



इलेक्ट्रॉनिक्स एवं
सूचना प्रौद्योगिकी मंत्रालय
MINISTRY OF
ELECTRONICS AND
INFORMATION TECHNOLOGY
सत्यमेव जयते



STUDY DESIGN

ADVANCING AI READINESS AND ADOPTION IN MANUFACTURING MSMEs



MSME
MICRO, SMALL & MEDIUM ENTERPRISES
सूक्ष्म, लघु एवं मध्यम उद्यम
OUR STRENGTH • हमारी शक्ति
Ministry of MSME, Govt. of India

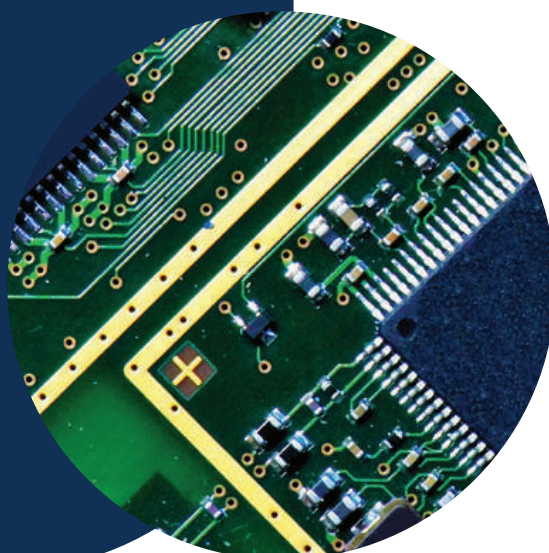


वस्त्र मंत्रालय
MINISTRY OF
TEXTILES
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Department of Pharmaceuticals
Ministry of Chemicals and Fertilizers

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Introduction

MSME Contributes

31.1%

of GDP

48.6%

of Exports

32.8 Cr.

Jobs

Strengthening the MSME sector is integral to India's ambition of becoming the world's third-largest economy, with an estimated GDP of approximately USD 7 trillion by 2030¹. According to the Economic Survey 2025–26, the MSME sector contributes approximately 31.1 percent of India's GDP and accounts for about 48.6 percent of the country's exports². The sector encompasses around 7.47 crore registered enterprises and provides employment to approximately 32.82 crore people, making it the second-largest employment provider after agriculture¹. MSMEs also account for 35.4 percent of total manufacturing output, underscoring their central role in industrial value chains¹.

These fundamentals position MSMEs as critical drivers of productivity growth, employment generation, and global competitiveness. Augmenting technology adoption, access to finance, and market linkages remain essential for future-proofing their contribution to national economic objectives.

Manufacturing MSMEs are increasingly operating under rising global expectations relating to quality standards, regulatory compliance, traceability, sustainability, and delivery timelines, embedded within international trade arrangements, procurement frameworks, and buyer-driven standards, particularly in advanced markets. These requirements are expected to become more stringent and more uniformly enforced over time. In this environment, incremental efficiency gains and cost optimisation measures alone are insufficient to sustain competitiveness.

¹ Press Information Bureau, Government of India. (2025). <https://www.pib.gov.in/PressNoteDetails.aspx?>

² Ministry of Finance, Government of India. (2025). <https://www.indiabudget.gov.in/economicsurvey/doc/echapter.pdf>

In this context, the adoption of artificial intelligence by Indian MSMEs represents a powerful lever to unlock productivity gains, enhance competitiveness, and deepen participation in global value chains. Scaled deployment of AI across MSMEs can unlock substantial national economic value while delivering direct, enterprise-level gains for entrepreneurs, positioning the sector as a future-ready engine of sustained growth.

IndiaAI Mission at Ministry of Electronics and Information Technology (MeitY) commissioned this study to develop a practical and operationally grounded roadmap for accelerating AI adoption in manufacturing MSMEs across Textiles, Pharmaceuticals and Medtech, and Electronics. The findings will inform MSME adoption pathways and government interventions that directly influence national manufacturing output, export competitiveness, and employment outcomes.

Budget 2026: Significant Boost to India's Industrial & MSME Ecosystem

Targeted measures to strengthen manufacturing MSMEs and advance specific industrial sectors through capital access, deepening supply chains, and modernization.



MSME Support & Capital Access

₹10,000 Crore SME Growth Fund

Dedicated fund providing manufacturing MSMEs with better access to equity and long-term capital.

Operational Ease & Liquidity

New measures designed to enhance liquidity and streamline compliance support for smaller enterprises.



