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From Skill Acquisition to Workforce Intelligence: An Institutional Financing Architecture for India's Skill Economy

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Abstract

Traditional Technical and Vocational Education and Training (TVET) systems suffer from structural misalignments caused by supply-side financing and labour-market information frictions, creating a systemic observability gap. To address this gap, this paper reconstructs a novel empirical baseline for aggregate TVET expenditure in India, triangulating fragmented data sources to estimate annual expenditure at ₹63,923–₹89,506 crore. To improve allocative efficiency, we propose a dual-pillar institutional architecture integrated into India's Digital Public Infrastructure (DPI): the Integrated Labour Contribution Base (ILCB), a layered data architecture unifying formal, payroll, and informal-worker records, and the Reimbursable Industry Contribution (RIC), a mandatory 2% payroll-linked levy – grant mechanism for formal-sector firms. Macro-fiscal lifecycle modelling demonstrates that a balanced annual allocation of ₹21,420 crore can sustainably co-finance in-firm and apprenticeship training while expanding support for Recognition of Prior Learning, skill loans, and training vouchers. The RIC generates sufficient revenue to mitigate training externalities and employer free-riding, offering a generalizable institutional blueprint for skills financing across the Global South.

JEL classification

H25, I25, J24, O15, O38

Keywords

TVET, human capital, Levy–Grant system, digital public infrastructure, informal economy, lifecycle fiscal projection

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1. Introduction

TVET systems in emerging economies face a paradox: policy claims to be demand-driven, but financing remains tethered to supply-side public budgets. This institutional disconnect creates systemic human capital mismatches. While firms are consumers of skilled labour, they remain peripheral to the financial and governance frameworks that govern skill formation. This paper addresses this equilibrium failure by establishing a unified institutional architecture that integrates employer-financed levy – grant mechanisms with real-time digital public infrastructure (DPI) to shift workforce policy from static 'skill acquisition' to dynamic 'workforce intelligence-driven skill formation.'

International experience suggests that this problem is not unique to India. More than one hundred countries have adopted training levy systems to address failures in workforce development, including underinvestment and weak alignment between training and labour-market needs. However, existing literature usually treats financing failures and information failures separately. Few studies combine employer-financed levies and labour-market intelligence within one governance framework. This paper addresses that gap by arguing that financing systems and information systems should not be treated as separate policy domains. Instead, they can be combined into a single governance framework that simultaneously achieves resource mobilization, accountability, and adaptiveness to labour-market demand.

Our argument is that workforce development has evolved beyond a training-finance problem into a broader challenge of institutional governance. Navigating rapid technological disruptions alongside structural informality requires deep systemic observability, followed by responsive and accountable institutional coordination. Given India's large informal workforce and fragmented training ecosystem, the proposed Reimbursable Industry Contribution (RIC)–Integrated Labour Contribution Base (ILCB) architecture is intended to enable institutional leapfrogging by moving directly to a continuous workforce-intelligence model rather than following the conventional linear 'Levy–Fund–Training' trajectory. By integrating labour-market information and financing flows across formal and informal segments of the economy, the framework addresses persistent coordination failures in skills development.

Our fiscal reconstruction for India's TVET establishes that the aggregate national expenditure across central ministries, states, multilateral loans, and corporate outlays ranges between ₹63,923–₹89,506 crore annually. Within this, corporate in-firm training investments represent a marginal portion, totalling ₹1,960 crore. Additionally, the system fails to systematically address worker skill needs over a lifetime (see Appendix A for the complete methodology and data sources of this national baseline). By contrast, our lifecycle fiscal projection targets operational efficiencies for specific labour-market participants, requiring an estimated ₹56,400 crore annually for active training delivery (see Table 7A and Table 7B for channel volumes and unit-cost assumptions).

Structurally, the paper operationalizes the 2% payroll levy recommendation originally outlined in the 2015 National Policy for Skill Development and Entrepreneurship while responding to recent calls of the Economic Survey 2024–25 for integrated labour-market data systems. Through digital interoperability between Employees' Provident Fund Organisation (EPFO), Employees' State Insurance Corporation (ESIC), e-Shram, and the National Career Service (NCS), the ILCB provides the workforce intelligence needed to support demand-led skills policy.

Against this institutional backdrop, this paper contributes to the literature in four ways. First, it reconstructs India's annual TVET financing envelope by triangulating fragmented administrative and fiscal data to establish a comprehensive empirical baseline. Second, it develops the Reimbursable Industry Contribution (RIC), a reimbursable levy–grant financing mechanism designed to internalise training externalities and strengthen employer incentives for workforce investment. Third, it integrates financing and labour-market information by proposing the Integrated Labour Contribution Base (ILCB), a digital public information infrastructure that generates workforce intelligence for evidence based financing and coordination across employers, workers, and public agencies. Fourth, it

operationalises these institutional innovations through a lifecycle fiscal projection that allocates resources across different worker groups while evaluating the fiscal sustainability of the proposed financing architecture.

Although these are calibrated using Indian administrative and fiscal data, the proposed institutional architecture is intended to be adaptable to other emerging economies characterized by fragmented skills financing, large informal labour-markets, and expanding Digital Public Infrastructure.

The paper is structured as follows: Section 2 distinguishes skill acquisition from skill formation and describes the methodology; Section 3 analyses India's skills financing challenge; Section 4 explores the theoretical rationale and market failures; Section 5 reviews international systems; Section 6 presents the Integrated Labour Contribution Base enabling RIC; Section 7 outlines the Reimbursable Industry Contribution mechanism and lifecycle model; Section 8 details its implementation pathway; Section 9 discusses limitations; and Section 10 concludes. Detailed data methodologies are provided in Appendix A and Appendix B.

2. Conceptual Framework and Research Methodology

2.1 Conceptual Framework

India's workforce policy heavily emphasizes skill acquisition (enrolments and certifications), but the structural challenge lies in *skill formation*—the broader institutional process through which human capital is created, financed, certified, and deployed. Unlike program-driven, supply-oriented acquisition models that rely on public funding, a true skill formation system is demand-oriented and institutionally embedded. It integrates critical governance arrangements, financing mechanisms, labour-market signals, and deep employer participation to shape how competencies are developed. In this view, skills do not emerge in institutional isolation; they are formed through continuous interaction among employers, workers, training providers, and the market infrastructure. Systemic success is then measured by employment outcomes, productivity gains, and workforce adaptability rather than by static certification volumes.

International experience suggests that effective vocational systems move beyond training-centered approaches toward broader skill formation systems. Countries such as Germany and Singapore are distinguished not just by training availability, but by institutional arrangements for collective endeavour that combine employer participation, stable financing, workforce intelligence, workplace learning, and nationally recognized qualifications.

These international experiences inform the institutional design proposed in this study. The following section presents the research methodology through which it is developed, calibrated, and evaluated in the Indian context.

2.2 Research Methodology

This paper adopts a mixed-methods research design to examine an institutional response to the resource mobilisation–accountability–responsiveness trilemma in TVET financing. The research comprises the following complementary components.

- i. *Theoretical framework and market-failure analysis:* We use Human Capital Theory and Institutional Economics to identify the market failures that constrain skills formation in India. These are categorised into financing failures (free-rider problems and credit constraints) and information failures (asymmetries and coordination gaps). This theoretical lens justifies the transition from a 'training-finance model' toward a 'workforce-intelligence model'.
- ii. *Comparative Policy Review:* A thematic analysis of international training levy systems was performed to identify adaptable design principles for the Indian context.

- iii. *Empirical Data Triangulation and Fiscal Modelling*: Because India lacks unified fiscal reporting for vocational training, our quantitative evaluation is structured around a dual-model analytical architecture to isolate historical baselines from future policy simulations:
 - i. *The National TVET Expenditure Reconstruction (Current State)*: We triangulate administrative data from public budgets, enterprise registries, corporate social responsibility (CSR) disclosures, and multilateral finance to systematically reconstruct the national TVET financial baseline. (see Appendix A).
 - ii. *The Lifecycle Fiscal Projection and Channel Allocation (Proposed State)*: To assess the sustainability of the proposed 2% levy, this accounting projection model applies parameter variations—including collection efficiencies, evasion risks, and cohort uptake rates—to an estimated EPFO payroll wage base to map and balance fund deployment across the four lifecycle channels (see Appendix B).

Methodological Note: These models serve distinct analytical purposes; the former maps the factual landscape of current expenditure, while the latter projects a counterfactual structural equilibrium for a targeted lifecycle fund. They are not directly comparable expenditure totals.

- iv. *Architecture Design (ILCB and SVI)*: The ILCB was designed by mapping key administrative databases used in India's digital public infrastructure, including Goods and Services Tax (GST) system, Ministry of Corporate Affairs (MCA) database, EPFO, ESIC, e-Shram, and the NCS. This structural mapping feeds directly into the allocative logic of our Lifecycle Fiscal Projection by supporting the Skill Vulnerability Index (SVI). The serves as a methodological tool developed to prioritise funding from appropriate public or private sources according to worker formality and wage stability, categorising the workforce into high (e-Shram), medium (ESIC), and lower (EPFO) priority levels for government funding intervention.

