

Ministry of Federal Education & Professional Training
Government of Pakistan
Federal Directorate of Education

# ROADMAP FOR ADVANCING DIGITAL LEARNING AND TECHNOLOGY INTEGRATION IN FDE

## (2026-2030)

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# Executive Summary

The *Roadmap for Advancing Digital Learning and Technology Integration in the Federal Directorate of Education (FDE)* is a five-year strategic plan to transform public schools in the Islamabad Capital Territory (ICT) into modern, technology-enabled learning ecosystems. Recognizing that digital integration is essential for preparing students and schools for the demands of the 21st century, it aligns with the government's broader vision of digitalization and skills development.

The roadmap provides strategic direction, investment priorities, and an implementation framework to shift from fragmented digital initiatives to a coordinated, system-wide approach, ensuring that every student, teacher, and school benefits from digital transformation. It focuses on six core domains of intervention:

1. Digital Infrastructure: Establish reliable, high-speed connectivity (fiber and Wi-Fi), digitally enabled classrooms, STEAM labs, smart classrooms in each school, improved student-to-device ratios, campus LAN connectivity, cloud migration, and a dedicated FDE intranet/VPN. These measures ensure equitable access to technology and a secure, scalable digital backbone.
2. Digital Learning Platforms & Student Support: Develop and scale a unified Learning Management System (LMS), digital student portfolios with parental engagement, centralized content repositories, access to online professional and soft skill courses, adaptive learning content, and curriculum integration of IT, AI, robotics, and coding.
3. Digital Capacity & Human Resource Development: Build a technology-competent teaching workforce and establish online professional learning communities. Dedicated Digital Pedagogical Leaders will provide on-site mentorship and support data-driven adjustments to instruction.
4. Data, Systems & Integration: Implement integrated, interoperable systems (EMIS, SIS, HRMIS) with real-time dashboards to enable monitoring, predictive decision-making, and evidence-based interventions.
5. Policy & Governance: Establish an Ed-Tech Cell at FDE to manage research, data analytics, adoption facilitation, helpdesk services, digital content development, alignment with national policies, and innovative financing mechanisms.
6. Cybersecurity & Data Protection: Implement robust security measures, ensure compliance with data privacy regulations, and develop a practitioner-focused Data Governance Framework. Ethical AI and cybersecurity courses will be integrated across all levels.

Immediate priorities include campus connectivity (Wi-Fi/LAN), cloud migration to the HEC Data Centre, integration of EMIS/SIS/HRMIS, deployment of adaptive learning content, and alignment of digital content with curriculum.

This comprehensive roadmap serves as the foundational blueprint to guide FDE and MoFEPT in systematically integrating technology across all aspects of education delivery, provide a shared framework for PSDP funding, development partners, and CSR contributors to align and support initiatives, and ensure that technology investments translate into measurable improvements in teaching quality, learning outcomes, and institutional efficiency.

The estimated investment required for full implementation is PKR 4.95 billion over five years.

# Background and Purpose

The Federal Directorate of Education (FDE) oversees more than 432 public schools and colleges in the Islamabad Capital Territory (ICT), providing education to over 237,938 students, 14000+ teaching/non-teaching staff and 6000+ classrooms.

| Category of Institutions | Urban Boys | Urban Girls | Urban Co-Ed | Urban Subtotal | Rural Boys | Rural Girls | Rural Co-Ed | Rural Subtotal | Total |
|---|---|---|---|---|---|---|---|---|---|
| IMSs (I–V) | 1 | 1 | 58 | **60** | 36 | 23 | 68 | **127** | **187** |
| IMSs (I–VIII) / (VI–VIII) | 1 | 6 | 3 | **10** | 14 | 12 | 24 | **50** | **60** |
| IMSs (I–X) / (VI–X) | 16 | 22 | 0 | **38** | 33 | 29 | 0 | **62** | **100** |
| IMCs (I–XII) / VI–XII (former FG-HSS) | 5 | 4 | 0 | **9** | 11 | 26 | 0 | **37** | **46** |
| **TOTAL IMSs** | **23** | **33** | **61** | **117** | **94** | **90** | **92** | **276** | **393** |
| IMCs / (F.G. Colleges) (XI–XIV or XVI) | 4 | 5 | 0 | **9** | 1 | 3 | 0 | **4** | **13** |
| Islamabad Model Colleges (Prep–XII, XIV or XVI) | 9 | 10 | 0 | **19** | 4 | 3 | 0 | **7** | **26** |
| **Total Institutions** | **36** | **48** | **61** | **145** | **99** | **96** | **92** | **287** | **432** |

Despite recent major education reforms, the strategic integration of technology into teaching, learning, and school management remains uneven and largely project-based. While successful pilot initiatives including smart classrooms, digital content development, and digital teacher training programs have demonstrated their potential, they currently exist as isolated successes rather than components of a coherent, system-wide transformation. This results in a deepening digital divide, where urban sector schools benefit from modern tools while institutions in rural or peripheral areas lag behind.