Strategic Industrial Outlays

₹40,000 Crore Electronics Boost

Enhanced outlay for electronics components manufacturing to strengthen domestic value addition.

India Semiconductor Mission 2.0

A mission to deepen domestic capabilities across design, equipment, and supply chains.

Biopharma & Textile Modernization

Includes the ₹10,000 crore SHAKTI programme and Samarth 2.0 for production system upgrades.

Study Design:

AI for Manufacturing MSMEs

Discovery

Generates evidence-based insights into MSME operations and market-ready AI solutions, identifying priority interventions with measurable impact on productivity, product-service expansion, and market access.

- Engage 350+ factories for shop-floor-to-senior management insights
- Map sectoral value chains, MSME pain points, and cluster-specific constraints
- Assess market-ready AI solutions for deployment feasibility
- Identify gaps and prepare structured AI use case specification sheets



The study systematically identifies, validates, and will guide the scaling of AI interventions for manufacturing MSMEs, anchored in national priorities, sector realities, and operational feasibility.

Design

Transforms priority interventions into scalable, deployable AI adoption pathways, defining operational, technological, and organisational requirements, while aligning with financing structures and policy frameworks for assured scale-up.

- Convert priority interventions into implementation archetypes
- Define minimum people, process, technology, data, and operational conditions
- Establish entry thresholds, scaling logic, and human oversight points
- Integrate procurement, financing, and policy alignment
- Secure policy concurrence for adoption at scale

Diffusion

Facilitate sector-wide AI adoption by mobilising the ecosystem, demonstrating actionable solutions, and embedding interventions within policy, procurement, and financing levers to ensure sustainable, and confident uptake.

- Kick-off at the AI Impact Summit
- Deliver a webinar series: demystify AI, spotlight solutions, build confidence
- Work with industry AI taskforces to anchor structured dialogues
- Facilitate policy dialogue in collaboration with NITI Aayog Line Ministries and, State Departments

Discovery

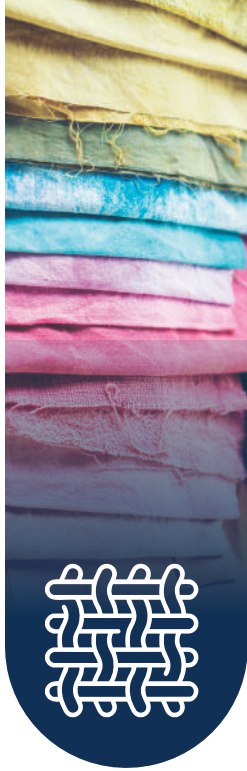


Alignment with National / State Priorities and Sector Strategies

A steering committee chaired by the IndiaAI Mission, with representation from line Ministries, will be set up to shape the design and outcomes of the study. The committee will oversee alignment with government schemes, and safeguards regulatory, compliance, and competitiveness considerations while guiding cluster selection and intervention focus for maximum impact on manufacturing MSMEs.

Consultations with industry associations, export promotion councils, federations, State Departments, industrial parks, industry promotion agencies, skill development missions, cluster leaders, and labor contractors are planned to enable deep operational diagnosis, surface sectoral value chains, uncover cluster-specific frugalities, identify MSME pain points, and pinpoint entry points where AI can create measurable value for manufacturing MSMEs.





Textiles

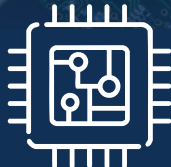
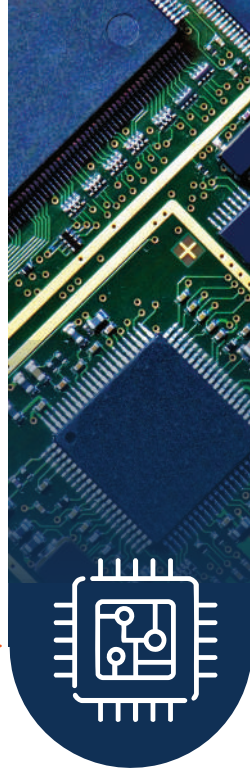
Confederation of Indian Textile Industry (CITI)

Export Promotion Councils such as TEXPROCIL, SRTEPC, HEPC, PDEXCIL, ISEPC, CEPC, and JPDEPC



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Electronics

Electronics Industries Association of India (ELCINA)

Electronics and Computer Software Export Promotion Council



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Pharma

Indian Drug Manufacturers' Association (IDMA)

Indian Pharmaceutical Alliance (IPA)
Pharmaceutical Export Promotion Council of India (Pharmexcil)