3. India's Skills Financing Challenge

3.1 Current Financing Architecture

India's TVET system claims to support demand-led training, but financing still depends heavily on general tax revenues. The state finances virtually every pillar of skill development, leaving employers—the primary beneficiaries of skilled labour—largely absent from the financing architecture. Our National TVET Expenditure Reconstruction establishes that the current TVET ecosystem represents a massive yet fragmented, public expenditure pool that lacks systemic observability (see Section 1 and Appendix A). Even within this, direct in-firm training investments by industry remain marginal; systemic expansions are heavily reliant on regulatory triggers from state-sponsored apprenticeship initiatives. This public-finance model has reduced incentives for employer ownership and weakened the connection between training provision and labour-market demand. The obvious question, therefore, is: Why has employer financing remained so limited despite decades of policy reform?

3.2 Why Employer Financing Remains Weak

While training levies are common global instruments, they have not gained traction in South Asia, partly due to a lack of regional policy diffusion comparable to the 'demonstration effect' provided by South Africa in the Southern African Development Community (SADC) region (Palmer, 2020). Historically, TVET in India was viewed primarily as a state responsibility, with limited expectations of direct employer financing until the economic reforms of the 1990s shifted the focus toward a demand-driven system.

This shift led to several institutional reforms, including the establishment of the National Skill Development Fund (NSDF) in 2008, the National Skills Qualifications Framework (NSQF) in 2012, and the Ministry of Skill Development and Entrepreneurship (MSDE) in 2015. Despite assessments of international training levy models by the Planning Commission to reduce government reliance, a national levy was never adopted (Mehrotra & Saxena, 2014). Four primary constraints explain this

outcome: (i) employer fragmentation outside large industries; (ii) the dominance of the informal economy; (iii) the absence of a unified payroll system; and (iv) policy reluctance to introduce payroll-linked contributions that could be perceived as increasing labour costs.

In 2017, the Sharda Prasad Committee Report (Ministry of Skill Development and Entrepreneurship, 2017) made a formal proposal for a Reimbursable Industry Contribution (RIC), arguing that employment and skilling goals could not be achieved through the current approach.

3.3 Why Reform is now Urgent

India remains a largely informally skilled economy; as of 2023–24, only about 4 per cent of the population had received formal vocational training, while more than 95 per cent acquire skills through informal channels (National Statistical Office [NSO], 2024). Employer-sponsored training is still limited, with only 7.7 per cent of Indian firms providing formal training to employees, compared with 79.1 per cent in China (World Bank, 2025).

The urgency for reform is driven by three critical factors:

- i. **Fiscal Allocation and Scale:** While our expenditure reconstruction demonstrates that aggregate TVET funding is substantial, its operational allocation remains profoundly misaligned with workforce needs. Investment in in-firm training is structurally limited, spending on new entrants is heavily concentrated in short-term programmes, and informal workers and lifelong skill development remain inadequately supported across the board.
- ii. **Demographic Peak:** India's demographic dividend is expected to peak in the 2030s, necessitating a scale of reskilling that public budgets alone cannot sustain.
- iii. **Technological Change:** Labour demand is being reshaped by automation and artificial intelligence and needs an adaptive system for lifelong learning.

There is growing policy recognition of the need for shared financing in India's TVET system. Recent initiatives like the Industrial Relations Code (2020), PM-SETU¹, and the Economic Survey 2024–25 indicate movement toward shared financing. However participation remains limited. Only 6,100 enterprises engage actively in apprenticeship training under National Apprenticeship Promotion Scheme (NAPS) (Ministry of Finance, 2025) suggesting that incentive alignment is needed to generate system-wide engagement. This provides the rationale for the proposed RIC–ILCB institutional architecture, which aligns employer incentives through a mandatory reimbursement mechanism and an integrated workforce database built on unified administrative registries (see Table 4 for complete database specifications), embedding training within firms' strategic workforce planning and investment decisions. The need for such an institutional architecture ultimately reflects deeper market failures that shape employer and worker behaviour. The following section develops this theoretical rationale.

4. Theoretical Foundations: Market Failures and the Skill Formation Trilemma

4.1 Financing Failures: The Underinvestment Trap

The Free-Rider Problem: Firms tend to underinvest in training because they cannot fully capture the returns from financing transferable skills, as trained workers may move to competing firms (Becker, 1964). In developing labour-markets characterised by informality and institutional frictions, this incentive problem is amplified, leading to collective underinvestment in skill formation (Acemoglu & Pischke, 1999).

The literature on collective skill formation argues that these market failures are best addressed through institutional arrangements that reduce free-riding, limit labour poaching, and coordinate investment among employers, workers, and the state (Thelen, 2004; Busemeyer & Trampusch, 2012). More broadly, Hall and Soskice (2001) argue that financing mechanisms, labour-market information systems, certification frameworks, and employer coordination are most effective when designed as complementary institutions within an integrated skill formation system.

¹ Pradhan Mantri Skilling and Employability Transformation through Upgraded ITIs (PM-SETU)

Credit Constraints and Opportunity Costs: Even when training is free, demand can remain low because many trainees face credit constraints. Potential trainees face high opportunity costs in the form of lost wages and living expenses, which poorer households cannot easily finance. This leads to a level of human capital investment that is significantly below socially optimal levels. The RIC financing mechanism seeks to address these constraints by financing skill loans, expanding apprenticeship opportunities, and providing training vouchers that reduce liquidity constraints for new labour-market entrants. Accumulated training credits, delivered through vouchers, enable individuals to choose among market-based training providers, expanding choice and fostering a more competitive training market.

4.2 Information and Coordination Failures: The Governance Gap

Information Asymmetry: Prospective workers often lack reliable information about future labour-market demand making it difficult for them to identify high-return skills. In India, this is exacerbated by fragmented labour-market information systems, a challenge only recently addressed by the nascent National Career Service (NCS), which has yet to mature into a comprehensive public employment utility.

Coordination Failure and Institutional Silos: Fragmented information systems lead to coordination failure, where institutions operate in isolation. The Indian skilling ecosystem is dispersed across roughly 18 ministries and departments each maintaining separate administrative databases and only recently beginning to exchange information through the Skill India Digital Hub. Core enterprise, employment, and workforce registries operate in administrative silos, duplicating efforts and preventing effective workforce planning (see Table 4).

Table 1: Market Failures and the Integrated RIC–ILCB Response

Market Failure	Manifestation in India	Required Function	Institutional RIC–ILCB Response
Financing: Free-Riding	Only 7.7% of firms train; "poaching" risk	Mandatory Revenue & Reimbursable Credits	RIC: Collective risk pooling & incentives
Financing: Credit Constraints	95% informal skill acquisition; high opportunity costs	Demand-side Subsidies & Skill Loans	RIC: Financing for new entrants & RPL
Information: Asymmetry	Trainees lack signals on high-return occupations	Interoperable Databases & real-time Signals	ILCB: Demand-led prioritisation via NCS
Information: Coordination	Fragmentation across 18 ministries & silos	Unified Administrative Architecture	ILCB: Data integration (EPFO, ESIC, e-Shram)

4.3 The Institutional Logic for RIC–ILCB

Against this backdrop, the proposed RIC–ILCB integrates financing with workforce intelligence within a unified skill formation architecture. The ILCB addresses the observability gap by coordinating administrative information across the skills ecosystem.

The RIC provides the corresponding financing architecture through reimbursement-linked employer contributions that support in-firm training, apprenticeships, RPL, skill loans, and training vouchers. Together, the RIC and ILCB operationalise an integrated skill formation system evaluated quantitatively via our lifecycle budget-balancing model, in which financing, labour-market information, certification, and workforce governance reinforce one another. The following section examines international training levy systems that embody similar institutional principles.

5. International Evidence

5.1 Global diffusion of skill levy systems

Skill levies are among the oldest instruments for financing vocational training, originating with France's 1925 *Taxe d'Apprentissage*, a compulsory employer contribution dedicated to TVET. Brazil established the first large-scale and continuously operating employer payroll levy system in 1942 through SENAI²

² *Serviço Nacional de Aprendizagem Industrial* (National Service for Industrial Training)

and the broader *Sistema S*, requiring firms to contribute a fixed share of payroll to vocational training. This created a stable, industry-financed training ecosystem and became a globally influential model of workforce development.

While France pioneered apprenticeship taxation, Brazil operationalised the most comprehensive and durable levy system, incorporating Germany's dual-system principles, which together shaped later international adoption. Many developing countries engaged with these models in the 2000s and 2010s as policy reference points, as reflected in the gradual diffusion of levy-based systems across countries over successive decades. Cross-country evidence indicates that skill levies are not an experimental option, well-designed levies are established policy instrument for financing, coordinating and strengthening training systems with labour-market demand. The table below details the global distribution of skill levy systems by SDG region.

Table 2: Global Distribution of Skill Levy Systems by Region

SDG Region	Number of Countries	Countries Included
Sub-Saharan Africa	29 (26+3)	Benin, Botswana, Burkina Faso, Central African Republic, Chad, Côte d'Ivoire, Congo, Equatorial Guinea, Gabon, Gambia, Guinea, Kenya, Malawi, Mali, Mauritania, Madagascar, Mauritius, Namibia, Niger, Nigeria, Senegal, South Africa, Tanzania, Togo, Zambia, Zimbabwe, Ghana, Mozambique and Sudan.
North Africa and Western Asia	6	Algeria, Jordan, Morocco, Oman, Tunisia, Yemen (suspended).
Eastern and South-east Asia	5	Republic of Korea, Malaysia, Mongolia, Singapore, Thailand.
Oceania	3	Australia, Fiji, Marshall Islands.
Latin America and the Caribbean	16	Barbados, Bolivia, Brazil, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela (Bolivarian Republic of).
Europe and Northern America	18	Austria, Belgium, Québec (Canada), Cyprus, Denmark, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Poland, Slovenia, Spain, Switzerland, United Kingdom of Great Britain and Northern Ireland.
Total	77 (74+3)	

Data Sources: ILO (2020) and further author insertions.

