Impact Evaluation of Capacity Building and Skill Development Scheme

Executive Summary

Background

India's ambition to emerge as a global leader in technology and innovation is a strategic national endeavour, articulated through the overarching goals of a Viksit Bharat@2047 and a self-reliant Atmanirbhar Bharat. This strategic vision is underpinned by the nation's immense demographic dividend, with over 65% of its population under the age of 35, representing one of the world's largest and youngest labour forces (PIB, 2025). To fully unlock this human capital and drive a knowledge-based, innovation-driven economy, India must cultivate a workforce that is not only skilled but also agile, adaptable, and proficient in frontier technologies. The urgency of this task is magnified by the national goal of achieving a $1 trillion digital economy by 2030. The global workforce is undergoing an unprecedented transformation driven by the rapid emergence and adoption of new technologies. This technological shift is creating new jobs while rendering existing skills obsolete, necessitating a paradigm shift from static education models to dynamic, lifelong learning. Global trends in technology and talent demand are reshaping economic landscapes, and India's skilling agenda must be strategically aligned with these shifts to maintain its competitive edge.

The World Economic Forum's (WEF) *Future of Jobs Report 2025* provides a critical benchmark for these global trends. It forecasts that technology, demographic transitions, and the global green economy will drive the creation of 170 million new jobs by 2030, though 92 million jobs will be displaced, resulting in a net gain of 78 million jobs (World Economic Forum, 2025). This monumental shift is concentrated in several key domains, with India facing acute domestic skill gaps as outlined here:

- **Artificial Intelligence (AI) and Machine Learning (ML)**: India shows strong momentum in AI adoption, with the *India AI Report 2023* by NASSCOM projecting 1 million AI-related jobs by 2025 (IndiaAI Expert Group, 2023). However, over 40% of biotech companies struggle to find data science and AI talent, especially in bioinformatics. Additionally, there is a 38% shortfall in AI-skilled professionals, particularly in healthcare AI, cybersecurity, and data science, where AI in healthcare could generate over $25 billion in value by 2030 but is hindered by a lack of skilled professionals to develop, manage, and regulate AI-based systems (IndiaAI Expert Group, 2023).
- **Cloud Computing**: The demand for cloud professionals continues to grow significantly, integrated into broader needs for upskilling in emerging tech domains like AI, ML, cybersecurity, and cloud computing. This aligns with the projected requirement of 30 million digitally skilled professionals in India, where only around 10 million are currently being trained, leaving a significant gap (IndiaAI Expert Group, 2023).

- **Cybersecurity and Data Privacy**: With the global cost of cybercrime projected to reach $10.5 trillion annually by 2025, there is substantial and growing demand for cybersecurity specialists (World Economic Forum, 2025). In India, this is amplified by the need for cyber resilience in essential government infrastructure, especially in border and sensitive regions. Further, low cyber and financial literacy among women, senior citizens, and tribal populations makes them vulnerable to frauds and digital exclusion.
- **Semiconductors and VLSI**: India faces significant skill shortages in the semiconductor sector, needing over 120,000 skilled professionals over the next 5 years, with critical shortages in VLSI design, fabrication, and packaging as identified in the Semicon India Program (Semicon India Program, 2021).
- **Quantum Computing**: India has launched the National Quantum Mission (2023) with the aim to position India in the top 5 globally in quantum research. NASSCOM estimates a global shortage of over 1 million quantum professionals by 2030, with India currently contributing less than 1% to this talent pool (IndiaAI Expert Group, 2023).

This third-party evaluation, meticulously executed by the Indian Institute of Public Administration (IIPA) employs a rigorous mixed-methods approach grounded in the NITI Aayog RCEEIS framework (Relevance, Coherence, Effectiveness, Efficiency, Impact, Sustainability). The analysis integrates quantitative metrics from MeitY reports, qualitative insights from beneficiary testimonials and case studies, and stakeholder consultations. It encompasses the scheme's performance from 2021 to August 2025, evaluating its seven sub-schemes and their contributions to national priorities. The evaluation underscores the scheme's role in mitigating skill mismatches, where 65% of organizations cite gaps as a primary growth barrier (NASSCOM, 2024) and promoting inclusive growth by addressing urban-rural, gender, and socio-economic divides (UNESCO, 2024). By institutionalizing continuous learning through industry-academia partnerships and NSQF-aligned certifications, the scheme positions India as a global talent powerhouse, directly supporting Sustainable Development Goals (SDGs) 4 (Quality Education), 5 (Gender Equality), 8 (Decent Work and Economic Growth), and 9 (Industry, Innovation, and Infrastructure).

Objectives & Scope

The Capacity Building and Skill Development (CB&SD) Scheme, instituted by the Ministry of Electronics and Information Technology (MeitY)under Digital India Programme, is strategically designed to foster a robust ecosystem for human capital development in Electronics and Information and Communication Technology (E&ICT). *Its primary objective is to skill over 1.5 crore learners by 2030, with a targeted focus on ensuring 25% representation from Tier-II and Tier-III cities, aligning over 50% of its programs with the National Education Policy (NEP) 2020 and the National Skills Qualification Framework (NSQF), and producing 1 lakh NSQF-certified trainers (MeitY, 2024).* The scheme's architecture is methodically structured into seven sub-schemes, each crafted to address distinct dimensions of capacity building through a systematic and evidence-based rationale.

Scheme Architecture/Design: The Capacity Building and Skill Development (CB&SD) Scheme represents a significant national initiative to scale up India's human capital and institutional capabilities in frontier and foundational technology domains. Given the pace of India's digital transformation, the strategic urgency of self-reliance, and the sheer scale of workforce requirements, this scheme serves as an essential intervention to prepare the country for the opportunities and challenges of the coming decade. It reflects the Government's commitment to delivering high-impact, technology-driven capacity building with a sense of urgency, equity, and innovation.