Department of Pharmaceuticals
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MedTech

Association of Indian Medical Device Industry (AIMED)

Medical Technology Association of India (MTAI)



Department of Pharmaceuticals
Ministry of Chemicals and Fertilizers

National, State and Industry Networks

CII, FICCI & ASSOCHAM

State Departments

NASSCOM

Industry promotion agencies

Industrial parks

Cluster leaders

Skill development missions

Software Technology Parks of India

AI Interventions for Manufacturing MSMEs

Grounded in Factory Conditions and Available Solution Capabilities for Immediate and Near-Term Adoption

The study covers 350 factories across India to establish a granular, experience-based understanding from the shop floor to senior management, and to identify AI interventions that materially improve-

- (a) Unit Economics
- (b) Product-Service Extension
- (c) Global Market Access & Participation.

In parallel, a comprehensive supply-side assessment establishes an actionable view of market-ready AI and automation solutions relevant to manufacturing MSMEs. Solution providers are examined through structured interviews and targeted field immersions to determine which offerings can be deployed immediately under prevailing factory conditions and which can be adopted with limited alignment to existing workflows.

All solutions are evaluated against factory operating realities, including data availability, infrastructure constraints, integration burden, risk exposure, and organisational readiness.

Where deployable solutions are identified, structured engagements between factories and solution providers are facilitated through focused webinar interactions that present validated products, deployment assumptions, and adoption pathways. These interactions provide evidence-based assurance to factory management and implementing agencies and support informed adoption decisions.

Where structurally significant operational problems are identified for which no suitable market-ready solutions exist, the assessment culminates in the preparation of structured AI use case specification sheets. These specifications translate field-validated factory problems into clearly bounded, deployment-oriented AI problem statements, with defined data inputs, operational constraints, risk parameters, and outcome expectations. The specification sheets serve as implementation-ready artefacts for startups, technology service providers, and research institutions, directing innovation towards validated demand and accelerating the emergence of deployable solutions aligned with MSME operating realities.



Factory-Level Diagnostic Dimensions

- Operational Pain and Economic Materiality
- Authority and Accountability Structures
- Workflow Configuration and Execution Reality
- Data and Information Flow
- Documentation Norms and Reporting Requirements
- Trust Boundaries for System-Led Decisions
- Prior Digital, Automation and AI Exposure
- Adoption Willingness
- Risk Perception and Control Concerns
- Organisational Capacity for Change



Supply Side Dimensions

- Operational Data Requirements for Immediate Deployment
- Solution Maturity (Pilot vs Production Grade)
- Predictability and Controllability of System Outputs
- Error Tolerance and Failure Containment
- Compatibility with MSME Infrastructure Constraints
- Integration Burden with Existing Systems and Workflows
- Availability of Local and Cluster-Level Support Services
- Degree of Shop-Floor Behavioural Change Required
- Operational Trustworthiness and Reliability
- Scalability Across MSME Sizes and Operating Archetypes
- Pricing and Commercial Models

Key Principles of AI Intervention Design

1

Human-In-Loop Design

AI supports decision-making but final judgement, accountability, and sign-off always remain with human practitioners.

2

Controlled and Verifiable AI Design

Only reliable, explainable, and repeatable AI systems are deployed, prioritising operational trust over novelty.

3

Explainability and Traceability by Design

Every AI output must be clearly explainable to non-technical users with traceable data, logic, and references.

6

Practical Feasibility and Workflow

AI solutions must integrate smoothly into real factory workflows without increasing cognitive burden.

5

Alignment with Digital Maturity and Adoption Readiness

AI use cases align with the organisation's existing digital maturity without forcing premature digitisation.

4

Data Minimisation, Sovereignty, and Edge-First Deployment

AI operates using minimal, locally available data while keeping sensitive information within factory boundaries.

7

Organisational Willingness and Enabling Conditions

Adoption considers organisational readiness, perceived value, and the availability of supporting enablers.

8

Incremental Adoption and Continuous Oversight

AI is adopted gradually with clear ownership, regular review, and continuous improvement.

9

Economic Value Discipline and ROI Traceability

Each AI intervention must clearly demonstrate measurable business value and cost-impact linkage.

12

Bias Awareness Without Overreach

AI systems are regularly reviewed for bias and drift without imposing excessive or abstract fairness constraints.

11

Interoperability and Portability by Design

AI solutions remain vendor-neutral, interoperable, and portable across systems and tools.