To fulfill the promise of inclusive and future-ready schooling, the Ministry of Federal Education and Professional Training (MoFEPT) is shifting its focus from scattered digital interventions to a coordinated, sustainable, and scalable transformation framework. The Five-Year *Roadmap for Advancing Digital Learning and Technology Integration in FDE (2025–2030)* define the strategic direction, investment priorities, and implementation model for transforming FDE institutions into robust, digitally-enabled learning environments. This approach will ensure a coherent and results-oriented effort that builds on past experiences to maximize long-term sustainability.

This document serves as the foundational blueprint that:

- Guides FDE and MoFEPT in systematically integrating technology into various aspects of education delivery;
- Serves as a shared framework for development partners, CSR contributors, and private sector collaborators to align and support initiatives;

- Ensures that technology investments translate into measurable improvements in teaching quality, learning outcomes, and institutional efficiency.

## Why This Plan is Needed

The need for a comprehensive roadmap arises from the following critical gaps, each requiring a coordinated response:

- **Fragmented Efforts:** Current digital initiatives are ad hoc, project-based, or donor-led, often lacking systemic coordination and interoperability. This leads to inefficient resource deployment, duplication of effort, and prevents the creation of a unified digital ecosystem.
- **Persistent Digital Divide:** There are disparities in infrastructure, connectivity, and access to technology between urban and rural/peripheral schools. This divide undermines the core principle of equitable access to modern educational opportunities.
- **Inadequate Teacher Readiness:** A majority of FDE teachers have not received structured, continuous professional development in digital pedagogy. Without this capacity, even modern tools remain underutilized, failing to translate into enhanced teaching quality.
- **Data Gaps & Missing Analytics**: The absence of a unified data management and analytics system (EMIS/LMS) limits the ability of administrators to conduct real-time performance monitoring and make evidence-based decisions regarding student outcomes and resource allocation.
- **Sustainability & Obsolescence Risk**: Without a defined and overarching strategy, investments in technology risks duplication, underuse, and ultimate obsolescence.

## Present Digital Interventions

The Ministry has recently made notable strides, reflecting a strong institutional commitment to initiating digital transformation. The table below outlines the current digital interventions across FDE schools, highlighting their status and plans for future expansion.

| S. No | Intervention | Description | Current Status / Coverage | Future / Scaling Plans |
|---|---|---|---|---|
| 1 | **Smart Classrooms & Interactive Screens** | Clicker-enabled classrooms and interactive screens to enhance teaching and learning. | 140 Smart Classrooms; 235 interactive screens installed via Ministry, school, and CSR funding. | Equip every classroom with interactive screens for maximum utilization of digital learning resources. |
| 2 | **Connected Classrooms** | Digital connectivity to address shortage of subject specialists through real-time interactive sessions | 40-50 schools are currently connected via the program. | Scale up to cover all rural schools, providing access to subject specialists where shortage exists. |

| S. No | Intervention | Description | Current Status / Coverage | Future / Scaling Plans |
|---|---|---|---|---|
| | | and recorded lecture repository. | | |
| 3 | **IT Labs** | Labs with computers, internet, screens, and allied equipment to provide digital tools access. | 78 labs in rural/urban schools;<br>PSDP Project: 30 latest-computer labs, 106 furnished labs with Chromebooks and STEAM kits;<br>22,000 Chromebooks distributed;<br>2 Centers of Excellence with Chromebooks and Google tools. | Expand IT labs and Chromebook access to ensure all students benefit. |
| 4 | **Robotics / STEAM Labs** | Hands-on skill development in Science, Technology, Engineering, Arts, and Mathematics through project-based learning. | 8 labs established via World Bank projects; additional labs through school and CSR contributions. | Scale STEAM labs to schools to enhance practical STEM learning. |
| 5 | **Digital Platforms** | Platforms for e-learning, teacher training, and student engagement. | The Ministry has acquired high-quality digital content from leading EdTech providers, offering approximately 80% coverage of mandated SLOs<br>Teleschool App: 6 digital TV channels, VOD library, 80,000+ registered users (9,171 out-of-school).<br>e-Taleem LMS: Modules for in-school and out-of-school children, Virtual Teacher Training Institute (VTTI), desktop version of Teleschool library; 95,000 students enrolled; 211 schools onboarded. | Expand user base and enhance content coverage. |
| 6 | **Teacher Training/NIETE** | Comprehensive, technology-enabled teacher training program featuring scripted lesson plans, AI-based assessment | Implemented with a monitoring system and coaching support. | Expand Continuous Professional Development (CPD) and scale certification to all FDE teachers. |