5.2 Three Design Models: Brazil, Singapore, and South Africa

Country-specific studies provide additional insights. We discuss three country examples below:

i) Brazil: Sistema S and Industry-Led Training

Centered on Sistema S established in 1942, Brazil's corporatist model embeds employer organizations directly into the governance of sectoral training networks like SENAI (Middleton et al., 1993). Earmarked payroll levies provide predictable, long-term financing for infrastructure, instructors, and apprenticeship programs, structurally mitigating the free-rider problem in transferable-skills training (Johanson, 2009). While globally recognized for cultivating deep industry ownership (Castro, 2000), the system historically suffers from uneven regional resource distribution and limited funding transparency—trade-offs that underscore the need for rigorous data observability.

ii) Singapore: Skills Development Levy and SkillsFuture

Singapore's architecture explicitly integrates workforce development with macro-industrial policy (Ashton et al., 2002). Founded in 1979 with the payroll-based Skills Development Levy (SDL), the system evolved past basic training provision into SkillsFuture in 2015—a national lifelong learning framework utilizing individual training credits (Ministry of Finance [Singapore], 2015). The model's hallmark is its sophisticated deployment of labour-market forecasting and skills anticipation infrastructure (OECD, 2019). By matching resource allocation directly to strategic economic demands,

Singapore systematically drives down information asymmetries between employers, workers, and training providers.

iii) South Africa: SETAs and Workplace Skills Plans

South Africa's statutory levy – grant mechanism, introduced through the Skills Development Act (1998) and Levies Act (1999), utilizes Sector Education and Training Authorities (SETAs) to collect payroll levies and promote workplace learning (Kraak, 2008). Employers reclaim a portion of their contributions by submitting formal Workplace Skills Plans (WSPs), an arrangement designed to catalyse long-term corporate workforce planning and mitigate collective-action failures (Allais, 2012). However, South Africa's experience highlights critical institutional vulnerabilities, often constrained by profound administrative inefficiencies, bureaucratic complexity, uneven sectoral performance, and weak accountability mechanisms (Kraak, 2008; SARS, 2022).

Table 3: Comparative Analysis of International Skill Levy Models

Country / Model	Mechanism & Funding	Key Strengths	Main Weaknesses	Principle	Limitation
A. Brazil: Industry-Led Corporatist Model (<i>Sistema S</i>)	Mandatory payroll levy (0.2–2.5%) earmarked for sectoral bodies like SENAI /SENAC .	Curricula, equipment, and instructors align directly with industrial needs run by industry	Regional inequities, a lack of transparency in fund usage, and insulation from competition.	Industry ownership matters	Limited labour-market intelligence.
B. Singapore: Strategic National Integration (<i>SkillsFuture</i>)	0.25% payroll contribution (Skills Development Levy) integrated with SkillsFuture, training credits.	Global benchmark for using labour-market forecasting to guide funding and strategic demand.	Highly reliant on centralised government control and central funding architecture.	Stable financing matters	Fragmented data and coordination.
C. South Africa: Statutory Shared Governance (<i>SETAs</i>)	1% mandatory payroll levy; firms can claim funds via Workplace Skills Plans (WSPs).	Creates a stable, statutory funding base and forces long-term workforce planning.	High administrative inefficiency, bureaucratic complexity, and significant delays in fund disbursement.	Information systems and lifelong learning matter	Less reliant on levy-based financing.

Data Sources: Author's compilation

5.3 The comprehensive design picture for India

How can large developing economies build workforce governance systems capable of financing, observing, and adapting to labour-market change? This question is particularly important for India, where workforce development must operate in a labour-market characterized by large-scale informality, migration, fragmented administrative databases, and limited occupational intelligence.

Unlike developed economies with integrated payroll and employer records, India must govern a heterogeneous workforce that includes informal, gig, migrant, and self-employed workers. International experience suggests that successful training levy systems differ in design but share five common features: (i) mandatory employer contributions, (ii) active industry participation, (iii) transparent fund governance, (iv) demand-led resource allocation, and (v) robust labour-market information systems.

While first-generation levy models such as Brazil and South Africa have been effective at mobilising employer contributions, they remain primarily focused on levy administration and training reimbursement rather than integrating workforce data into a unified labour-market information system. Singapore moves further towards data-driven workforce planning but relies heavily on central government coordination. The proposed model departs from the conventional sequence of *Levy* → *Fund Collection* → *Training Reimbursement*, and operates as:

Market Failures → RIC Financing → ILCB Data Architecture → Labour-Market Intelligence → Skills Funding Allocation → Training Outcomes → Reimbursement and Governance.

By integrating financing and workforce intelligence, the architecture responds to both financing and observability failures.

6. The Integrated Labour Contribution Base (ILCB): Digital Infrastructure for Workforce Intelligence

6.1 Why ILCB? Integrating India's Fragmented Labour Databases

Effective skills financing requires comprehensive workforce observability. While conventional levy systems primarily mobilise financial resources, the ILCB complements financing by integrating India's fragmented administrative databases into a unified labour-market information architecture (see Table 4 for detailed layer specifications).

The ILCB combines four complementary data layers. The MSME³ Udyam and MCA databases identify enterprises and assess their levy-contribution capacity. EPFO and ESIC provide establishment-level payroll and social insurance data to monitor formal employment, workforce composition, and contribution flows. e-Shram extends system coverage to informal, gig, and self-employed workers, ensuring that workforce planning reflects India's labour-market structure. Finally, the NCS contributes real-time vacancy and occupational demand data to systematically map shifting enterprise skills requirements onto existing formal and informal labor supplies.

6.2 Architecture for ILCB

Table 4 below details the architecture of the ILCB, categorised by layer, database, and its specific functional role within the RIC financing mechanism. Crucially, these administrative layers supply the data parameters and cohort definitions that feed directly into the predictive equations of our Lifecycle Fiscal Projections.

Table 4: ILCB - Information Infrastructure for Skills Financing and Intelligence

Layer	Database	Core Strength & Technical Role	Limitation	Strategic Policy Value / Interoperability ("Overlap" Value)
Enterprise	GST	Firm activity and sectoral data; serves as the primary verification database.	Does not track individual workers.	Provides the macro-compliance frame to identify outsourcing or levy avoidance.
	MCA	Provides ownership and financial capacity indicators.	It has no workforce-level data.	It can provide training disclosures of companies like being done for CSR. <i>Intersection with ESIC:</i> Links corporate capacity to workforce vulnerability and labour intensity. Provides critical signals for manufacturing, construction, logistics, warehousing, retail, and hospitality.

³ Ministry of Small and Medium Enterprises

Layer	Database	Core Strength & Technical Role	Limitation	Strategic Policy Value / Interoperability ("Overlap" Value)
Employment	MSME UDYAM	Primary source for enterprise identification and classification.	No payroll information.	Facilitates tracking of transitions across skills and employment databases. <i>Intersection with EPFO:</i> Tracks formalization level within MSMEs, allowing for targeted productivity interventions. <i>Intersection with ESIC:</i> Tracks labour formalisation among smaller enterprises (manufacturing, textiles, garments, logistics, retail, construction). Essential for workforce planning, apprenticeship targeting, and safety initiatives.
	EPFO	The RIC levy collection backbone; provides establishment-level payroll and Universal Account Number(UAN)-linked records.	Captures only the formal sector (~11 crore workers).	Primary anchor for the RIC wage-base (₹14 lakh crore).
	ESIC	Captures lower-wage formal workers and labour-intensive industry signals.	Limited by statutory wage ceilings.	<i>Intersection with MSME:</i> Tracks formalization trajectories in manufacturing, textiles, and logistics.
Workforce	e-Shram	"Invisible" informal workforce (31 crore workers including gig workers) for RPL.	No firm-level identification.	Enables the Skill Vulnerability Index by identifying high-priority workers for government-funded certifications.
Training	Skill India Digital	The Repository for digital credentials and training outcome verification.	New system with developing data history.	Provides the 'Output Layer' for the governance loop, ensuring training leads to recognized outcomes.
Demand	NCS	Real-time demand signals from vacancies and job seekers.	No verified employment records.	Shifts financing from administrative targets to demand-driven prioritization based on occupational shortages.

