

AI-force multiplier: Leveraging AI for manufacturing and MSMEs

EY report for FTCCI
GROWTH[X] 2026



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Foreword

The manufacturing and Micro, Small and Medium Enterprise (MSME) sectors stand at a defining moment in India's economic trajectory. As competitive pressures intensify and value chains become increasingly data-driven, the role of Artificial Intelligence (AI) has shifted from being an emerging innovation to a strategic capability essential for long-term resilience and growth. For MSMEs in particular – who form the backbone of India's industrial ecosystem – AI presents an unprecedented opportunity to overcome legacy constraints, elevate operational efficiency and strengthen their position in domestic and global markets.

In Telangana, this opportunity is reinforced by a progressive policy framework, strong digital infrastructure and a thriving innovative ecosystem. The state's commitment to building a future-ready AI landscape creates fertile ground for MSMEs and manufacturing enterprises to adopt intelligent, secure and customer-centric operating models. This thought leadership, developed in collaboration with the Federation of Telangana Chambers of Commerce and Industry (FTCCI), examines these shifts and outlines a practical roadmap for AI adoption tailored to the realities of India's manufacturing corridors and small businesses.

Our analysis highlights that the next decade of industrial competitiveness will belong to enterprises that effectively combine human expertise with AI-enabled decision-making – reducing downtime, improving quality, optimizing energy consumption and strengthening customer engagement across the value chain. Equally, as digital intensity grows, the importance of responsible AI, data governance and regulatory compliance becomes foundational. India's Digital Personal Data Protection Act, 2023, places renewed emphasis on privacy, security and trust – critical elements for sustainable innovation and global alignment.

This thought leadership aims to support industry leaders, policymakers and ecosystem collaborators in navigating this transformation with clarity and confidence. It brings together sector insights, use cases, policy developments and a phased adoption framework that MSMEs can implement with minimal disruption and high impact. Our goal is to make AI accessible, actionable and architected for scale.

We want to advance this vision for an AI-powered, globally competitive manufacturing economy and hope this thought leadership contributes meaningfully to ongoing efforts to build future-ready enterprises that are innovative, secure and customer-centric at their core.

- Arun Nagarajan - Partner, Technology Consulting, EY India

"India's growth ambitions will ultimately be constrained or enabled by the quality of its talent pipeline.

FTCCI initiatives like GrowthX Impact are addressing this question head on by partnering with Industry for problem statements to be solved by students making it win-win for all stakeholders.

By shifting from evaluating potential on paper to observing capability in practice, industry has an opportunity to reduce hiring risk, improve employability outcomes, and contribute meaningfully to the national vision of Viksit Bharat"

Pankaj Diwan, Co-Chair, ICT, FTCCI

"AI is rapidly becoming a force multiplier for India's MSMEs, especially in manufacturing. In Telangana, AI is already delivering tangible outcomes—improving shop-floor efficiency, reducing defects through vision-based quality checks, predicting equipment failures, optimizing energy and inventory, and strengthening cash flows. As MSMEs digitize, cybersecurity and data protection are no longer optional; trust and resilience will define participation in global value chains. AI will not replace jobs but will augment the workforce, making rapid, industry-aligned skilling essential. Looking ahead, AI will be the invisible backbone across sunrise sectors such as electronics, pharma, agri-manufacturing, green manufacturing, and precision engineering. With the right ecosystem and intent, Telangana can lead India in building intelligent, resilient, and globally competitive MSMEs."

Bala Prasad Peddigari, Chair, ICT and Startup Committee, FTCCI

1.

Executive summary

Artificial Intelligence (AI) is accelerating a structural shift in India's manufacturing and MSME landscape, offering a practical pathway to overcome constraints of scale, cost, quality and skilled manpower. For MSMEs – who drive a significant share of India's production output – AI enables measurable improvements in productivity, equipment uptime, customer engagement and operational predictability. Telangana's progressive AI ecosystem, combined with its strong industrial base, positions the state as a natural accelerator for these transformations.

This thought leadership highlights how AI is reshaping every stage of the manufacturing value chain. From AI assisted design and virtual prototyping to predictive maintenance, intelligent scheduling, computer vision based quality inspection, energy optimization and supply chain intelligence, Indian MSMEs now have access to capabilities that were once limited to large enterprises. Cloud native platforms, modular tools and shared digital infrastructure significantly lower the adoption barrier, allowing businesses to begin with targeted, high impact use cases and scale pragmatically.

As adoption expands, responsible AI becomes foundational. Embedding privacy by design, complying with national data protection requirements and strengthening cybersecurity maturity are critical to maintaining trust and enabling safe deployment across workforce systems, shop floor environments and customer facing processes.