10

Defined Failure Modes, Safeguards, and Exit Pathways

AI systems are designed to fail safely, allow overrides, and avoid becoming single points of failure.

Design



AI Adoption Pathways for Manufacturing MSMEs

Backed by Procurement and Financial Structures, Policy Instruments, and Ministerial Buy-In

The Design converts priority AI interventions into forms that can be executed at scale within manufacturing MSMEs. The focus is on enforceable design choices that determine how AI enters factories, how risk is contained, and how public and private actors act with certainty.

Priority AI interventions are formalised into implementation archetypes across MSME segment typologies, specifying the minimum people, process, platform/technology, data, and operational conditions required for successful deployment. These archetypes define clear entry thresholds and progression paths, enabling firms to adopt AI incrementally while retaining managerial control and operational continuity. Each archetype establishes what must be in place, who acts on AI outputs, where decisions sit, and how errors are contained.

Each archetype also defines explicit scaling logic. KPIs indicate when firms reach maturity thresholds, triggering advancement and preventing premature complexity or over-instrumentation.

Periodic human review points ensure continued alignment with evolving operational, market, and workforce conditions.

The design also establishes procurement and financing structures aligned to MSME risk-bearing capacity. Total cost exposure accounts for instrumentation, integration, support, and organisational overheads. Procurement models are structured to allow firm-level, cluster-level, and service-based access. Financing options are assessed to ensure risk is transparently allocated and exit options remain viable.

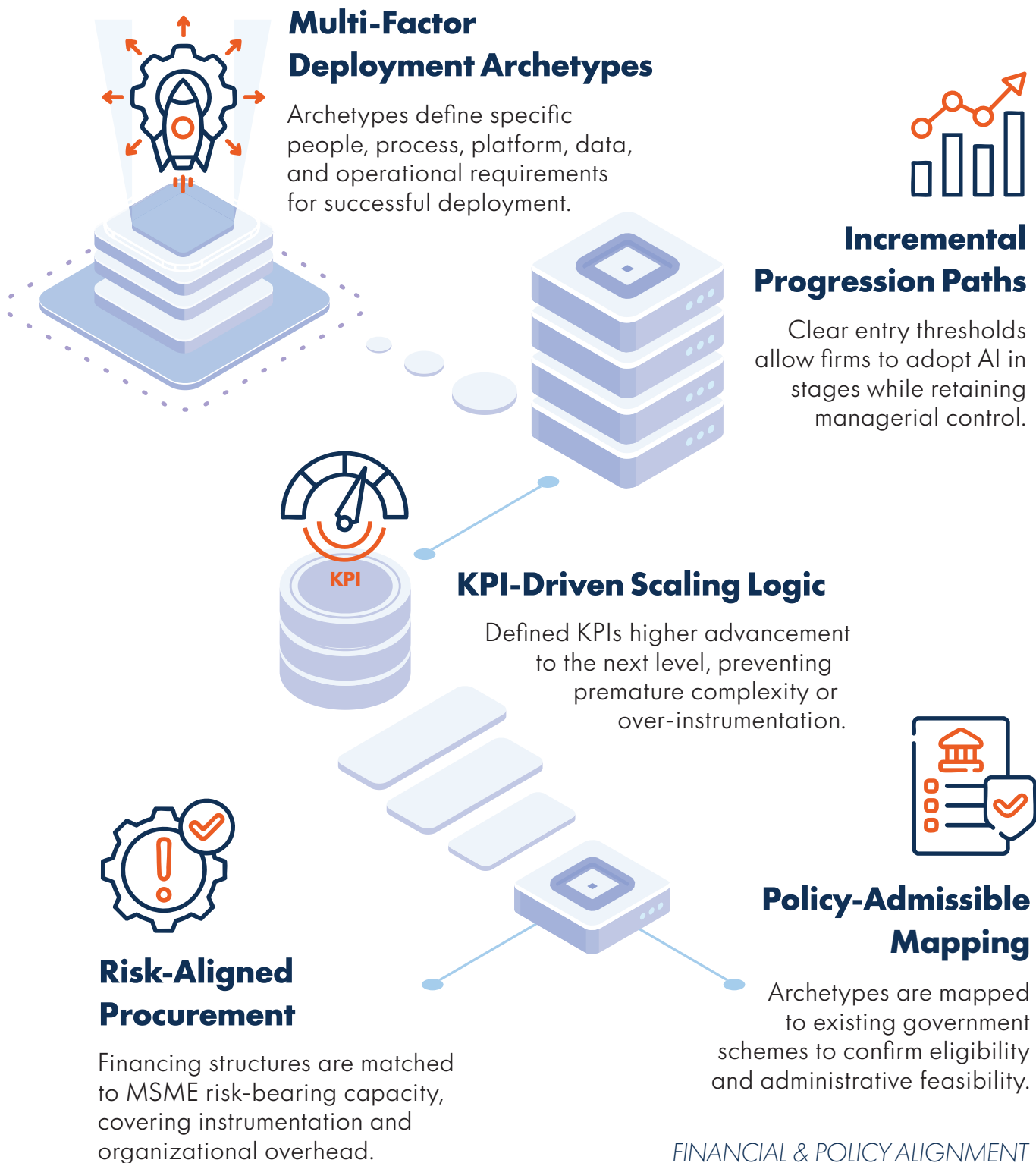
Finally, the Design translates validated interventions into policy-admissible forms.