Data Sources: Author's compilation from public sources

6.3 Key Institutional Implications

Building on the above, the ILCB enables evidence-based skills financing. By linking labour-demand data from the NCS with employment records from EPFO and other administrative databases, funding

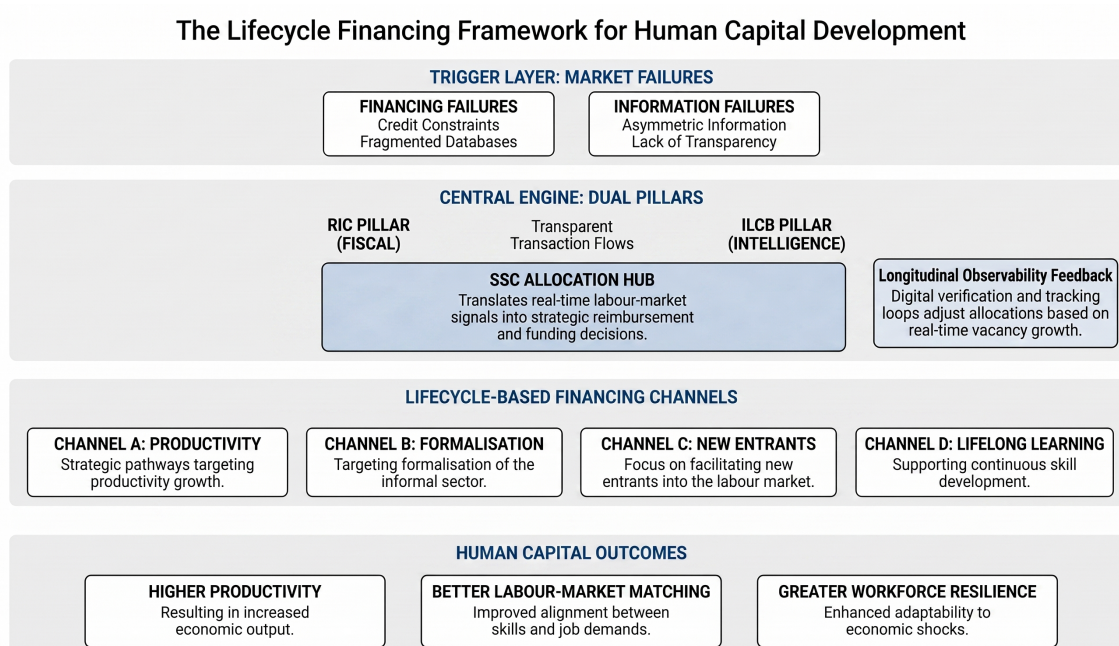
decisions can respond to observed labour-market conditions—including vacancy growth, occupational shortages, and training outcomes—rather than historical allocations or administrative targets. Operationally, this allows public and private entities to track dynamic workforce transitions over time, including movements from informal to formal employment

The integrated architecture also enables workforce transitions to be tracked over time, including movements from informal to formal employment, low- to higher-skill occupations, and declining to expanding sectors. Workforce policy can therefore shift from financing training programmes to supporting lifelong labour-market transitions.

These integrated data streams further support the development of a Skill Vulnerability Index (SVI)—a composite indicator that identifies workers and occupations at elevated risk of skill obsolescence or labour-market displacement. By translating administrative and labour-market information into an objective measure of training need, the SVI provides an evidence-based basis for prioritising funding, with higher priority assigned to more vulnerable groups such as e-Shram workers. In our lifecycle fiscal projection and allocation, this index formally sets the target population caps and limits allocation drift across the four strategic financing channels.

Figure 1 below summarises the proposed RIC–ILCB institutional architecture. The RIC finances workforce development, while the ILCB provides workforce intelligence, together enabling targeted lifecycle investments across four workforce channels.

Figure 1: RIC–ILCB Governance & Intelligence Loop



7. The Reimbursable Industry Contribution (RIC): A Lifecycle-Based Skills Financing Architecture

7.1 Conceptual Foundations and Design Logic

The Reimbursable Industry Contribution (RIC) is a mandatory, payroll-linked employer contribution that finances workforce development through a hybrid levy–grant mechanism, combining three elements:

Mandatory Contribution (Levy) + Conditional Reimbursement (Incentive) + DPI Observability (Coordination)

Table 5. specifies the operational boundaries, governing rules, and targeted structural outcomes of this design architecture.

Table 5: RIC Design Architecture

Dimension	Elements
Design principles	Employer ownership · outcome-based financing · institutional separation of custody and allocation · digital verification and interoperability with labour databases · inclusion of informal workers
Operating logic	Quarterly levy collection and reimbursement · maximal claim-based reimbursement · administrative simplicity with capped administrative cost · continuous income–expenditure projection
Intended outcomes	Wider access and enterprise productivity · improved individual employability · demand-responsive prioritisation as technology and market needs evolve

7.2 Financing Structure and Macro-Fiscal Scale

India lacks a unified payroll database; EPFO and ESIC are the only payroll-linked sources, and while the MSME database is important to India's jobs picture, it lacks usable worker counts. EPFO and ESIC overlap by over 85% (per government and independent estimates), so using both would double-count; EPFO alone is retained as the collection backbone, both because its ~12% employer contribution rate is cleaner to model than ESIC's tiered rates and in keeping with the GST principle of design simplicity.

The EPFO wage base is estimated using the EPFO Annual Performance Report for FY 2024–25⁴, which records total annual contributions of ₹3,35,628.81 crore. Under the Employees' Provident Fund (EPF) scheme, both employers and employees contribute 12% of wages, implying a combined contribution rate of 24% of the contributory wage base. Accordingly, the covered wage base is estimated by dividing total annual contributions by the combined contribution rate:

$$₹3,35,628.81 \text{ crore} \div 24\% = ₹13.98 \text{ lakh crore per annum.}$$

We simulate system-wide RIC revenue across three sensitivity scenarios using the baseline formal-sector wage base derived from EPFO gross contributions. Table 6 presents a sensitivity analysis of projected RIC revenues under alternative assumptions regarding collection efficiency and employer compliance. The conservative scenario assumes 75% collection efficiency and a 20% revenue loss due to evasion, reflecting significant implementation frictions. The balanced scenario assumes 85% collection efficiency with moderate evasion (10%), representing a realistic medium-term implementation outcome. The optimistic scenario assumes 95% collection efficiency with negligible evasion, consistent with mature DPI and near-universal compliance.

Across all scenarios, a 2% levy generates annual revenue ranging from ₹16,800 crore to ₹26,600 crore, with the balanced estimate of ₹21,420 crore serving as the baseline for subsequent simulations. The results suggest that the proposed financing mechanism remains fiscally viable under a wide range of implementation conditions.

Table 6: RIC Revenue Projections across Sensitivity Scenarios
(Calculated on a Fixed ₹14 Lakh Crore Wage Base)

Parameter/Assumption	Conservative Scenario	Balanced Scenario	Optimistic Scenario
Assumptions			
Collection Efficiency	75%	85%	95% (High DPI Integration)
RIC Evasion Risk	-20% (High Friction)	-10% (Moderate)	Negligible (Full Compliance)
Projected Annual Revenue			
1.0% Levy	₹8,400 crore	₹10,710 crore	₹13,300 crore
1.5% Levy	₹12,600 crore	₹16,065 crore	₹19,950 crore
2.0% Levy (Target)	₹16,800 crore	₹21,420 crore	₹26,600 crore

⁴ **Source:** Employees' Provident Fund Organisation (EPFO), FY 2024–25 contribution collections of ₹3,35,628.81 crore, as reported by the Government of India and the EPFO Central Board of Trustees.

The baseline execution of our fiscal projection assumes a formal contributory wage base of approximately ₹14 lakh crore, a 2% RIC levy, 85% collection efficiency, and a 90% compliance rate. Under these assumptions, the RIC would generate approximately ₹21,420 crore annually. (See Appendix B)

Why 2% levy?

A 2% levy is consistent with the National Policy for Skill Development and Entrepreneurship (2015), which recommended that enterprises invest 2% of their payroll in workforce training. It also represents the minimum rate required to sustainably finance the lifecycle investment model developed in Section 7.4. Sensitivity analysis indicates that lower levy rates of 1.0% and 1.5% generate insufficient revenue to support the proposed financing architecture.

Importantly, the levy does not impose an equivalent increase in firms' net fiscal burden. Because contributions are reimbursable against eligible training expenditure, compliant employers recover their contributions through training credits, converting the levy into a financing mechanism for workforce investment rather than an additional tax.

7.3 Institutional Architecture

The proposed RIC financing mechanism separates four core institutional functions:

1. **Collection authority:** Employees' Provident Fund Organisation (EPFO)
2. **Fund custodian:** Revived National Skill Development Fund (NSDF)
3. **Allocation authority:** National Industrial Classification aligned and rationalised Sector Skill Councils (SSCs)
4. **Certification authority:** National Credit Framework (NCrF) regulators

To operationalize this layout, real-time digital interoperability across EPFO, GST, ESIC, e-Shram, and related administrative databases is utilized to execute automated verification. The NSDF serves as a ring-fenced training fund.

Having established the institutional architecture, the next section specifies how RIC resources are allocated across different worker groups over the workforce lifecycle.

7.4 Allocation Mechanism and Lifecycle-Based Skills Financing Model for RIC and beyond

The principal innovation of the RIC–ILCB architecture is its transformation of a conventional training levy into a lifecycle-oriented investment architecture. By addressing the observability gap through the ILCB, it allocates resources across four complementary workforce channels.

1. *Channel A (Productivity Upgrading)* supports in-firm upskilling of the formal workforce (EPFO-linked) through employer-financed RIC reimbursements, strengthening productivity and technological adaptation within existing employment relationships.
2. *Channel B (Formalisation through RPL)* targets informal workers identified through e-Shram. Publicly funded RPL converts experiential skills into nationally recognised qualifications, improving labour mobility and formalisation. As RPL is a public good rather than employer training, these expenditures are financed entirely through government budgets.
3. *Channel C (Human Capital Formation for New Entrants)* supports foundational TVET and apprenticeships through a 50:50 RIC–government cost-sharing model. It comprises foundational training (C1), NAPS apprenticeships (C2), and National Apprenticeship Training Scheme (NATS) apprenticeships under Ministry of Education (MoE) (C3), addressing credit constraints and facilitating school-to-work transitions.