The CB&SD scheme is a unified architecture comprising six distinct sub-schemes with the additional contribution from the Internet Governance Sub-Scheme (Further used as Sub-Scheme VII in the report). Each sub-scheme has a specific focus area, a dedicated budgetary allocation, and well-defined targets, all contributing to the overarching goals of skilling 1.5 crore learners by 2030 and fostering an inclusive digital ecosystem.

The scheme operates on a modular framework comprising seven distinct sub-schemes, each designed to address specific dimensions of capacity building. The categorization is based on four key parameters:

1. Target beneficiaries (ranging from high-end researchers and PhD scholars to marginalized communities and rural artisans)
2. Thematic focus (encompassing advanced R&D in frontier technologies, professional upskilling, employability, and digital governance)
3. Delivery mechanisms (including laboratory-based training, mobile ICT units, and scalable online platforms)
4. Alignment with national policy imperatives such as Digital India, Atmanirbhar Bharat, and the Sustainable Development Goals (SDGs)

Name of Sub-schemes/components

The CB&SD scheme comprises six strategically designed Sub-schemes with additional contributions from the Internet Governance Projects (Referred as the Sub-Scheme VII hereafter in this evaluation report):

1. Sub-Scheme I: Manpower Development in Niche Areas- Focused on frontier technologies where talent shortages are acute, this sub-scheme supports targeted interventions in domains such as semiconductors, quantum technologies, cybersecurity, unmanned systems, nanoelectronics, AI/bioinformatics, and other emerging fields. Public funding supplements institutional efforts by scaling up specialized labs, digital platforms, and thematic Centres of Excellence.
2. Sub-Scheme II: Professional Development- This sub-scheme aims to continuously upgrade competencies of stakeholders, including students, working professionals, educators, researchers, etc. so that curricula, workplace skills, and teaching methodologies remain relevant. By co-developing industry-aligned modules,

organizing faculty development workshops, and offering certification programs, this sub-scheme enhances workforce adaptability and teaching quality.

3. Sub-Scheme III: Skill Development for Employability:Designed to bridge the gap between academic output and industry requirements, especially for graduates and youth in underserved regions, this sub-scheme through work-based learning, vocational training, and partnerships with local institutions, aims to equip participants with relevant skills in Electronics and ICT roles, including technology-enabled services.
4. Sub-Scheme IV: Empowerment - Women/SC/ST/EWS/OBC/Specially Abled/ Senior Citizens, etc.: This sub-scheme prioritizes inclusive interventions, such as digital literacy, domain-specific upskilling, and entrepreneurship support, tailored for underrepresented and vulnerable groups. By lowering barriers and offering targeted outreach, this sub-scheme also amplifies social impact and expands the talent base, contributing to equitable growth.
5. Sub-Scheme V: Livelihood Enhancement and Awareness Programme (LEAP)- This sub-scheme leverages ICT to foster sustainable livelihoods and digital inclusion in rural, semi-urban, and marginalized communities. Interventions include digital literacy drives, cluster-based models for artisan and farmer empowerment, technology-integrated livelihood projects, and campaigns linking beneficiaries to government services.
6. Sub-Scheme VI: Strengthening of ICT Infrastructure: This sub-scheme focuses on establishing and upgrading digital and physical infrastructure, training labs, setting up of new/ extension centers, experiential learning platforms, and intelligent educational systems, particularly in underserved areas (including North-Eastern Region). Robust infrastructure underpins delivery of all other interventions, ensuring scalability, resilience, and accessibility for diverse stakeholders.
7. Sub-Scheme VII: Internet Governance: This sub-scheme focuses on enhancing India's role in global digital governance. It aims to make India's internet infrastructure more resilient, safe, and trustworthy by 2030.

Apart from these seven sub schemes and the projects included in sub schemes, the National Institute of Electronics & Information Technology (NIELIT), under the Ministry of Electronics & Information Technology (MeitY), plays a pivotal role in India's capacity building and skill development ecosystem. As the HRD arm of MeitY, NIELIT implements over 20 major projects, including Chips to Startup (C2S), FutureSkills PRIME, and India AI Labs, targeting youth, government employees, and marginalized groups in aspirational districts and Northeast states. It offers a continuum of NSQF-aligned programs, from school-level digital literacy to PhD research in AI, IoT, cybersecurity, and semiconductors, through 56 centers, 700+ affiliates, and 8,500+ facilitation hubs. Its 2024 Deemed-to-be University status enables innovative degree programs via the NIELIT Digital University Platform (ndu.digital), launched October 2, 2025, offering AI-driven, multilingual courses with credit transfers, virtual labs, and career tools to empower 40 lakh learners by 2030, aligning with Digital India and Skill India.

CB&SD Scheme Implementation Model

The CB&SD Scheme employs a modular, project-based model that balances continuity and adaptability, building on proven initiatives while responding agilely to evolving technological priorities. At its core is the co-creation of industry-aligned curricula integrated with value-added services like competency-based assessments, ensuring measurable, employer-recognized proficiencies. Delivery emphasizes scale and inclusivity through blended approaches, online modules, virtual labs, mobile units, and localized centers, targeting Tier-II/III cities and remote areas. It invests in thematic Centres of Excellence and incubation platforms to drive applied R&D, prototypes, and startups in niche domains, supported by advanced infrastructure such as semiconductor simulators, nanofabrication labs, quantum testbeds, and AI-cloud environments. Regional hubs localize implementation, while global collaborations and standards alignment position Indian talent for international workforce gaps. Continuous upgradation occurs via periodic curriculum reviews and stakeholder feedback. Success relies on multi-stakeholder hub-and-spoke partnerships involving industry, academia, government, and CSR entities, fostering a unified framework that promotes synergy, scalability, sustainability, innovation, and impact across all sub-schemes.