| S. No | Intervention | Description | Current Status / Coverage | Future / Scaling Plans |
|---|---|---|---|---|
| | | tools, and a three-level certification program with content validated by Aga Khan University. | | |
| 7 | **Tech Fellows / Coding Fellows** | Placement of fellows from NUST and other top universities in schools to teach Coding, AI, Blockchain, and other emerging technologies. | Piloted in select schools across ICT with 150 Tech Fellows and 87 Coding & AI Fellows. | Scale to all FDE schools to enhance access to ICT, AI, and coding education, building future-ready skills among students. |
| 8 | **Internet Connectivity** | High-speed internet access for all FDE schools under Prime Minister directive. | Centralized contract with NTC; rollout to be completed by January 2026. | Ensure uninterrupted connectivity and support all digital initiatives. |
| 9 | **Other Initiatives** | Career and ICT skill development programs. | Google Career Certifications: Project Management, Web Development, UI/UX, AI, Cybersecurity.<br>Huawei ICT Skills: 70,000 students enrolled in 17 ICT courses.<br>Khan Academy / Khanmigo LMS: Piloted in 10 classes, completion expected March 2026. | Expand enrollment in courses, pilot AI-assisted learning in more classes. |

## Problem–Intervention–Outcome Matrix

| S. No. | Problem | Proposed Interventions | Expected Outcomes |
|---|---|---|---|
| **1** | **Fragmented and outdated ICT infrastructure in Schools** | Develop minimum ICT standards and implement a phase-wise upgrade of hardware (Interactive Screens, Clickers, Computers etc.) and reliable power backup systems. | All FDE schools meet ICT infrastructure standards by 2030. |
| **2** | **Digital divide and limited access to devices for students** | Provide shared devices, accessible learning software, and assistive technologies for inclusive education. | Enhanced inclusion and reduced digital divide, ensuring all students can access digital learning opportunities. |
| **3** | **Limited internet access and internal connectivity** | Expand broadband coverage and establish internal school networks (LAN/Wi-Fi) across all FDE institutions, including rural campuses. | Complete and reliable connectivity across 100% of FDE schools, ensuring equitable digital access. |

| S. No. | Problem | Proposed Interventions | Expected Outcomes |
|---|---|---|---|
| 4 | **Limited teacher capacity for digital learning** | Implement continuous professional development (CPD) programs for teachers. | At least 70% of teachers are proficient in integrating digital tools and resources in classroom instruction. |
| 5 | **Lack of continuous development of curriculum-aligned digital content** | Curate, localize, and continuously update digital learning content aligned with updated curriculum. | High-quality, curriculum-aligned e-content is available for all grades and subjects. |
| 6 | **Weak data systems and manual reporting processes** | Develop an integrated EMIS with real-time dashboards, linking academic, administrative, and performance data for schools. | Transparent, efficient, and data-driven decision-making across the FDE system. |
| 7 | **Low Cybersecurity and Data Protection Measures** | Develop and implement data protection protocols, secure networks, and digital literacy campaigns on cyber safety. | Secure and responsible use of technology in schools. |
| 8 | **Sustainability and lack of institutional coordination** | Establish an "FDE Ed Tech Cell" to oversee strategy, partnerships, and implementation of all digital initiatives. | Sustained coordination, institutional ownership, and long-term digital governance ensured |

# Vision, Mission, and Objectives

**Vision:** To establish the Federal Directorate of Education (FDE) as a fully digitally integrated, inclusive, and future-ready public school system that leverages technology to provide equitable access to high-quality foundational and 21st-century skills for every learner in the ICT by 2030.

**Mission:** To lead the digital transformation of public education in ICT by systematically integrating technology, advanced pedagogy, and data-driven governance, achieving measurable improvements in foundational and future-ready skills, and serving as the national pilot for scalability across Pakistan.