4. *Channel D (Lifelong Learning)* provides government-funded skill vouchers that support continuous upskilling throughout the workforce lifecycle, enabling workers to adapt to technological and structural labour-market change.

The differentiated financing of these channels aligns funding mechanisms with distinct labour-market needs, combining employer-financed investment where firms directly benefit with public financing for interventions that address broader market failures. Detailed population coverage, targeting criteria, and fiscal allocations are presented in Tables 7A and 7B.

Table 7A: Workforce Intelligence & Targeting Logic

Channel	Target Group	Training Type	Universe / Baseline Population	Targeting Formula (Uptake Logic)	Data Sources
A. Productivity Upgrading	Formal Sector Workers	Upskilling existing in-firm workforce	11 Crore	10% annual steady-state uptake	EPFO / ESIC
B. Formalisation (RPL)	Informal Workers (< Diploma)	Certification for informal workers	12 Crore (Eligible pool)	8–10% annual certification rate	e-Shram workforce
C1. Foundational (New Entrants)	Non-working and non-degree Entrants	Short-Term and Long-Term training with Skill Loan	Sub-segment of 80 Lakh pool	Residual (80 Lakh - C2 + C3)	PLFS
C2. NAPS (New Entrants)	Formal Sector Entrants	Apprenticeships	9.85 Lakh (Current base)	50% scale-up of existing base	MSDE / NAPS
C3. NATS (New Entrants)	Higher / Tech Entrants	Apprenticeships	5.23 Lakh (Current base)	50% scale-up of existing base	MoE / NATS
D. Lifelong Learning	Working-Age Population	Voucher-based continuous skilling	92 Crore (Total)	7% uptake phased over 10 years	PLFS

7.5 Aggregate Financing Envelope and Budget Balancing

Synthesizing the multi-channel lifecycle model generates a total annual operational budget of ₹56,400 crore, tracking 354 lakh beneficiaries at a weighted systemic unit cost of ₹15,932 per beneficiary per year:

Table 7B: Lifecycle-Based Fiscal Projection, Allocation & Cost-Sharing

Channel	Annual Target (Lakhs)	Unit Cost & Logic	Financing Source	Annual RIC Cost (₹ Cr)	Annual Govt Cost (₹ Cr)
A. Productivity Upgrading	110.00	₹5,000: Marginal cost for in-firm	RIC Only	₹5,500	₹0
B. Formalisation (RPL)	100.00	₹3,000: PMKVY benchmark	Government Only	₹0	₹3,000
C. New Entrants					
<i>C1. Foundational</i>	57.37	₹20,000: Middle of Common Norms	Govt / fees based	₹0	₹11,474 (+ ₹2,000 Skill loan)
<i>C2. NAPS</i>	14.78	₹1,20,000: ₹10,000/mo stipend	50:50 RIC-Govt	₹8,868	₹8,868
<i>C3. NATS</i>	7.85	₹1,80,000: ₹15,000/mo stipend	50:50 RIC-Govt	₹7,065	₹7,065
D. Lifelong Learning	64.00	₹4,000: Capability-stacking voucher	Government Only	₹0	₹2,560
TOTAL	354.00	Weighted Avg: ₹15,932	Blended Cost-Sharing	₹21,433	₹34,967

Budgetary Reconciliation within the Fiscal Projection Model: Under the balanced sensitivity scenario, a 2.0% payroll levy generates an estimated ₹21,420 crore from the formal-sector wage base. The proposed allocation to employer-facing interventions under Channels A, C2, and C3 amounts to ₹21,433 crore, resulting in a marginal financing gap of ₹13 crore (approximately 0.06% of total collections). Given its negligible magnitude, the model produces an internal budget-balancing equilibrium, demonstrating that the mechanism is structurally self-sustaining and adequate. The difference can be accommodated through a minor budgetary adjustment without affecting the overall financial viability of the RIC mechanism. Additional public expenditure would be required to support levy administration, including human resources, digital systems, compliance monitoring, and the proposed National Labour Market Observatory.

Consistent with the mechanism's financing principles, RIC resources are allocated exclusively to employer-linked productivity investments and apprenticeship programmes (Channels A, C2, and C3). Public expenditure finances interventions that address broader market failures—including RPL, foundational training, and lifelong learning vouchers (Channels B, C1, and D)—thereby preserving the integrity of employer contributions while supporting wider social and labour-market objectives.

Interpretation of the Lifecycle Fiscal Projection: The lifecycle fiscal projection is not intended to forecast realised levy collections, employer behaviour, or macroeconomic labour-market dynamics. Rather, it provides an internally consistent accounting framework for assessing the fiscal feasibility of the proposed institutional architecture under transparent and explicitly stated assumptions. Accordingly, the estimates should be interpreted as policy scenarios rather than predictive forecasts.

8. Policy Implementation and Institutional Feasibility

8.1 Implementation Strategy and Institutional Sequencing

The proposed RIC–ILCB architecture can be implemented through a phased approach that minimizes implementation risks while allowing institutional learning and capacity building.

Stage 1: Establishing Workforce Observability

Implementation begins with operationalising the ILCB through the phased integration of existing administrative databases. This stage establishes interoperable data infrastructure, governance arrangements, and pilot programmes to validate data quality, compliance behaviour, and administrative processes before national rollout.

Stage 2: Phased Rollout of the RIC

The RIC is introduced progressively, beginning with large EPFO-registered firms, followed by ESIC-covered enterprises, and subsequently extending support to informal workers through the e-Shram platform for RPL.

Stage 3: Operationalising Lifecycle Financing

Following implementation of the financing mechanism, resources are allocated across the four lifecycle financing channels described in Section 7.4, aligning employer contributions and public expenditure with distinct workforce needs.

Stage 4: Adaptive Governance

As the architecture matures, the ILCB supports continuous monitoring of employment transitions, training outcomes, and emerging skill shortages. Additional administrative datasets and forecasting capabilities can be incorporated over time to strengthen evidence-based planning and adaptive workforce governance.

8.2 Institutional Feasibility and Risk Mitigation

Institutional Feasibility

The proposed RIC–ILCB architecture is designed to be institutionally feasible because it assigns clear and limited functions to existing administrative databases rather than requiring comprehensive integration across all systems. By relying on the modular layout mapped out in Table 4, this design minimizes implementation complexity and avoids systemic friction by leveraging existing administrative boundaries

India has also developed substantial institutional capacity in digital public administration. Existing platforms—including Aadhaar, Direct Benefit Transfer (DBT), the Unified Payments Interface (UPI), GST, and digital tax administration—demonstrate the feasibility of secure identity management, large-scale financial transactions, and interoperable administrative systems. These capabilities provide a practical foundation for timely reimbursement of employer training expenditure and digital verification of levy compliance.

Importantly, the proposed architecture requires only purpose-specific data sharing rather than unrestricted integration of administrative databases. As interoperability standards continue to evolve, linking payroll, enterprise, and labour-market records for defined governance functions is administratively achievable through incremental institutional reforms. This approach minimises implementation risks while enabling progressively richer labour-market intelligence and outcome monitoring.

Technical feasibility alone, however, is insufficient. Realising the full potential of the RIC–ILCB architecture will also require complementary reforms to strengthen institutional governance, sectoral coordination, data stewardship, and implementation capacity.

Risk Mitigation

The principal implementation risks associated with the proposed RIC–ILCB architecture are institutional rather than fiscal. International experience shows that administrative credibility, employer trust, and effective governance are more important than contribution rates in determining the success of levy systems (Dar et al., 2003; Johanson, 2009). Key risks include employer resistance, administrative complexity, weak institutional capacity, persistent informality, and limited interoperability across administrative systems.

Employer compliance will depend on perceived net benefits, administrative simplicity, and confidence in reimbursement mechanisms. While some firms may increase training investment to recover contributions, others may respond through payroll under-reporting, outsourcing, or contractual employment. Consequently, the revenue estimates presented in this paper should be interpreted as indicative scenarios rather than precise forecasts. These risks may be mitigated through phased implementation, stakeholder consultation, reimbursement-linked incentives, and cross-verification of payroll and enterprise records using EPFO, GST, and corporate filings.

A longstanding weakness of India's skilling ecosystem has been its inability to systematically track training outcomes over time. By linking training data with unique worker identifiers across EPFO, ESIC, and e-Shram, the proposed ILCB enables longitudinal tracking of employment trajectories, creating a robust evidence base for evaluating the labour-market impacts of both public and employer-funded training. Continued expansion of e-Shram registration, data validation, and integration with RPL will improve workforce coverage, strengthen outcome measurement, and support evidence-based resource allocation.