Governance, Monitoring, and Quality Assurance

The CB&SD Scheme employs a layered, multi-tiered governance model that promotes transparency, accountability, and agile decision-making through policy leadership, domain expertise, and institutional coordination, effectively balancing top-down guidance with bottom-up responsiveness. At its core are several key mechanisms: a Thought-Leadership Committee comprising representatives from MeitY, relevant line ministries, industry bodies, academia, and experts, which sets strategic priorities, reviews emerging trends, and guides thematic focus; a standardized approval process where project proposals are evaluated by Working Groups or Empowered Committees (such as SFC or EFC) based on funding size and strategic importance, followed by approvals from competent authorities; Thematic Project Review and Steering Groups (PRSGs) for clusters of related projects, like multiple semiconductor initiatives, to enable holistic evaluation, reduce duplication, and foster synergies; outcome-oriented monitoring that tracks Key Performance Indicators including the number of trained and certified professionals, placement and start-up conversion rates, infrastructure deployment and utilization, innovation outputs such as prototypes and patents, and inclusion measures for representation from underserved regions and groups; real-time oversight through quarterly reviews, regular progress reports, and a centralized Management Information System (MIS) dashboard to facilitate timely decision-making and mid-course corrections; and quality assurance via third-party impact assessments, competency-based evaluations to suggest corrections and updates that reinforce training quality, and stakeholder feedback loops to ensure continuous improvements. Apart from this, NIELIT adopts an inclusive, industry-aligned approach, blending formal (AICTE-approved degrees) and non-formal (NCVET-recognized skilling) education. It customizes upskilling in emerging technologies like AI and blockchain via short/long-term courses, virtual labs, and multilingual platforms. Leveraging a pan-India network and AI-driven tools on NDU.digital, it bridges digital divides, ensures outcome-based learning, and integrates credits via ABC for lifelong employability.

Alignment with broader goals

The Capacity Building and Skill Development (CB&SD) scheme is explicitly positioned to advance India's technology-led growth agenda by expanding human capital in electronics and Information and Communication Technology (E&ICT) in line with Digital India (2015), Skill India (2015), Atmanirbhar Bharat (2020), and the Viksit Bharat@2047 vision for a knowledge-driven economy. Its six sub-schemes and Internet Governance collectively operationalize national missions, IndiaAI, the India Semiconductor Mission, and Cyber Surakshit Bharat, through targeted skilling in frontier domains, professional development, employability, inclusion, and ICT infrastructure. The scheme's modular, NSQF-aligned design and use of platforms like DigiLocker embed portability and quality assurance while reinforcing National Education Policy (NEP) 2020 and National Digital Education Architecture (NDEAR) objectives for lifelong learning at scale. Outcomes directly map to SDGs 4, 5, 8, and 9 via standardized credentials, job creation and startups, and lab/infrastructure expansion; Internet Governance efforts complement this by strengthening multilingual access and cyber resilience, supporting a secure, inclusive digital ecosystem aligned with national and global priorities.

Need for the evaluation

The impact evaluation of the scheme was necessitated to guide mid-course corrections and inform evidence-based decision-making as it transitions from the FY 2021–2026 cycle to the upcoming XVI Finance Commission period (2026–2031). The scheme has set ambitious targets to build a robust pool of 1.5 crore skilled professionals across multiple domains, comprising 15 lakh individuals through upskilling and reskilling in niche and emerging technologies (such as Semiconductors, Quantum Computing, Artificial Intelligence and Machine Learning, Internet of Things, Cloud Computing, Cyber Security, Drones, PCB Design, Electronics Manufacturing, and Industrial Automation); 25 lakh in generic E&ICT skill areas; 35 lakh for livelihood enhancement; and 75 lakh from underprivileged segments empowered through targeted skilling and capacity-building initiatives. Achieving these outcomes entails a total budgetary allocation of ₹5,018.22 crore towards ongoing and new projects under the scheme.

The evaluation, undertaken by the Indian Institute of Public Administration (IIPA), employs NITI Aayog's RCEEIS framework to appraise the scheme's Relevance, Coherence, Effectiveness, Efficiency, Impact, and Sustainability across seven sub-schemes for the period 2021–August 2025. The assessment draws exclusively on official MeitY documents, dashboards, and utilization records to ensure objectivity and data integrity.

The need for evaluation arises from the rapidly evolving technological landscape and the growing mismatch between workforce skills and industry demands. In niche technology areas, advancements in AI, ML, blockchain, quantum computing, cybersecurity, IoT, and semiconductors are outpacing the current education and training systems. Industry estimates indicate a requirement of over 1.2 lakh professionals in semiconductors within five years, one million in AI by 2025, and one lakh in drone technology by 2030. Globally, quantum talent

shortages are projected to exceed one million by 2030, while India's contribution remains below 1%. Similar capacity gaps in nanoelectronics and AI-bioinformatics are constraining the realization of national missions such as Digital India and Atmanirbhar Bharat.

At the professional level, there is a need for over 30 million digitally skilled workers, yet only about 10 million are trained annually, leaving a 38% shortfall in critical domains like AI, cybersecurity, and health informatics. Faculty shortages, particularly in Tier II and Tier III institutions, and weak cyber resilience in sensitive regions further compound this challenge. In terms of employability, deficits in practical training across IoT, AI/ML, and VLSI disciplines have limited job readiness among youth in smaller cities and marginalized groups, resulting in underemployment, migration, and regional imbalances. From an inclusion perspective, empowerment initiatives targeting women, SC/ST, OBC, EWS, senior citizens, and differently-abled persons remain essential, as low digital and financial literacy continues to exacerbate vulnerabilities. The Livelihood Enhancement and Awareness Programme (LEAP) directly addresses these concerns by tackling low rural internet penetration (below 25%), limited youth employability (51.3%), and anticipated future job-skill mismatches, while advocating early STEM exposure. Additionally, strengthening ICT infrastructure, particularly the modernization of laboratories and rural connectivity, remains critical to scale equitable and inclusive skilling.