**Strategic Objectives:**

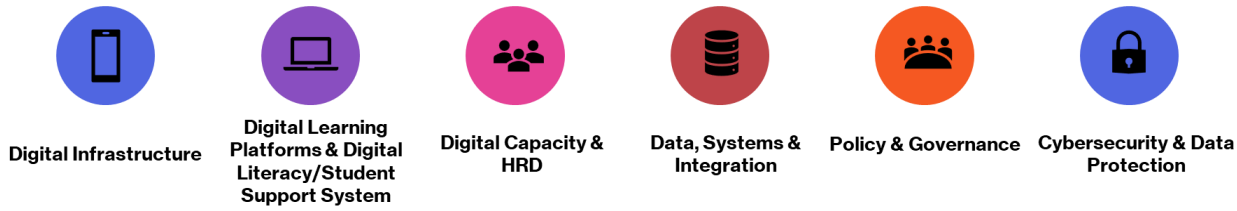
1. **Achieve Universal Digital Access:** Ensure 100% of FDE schools and colleges have reliable internet connectivity and shared digital devices, enabling all students to learn in digitally equipped classrooms with consistent access to technology.
2. **Modernize Learning Content and Curriculum Delivery:** Integrate localized, interactive, and curriculum-aligned digital learning resources including simulations, videos, and adaptive learning tools into classroom instruction. Incorporate digital formative assessments to better capture student understanding.
3. **Strengthen Teacher Capacity for Digital Pedagogy:** Provide continuous professional development to equip teachers with 21st-century digital teaching competencies, ensuring at least 70% achieve advanced certification and effectively

implement blended learning and technology-based assessments.

4. **Establish a Unified Digital Learning Platform:** Implement a centralized Learning Management System (LMS) across all FDE institutions to host textbooks, online lessons, instructional materials, simulators, gamified content, personalized learning, assessments and virtual training resources within a single digital ecosystem.
5. **Strengthen Governance through Data and AI Integration:** Develop an integrated data architecture linking LMS, EMIS, HRMIS, and Finance to enable real-time monitoring, evidence-based decision-making using AI-driven analytics and dashboards.
6. **Align Technology Investments with Learning Outcomes:** Institutionalize a quality assurance and monitoring and evaluation framework including centralized EdTech Quality Benchmarking Tool, to ensure all digital initiatives directly contribute to measurable improvements in teaching quality, student learning outcomes, and system efficiency.

## Roadmap for Advancing Digital Learning and Technology Integration in FDE: Six Core Domains & Interventions Mapping

This Roadmap is inspired by UNESCO's ICT in Education Policy Framework and the OECD Digital Education Outlook. It identifies six core domains for targeted intervention:




| Domain | Sub-Domain / Intervention | Description / Key Activities | Targets / Expected Outcomes |
|---|---|---|---|
| **I. Digital Infrastructure** | Digitally Enabled Classrooms | Interactive boards with internet connectivity, enabling blended learning, real-time assessment, and student engagement. | 50% classrooms digitally enabled by Year 2; 100% by Year 5. Improved access to digital resources and digital readiness across all classrooms. |
| | STEAM Labs Upscaling | Project-based learning with STEAM kits and VR/AR integration. Gradual integration with teacher training and pilot-based evaluation. | 50% schools by Year 2; 100% by Year 5. Builds innovation, creativity, and problem-solving skills among students. |

| Domain | Sub-Domain / Intervention | Description / Key Activities | Targets / Expected Outcomes |
|---|---|---|---|
| | Smart Classroom for Each School | Integration of interactive screens, computers, clickers, and LMS-based assessments in at least 3 classrooms per school. | Enable real-time digital assessment and data-driven learning across schools. |
| | Upscaling Student-to-Device Ratio | Provide additional devices to improve student-to-device ratio and equitable access. | Ensure all students have access to digital learning tools; enhanced digital inclusion. |
| | Schools Connectivity (Internet) | Fiber-based internet across all FDE schools to establish a digital backbone. | Reliable high-speed internet in all schools; supports e-learning and digital operations. |
| | Campus Connectivity (LAN) | High-speed Wi-Fi within campuses to ensure seamless access to digital learning and admin systems; enable IoT-enabled smart education. | Smooth digital learning experiences and improved institutional efficiency. |
| | Cloud Shift | Transition all systems to centralized cloud (HEC Data Centre Cloud) for unified access and scalability. | Scalable, efficient, and connected digital infrastructure. |
| | FDE Network (Intranet/VPN) | Dedicated VPN linking schools, colleges, and directorate; host learning and management systems securely. | Secure and uninterrupted access to digital systems across all FDE institutions. |
| **II. Digital Learning Platforms & Student Support** | Learning Management System (LMS) | Centralized platform for digital content, teacher training, assessments; integration with EMIS via unique student ID. | Phased deployment across 100% schools; enables data-driven monitoring and institutional performance tracking. |
| | Digital Student Portfolios & Parental Engagement | Track student learning progress, achievements, co-curricular participation, attendance, and health data; enable parental access. | Improved student monitoring and parental engagement. |
| | Digital Content Repository | Centralized, searchable, bilingual, SLO-aligned digital content including e-books and practice exercises. | Standardized access to high-quality content; supports blended and self-paced learning. |
| | Access to Online Courses | Provide free access to technical, professional, and soft skill courses; partner with Google, Huawei, etc. Introduce specialized credit courses. | Build technical, professional, and cognitive skills valuable in the digital economy. |