A forward looking roadmap provides a phased adoption strategy tailored to MSME realities. Early efforts focus on readiness diagnostics and quick win pilots – such as predictive maintenance, energy monitoring and quality vision – to deliver immediate operational benefits. The next phase prioritizes scaling proven use cases through standardized playbooks and embedding risk, privacy and data governance controls. As enterprises mature, AI begins to integrate across the value chain, enabling capabilities such as promise date reliability, supplier quality analytics and autonomous planning supported by digital twins. Over the longer horizon, manufacturers prepare for convergence with sunrise sectors through advanced analytics, semi autonomous operations and early exploration of quantum assisted optimization and semiconductor aligned manufacturing intelligence.

Together, these shifts signal a decisive moment for India's manufacturing and MSME ecosystem. By adopting AI thoughtfully and systematically, enterprises can strengthen competitiveness, improve reliability, elevate customer experience and position themselves for the next decade of industrial growth.





2. Introduction

AI acts as a force multiplier by augmenting human decision-making, automating repetitive processes and extracting actionable insights from data at scale. Unlike previous waves of digitization that focused primarily on automation, AI enables learning systems – systems that continuously improve with usage.

For manufacturing and MSMEs, AI can enable:

- Higher productivity without proportional increases in manpower
- Faster, data-driven decision-making
- Improved quality, consistency and predictability
- Enhanced customer engagement and personalization

In the Indian context – where MSMEs contribute nearly 30% of GDP and over 45% of manufacturing output – AI adoption is not just an efficiency play; it is a competitiveness and survival imperative.

3.

Customer-centric growth in today's smart AI age

In an increasingly competitive and fragmented manufacturing landscape, customer centricity has evolved from a “nice-to-have” differentiator to a core growth factor. For manufacturing enterprises and MSMEs alike, growth is no longer driven solely by capacity expansion, pricing or distributor reach. Instead, the ability to deeply understand customers, anticipate their needs and deliver consistent, personalized experiences at scale is becoming the defining factor for long-term success.

The emergence of Artificial Intelligence (AI) marks a pivotal shift in how manufacturers can operationalize customer centricity – moving from reactive engagement to intelligent, predictive and outcome-driven growth models.

3.1 From product-centric to customer-centric models

Traditionally, manufacturing organizations have been product-centric, focused on efficiency, throughput and cost optimization. Customer feedback was often indirect, delayed and mediated through multiple layers of distributors, dealers or channel associates.

In the smart AI age, this paradigm is rapidly changing. AI can enable manufacturers to:

- Capture real-time customer signals across touchpoints (sales interactions, service requests, digital platforms, complaints and social channels)
- Convert unstructured data into actionable customer insights
- Shift decision-making from intuition-based to data-driven and evidence-led
- Transition from reactive customer service to predictive customer engagement
- Move from mass offerings to personalized products and services
- Evolve from periodic feedback to continuous customer insight

This transition allows MSMEs and large manufacturers to move towards customer-led manufacturing, where products, services and go-to-market strategies are continuously shaped by evolving customer needs.

3.2 AI as the enabler of deep customer understanding

One of AI's most transformative impacts lies in its ability to unify and analyze large volumes of customer data that were previously siloed or underutilized.

AI systems can aggregate and analyze data from multiple touchpoints – sales orders, CRM systems, service tickets, website interactions and even distributor feedback – to build a unified customer view.

➤ Key AI-enabled possibilities include:

- Customer segmentation and profiling: AI models can dynamically segment customers based on buying behavior, order frequency, price sensitivity, geography and lifecycle stage – far beyond traditional demographic segmentation.
- Voice of customer (VoC) intelligence: Natural Language Processing (NLP) enables manufacturers to analyze complaints, service tickets, call transcripts and feedback forms to uncover recurring issues, unmet needs and emerging demand patterns.
- Predictive demand and preference analysis: By correlating historical sales data with market trends and external variables, AI helps anticipate customer requirements before they are explicitly expressed.

For Telangana-based MSMEs supplying to large original equipment manufacturers (OEMs) or export markets, such intelligence improves reliability and strengthens long-term relationships.

3.3 Hyper-personalization at scale: A new growth lever

In today's B2B and B2B2C manufacturing ecosystems, customers expect the same level of personalization they experience in digital-first industries.

AI can enable mass personalization without operational complexity by allowing manufacturers to:

- Offer customized product recommendations to dealers, distributors and large buyers
- Design region-specific pricing, promotions and schemes
- Tailor communication, technical support and after-sales engagement based on customer behavior and maturity

For MSMEs, this can translate into higher conversion rates, improved customer stickiness and stronger brand recall – without proportional increases in sales or marketing costs.