Overall, these gaps underscore the need for a comprehensive evaluation to identify strategic priorities, strengthen program design, and ensure that the scheme effectively contributes to India's broader vision of technological leadership, innovation, and inclusive growth in alignment with flagship initiatives such as Digital India, Make in India, and Skill India.

Observations

The Capacity Building and Skill Development (CB&SD) scheme, through its seven sub-schemes, has made significant contributions to advancing India's digital and innovation ecosystem. Collectively, the initiatives have expanded access to training, strengthened professional capacities, and created pathways for inclusive growth, while aligning closely with national missions.

1. Access and Equity: Training opportunities have been expanded to diverse geographies, with targeted initiatives promoting participation of women, SC/ST communities, PwDs, and economically weaker groups, thereby contributing to inclusive and equitable growth.

2. Curriculum Advancement: Programmes have integrated emerging technologies such as AI, IoT, semiconductors, blockchain, AR/VR, cybersecurity, and quantum computing, ensuring global relevance and future-readiness of the talent pool.

3. Industry–Academia Collaboration: Strong partnerships with industry, and startups have enhanced the employability and entrepreneurial potential of participants through internships, mentorship, research, and incubation support.

4. Infrastructure Strengthening: Investments in Learning Management System (LMS) platforms, cyber labs, AR/VR facilities, and mobile ICT labs have built robust digital and physical ecosystems, enabling scalable and accessible delivery models.
5. Inclusivity and Empowerment: Dedicated measures for gender equity, regional balance, and social inclusion have ensured that marginalized and underserved groups are integral beneficiaries of the programme.
6. Post-Training Ecosystems: Alumni networks, job portals, and incubation platforms have facilitated sustained employability, entrepreneurship, and long-term engagement with beneficiaries.
7. Monitoring and Sustainability: Robust evaluation frameworks, real-time digital dashboards, and alignment with Digital India, Skill India, NEP 2020, and Atmanirbhar Bharat have reinforced accountability, sustainability, and policy coherence.

Together, the seven sub-schemes have established a strong foundation for India's digital future, contributing to national priorities while nurturing a globally competitive, inclusive, and innovation-driven talent ecosystem.

Key Achievements & Impact

Under the Capacity Building and Skill Development (CB&SD) scheme, significant progress has been achieved over the past five years in advancing digital empowerment and workforce readiness. More than 65 lakh candidates have been trained and skilled across diverse domains, including niche technology areas, E&ICT skill development, empowerment, and livelihood enhancement through institutions such as NIELIT, C-DAC, and partner academic organizations. Additionally, over 6.3 crore individuals have been trained in digital literacy, extending the reach of digital inclusion to rural and remote regions of India. Complementing these efforts, more than 15 crore citizens have been sensitized on cybersecurity awareness through direct and indirect outreach initiatives, contributing to the vision of building a cyber-safe and digitally empowered nation. This robust performance highlights the scheme's scalability, responsiveness to industry demands in electronics and ICT sectors, and alignment with India's digital economy goals. The scheme has delivered transformative outcomes in building a skilled workforce, promoting innovation, bridging digital divides, strengthening R&D, advancing self-reliance, and fostering multi-stakeholder collaborations. Key achievements are organized thematically below, emphasizing advanced research and innovation, professional and faculty development, employability-focused skilling, inclusive community empowerment, and infrastructure scalability.

1. **Advanced Research and Innovation**

   • High-End Skill Development: Under the Visvesvaraya PhD Scheme, 966 PhDs have been completed (795 full-time, 171 part-time), with 39 theses submitted and 154 ongoing, alongside 158 Young Faculty Research Fellows (YFRFs). Phase II has allotted 1,000 full-time seats to 155 institutions, 153 part-time seats to 112

institutions, 11 YFRFs, and 125 post-doctoral fellowships to 114 entities, bolstering India's R&D in frontier technologies.

• Intellectual Property and Innovation: Generated 90 patents (20 granted) and supported 1,686 projects under the Visvesvaraya PhD Scheme and INUP-i2i, including 73 patents, 1,084 theses, 1,030 publications, and 48 prototypes from INUP-i2i, which empowered 17,344 researchers across 2,218 institutes (2008-2025) and fostered 37 startups, with innovations like MEMS sensors for ISRO.

• Specialized Infrastructure: Equipped 100 academic/R&D institutions and 13 startups/MSMEs across 28 states/UTs with EDA tools under Chips to Startup (C2S), training 61,947 engineers via VLSI SMART Lab and enabling fabrication of 94 student-designed chips at SCL Mohali. Established advanced facilities including ChipIN Centre at C-DAC Bangalore (EDA tools for 282 institutions), VLSI SMART Lab at NIELIT Calicut (100 systems), UAS labs in 30 institutions under SwaYaan, and nanofabrication platforms at 6 IITs/IISc via INUP-i2i Phase III.

• Targeted Expertise Building: ISEA Phase III developed a 117-module CISO syllabus across 13 domains, training 339 candidates (180 certified) in the initial batch and 691 in specialized tracks (OT/ICS Security, Telecom Security, BFSI Security, Secure Software Development, Cyber Forensics). SwaYaan aligned 30 institutions across 5 themes (Drone Electronics, GNC Algorithms & Simulation, Aeromechanics, Drone Applications, Allied UAS Technologies), yielding 50 IPR publications, 10 patents, and 117 proofs-of-concept involving 650 participants.

2. Professional and Faculty Development

• Platform-Based Upskilling: FutureSkills PRIME has attracted 23.72 lakh+ sign-ups, with 14.71 lakh+ enrolled and 8.09 lakh unique learners (84% from Tier 2/3 cities, 41% women) earning 1.63 crore+ badges across 585 courses in AI, Big Data, IoT, 3D Printing, Cloud, Cybersecurity, Blockchain, and AR/VR. C-DAC & NIELIT centres trained 21,433 government officials and 2,367 trainers; additionally, 449 bootcamps under SwaYaan trained 17,194 beneficiaries.