| Domain | Sub-Domain / Intervention | Description / Key Activities | Targets / Expected Outcomes |
|---|---|---|---|
| | Adaptive Learning Content | AI/analytics-driven system to tailor content delivery; remedial support for at-risk students. | Personalized learning, improved student outcomes, and efficient remediation. |
| | Curriculum Alignment & Integration | Embed IT, AI, robotics, ICT, coding into the curriculum; NCC-aligned skills as core credit courses; Ed-Tech Cell develops digital curriculum and content policy. | Institutionalize digital literacy and future-ready competencies; sustainable integration into mainstream education. |
| **III. Digital Capacity & HRD** | Tech-Enabled Workforce | Integrate digital content, scripted lesson plans, and tech-enabled classrooms. Two Digital Pedagogical Leaders per school to mentor teachers. NIETE Level 1–3 training for all teachers. | Fully tech-competent teaching workforce; improved instructional quality; consistent technology-integrated learning experiences. |
| | Online Professional Learning Communities | Digital platforms for educators, learners, and industry professionals to collaborate, share knowledge, and develop skills. | Continuous professional development and peer learning; enhanced digital pedagogy adoption. |
| **IV. Data, Systems & Integration** | Integrated Systems & Analytics | Create interoperable student, financial, HR systems; implement real-time dashboards; AI-powered analytics for insights on learning outcomes, dropout risks, and school performance. | Predictive decision-making, proactive interventions, efficient administration, and evidence-based governance. |
| **V. Policy & Governance** | Ed-Tech Cell Establishment | Academic hub for standards, research, implementation, integration; oversee PPPs, data analytics, school support, content development, alignment, innovative financing, policy implementation, and outcome monitoring. | Sustainable, scalable, accountable digital education implementation; improved institutional coordination and governance. |
| | EdTech Quality Standards & Evaluation Framework | To ensure that all digital tools, platforms, and content deployed across FDE meet minimum benchmarks of quality, safety, and effectiveness, FDE will adopt a formal EdTech Quality Standards and Evaluation Framework. This framework will be based on global good practices, including UNESCO's ICT Competency | The framework will ensure all EdTech tools are assessed before procurement or integration, leading to consistent, evidence-based decisions and the adoption of only safe, high-quality, curriculum-aligned solutions across FDE. |

| Domain | Sub-Domain / Intervention | Description / Key Activities | Targets / Expected Outcomes |
|---|---|---|---|
| | | Framework, UNICEF's Digital Public Goods principles, and the Tulna EdTech benchmarking model. | |
| | EMIS/MIS/SIS Replication | Replicate Punjab SED systems for facilities, attendance, teacher/student profiles, assets, HR, finance. Customize and integrate for FDE operational needs. | Unified digital ecosystem for real-time decision-making, transparency, accountability, and improved educational outcomes. |
| **VI. Cybersecurity & Data Protection** | Security Measures & Governance | Firewalls, encryption, GDPR/local compliance; Data Governance Framework with four-phase strategy: accountability, controls/protocols, compliance, and DPIAs. Integrate child safety, cybersecurity, and ethical AI in ICT syllabus. | Secure, trustworthy digital systems; protection of critical data; student-first ethical practices; compliance with national and international data privacy standards. |

# Implementation Plan

The FDE Digitalization Roadmap identifies a series of high-priority interventions aimed at transforming public schools into digitally enabled, future-ready learning environments. In the first instance, the focus will be on five critical areas to establish a strong digital foundation and ensure maximum impact:

1. **Campus Connectivity**: The top priority is ensuring seamless connectivity within all school campuses. High-speed Wi-Fi networks will be deployed to provide uninterrupted access to digital learning resources, administrative systems, and IoT-enabled technologies. This foundational step will enable real-time teaching, learning, and operational efficiency across all campuses, ensuring that both students and staff can fully leverage digital tools.

2. **Cloud Shift**: Aligned with the National Cloud First Policy, all FDE systems will transition to a centralized cloud infrastructure hosted at the HEC Data Centre. This shift will provide scalable, secure, and unified access to digital services for teachers, students, and administrators. Centralization will also streamline maintenance, enhance system reliability, and facilitate future integration of emerging technologies, including AI-driven applications.

3. **EMIS Integration**: The Education Management Information System (EMIS) will serve as the backbone for data-driven decision-making. By replicating and customizing the proven Punjab

SED model, FDE will establish a comprehensive digital ecosystem encompassing student information, attendance, teacher and staff profiles, assets, human resources, and financial management. Integration with the Learning Management System (LMS) will enable real-time insights into school performance, learning outcomes, and administrative efficiency, supporting evidence-based policy and resource allocation.