Rather than replicating any single international model, the proposed architecture adapts internationally proven principles of employer co-financing, lifelong learning, labour-market intelligence, and outcome-based accountability to India's institutional context. By leveraging India's expanding DPI, it builds on existing administrative systems, reducing implementation risks while avoiding the need for entirely new institutional structures

8.3. Political Economy readiness

The proposed RIC–ILCB architecture builds on ongoing institutional reforms rather than requiring entirely new administrative systems. Its emphasis on interoperable administrative databases directly operationalizes the inter-ministerial data-sharing and statistical modernization mandates currently demanded by public officials. A prominent case in point is the *Government of India's Task Force Report for Strengthening the Statistical System of the Textiles Sector (2026)*, which explicitly highlights the need to eliminate data fragmentation across highly unorganized, labor-intensive segments by integrating EPFO, ESIC, Udyam, MCA, and GST through common identifiers. By providing a unified, real-time data exchange infrastructure, the ILCB functions as the practical execution mechanism for these 2026 policy directives. It successfully bridges the gap between sectoral ministries and national labor data architecture, transforming isolated statistical mandates into an active, cross-compatible workforce intelligence ecosystem.

The ILCB strengthens compliance by relying on digital cross-verification rather than additional reporting burdens. By matching EPFO payroll records with GST filings, MCA corporate records, and other administrative databases, the ILCB can identify anomalies associated with payroll under-reporting, excessive outsourcing, labour misclassification, or abrupt changes in wage and employment patterns that may indicate levy avoidance. Automated cross-database audit trails could substantially increase the cost of strategic evasion while reducing compliance costs for participating firms. Complementary measures—including fast-track reimbursement for compliant employers and performance-linked incentives—can further strengthen employer participation and confidence in the reimbursement mechanism.

The reimbursable design also introduces a market-based incentive for workforce investment. It builds on the National Education Policy (NEP) 2020's emphasis on lifelong learning and cumulative credit accumulation. While the NEP introduced portable academic credits for learners, the proposed RIC extends this logic to employers by creating reimbursable training credits that reward sustained investment in workforce development. By converting employer training expenditure into recoverable financial assets rather than sunk costs, the mechanism internalises the positive externalities of skill formation. In this respect, it is conceptually analogous to other credit-based policy instruments, such as carbon credit systems, which use economic incentives to encourage socially beneficial investment while addressing collective-action problems.

The RIC could be further strengthened through enhanced corporate disclosure of workforce development. Just as the Ministry of Corporate Affairs (MCA) requires companies to report CSR expenditure under the Companies Act, reporting requirements could be extended to include annual disclosures of RIC contributions, employer training expenditure, apprenticeship participation, and workforce development outcomes. Such disclosures would improve transparency, comparability, and accountability while creating a standardized administrative dataset for evaluating employer investment in skills.

The proposed architecture extends the ILCB to apprenticeship tracking by bringing them within India's payroll information architecture. Apprentices would be recorded in EPFO-linked payroll systems while remaining exempt from statutory payroll contributions, with eligible training costs reimbursed through the RIC. This approach, adopted in various forms in countries such as the United Kingdom, Germany, and Australia, preserves visibility of apprenticeship participation without increasing employers' net costs. In contrast, the current exclusion of apprentices from India's principal payroll databases obscures

the scale of employer-supported training, weakens longitudinal tracking of school-to-work transitions, and limits the evaluation of apprenticeship outcomes.

Finally, the RIC–ILCB architecture distributes responsibility across all stakeholders. Employers finance training but recover eligible expenditure through reimbursement, individuals invest in learning with support from skill loans and vouchers, and government resources remain focused on interventions where market provision is insufficient. By aligning incentives rather than imposing unfunded mandates, the RIC–ILCB architecture establishes workforce development as a shared investment between employers, workers, and the state, while leveraging India's DPI to strengthen governance, accountability, and long-term human capital development.

8.4 Institutional Prerequisites

Effective implementation of the RIC–ILCB architecture requires complementary institutional reforms beyond financing. A key prerequisite is the rationalisation of Sector Skill Councils (SSCs), as recommended by the Sharda Prasad Committee (Ministry of Skill Development and Entrepreneurship, 2017). To function as effective allocation intermediaries, SSCs should be aligned with the National Industrial Classification (NIC) and consolidated so that each corresponds to a broad NIC section. This would reduce institutional overlap while strengthening coordination between industry, skills policy, labour-market statistics, and public administration.

International experience supports this approach. Brazil operates through nine broad sectoral organisations under the *Sistema S* framework, while South Africa administers its levy through 21 Sector Education and Training Authorities (SETAs). These experiences suggest that streamlined sectoral governance improves administrative efficiency, whereas excessive fragmentation can weaken coordination and delay resource allocation. Consolidating India's current 36 SSCs into a smaller number of NIC-aligned umbrella bodies would therefore strengthen governance while preserving sector-specific representation.

Financial reform must also be accompanied by qualification reform. As argued by Mehrotra and Singh (2026), a trusted qualifications architecture is essential for creating transparent pathways between training, certification, employment, and lifelong learning. A coherent qualifications framework, combined with employer-led financing and integrated labour-market intelligence, would provide the institutional foundation for a coordinated and demand-responsive skill formation system.

Rather than creating a new funding institution, the National Skill Development Fund (NSDF)—whose role has diminished over time with the expansion of other financing mechanisms—should be revitalised and repurposed as the principal custodian of RIC resources. Building on its existing institutional foundation would minimise administrative duplication while providing a dedicated, ring-fenced fund for workforce development. To strengthen governance, the NSDF could be supported by a RIC Council, modelled on the GST Council, to provide strategic oversight through representation from government, employers, and worker organisations, together with a National Labour-market Observatory responsible for analysing administrative data, generating labour-market intelligence, evaluating programme outcomes, and supporting AI-enabled workforce forecasting.

Finally, the RIC would benefit from a dedicated legislative foundation. As in South Africa, where the Skills Development Act (1998) and the Skills Development Levies Act (1999) provide the statutory basis for levy collection, governance, and accountability, India's RIC–ILCB architecture should likewise be established through dedicated legislation. Such legislation should define the institutional roles of the collection authority, fund custodian, allocation agencies, and oversight bodies; provide for independent audits, parliamentary oversight, and purpose-specific data sharing across administrative systems; and enable the routine release of anonymised administrative data for independent evaluation and continuous improvement. A statutory foundation would provide long-term policy certainty, strengthen employer confidence, and insulate workforce financing from ad hoc administrative changes.

The effectiveness of the ILCB depends on robust data governance. As the ILCB links administrative records across GST, EPFO, ESIC, e-Shram, MCA, and related systems, data sharing should operate within India's Data Empowerment and Protection Architecture (DEPA) (NITI Aayog, 2020), using secure, consent-based, and purpose-specific protocols.

8.5 Data Privacy & Security

The ILCB requires only limited data exchange for defined functions such as levy verification, training reimbursement, labour-market analysis, and programme evaluation. Individual records would remain with the originating agencies, while the National Labour-market Observatory would rely on anonymised or pseudonymised data for workforce intelligence and policy analysis. Embedding these safeguards from the outset balances workforce observability with privacy protection, thereby strengthening employer confidence, worker trust, and the long-term legitimacy of the RIC–ILCB architecture

8.6 Broader Implications

i. Institutional Transferability

The proposed RIC–ILCB architecture has broader relevance for emerging and developing economies characterized by large informal labour-markets, fragmented TVET financing, and expanding Digital Public Infrastructure (DPI). Countries such as Indonesia, the Philippines, Vietnam, South Africa, Kenya, and Nigeria face similar challenges of employer underinvestment in training, fragmented labour-market information, and growing demand for industry-responsive skills. Integrating employer-financed levy mechanisms with interoperable labour-market data systems can strengthen coordination among governments, employers, and training providers while extending workforce development to informal workers. The architecture is intended as an adaptable institutional model, with implementation calibrated to national administrative capacity, digital readiness, and existing labour-market institutions.

The lifecycle-based financing model further broadens its applicability by shifting employer-financed levies from funding isolated training activities to supporting lifelong learning across the worker lifecycle, including apprenticeships, workplace learning, mid-career reskilling, RPL, and employment transitions.

The architecture is particularly relevant for African economies pursuing TVET modernization. Countries with established levy systems, such as South Africa, can use the lifecycle allocation model to improve the efficiency, targeting, and responsiveness of employer-financed training. For countries at earlier stages of institutional development, including Kenya, Ghana, Nigeria, Morocco, and Egypt, the ILCB offers a scalable digital foundation for progressively linking labour-market information, employer financing, and lifelong learning, while accommodating differences in institutional capacity and governance.

ii. Implications for AI-Enabled Workforce Governance

As governments increasingly adopt AI-supported labour-market analytics and digital public services, the availability of integrated, high-quality administrative data will become a prerequisite for effective workforce governance. The institutional architecture proposed in this paper provides one possible foundation for that transition by aligning skills financing, labour-market information, and Digital Public Infrastructure within a unified lifecycle framework.

Such an integrated data ecosystem would also enable a new generation of AI-assisted workforce policy tools by providing the structured, interoperable datasets required for evidence-based decision-making. These capabilities include forecasting emerging skills demand, improving apprenticeship and employer–worker matching, supporting personalized lifelong learning pathways, dynamically targeting training vouchers to workers with the greatest reskilling needs, and enabling the early identification of

sectoral and regional skill shortages. Although the present study does not develop or evaluate AI algorithms, it identifies the institutional and governance preconditions necessary for the transparent, accountable, and effective application of AI in workforce planning and TVET policy.

9. Limitations and Future Research

This study has several limitations. First, the fiscal projections are based on publicly available administrative and labour-market data. Actual outcomes will depend on employer compliance, enforcement effectiveness, behavioural responses, and broader economic conditions. Similarly, the aggregate TVET expenditure estimates are reconstructed by triangulating multiple administrative and budgetary datasets and should be read as indicative rather than precise. Their value lies not in measurement accuracy but in establishing an empirical baseline that demonstrates the importance of workforce observability for skills financing and planning.