• Faculty Enablement: Under Electronics & ICT Academy Phase II, 53,327 beneficiaries (47,659 faculty, 5,668 students/others) have been trained via 813 Faculty Development Programmes across 14 agencies in 10 strategic technology families, targeting 1.35 lakh faculty/trainers overall.

• Cybersecurity Expertise: ISEA Phase III trained/undergoing training for 17,920 candidates through 50 institutions, targeting 2.75 lakh professionals including 45,000 certified cybersecurity experts and 2.3 lakh students/researchers/faculty. Awareness efforts reached 5.1 lakh direct participants via 2,320 workshops and 10 crore indirectly through 3 Awareness Weeks (31 lakh direct in Bihar, Uttar Pradesh, Delhi), 32 broadcasts, and multilingual materials (5 handbooks, 7 brochures, 10 advisories, 1 newsletter, 1,200 posters, 80 videos); 6,472 master-trainers were trained across 14 programs. Safer Internet Day (February 11, 2025) engaged 3.05 lakh participants via

1,512 workshops across 34 states/UTs and 599 districts, plus broadcasts on 200 primary stations, 30 FM channels, and Vivid Bharati networks.

• Regional Capacity Building: 17 cyber labs established in North East state capitals and districts; 6,127 officials (including SC/ST/OBC/women) trained under the Empowering Police project via 8 NIELIT centres.

3. **Employability-Focused Skilling**

• Youth Skilling: Reached thousands of youth across 600+ districts, with coverage in 81 aspirational districts and all 8 North Eastern states under LEAP and ESDM initiatives. Work-Based Learning enrolled 2,878 (1,305 completed) from SC/ST/women/EWS categories.

• Emerging Technologies: SwaYaan trained 21,224 out of 42,560 targeted trainees via 734 activities across 30 institutions, including 5,660 formal (via 413 activities like M.Tech/minor degrees/IPR/conferences) and 37,100 non-formal (via 1,287 activities like workshops/bootcamps/POCs/competitions) to build the UAS ecosystem.

• North East Focus: LEAP initiatives trained 5075 weavers/artisans in two districts of Assa, Bodoland (Assam) Phase II with ICT tools for e-commerce; Capacity Building in IECT via 8 NIELIT centres reached thousands across states.

4. **Inclusive Community Empowerment**

• Marginalized Groups: Prioritized SC/ST/women/EWS through Work-Based Learning (2,878 enrolled) and North East training (6,127 officials including SC/ST/OBC/women); ISEA Phase III workshops targeted school/college students, teachers, officials, LEAs, general users, parents, women, and CSCs.

• Rural Livelihoods: ICT upgrades for 290 Eklavya Model Residential Schools.

• Inclusivity Metrics: Awareness and training extended to underserved regions, with 41% women participation in FutureSkills PRIME and coverage in Tier 2/3 cities (84% of learners), aligning with self-reliance goals for 10+ crore beneficiaries via Cyber Aware Digital Naagrik.

5. **Infrastructure and Scalability**

• ICT Infrastructure: Implemented 150+ upgrades, including NIELIT extension centres (Pilibhit, Hyderabad, Tirupati, Chitradurga) and SMART infrastructure; hub-and-spoke models via ISEA Phase III (50 institutions), SwaYaan (30 institutions with 5 resource centres), and Electronics & ICT Academy Phase II (14 agencies including IITs/NITs/IIITs/C-DAC/NIELIT). C2S supported Rs. 250 crore outlay for fabless ecosystem, MPW fabrication at SCL Mohali, and FPGA prototyping for 100 institutions.

• Digital Learning Platforms: Developed aggregator platforms like FutureSkills PRIME for scalable outreach to remote and underserved areas, contributing to $1 trillion digital economy target by 2030 and alignment with India Semiconductor

Mission (120,000 professionals by 2027) and IndiaAI. Further, NIELIT, through its 2024 Deemed-to-be University status enables innovative degree programs via the NIELIT Digital University Platform (ndu.digital), launched on October 2, 2025, offers AI-driven, multilingual courses with credit transfers, virtual labs, and career tools to empower 40 lakh learners by 2030, aligning with Digital India and Skill India.

Performance Evaluation Using NITI Aayog RCEEIS Framework

The CB&SD Scheme's performance from 2021–2026 (Table E3) was rigorously evaluated using the NITI Aayog RCEEIS framework, integrating quantitative metrics and qualitative insights to assess its impact and alignment with national priorities.

Table E3: Key Findings – Mapped in RCEEIS Framework

RCEEIS Dimension	Key Findings
Relevance	Training programs aligned with national digital priorities (e.g., e-governance, cybersecurity, AI, IoT), addressing critical skill gaps in government, academia, and industry.
Coherence	Complemented MeitY initiatives (e.g., Digital India, PMGDISHA) without duplication. Partnerships with premier institutions (IITs, NITs, IIITs, IIMs, State ATIs) ensured academic credibility, with industry-informed curricula fostering ecosystem linkages.
Effectiveness	Trained more than 65.00 Lakh beneficiaries across diverse categories, with specialized courses (e.g., IoT, AI, Blockchain, Cyber Forensics) demonstrating strong uptake and practical utility.
Efficiency	Leveraged hybrid training modes (offline/online) to reduce costs and widen reach, utilizing existing institutional infrastructure for cost-effectiveness.
Impact	Created a skilled talent pool contributing to Digital India, Smart Cities, and Industry 4.0. Enhanced institutional capacities of ATIs, IITs, and NITs, strengthening India's position in emerging technology domains.
Sustainability	Institutionalized courses in university curricula and developed reusable digital content and LMS platforms. Long-term sustainability is challenged by dependency on central funding and limited state-level ownership, necessitating diversified funding models.