3.4 AI-driven customer experience across the value chain

Customer centricity in manufacturing is not limited to sales; it spans the entire value chain. AI can help embed customer focus across key functions:

- Sales and channel management: AI-powered Sales Force Automation (SFA) systems can guide field teams with next-best-action recommendations, improving productivity and the quality of customer engagement.
- Order management and fulfilment: Predictive analytics can optimize inventory placement, reduce lead times and improve order fill rates – directly impacting customer satisfaction.
- Service and support: AI chatbots, intelligent ticket routing and predictive maintenance can reduce downtime and facilitate faster issue resolution.
- Post-sales and loyalty: AI-enabled loyalty platforms help manufacturers engage electricians, contractors, retailers and influencers with targeted rewards and learning journeys.

Collectively, these capabilities shift the organization from transaction-based selling to relationship-driven growth.

Benefits can include:

- 24x7 customer support without increased staffing
- Faster response times and resolution
- Consistent communication across channels
- Multilingual/Telugu language support, critical for India's diverse markets

In sectors, such as auto components, pharma manufacturing, food processing and textiles – where Telangana has a strong presence – this can directly translate into higher customer trust and repeat business.

3.5 MSMEs: Leveling the playing field with AI

For MSMEs, customer centricity has traditionally been constrained by limited data, manpower and technology budgets. AI can fundamentally change this equation.

Cloud-based AI solutions can allow MSMEs to:

- Access enterprise-grade analytics without heavy upfront investments
- Automate routine customer interactions while focusing human effort on high-value relationships
- Compete with larger players on experience, responsiveness and personalization

This democratization of AI can empower MSMEs to scale sustainably while staying close to their customers.

3.6 Telangana's initiatives to foster customer-centric growth

3.6.1 AI-City vision: Accelerating innovation, GCC expansion and manufacturing competitiveness

Telangana's initiative to develop an AI-City represents a transformative step toward positioning the state as a global hub for artificial intelligence-driven innovation. Beyond being an infrastructure project, the AI-City is envisioned as a catalytic ecosystem that integrates advanced research, startups, Global Capability Centers (GCCs), academia and manufacturing enterprises. This ecosystem-driven approach can significantly accelerate 'customer-centric growth' for industries, especially MSMEs and manufacturing firms, by enabling faster innovation cycles, improved product design aligned with market needs and rapid commercialization of AI-enabled solutions.

3.6.2 Driving innovation, R&D and patent creation

The AI-City will foster collaborative innovation through shared research infrastructure, industry-academia collaborations and access to high-performance computing resources. Such an environment encourages companies to experiment with AI-enabled manufacturing, predictive analytics, digital twins and intelligent supply chains. As firms gain access to specialized talent pools, incubation programs and government-supported research grants, the pace of intellectual property creation, patents and deep-tech startups is expected to increase significantly. For MSMEs, participation in these innovation networks reduces the traditional barriers of R&D cost and technology access, allowing them to co-develop solutions tailored to evolving customer expectations such as mass customization, faster product delivery and superior service quality.

3.6.3 Attracting Global Capability Centers (GCCs) and strengthening industrial ecosystems

A dedicated AI strategy (AI-City) provides a compelling value proposition for multinational corporations seeking to establish or expand GCCs focused on AI engineering, analytics and digital manufacturing solutions. The presence of GCCs brings global best practices, advanced skill development and cross-industry collaboration opportunities, creating a multiplier effect for the regional economy. Manufacturing firms benefit through collaborations with GCCs for AI-driven process optimization, quality intelligence, demand forecasting and customer insight generation. Over time, such collaborations enable enterprises to transition from cost-focused operations to innovation-led, customer-centric manufacturing models.

3.6.4 Enabling MSME-led customer-centric transformation

For MSMEs, proximity to an AI innovation ecosystem enables affordable access to shared AI platforms, solution accelerators and talent marketplaces. This reduces technology adoption barriers and allows smaller enterprises to implement customer-centric capabilities such as AI-driven product personalization, predictive service maintenance, intelligent pricing and omnichannel customer engagement. As MSMEs adopt these capabilities, they can compete more effectively in both domestic and export markets, improving responsiveness to customer needs while maintaining operational efficiency.