Second, the proposed architecture assumes progressive integration of administrative databases and digital platforms. In practice, differences in data quality, interoperability, and institutional capacity may affect the accuracy and completeness of labour-market intelligence. Third, employer responses to the proposed RIC, including compliance behaviour and training investment decisions, remain uncertain and require empirical validation through pilot implementation. Finally, the paper focuses primarily on institutional design and financing architecture rather than long-term labour-market outcomes, which can only be assessed after implementation.

Future research should therefore examine implementation feasibility, employer compliance, administrative costs, and the effects of the proposed architecture on productivity, employment quality, formalisation, skills utilisation, and workforce mobility. Comparative studies across countries adopting similar digital workforce architectures would also help assess the transferability of the proposed model.

These limitations notwithstanding, the paper's institutional and empirical contributions are summarised in the concluding section.

10. Conclusion

India's skills challenge is not primarily a shortage of training programmes but a deficit in the institutions that finance, coordinate, and govern workforce development. This paper argues that resolving the skill formation trilemma—balancing resource mobilisation, accountability, and responsiveness—requires moving beyond fragmented, supply-driven financing towards an integrated skill formation system that combines sustainable financing with labour-market intelligence.

The proposed RIC–ILCB architecture addresses this challenge through two complementary institutional innovations. The Reimbursable Industry Contribution (RIC) aligns employer incentives by transforming payroll contributions into reimbursable investments in workforce development, while the ILCB addresses the observability gap by providing the workforce intelligence required for evidence-based financing, planning, and policy evaluation. Together, these mechanisms shift workforce policy from episodic skill acquisition towards continuous, lifecycle-oriented skill formation.

Beyond the institutional proposal, the paper makes three contributions. First, it develops one of the first empirical estimates of aggregate TVET expenditure in India, providing a baseline for workforce financing. Second, it demonstrates how Digital Public Infrastructure can strengthen workforce governance through an integrated institutional architecture for skills financing and workforce intelligence. Third, it offers a scalable institutional blueprint for developing economies seeking to modernise skills systems while accommodating extensive informality. More broadly, the paper argues that workforce financing and labour-market intelligence should be designed as complementary institutions rather than separate policy domains. As digital administrative systems mature and AI-enabled analytics become embedded in labour-market governance, this integrated approach may be

foundational to workforce policy, offering a scalable model for emerging economies seeking to finance, monitor, and continuously adapt workforce development.

As India approaches its demographic peak, the effectiveness of workforce policy will depend less on the volume of training delivered than on the quality of the institutions that govern how skills are financed, coordinated, and continuously renewed. The RIC–ILCB architecture offers one pathway towards building a more adaptive, evidence-based, and sustainable skill formation system for India and, potentially, for the wider Global South.

Appendix A: The National TVET Expenditure Reconstruction Model

India does not publish a consolidated estimate of national expenditure on TVET. This appendix reconstructs the annual TVET financing envelope by triangulating administrative records, government budgets, enterprise expenditure, corporate disclosures, and multilateral project financing.

The resulting baseline estimate of ₹63,923–₹89,506 crore per annum should be interpreted as an indicative, system-wide financing envelope rather than an audited accounting total. The purpose of this exercise is to establish an empirical baseline for analyzing India’s skills financing architecture and to highlight the role of workforce observability in public policy.

Table A.1: Annual System-Level TVET Financing Envelope

Expenditure Component	Annual Volume (₹ crore)	Primary Institutional / Behavioral Driver
A1. Central Government	11,000–15,000	Central ministries and national TVET programs
A2. State Governments	35,000–50,000	ITIs, polytechnics, State Skill Development Missions
A3.1 Enterprise Training	1,960	Formal employer workforce training expenditure
A3.2 Employer Apprenticeship (NAPS)	7,700–12,400	Employer stipend contributions
A3.3 Employer Apprenticeship (NATS)	3,766–5,649	Employer stipend contributions
A4. Corporate Social Responsibility	1,397	CSR expenditure allocated to vocational skills
A5. Multilateral Financing	3,100	Annualized development partner project financing
Estimated Total Financing Envelope	63,923–89,506	Annual system-wide TVET expenditure

A1. Central Government Expenditure

Method: Central government expenditure was reconstructed by consolidating budget allocations for MSDE, apprenticeship programs administered by the MoE, vocational education under *Samagra Shiksha*, and training-related expenditures across major sectoral line ministries.

Core Components

MSDE: Although the FY2026–27 allocation increased to ₹9,540.5 crore, much of this reflects temporary program expansions (e.g., PM-SETU)⁵. Excluding these episodic initiatives, the underlying, recurring annual MSDE TVET expenditure is conservatively estimated at ₹5,000–6,000 crore.

NATS: The MoE allocated approximately ₹1,100–1,200 crore for NATS during FY2025–26.

Vocationalization of School Education: Vocational education under *Samagra Shiksha* accounts for approximately ₹750–1,500 crore annually. Based on the prevailing intergovernmental funding formula, this comprises a central contribution of ₹450–1,000 crore and a state match of ₹300–500 crore.

⁵ The escalation in the MSDE Budget Estimate (BE) from ₹5,749.90 crore in FY2025–26 to ₹9,540.50 crore in FY2026–27 is driven by rollout of the Pradhan Mantri Skilling and Employability Transformation through Upgraded ITIs (PM-SETU) scheme. It is a time-bound, capital-expenditure intervention of ₹60,000 crore over a five-year implementation horizon (Central share capped at ₹30,000 crore). Because its funding architecture targets front-loaded infrastructural upgrades (transforming 1,000 institutional clusters via a Hub-and-Spoke model) rather than recurring operational subsidies, these outlays operate under a de facto sunset clause. To prevent an artificial inflation of the long-term, baseline TVET financing envelope, this episodic capital injection is normalized, isolating an underlying, steady-state recurring MSDE expenditure baseline of ₹5,000–6,000 crore.

Sectoral Line Ministries: Training expenditure was isolated from broader welfare and infrastructure outlays across line ministries. Only line items directly attributable to technical skill development and capacity building were included.

Table A1.1: Estimated Central Sectoral Training Expenditure

Ministry / Programme	Annual Training Expenditure (₹ crore)
Rural Development (<i>DDU-GKY, RSETIs</i>)	1,700–2,300
MSME (<i>PM Vishwakarma</i>)	1,300–2,000
Textiles (<i>SAMARTH</i>)	500–700
Agriculture (<i>ATMA, KVK</i>)	300–600
Housing & Urban Affairs (<i>DAY-NULM</i>)	300–500
Electronics & IT (<i>FutureSkills PRIME</i>)	200–300
Social Justice (<i>PM-DAKSH</i>)	200–300
Tourism (<i>HSRT</i>)	50–100
Estimated Total Sectoral Outlay	4,550–6,800

A2. State Government Expenditure

Method: State-level TVET expenditure is not reported as a consolidated budget line. Estimates were modeled by aggregating localized expenditure on Industrial Training Institutes (ITIs), polytechnics, technical education departments, State Skill Development Missions (SSDMs), and state-specific vocational schemes.

Consistent with India's fiscal federal structure for education, state governments absorb the majority of institutional, asset, and operational costs. Based on a model-based aggregation across states, annual state expenditure is estimated at ₹35,000–50,000 crore.

Table A2.1: Indicative State TVET Spending Tiers

Spending Tier	Annual Range Per State (₹ crore)	Representative States / Operational Profile	Primary Fiscal Anchors
Tier 1: High Scale	3,500–5,500	Maharashtra, Tamil Nadu, Uttar Pradesh, Karnataka	Dense ITI networks, high polytechnic enrollment, dedicated state skill funds.
Tier 2: Medium Scale	1,500–3,500	Gujarat, Andhra Pradesh, Rajasthan, Madhya Pradesh	Active State Skill Missions, moderate-to-high capital expenditure on vocational upgrades.
Tier 3: Compact Scale	300–1,500	Haryana, Kerala, Jharkhand, Northeastern States	Leaner institutional footprints, higher reliance on central co-financing (<i>Samagra Shiksha</i>).
Aggregated Total	35,000–50,000	All States & UTs Combined	System-wide state-level operational envelope

A3. Employer-Financed Training

A3.1 Direct Enterprise Training Expenditure

Method & Assumptions

Enterprise training expenditure is approximated using the formal-sector payroll base reported by the EPFO.

- EPFO contributions represent the formal-sector contributory wage base.
- Approximately 7% of formal enterprises in India undertake structured workforce training (World Bank enterprise baseline).
- Training-active firms allocate an estimated 2% of covered payroll to learning and development (L&D) outlays.

Calculation Sequence

1. *Establish Contributory Wage Base:* EPFO reported total annual contributions of ₹3,35,628.81 crore during FY2024–25. Since employee and employer contributions combined equal 24% of contributory wages:

$$\text{Estimated Formal Wage Base} = \frac{\text{₹3,35,628.81 crore}}{0.24} \approx \text{₹13,98,453 crore (or } \sim \text{₹14 lakh crore)}$$

2. *Isolate Training-Active Firms:* Applying the 7% threshold for structured training enterprise penetration:

$$\text{₹13,98,453 crore} \times 0.07 = \text{₹97,892 crore}$$

3. *Calculate Final L&D Outlay:* Assuming an average L&D intensity of 2% of the covered wage base:
 $\text{₹97,892 crore} \times 0.02 \approx \text{₹1,960 crore}$

Accordingly, annual direct enterprise-funded workforce training is estimated at **₹1,960 crore**.