Beyond performance indicators, the scheme's impact is also reflected in its financial trajectory, which illustrates both effective fund utilization and the government's sustained commitment to scaling future initiatives.

Financial Overview

The Manpower Development Programme (2021–26) (Table E1) featured a BE of ₹2650 crore, rationalized to ₹2466.51 crore (RE), with an actual expenditure of ₹1964.25 crore, indicating approximately 80% utilization amid early disruptions such as the COVID-19 pandemic. Expenditure trends strengthened progressively, with utilization rates against RE

climbing from 68% in 2021-22 and 65% in 2022-23 to 100% in 2023-24, and sustaining at 87% in 2024-25 and 77% in 2025-26, particularly post-merger with PMGDISHA in 2023, demonstrating improved alignment of allocations with execution capabilities.

The PMGDISHA scheme (2020–22) (Table E2) exhibited robust efficiency, with a BE of ₹700 crore revised downward to ₹550 crore (RE), which was fully utilized at 100%, highlighting strong beneficiary demand, refined financial forecasting, and seamless implementation.

In tandem, the schemes affirm the Government's resolve to advance digital literacy and skilling. Their merger into the Capacity Building and Skill Development Scheme (effective April 1, 2023) fuses PMGDISHA's proven demand-responsive model with the Manpower Programme's comprehensive training scope, fostering greater potential for consistent, high-impact resource deployment moving forward.

Table E1: Manpower Development Programme - BE/RE/Actual (2021-2026) (Rs. in crore)

Sl. No.	Financial Year	Budget Estimates	Revised Estimates	Actual Expenditure
1.	2021-22	400.00	400.00	273.67
2.	2022-23	600.00	500.00	323.64
3.	2023-24	537.50	454.01	454.01
4.	2024-25	537.50	537.50	468.84
5.	2025-26	575.00	575.00	444.09

Table E2: PMGDISHA – BE/RE/Actual (Rs. in crore)

Sl. No.	Financial Year	Budget Estimates	Revised Estimates	Actual Expenditure
1.	2020-21	400.00	250.00	250.00
2.	2021-22	300.00	300.00	300.00

Note: Manpower Development and PMGDISHA as both the schemes have been merged to form "Capacity Building and Skill Development Scheme" w.e.f. 01.04.2023.

Tentative Allocation of Funds under XVI Finance Commission

The proposed budget for the Capacity Building and Skill Development (CB&SD) Scheme during the XVI Finance Commission period has been carefully structured to address both ongoing commitments and new initiatives. A detailed distribution of allocations across sub-schemes highlights the strategic emphasis on manpower development, professional skilling, employability enhancement, inclusive capacity building, livelihood programmes, and ICT infrastructure. These allocations have been phased across five financial years to ensure both immediate capacity creation and long-term sustainability.

The tentative allocation of funds for capacity building and skill development initiatives during the XVI Finance Commission period (2026-27 to 2030-31) amounts to ₹5,018.22 crore, encompassing both new and ongoing projects across seven strategic sub-schemes. The

largest allocation has been earmarked for Strengthening of ICT Infrastructure for Capacity Building at ₹1,906.84 crore, reflecting the critical importance of digital infrastructure in enabling effective capacity development programs. This is followed by Manpower Development in Niche Areas at ₹1,062.30 crore, which includes R&D Division funding and focuses on creating specialized expertise in emerging technology domains. Skill Development for Employability receives ₹769.82 crore to address workforce readiness and employability challenges, while Professional Development – Skilling/Reskilling/Upskilling including Faculty Training is allocated ₹510.44 crore to ensure continuous skill enhancement of the existing workforce and training personnel. Livelihood Enhancement & Awareness Programmes (₹485.12 crore) and Empowerment initiatives for Women, SC/ST, EWS, OBC, PwDs, and Senior Citizens (₹258.70 crore) demonstrate a commitment to inclusive growth and socio-economic development. Additionally, ₹25.00 crore has been provisioned for Internet Governance and Digital Inclusion to strengthen digital governance frameworks. The allocation pattern shows higher budgetary commitments in the initial years (₹1,564.46 crore in FY 2026-27), gradually tapering to ₹743.25 crore by FY 2030-31, reflecting the frontloading of infrastructure development and capacity creation activities.

Justification for the Continuation of the CB&SD Scheme

The continuation of the CB&SD Scheme is not merely desirable but an urgent national imperative. Several key factors justify its sustained and enhanced funding:

- Proven Performance: Under the Capacity Building and Skill Development (CB&SD) scheme, significant progress has been achieved over the past five years in advancing digital empowerment and workforce readiness. More than 65 lakh candidates have been trained and skilled across diverse domains, including niche technology areas, E&ICT skill development, empowerment, and livelihood enhancement through institutions such as NIELIT, C-DAC, and partner academic organizations. Additionally, over 6.3 crore individuals have been trained in digital literacy, extending the reach of digital inclusion to rural and remote regions of India. Complementing these efforts, more than 15 crore citizens have been sensitized on cybersecurity awareness through direct and indirect outreach initiatives, contributing to the vision of building a cyber-safe and digitally empowered nation.
- Bridging Critical Skill Gaps: India faces a talent crunch in semiconductors (projected need for 1.70 lakh professionals by 2025 amid demand-supply gaps) and contributes <1% to the global quantum workforce (global market $1.79B in 2025). Without this scheme, structural deficits in VLSI (61,947/85,000 trained via C2S) and drones (21,224/42,560 via SwaYaan) will intensify.
- Economic Imperative: India’s ambition of achieving a $1 trillion digital economy by 2030, from $370B currently, hinges on skilled professionals in frontier technologies like AI (17, 920 trained via ISEA III) and semiconductors.