Each archetype is mapped against existing central and state schemes to confirm eligibility, admissible cost components, and administrative feasibility.

The Blueprint for Scalable AI:

Designing for Manufacturing MSMEs

IMPLEMENTATION ARCHETYPES & SCALING



FINANCIAL & POLICY ALIGNMENT

Diffusion



Evidence Driven Dissemination to Accelerate AI Adoption

The study mobilises the ecosystem around a shared mission of AI-driven MSME growth, showcases actionable AI solutions, and embeds interventions within government's policy, financing and procurement frameworks.

Under the leadership of IndiaAI Mission and MeitY, all relevant line Ministries and industry leaders are convened at IndiaAI Summit to initiate sector-wide dialogue.

A series of webinars will be organized to present global and domestic best practices, and spotlight market-ready solutions. Audiences are curated to include MSMEs, industry associations, and policymakers at state and national levels. These sessions build operational confidence, illustrate immediate adoption pathways, and demonstrate credible, deployable AI interventions.

The Diffusion culminates in a policy roundtable with NITI Aayog and a national dissemination event, translating study findings into adoption-ready, policy-aligned guidance that enables MSMEs to embrace AI confidently, sustainably, and at scale.

Key Activities

- 1 Kick-off** at IndiaAI Summit
- 2 Webinar Series:** Demystify AI and spotlight market-ready solutions for curated audiences of MSMEs, industry associations, and policymakers.
- 3 Sectoral Exhibitions & Forums:** Leverage industry events to anchor structured dialogues, foster cross-sector collaboration, and integrate stakeholder perspectives.
- 4 Highlight Success Stories** and the AI opportunity pipeline actively through Social Media Campaigns
- 5 Policy Roundtable** with NITI Aayog
- 6 National Dissemination Event:** Share study findings and actionable adoption pathways widely.

Outcomes

MSMEs

- Validated AI use cases grounded in MSME operations.
- Clear, low-risk adoption pathways and implementation archetypes.
- Guidance on procurement, financing, and policy levers.
- Visibility into productivity, product-service extension, and market expansion.
- Access to demonstrations, expert engagements, and adoption-ready learning.



Faster AI adoption with measurable productivity and market gains.

Policymakers

- Sector-specific insight into MSME constraints and AI readiness.
- Evidence-based mapping of AI use cases to national and state schemes.
- Targeted financial, procurement, and regulatory recommendations.
- Identification of ecosystem gaps, scaling pathways, and cluster opportunities.
- Monitoring frameworks to evaluate AI adoption impact at scale.



Reduced risk and improved ROI for MSMEs.

Technology Providers

- Deployment-ready MSME problem statements and use cases.
- Clear operational and technical requirements.
- Evidence on priority clusters and adoption pathways.
- Structured engagement with MSMEs and policymakers.
- Early visibility into nationally aligned scaling opportunities.



Stronger public-private collaboration and a sustainable AI ecosystem.

Impact

Study Partners

This study is being undertaken by the National Institute for Smart Government (NISG) and Athena Infonomics, under the aegis of Ministry of Electronics and Information Technology (MeitY) and IndiaAI Mission, in coordination with relevant line Ministries.



National Institute for Smart Government (NISG) is an autonomous, not-for-profit organization functioning under the administrative control of the Ministry of Electronics and Information Technology, Government of India.



Athena Infonomics is a global economic research and impact advisory firm established in Chennai in 2010, with operations across Africa, South Asia, the United Kingdom, and the United States. Over the past 15 years, Athena Infonomics has worked across more than 60 countries with governments, multilateral institutions, and corporate stakeholders, supporting evidence-based policy design through economic research, impact assessment, and technology-enabled monitoring and evaluation.



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