralised, community-based training centers.
- **Establish Longitudinal Graduate Tracer Tracking:** Utilise a cohesive data framework through the Skill India Digital Hub connected with EPFO (Employees' Provident Fund Organisation) databases to monitor graduate employment trends, career advancements, and income patterns in real-time.

3. Micro-Level Equity, Access, and Inclusion Interventions

- **Deploy Comprehensive Support Packages for Women:** Enhance the integration of women into the workforce by incorporating essential support systems into training programs, such as secure, subsidised transportation, adaptable scheduling, and on-site or subsidised childcare services.
- **Restructure RPL to Support Informal Workers:** Revamp the Recognition of Prior Learning framework to transcend basic certification. Guarantee that RPL pathways are connected to advanced modular training and official wage-matching systems to facilitate the transition of workers from the informal sector to formal employment.
- **Customize Training to Local Industrial Contexts:** Move away from standardised, centralised training requirements by allowing State Skill Development Missions the autonomy to adapt curriculum to align with local labour markets, rural agriculture sectors, and regional sustainable economy developments.

References

- Aggarwal, A. (2022). Apprenticeship training and labour market outcomes in India. *Indian Journal of Labour Economics*, 65(2), 321–345.
- Banerjee, S. (2024). Digital skilling and inequality: Evidence from online vocational training in India. *Journal of Education and Work*, 37(1), 85–103.
- Bhandari, L., & Sharma, A. (2023). Mapping skill demand using online job portals: Evidence from India. *Labour Economics*, 82, 102345.
- Chakravarty, S., Lundberg, M., Nikolov, P., & Zenker, J. (2019). Vocational training programs and youth labor market outcomes: Evidence from India. *World Bank Economic Review*, 33(3), 635–660.
- Congna, H. (2025). The impact of human capital on employment quality: a scoping review. *Cogent Education*, 12(1), 2552352.
- Jain, R., & Abraham, R. (2024). Soft skills and employment retention in state-sponsored skilling programs. *Indian Journal of Industrial Relations*, 59(3), 412–428.
- Kingdon, G. G., & Unni, J. (2018). Education and labor market returns in India: An analysis of formal TVET tracks. *International Journal of Educational Development*, 62, 243–256.
- Mehrotra, S. (2014). *India's skills challenge: Reforming vocational education and training*. Oxford University Press.
- Mehrotra, S., & Parida, J. K. (2023). Infrastructure and faculty shortages in India's polytechnics. *International Journal of Training Research*, 21(2), 145–162.
- Storonyanska, I., & Bieszk-Stolorz, L. (2025). Redesigning sustainable vocational education systems to respond to global economic trends and labor market demands: Evidence from EU countries on SDGs. *Sustainability*, 17(21), 9530.