4. **Adaptive Learning Content**: To ensure personalized and effective learning, adaptive digital content will be developed and integrated across the curriculum. Leveraging AI and analytics, this content will automatically identify at-risk students and provide tailored remediation, enabling flexible, self-paced learning for all students. This approach will enhance engagement, strengthen learning outcomes, and support teachers in delivering differentiated instruction.

5. **Content Integration**: A comprehensive strategy for integrating digital content into classroom instruction will complement these initiatives. Curriculum-aligned resources, including e-books, interactive exercises, and multimedia content, will be centrally curated and made accessible through the LMS. This will ensure that students have equitable access to high-quality, standardized learning materials while teachers can effectively embed technology into everyday instruction.

# Financial Phasing, Budget, Resource Mobilization

| Core Area | Intervention | Nos. | Cost Per Unit (Estd)* | Phase 1 (1-2 Year) | Phase 2 (3-5 Year) | TOTAL |
|---|---|---|---|---|---|---|
| . Digital Infrastructure | Digitally Enabled Classrooms (Interactive Screens) | 6,000 | 0.300 | 900.00 | 900.00 | 1800.00 |
| | STEAM Kits Upscaling Incl. VR Box | 316 | 0.650 | 102.70 | 102.70 | 205.40 |
| | Retrofitting Existing Interactive Screens with Clickers | *266* | 0.500 | 0.00 | 133.00 | 133.00 |
| | Upscaling Student to Device Ratio - Refurbished Chromebooks | 50,000 | 0.012 | 300.00 | 300.00 | 600.00 |
| | Schools Connectivity (Internet) | 432 | 0.000 | 0.00 | 0.00 | 0.00 |
| | IT Labs Upscaling | 50 | 9.000 | 225.00 | 225.00 | 450.00 |
| | Campus Connectivity (LAN) | 432 | 1.000 | 432.00 | 0.00 | 432.00 |
| | Cloud Shift from Lagacy Servers & New Intervention Deployments - Yearly Basis | 5 | 20.000 | 40.00 | 100.00 | 140.00 |
| | FDE Network (Intranet/VPN) | Complete Activity | 100.000 | 0.00 | 100.00 | 100.00 |
| | **Sub-Total** | | | **1999.70** | **1860.70** | **3860.40** |
| | Learning Management System (LMS) & Digital Content Library - Yearly Basis | 5 | 60.000 | 120.00 | 180.00 | 300.00 |

| Core Area | Intervention | Nos. | Cost Per Unit (Estd)* | Phase 1 (1-2 Year) | Phase 2 (3-5 Year) | TOTAL |
|---|---|---|---|---|---|---|
| Digital Learning Platforms | EMIS/MIS/SIS (Yearly Operational Expenses) | 5 | 10.000 | 20.00 | 30.00 | 50.00 |
| | **Sub-Total** | | | **140.00** | **210.00** | **350.00** |
| Digital Capacity & Literacy | Adaptive Learning Content | Lump-Sum Estd. | | 50.00 | 50.00 | 100.00 |
| | Curriculum Alignment & Integration | Lump-Sum Estd. | | 10.00 | 10.00 | 20.00 |
| | Teacher's Training on Digital Learning and EdTech (Yearly Basis) | 5 | 5.000 | 10.00 | 15.00 | 25.00 |
| | **Sub-Total** | | | **70.00** | **75.00** | **145.00** |
| Data, Systems & Integration | Systems Integration @ Singal Shared Database | Lump-Sum Estd. | | 10.00 | 15.00 | 25.00 |
| Policy & Governance | Establishment of Ed-Tech Cell (2 Years Costing: Establishment & 1 Year Ops.) | Year 2 & 3 | | 173.00 | 68.00 | 241.00 |
| | Strengthening of School Support Office & Capacity Building | 432 | 0.500 | 108.00 | 108.00 | 216.00 |
| | 06 Month HR Support to Schools (One Time Onboarding & Handholding Activity) 150 Support Fellows @80,000 Per Month | 150 | 0.480 | 36.00 | 36.00 | 72.00 |
| | **Sub-Total** | | | **327.00** | **227.00** | **554.00** |
| Cybersecurity & Data Protection | Courses, Trainings & Systems Framework | Lump-Sum Estd. | | 5.00 | 10.00 | 15.00 |
| O&M Costs (Hardware) - Yearly Basis | | 5 | 5.000 | 10.00 | 15.00 | 25.00 |
| **Grand Total** | | | | **2551.70** | **2397.70** | **4949.40** |
| **All costs are indicative and based on current market estimates.* | | | | | | |