3.6.5 Economic and competitiveness impact

By integrating innovation clusters, startup ecosystems and global technology investments, Telangana's AI-City has the potential to create a virtuous cycle of innovation patents GCC investments manufacturing modernization customer-centric growth. This cycle not only enhances industrial productivity but also positions the region as a preferred destination for advanced manufacturing and digital innovation. Over the long term, such initiatives can significantly contribute to employment generation, export competitiveness and the development of globally scalable AI solutions originating from India.





4.

AI and manufacturing (MSME and traditional businesses)

MSMEs form the backbone of India's economy, accounting for nearly 30% of GDP and about 36% of total manufacturing output. They strengthen economic resilience by boosting domestic production, developing localized supply networks and serving as critical ancillary units for large industries.

Multiple studies and national policy analyzes show that India's MSMEs face significant barriers in adopting technologies like AI, including high implementation costs, lack of skilled talent, limited digital infrastructure, low awareness, data privacy concerns and insufficient ecosystem support.

4.1 The manufacturing reality in India and Telangana

Manufacturing MSMEs in India face persistent challenges:

- Thin margins and high-cost pressures
- Equipment downtime and inconsistent quality
- Limited access to skilled labor and advanced analytics
- Fragmented data across operations
- Restricted ability to reach wider customer bases (marketing reach)

Telangana's manufacturing landscape – spanning pharmaceuticals, bulk drugs, electronics, precision engineering, food processing and textiles – mirrors these challenges while also benefiting from strong industrial parks, T-Hub and policy support.

AI offers a practical pathway to overcome these structural constraints.

4.2 AI use cases across the manufacturing value chain

AI can deliver maximum impact in manufacturing when applied end-to-end across the value chain, rather than as isolated pilots. For MSMEs and traditional manufacturing businesses, AI adoption should be pragmatic, modular and closely aligned to operational pain points. This section outlines key AI use cases that can be mapped to the manufacturing lifecycle.

4.2.1 Design, engineering and product development

AI is increasingly influencing the early stages of manufacturing, where design decisions determine long-term cost, quality and scalability.

Potential applications

- AI-assisted design optimization: Algorithms analyze historical designs, performance data and failure patterns to recommend optimal material usage, tolerances and configurations.
- Simulation and virtual prototyping: AI-driven simulations reduce dependence on physical prototypes, lowering time-to-market and R&D costs.
- Design for manufacturability (DFM): AI identifies design elements that may cause production inefficiencies or quality issues downstream.

4.2.2 Predictive maintenance and asset management

Unplanned equipment downtime can be one of the most significant cost drivers for MSME manufacturers. AI-based predictive maintenance can shift maintenance from a reactive or calendar-based model to a condition-based and predictive model.

Potential applications

- AI models analyze sensor data such as vibration, temperature, pressure and power consumption
- Patterns indicating early-stage wear or failure are detected before breakdowns occur

4.2.3 AI-driven quality control and inspection

Quality consistency can be a decisive differentiator for manufacturers supplying to OEMs, export markets and regulated industries. AI-powered quality inspection systems can significantly outperform manual inspection in speed, accuracy and consistency.

Potential applications

- Computer vision-based defect detection for surface defects, dimensional inaccuracies and assembly errors
- Real-time quality monitoring during production rather than post-production checks
- Root-cause analysis linking defects to machine parameters, raw material batches or operator actions

4.2.4 Intelligent production planning and scheduling

Production planning in MSMEs is often experience-driven and spreadsheet-based, making it vulnerable to demand volatility, machine breakdowns and supply disruptions. AI introduces adaptive and self-learning planning systems.

Potential applications

- Demand-driven production scheduling
- Constraint-based optimization considering machine capacity, labor availability and material supply
- Real-time rescheduling in response to disruptions

4.2.5 Supply chain and inventory optimization

Supply chain inefficiencies can often lock up working capital and erode margins – especially for MSMEs operating with limited cash buffers.

Potential applications

- Demand forecasting using historical sales, seasonality and market signals
- Inventory optimization to balance service levels and carrying costs
- Supplier performance analytics for quality, reliability and cost
- Logistics optimization, including route planning and delivery prioritization

4.2.6 Energy optimization and sustainability

Energy costs represent a significant portion of operating expenses for manufacturers, particularly in energy-intensive sectors.

Potential applications

- Real-time monitoring of energy consumption at machine and process levels
- Pattern recognition to identify energy wastage
- Optimization recommendations for load balancing and peak demand management

4.2.7 Workforce augmentation and safety

AI may not replace shop-floor workers; instead, it can augment human capability and improve safety.

Potential applications

- AI-based operator guidance systems
- Skill gap identification and targeted training recommendations
- Computer vision for safety compliance (PPE detection, unsafe behavior alerts)

From point solutions to integrated AI manufacturing

The true power of AI emerges when these use cases are integrated into a connected, data-driven manufacturing ecosystem – often referred to as a “smart factory” or “intelligent manufacturing system.”