- Inclusivity and Social Equity: With 35% women participation (e.g., 41% in FutureSkills PRIME) and strong outreach to SC/ST/EWS (69,011 via fee reimbursement, 3,361 in EELTP), the scheme directly supports SDGs 4, 5, 8, and 9.
- Future Readiness: The projected creation of 170 million tech jobs globally by 2030 necessitates India's readiness with a robust, skilled workforce, building on 966 PhDs via Visvesvaraya Scheme and 85 patents achieved.

Further, the Scheme's success is significantly driven by its flagship projects: FutureSkills PRIME, Chips to Startup (C2S), Work-Based Learning (WBL), and Information Security Education and Awareness (ISEA), Capacity building for human resource development in Unmanned Aircraft System (Drone and related Technology). These initiatives are pivotal in shaping India's digital talent pipeline, fostering robust industry-academia collaboration, and fortifying national cybersecurity frameworks. Around 23.72 lakh+ candidates registered, 14.71 Lakh+ enrolled and 8.09 lakh completed in FutureSkills PRIME. C2S has equipped 100 academic institutions with advanced EDA tools, training 61,947 engineers in VLSI and fostering innovation in semiconductor design. WBL has total enrollment of 3190candidates, out of which 1331 graduate engineers have completed the training.

The Phase-III of the ISEA project aimed to generate 2.75 lakh information-security professionals over five years. As of 31 Aug 2025, 17,920 candidates have been trained or are under training through 50 institutions. The awareness component has delivered 2,320 workshops reaching 5.1 lakh direct participants (and an estimated ~10 crore beneficiaries via indirect modes such as broadcast and mass outreach). Additionally, 6,472 master-trainers have been trained; on Safer Internet Day (Feb 11, 2025) 1,512 awareness workshops reached 3.05 lakh participants. These projects are strategically aligned with national priorities such as Digital India, Atmanirbhar Bharat, and Cyber Surakshit Bharat, serving as critical enablers of India's ambition to lead in frontier technologies and digital governance. The continuity of these flagship projects over the next 1–2 years is imperative to maintain momentum, realize long-term outcomes such as patent generation, job creation, and global competitiveness, and ensure seamless alignment with India's broader skilling and digital capacity-building roadmap. Their sustained implementation will amplify the scheme's impact by bridging critical skill gaps (e.g.,shortfall in VLSI skilled professionals,rural digital literacy gap), strengthening institutional capacities, and fostering inclusive growth across diverse demographics.

Considering these factors, continued financial commitment under the XVI Finance Commission is indispensable for ensuring India's talent ecosystem remains globally competitive, socially inclusive, and economically transformative.

Policy Recommendations

The Capacity Building and Skill Development (CB&SD) Scheme has achieved significant training targets and created measurable socio-economic impact. Yet, critical gaps remain in advanced technology skills, inclusivity, rural digital penetration, and sustainability. The

following recommendations, aligned with the proposed outlay for the XVI Finance Commission, are structured around broad thematic areas with clear outcomes, timelines, and accountability mechanisms.

Key Recommendations for the Capacity Building and Skill Development (CB&SD) Scheme:

1. **Standardized Skill Training**: All training programs should follow the National Skills Qualification Framework (NSQF). This means the courses are structured, certified, and recognized nationally, so every learner gets the same quality training no matter where they are.
2. **Hub-and-Spoke Model:** The scheme should set up central "hub" centers that provide advanced training and support, connected to smaller regional "spoke" centers. This ensures that people in remote or rural areas can still access quality skill development programs.
3. **Digital and Hybrid Learning:** To make training more accessible, online platforms and e-learning tools should be used. This way, learners can join courses from home, reducing travel barriers and allowing flexible learning schedules.
4. **Focus on Emerging Technologies:** Training should emphasize future-ready skills such as artificial intelligence, robotics, cybersecurity, quantum computing, and nanoelectronics. This prepares youth for high-demand, specialized jobs.
5. **Inclusivity in Underserved Regions:** Special efforts should be made to expand training opportunities in North-Eastern states, rural areas, and marginalized communities, so skill development is fair and benefits everyone.
6. **Industry Collaboration:** Partnerships with private companies and educational institutions are important. They ensure that training is practical, relevant to real-world jobs, and increases employability.
7. **Monitoring and Evaluation:** Regular impact assessments and audits should be conducted to check the effectiveness of programs. This helps identify gaps, improve quality, and ensure that the scheme achieves its goals efficiently.
8. **Integration with NEP 2020 Vision:**

   The Scheme should be closely aligned with the vision of the National Education Policy (NEP) 2020, which emphasizes holistic, multidisciplinary, and competency-based learning. Skill development programs must integrate vocational education and practical exposure from an early stage, enabling students to acquire both academic knowledge and hands-on skills simultaneously. In doing so, the scheme can nurture a generation that is not only technically proficient but also capable of critical thinking, problem-solving, creativity, and digital literacy, qualities essential for thriving in the rapidly evolving knowledge and innovation economy.

9. **Focus on Semiconductor and Electronics Skills:**

The scheme should place a strong emphasis on semiconductor and electronics skill development, recognizing their strategic importance for India's technological self-reliance and global competitiveness. Dedicated Centres of Excellence and advanced laboratories should be established for semiconductor design, fabrication, testing, and validation, fostering a robust ecosystem for research and innovation. Training programs must focus on VLSI design, embedded systems, and chip manufacturing, equipping students and professionals with domain-specific expertise to meet the growing industry demand. Furthermore, industry, academia partnerships should be strengthened to facilitate hands-on learning, internships, and collaborative projects, ensuring that the workforce is aligned with real-world semiconductor and electronics sector requirements.