# Financing Strategy

The successful implementation of the Roadmap requires sustained investment and coordinated resource mobilization. A multi-pronged financing strategy will ensure the long-term viability, scalability, and impact of digital initiatives:

- **Public Financing (Federal PSDP)**: PSDP allocations will support the core operational costs of the EdTech Cell, annual service-level agreements (SLAs) for software licensing, security, and cloud hosting, as well as expenditures on hardware deployment, digital research, and teacher professional development programs.
- **Development Partner Support**: MoFEPT will actively engage development partners to secure grants and technical assistance for large-scale ICT infrastructure upgrades, digital content creation, and capacity-building initiatives, ensuring alignment with the strategic objectives of the Roadmap.
- **Private Sector and CSR Contributions:** MoFEPT will explore innovative financing mechanisms including public-private partnerships (PPPs) and CSR contributions to sustain digital initiatives and encourage active private sector participation in the education technology ecosystem.

## Governance Structure

The overall execution will be managed by a tiered governance structure:

| Mechanism | Composition | Mandate |
|---|---|---|
| **Steering Committee (SC)** | MoFEPT Secretary (Chair), FDE Director General, EdTech Cell Director, MoIT Rep, and Senior Representatives from Budget/Finance and Dev. Section. | Ultimate oversight, budget approval, policy direction, and inter-departmental conflict resolution. |
| **Digital Transformation Cell (Implementation Committee)** | Housed within FDE/EdTech Cell, comprising technical project managers, M&E specialists, and finance experts. | Project management, contract monitoring (validation), technical support, Implementation and data governance enforcement. |
| **Technical Advisory Group (TAG)** | Ed-Tech Director, EdTech Industry representatives, PCU, FDE teachers and experts from relevant Organizations. | Provide specialized input on pedagogy, technology standards, risk assessment, and market readiness. |

## Key Performance Indicators (KPIs)

| Category | KPI | Baseline 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| **Infrastructure & Access** | % schools with **tech-enabled classrooms** | 12% | 30% | 50% | 70% | 85% | 100% |
| | % schools ≥**98% network uptime** | 0% | 50% | 80% | 95% | 98% | 98% |
| | % schools with ≥**2 clicker-based smart classrooms** | 0% | 20% | 50% | 75% | 90% | 100% |
| | % schools with **STEAM kits/training** | 25% | 40% | 50% | 70% | 85% | 100% |
| | % remaining **school labs upgraded** | 0% | 20% | 40% | 60% | 80% | 100% |
| **Digital Platforms** | % schools on **EMIS** | 0% | 100% | 100% | 100% | 100% | 100% |
| | % students with **LMS access** | 0% | 30% | 50% | 70% | 85% | 100% |
| | % schools with **campus-wide Wi-Fi** | 0% | 30% | 50% | 70% | 85% | 100% |
| **Teacher Capacity (NIETE)** | % teachers **Level-1/2 certified** | 0% | 40% | 70% | 85% | 95% | 100% |
| | % teachers **Level-3 certified** | 0% | 5% | 15% | 25% | 30% | 30% |
| **Data-Driven Instruction** | % teachers using **LMS/MIS data** for differentiation | 0% | 20% | 40% | 60% | 80% | 90% |
| **Learning Outcomes** | **HOTS score uplift** vs 2025 baseline | 0% | 5% | 10% | 15% | 18% | 20% |
| | **Digital literacy rate** (ages 10–18) | 45% | 55% | 65% | 70% | 75% | 80% |

| Category | KPI | Baseline 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| **Accountability** | % EdTech contracts **PFR-tied** | 0% | 50% | 80% | 100% | 100% | 100% |
| | % teachers promoted with **Level-2 cert** | 0% | 30% | 60% | 80% | 90% | 100% |
| **Cybersecurity & Data Protection** | % students completing **Child Safety & Cyber Security course** | 0% | 40% | 70% | 90% | 95% | 100% |

# Risk & Mitigation Strategy

The successful implementation of the roadmap depends on proactively identifying and managing a range of strategic, operational, technical, human, and financial risks. These risks, typical of large-scale digital transformation programs, can impact the effectiveness of digital interventions if not carefully mitigated.

**1. Strategic & Policy Risks:** A primary risk at the strategic level is fragmentation and discontinuity. With multiple stakeholders, ongoing donor-supported initiatives, and legacy digital systems, there is a possibility that interventions may continue to operate in silos, undermining the roadmap's system-wide objectives. Changes in leadership or shifts in policy priorities can further affect long-term commitment. To mitigate this, the EdTech Cell has been institutionalized as a single coordinating authority, ensuring all initiatives are aligned with the approved roadmap. Oversight by a high-level Steering Committee will provide continuity, policy coherence, and ensure that strategic objectives are maintained even in the face of leadership changes.