A3.2 Employer Expenditure under NAPS

Employer expenditure under the NAPS primarily consists of apprentice stipends remaining after government subsidy caps are applied.

Assumptions

Total Registered Apprentices (FY2024–25): 9.85 lakh

Subsidy Rule: Government reimburses 25% of the stipend, subject to a hard ceiling of ₹1,500 per month per apprentice.

Table A3.A: Estimated Employer Expenditure under NAPS

Average Monthly Stipend	Net Annual Employer Expenditure (₹ crore)
₹8,000	7,700
₹10,000	10,000
₹12,000	12,400

A3.3 Employer Expenditure under NATS

Under NATS, the government reimburses approximately 50% of the prescribed stipend costs, leaving the remaining half to be cleared by the employer.

Table A3.B: Estimated Employer Expenditure under NATS

Average Monthly Stipend	Net Annual Employer Expenditure (₹ crore)
₹12,000	3,766
₹15,000	4,707
₹18,000	5,649

A4. CSR

CSR expenditure is derived from Ministry of Corporate Affairs (MCA) statutory disclosures relating to vocational education and skill development (indexed to *Lok Sabha Unstarred Question No. 2315*). Only expenditures directly attributable to vocational skills development and livelihoods training are isolated, yielding a stable annual contribution of ₹1,397 crore.

A5. Multilateral Financing

India's TVET framework utilizes project-based loan and grant financing provided by multilateral development partners. Current outstanding systemic commitments total approximately ₹15,500 crore, consisting of: World Bank (Central Portfolio): ₹6,900 crore; Asian Development Bank (Central Portfolio): ₹7,000 crore and State-Specific Projects: Odisha (₹700 crore); Gujarat (₹900 crore)

Assuming a standardized, average implementation and disbursement period of five years, this portfolio corresponds to an annualized financing flow of ₹3,100 crore.

Limitations of the Reconstruction

Methodological Note: The expenditure estimates presented are reconstructed by triangulating administrative datasets, public budgets, corporate disclosures, and behavioral proxies. They should be interpreted as indicative system-wide parameters rather than absolute accounting metrics.

Nevertheless, they clear a persistent blind spot by providing one of the first integrated, multi-sectoral estimations of India's annual TVET financing envelope, establishing a repeatable empirical baseline for analyzing workforce financing efficiency, institutional design, and future structural reforms.

Appendix B. RIC Revenue and the Lifecycle Fiscal Projection and Channel Allocation Model

This appendix presents the assumptions, targeting methodologies, and cost benchmarks underlying the projected revenue from the proposed RIC and the lifecycle financing model presented in Section 7. The estimates are illustrative and are intended to demonstrate the financial feasibility of the proposed institutional architecture rather than provide precise fiscal forecasts.

The appendix is organized into five parts: *B1. Revenue Model*; *B2. Lifecycle Financing Model*; *B3 Targeting Methodology*; *B4. Cost Benchmarks and Coverage Summary*; *B5. Structural Equilibrium and Fund Sustainability*.

B1. Revenue Model

Baseline Parameters

Parameter	Symbol	Value	Source / Assumption
Formal contributory wage base	W	₹13,98,453 crore ($\approx$ ₹14 lakh crore)	Derived from EPFO FY2024–25 contributions
Proposed RIC levy	L	2.0%	National Skills Policy (2015) recommendation and discovery by sensitivity testing
Collection efficiency	η	85%	Balanced scenario
Compliance rate	$(1 - \varepsilon)$	90%	Assumes 10% effective evasion

Revenue Formula

The annual revenue generated by the Reimbursable Industry Contribution (R_{RIC}) is modelled as follows:

$$R_{RIC} = W \times L \times \eta \times (1 - \varepsilon)$$

Balanced Scenario Estimation

Substituting the baseline parameters into the revenue formula yields:

$$₹14,00,000 \text{ crore} \times 0.02 \times 0.85 \times 0.90 = ₹21,420 \text{ crore}$$

Accordingly, the proposed RIC generates an estimated ₹21,420 crore annually under the balanced scenario.

B2. Lifecycle Financing Model

Table B1. Population Universe, Target Coverage, and Resource Requirements

Channel	Population Universe	Annual Target	Unit Cost	Gross Annual Resource Requirement	Net RIC Share (Employer)	Net Government Share (Public)
A. Productivity Upgrading	11 crore formal workers	110.00 lakh	₹5,000	₹5,500 crore	₹5,500 crore*	—
B. RPL	12 crore informal workers	100.00 lakh	₹3,000	₹3,000 crore	—	₹3,000 crore*
C1. Foundational TVET	80 lakh new entrants	57.37 lakh	₹20,000	₹11,474 crore	—	₹11,474 crore*+2000 crore(skill loan)
C2. NAPS Apprenticeships	9.85 lakh current	14.78 lakh	₹1,20,000	₹17,736 crore	₹8,868 crore	₹8,868 crore
C3. NATS Apprenticeships	5.23 lakh current	7.85 lakh	₹1,80,000	₹14,130 crore	₹7,065 crore	₹7,065 crore
D. Lifelong Learning	92 crore working-age	64.00 lakh	₹4,000	₹2,560 crore	—	₹2,560 crore*

Total		354.00 lakh		₹56,400 crore	₹21,433 crore	₹34,967 crore
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***Note on Financing Architecture:** Under the proposed structural boundaries, Channel A is entirely employer-financed via the RIC levy; Channels B, C1, and D are entirely publicly funded; and Channels C2 and C3 (Apprenticeships) utilize a strict 50:50 RIC–Government cost-sharing arrangement.

B3. Targeting Methodology

Channel A – Productivity Upgrading

Target Population: 11 crore EPFO/ESIC-covered formal workers.

Targeting Logic: Assumes a 10% annual participation rate among the formal workforce.

$$\text{Annual Target}_A = 11 \text{ crore} \times 10\% = 110 \text{ lakh}$$

Channel B – Recognition of Prior Learning

Target Population: 12 crore e-Shram registered workers lacking formal technical qualifications.

Targeting Logic: Assumes a phased certification rate of 8.33% annually over a 12-year horizon.

$$\text{Annual Target}_B = 12 \text{ crore} \times 8.33\% \approx 100 \text{ lakh}$$

Channel C – New Labour-Market Entrants

Target Population: Annual net labour-market entry is estimated at 1–1.2 crore, of whom approximately 80 lakh do not pursue university-level higher education.

Targeting Logic: Entrants are structurally channelled through three mutually exclusive pathways:

NAPS (C2): 50% expansion on the current baseline of 9.85 lakh apprentices.

$$\text{Target}_{C2} = 9.85 \text{ lakh} \times 1.5 = 14.78 \text{ lakh}$$

NATS (C3): 50% expansion on the current baseline of 5.23 lakh apprentices.

$$\text{Target}_{C3} = 5.23 \text{ lakh} \times 1.5 = 7.85 \text{ lakh}$$

Foundational TVET (C1): Captures the residual non-university entry cohort after apprenticeship enrollment.

$$\text{Target}_{C1} = 80 \text{ lakh} - (14.78 \text{ lakh} + 7.85 \text{ lakh}) = 57.37 \text{ lakh}$$

Channel D – Lifelong Learning

Target Population: 92 crore total working-age population.

Targeting Logic: Assumes a net lifelong learning participation rate of 7% structured over a rolling 10-year period.

$$\text{Annual Target}_D = \frac{92 \text{ crore} \times 7\%}{10} = 64 \text{ lakh}$$

B4. Cost Benchmarks and Coverage Summary

Table B2. Empirical Basis for Unit Cost Parameters

Channel	Unit Cost	Basis of Unit Cost Parameter
A	₹5,000	Marginal employer learning and development (L&D) expenditure for short-duration, specialized in-firm technical training.
B	₹3,000	Benchmarked against PMKVY 4.0 RPL independent assessment and bridging-course fiscal norms.
C1	₹20,000	Aligned with Government Common Norms for formal institutional technical training, accounting for average hours and stipends.
C2	₹1,20,000	Reflects the statutory NAPS average stipend support of ₹10,000/month over a 12-month period.
C3	₹1,80,000	Reflects the statutory NATS graduate/diploma stipend support of ₹15,000/month over a 12-month period.
D	₹4,000	Value of a state-backed learning voucher designed to allow targeted workers to flexibly accumulate up to ₹20,000 in credits over five years.

B5. Structural Equilibrium and Fund Sustainability

The proposed lifecycle financing model systematically targets 354 lakh individuals annually, representing approximately 7% of India's active workforce, at a system-wide weighted average investment of ₹15,932 per beneficiary.

By isolating employer-financed productivity pathways (Channel A and a 50% co-investment in Channels C2/C3) from state-funded equity interventions (Channels B, C1, and D), the mechanism establishes a precise fiscal equilibrium. The Net Annual RIC Liability of ₹21,433 crore balances almost perfectly against the projected annual revenue generation of ₹21,420 crore derived in Section B1. This marginal structural deficit of ₹13 crore (0.06%) can easily be absorbed by minor adjustments to collection efficiency η or via baseline demographic growth in the formal wage base W , verifying the long-term institutional feasibility of the architecture.

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