10. Artificial Intelligence (AI) Skill Development:

The scheme should strengthen Artificial Intelligence (AI) skill development through structured programs encompassing machine learning, deep learning, data analytics, robotics, and AI ethics. These programs should combine theoretical foundations with practical, research-oriented learning to produce industry-ready professionals. Emphasis must be placed on research-driven internships, live projects, and innovation challenges that encourage problem-solving using AI tools and methodologies. Additionally, the training framework should promote sector-specific AI applications, particularly in domains such as healthcare, agriculture, manufacturing, and smart cities, to ensure that AI capacity building directly contributes to India's national development priorities and enhances productivity across key economic sectors.

11. Early Exposure and Foundation Building:

The scheme should prioritize early exposure and foundational skill-building by integrating AI, coding, and electronics into school-level curricula, in line with the National Education Policy (NEP) 2020 emphasis on 21st-century competencies. Introducing these subjects at an early stage will help nurture logical reasoning, creativity, and problem-solving abilities among students. Schools and colleges should be encouraged to establish coding clubs, robotics laboratories, and AI innovation workshops to provide hands-on learning experiences and stimulate curiosity in emerging technologies, thereby building a strong foundation for future digital and technological proficiency.

12. Public-Private-Academia Collaboration:

The scheme should promote the creation of innovation hubs in collaboration with technology companies, startups, and academic institutions to foster real-world learning, mentorship, and co-creation opportunities. These hubs can serve as dynamic platforms for hands-on training, incubation, and applied research, bridging the gap between academia and industry. Additionally, the scheme should facilitate job-oriented skill development programs tailored to high-growth sectors such as Artificial Intelligence, semiconductors, Internet of Things (IoT), and quantum technologies,

ensuring that the emerging workforce is well-equipped to meet the evolving demands of India's digital and high-tech industries.

13. Digital Infrastructure and Remote Learning:

The scheme should focus on strengthening digital infrastructure and remote learning ecosystems to make quality education and training accessible to all. Robust online platforms, virtual laboratories, and simulation-based learning environments should be developed, particularly for advanced domains such as Artificial Intelligence and semiconductor technologies. These digital tools will enable learners to gain practical exposure and technical proficiency regardless of their geographical location. Special emphasis must be placed on ensuring that students in rural and remote areas have reliable connectivity and access to high-quality digital resources, thereby bridging the digital divide and promoting inclusive capacity building across the country.

14. Continuous Assessment and Certification:

The scheme should introduce modular, credit-based courses that offer certifications recognized both nationally and internationally, enabling learners to build competencies progressively and enhance their global employability. To maintain relevance and quality, regular skill audits should be conducted to identify emerging industry trends, technological advancements, and workforce gaps. The findings from these audits should inform periodic curriculum updates and program redesigns, ensuring that the skill development ecosystem remains agile, future-ready, and aligned with national and global market demands.

15. **Enhanced Cybersecurity Awareness and Capacity Building:**

To strengthen India's cyber resilience and citizen safety in the digital ecosystem, the scheme should aim to reach 20 crore citizens by 2030 through structured cybersecurity awareness programs. This enhanced target reflects the growing exposure of individuals and small enterprises to digital risks amid accelerated digital adoption. A coordinated campaign involving educational institutions, industry bodies, and local governance networks can promote cyber hygiene, digital safety, and data protection practices. Integrating basic cybersecurity awareness into school curricula and professional skilling modules will further reinforce the objectives of Cyber Surakshit Bharat and Digital India, ensuring that citizens are not only digitally literate but also digitally secure.

16. **Continuation and Expansion of Flagship Projects and Allied Programs:**

Given their demonstrated sectoral relevance and strategic value, flagship initiatives such as FutureSkills PRIME, Chips to Startup (C2S), Information Security Education and Awareness (ISEA), SwaYaan, and NIELIT Digital University should be continued/ scaled during the XVI Finance Commission period. Additionally, complementary national programs like PMGDISHA, Visvesvaraya Ph.D. Scheme, and Skill Development in ESDM have played pivotal roles in fostering digital

inclusion, higher education research, and domain-specific technical capacity. The continuation and integration of these programs under a unified skill development architecture will ensure coherence, avoid duplication, and strengthen India's position as a global digital talent hub.

These programs collectively address evolving workforce trends, such as the surging demand for skills in semiconductors, AI, quantum computing, drones, cybersecurity, and advanced electronics manufacturing. Sustained funding support, inter-ministerial collaboration, and strong industry participation are vital to ensure that India not only meets domestic requirements but also contributes to the global digital economy. In doing so, the CB&SD ecosystem will continue to advance the national vision of Atmanirbhar Bharat, Viksit Bharat @2047, and Digital India, by building a self-reliant, future-ready, and globally competitive workforce.

The Capacity Building and Skill Development (CB&SD) Scheme stands as a cornerstone of India's digital transformation, having trained more than 65.00 lakh beneficiaries from 2021–2026andgenerating an economic value through innovation, job creation, and inclusive growth. Its continuation over the next five years (2026–2031) is imperative to address critical skill gaps, including trained VLSI candidates, rural women digital literacy gap, and emerging demands in drone technology, while sustaining momentum in flagship projects like, FutureSkills PRIME, Chips to Startup (C2S), Work-Based Learning (WBL), Information Security Education and Awareness (ISEA), and Capacity Building for Human Resource Development in Unmanned Aircraft System (Drone and Related Technology). These flagship projects are pivotal in bridging skill deficits, fostering industry-academia synergy, strengthening cybersecurity resilience, and enabling applications in agriculture, infrastructure, and disaster management through drone expertise. By scaling infrastructure, innovating curricula, and ensuring inclusivity. the scheme aims to empower 1.5 crore beneficiaries by 2030. The continuation of the scheme is essential to mitigate unemployment risks, to harness India's demographic dividend, and to position the nation as a global leader in AI, quantum, green, and drone technologies, aligning with the $1 trillion digital economy target and Viksit Bharat@2047 vision.