**2. Infrastructure & Connectivity Risks:** Operational risks associated with infrastructure and technology include delays in campus connectivity, unreliable internet in peripheral schools, and power disruptions. These factors can significantly constrain the classroom use of digital tools. It can be addressed through back-up connectivity models, solarization of schools, and offline-capable learning platforms. Implementation will occur in phased rollouts, supported by service-level agreements and third-party quality assurance to ensure reliability and minimize disruptions.

**3. Digital Platforms & Systems Integration Risks:** Poor interoperability between learning management systems (LMS), education management information systems (EMIS), human resources systems (HRMIS), and financial systems presents a material risk. Data inconsistencies or fragmented analytics could limit the effectiveness of monitoring and decision-making. Mitigation measures include enforcing open standards, API-based integrations, and developing a unified data architecture based on unique student and teacher identifiers. A robust data governance framework will further ensure data quality and facilitate cross-system analytics.

**4. Human Resource Readiness & Change Management Risks:** The most critical risk to digital adoption lies in human resource readiness. Teachers and school leadership may resist new technologies, particularly if digital tools are perceived as an added burden rather than an enabler of learning. Adjusting from traditional teaching approaches to technology-enabled pedagogy requires a structured change management strategy. To address this, the roadmap implements a structured "support and incentive" model, including scripted lesson plans, continuous mentoring by Digital Pedagogical Leaders, and mandatory NIETE certifications linked to career progression. Early engagement with teachers, ground research, and a comprehensive change management strategy for all personnel will help ensure that technology adoption enhances, rather than disrupts, existing practices.

**5. Curriculum, Content & Assessment Risks:** The benefits of digitization are contingent on the quality of traditional educational inputs. If the curriculum, instructional materials, textbooks, or assessments are heavy or misaligned with students' learning needs, digital tools alone will not improve learning outcomes. To mitigate these risks, all digital content will be prepared by education professionals, with AI and digital platforms supporting delivery rather than creation. Assessment and examination systems will be progressively improved, ensuring meaningful analytics. Change management strategies for content development, teaching, and assessment processes will also be implemented. If integrated change management cannot be fully embedded in the current roadmap, a follow-up strategy paper will address remaining limitations and risks.

**6. Cybersecurity & Data Protection Risks:** Digitizing student and teacher data carries significant cybersecurity and data protection risks. Potential breaches or misuse of AI-driven tools could erode trust and disrupt operations. To mitigate this, the roadmap mandates a comprehensive Data Governance Framework, robust security controls, periodic security audits, and the integration of child safety, cybersecurity, and ethical AI principles into both policy and curriculum.

**7. Financial & Sustainability Risks:** Insufficient multi-year funding, rising operational costs, and over-reliance on donor or CSR funding pose risks to the sustainability of digital initiatives. These will be mitigated through cloud cost optimization, and a diversified financing strategy encompassing government allocations, CSR contributions, and other sustainable funding sources.

**8. Governance & Accountability Risks:** Weak oversight and performance monitoring could compromise the effectiveness of digital interventions. To ensure accountability, the roadmap links key performance indicators (KPIs) to contracts and funding, employs real-time dashboards for evidence-based decision-making, and mandates regular reporting to the Steering Committee. Independent evaluations will supplement these mechanisms to verify progress and inform continuous improvement.

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***Development***
*Ministry of Federal Education & Professional Training*
*Federal Directorate of Education*
*Project Coordination Unit, M/o FE&PT*
*Huawei Technologies*

***Review***
*Ministry of Information Technology & Telecom*
*Higher Education Commission of Pakistan*
*Industry Expert – Ed-Tech Partner*

## *Annex*

### NIETE Three-Level Certifications

| | |
|---|---|
| Level 3 (Advanced) | **DIGITAL:** Can **create** and introduce new proprietary content into LMS[1]<br>**PEDAGOGY:** Can create innovative lesson plans for 21st century pedagogy that can further improve HOTS[2] learning in their subjects and upon FCE approval, upload them through the CMS[3] on the national distance learning portal for use by the entire teaching community |
| Level 2 (Intermediate) | **DIGITAL:** Can **integrate** open sourced content into LMS<br>**PEDAGOGY:** Can modify lesson plans for 21st century pedagogy that can enhance HOTS learning in their subjects |
| Level 1 (Basic) | **DIGITAL:** Can **use** LMS effectively<br>**PEDAGOGY:** Can facilitate **scripted lesson plans** competently for 21st century pedagogy in their subjects |

**Table 1 - Multilevel teacher certifications defined in NDIES**