For MSMEs, this may not require large upfront investments. Analysis suggests that a phased approach – starting with one or two high-impact use cases – can deliver quick ROI while building long-term AI maturity.

4.3 AI for traditional and family-run MSMEs

Traditional and family-run MSMEs remain core to India's manufacturing base, built on generational knowledge and strong community relationships. Yet many still rely on informal processes, limited digitization and intuition-led decisions. In the AI era, these strengths can be retained while addressing structural gaps – through practical, trust oriented and phased adoption. AI for such MSMEs is not about disruption but about augmenting experience with data-driven intelligence, improving predictability and enabling continuity across generations.

A common misconception is that AI can only assist large enterprises. However, cloud-based AI, SaaS platforms and low-code tools make AI accessible even to small, family-run businesses.

Examples include:

- AI-enabled accounting and cash-flow forecasting
- Automated procurement recommendations
- Sales demand prediction for seasonal businesses
- Digital twins for small production lines

4.4. Development of manufacturing corridors using AI

The strategic development of manufacturing and industrial corridors, particularly in areas neighboring other states and emerging growth centers, can significantly amplify Telangana's MSME competitiveness. Regions bordering Maharashtra, Karnataka, Chhattisgarh and Andhra Pradesh offer natural advantages in logistics, labor mobility and market access.

AI can play a foundational role in corridor planning and execution through:

- Data-driven site selection: AI models can analyze logistics data, freight movement, land costs, labor availability, power reliability and proximity to suppliers and markets to identify optimal locations for MSME clusters.
- Smart infrastructure planning: Predictive analytics can forecast future industrial demand, enabling state agencies and industrial park developers to proactively plan roads, utilities, warehouses and shared manufacturing facilities.

- Dynamic zoning and resource allocation: AI-enabled decision systems can help policymakers adapt corridor development plans based on real-time industrial growth patterns and MSME adoption rates.
- Digital twin-based corridor planning: Simulating infrastructure utilization, environmental impact and production flows enables better long-term industrial planning.

For MSMEs, AI-driven corridors reduce entry barriers by offering shared digital infrastructure – common ERP platforms, AI-based quality inspection centers and predictive maintenance services – making advanced manufacturing capabilities affordable even for small enterprises.

4.5 Cross-pollination of innovations across clusters

Manufacturing excellence can increasingly depend on the flow of ideas, talent and technology across sectors and regions. Telangana's diverse base of traditional industries – textiles, food processing, foundries, auto ancillaries and pharmaceuticals – presents fertile ground for innovation cross-pollination.

AI can enable this cross-pollination in multiple ways:

- Knowledge discovery platforms: AI-powered platforms can aggregate insights from academia, startups, R&D labs and MSMEs, identifying applicable innovations across industries (e.g., applying AI vision systems from pharma to textile defect detection).
- Collaborative design and prototyping: Generative AI and digital twin technologies allow MSMEs to rapidly experiment with product designs inspired by best practices from other sectors.
- Innovation diffusion analytics: AI can identify sectors or regions where specific technologies have high adoption potential and guide targeted policy interventions.
- Talent and skill mobility: AI-based skill mapping tools can identify transferable competencies among workers, enabling faster reskilling and redeployment across manufacturing domains.

By fostering AI-enabled innovation networks, Telangana can enable breakthroughs in one cluster (e.g., Hyderabad's tech ecosystem) to be rapidly adapted by MSMEs in peripheral manufacturing belts such as Warangal, Nalgonda, Adilabad and Mahbubnagar.

4.6 Tapping into inter-state opportunities through AI

AI also allows Telangana's MSMEs to look beyond state boundaries and integrate into inter-state value chains. Neighboring states present complementary strengths – automotive hubs in Maharashtra, electronics in Karnataka, minerals in Chhattisgarh and ports in Andhra Pradesh.

Key AI-driven enablers can include:

- Supply chain intelligence: AI tools can analyze procurement trends, policy incentives, infrastructure readiness and demand clusters across states to guide expansion decisions.
- Supplier discovery and qualification platforms: AI-based matching systems can connect MSMEs to large OEMs and Tier-1 suppliers operating in other states.

- Smart logistics and routing: Machine learning algorithms optimize transportation routes, reduce fuel costs and improve delivery timelines, making inter-state trade viable even for small manufacturers.
- Market forecasting and pricing: AI-powered market analytics can help MSMEs anticipate demand trends in neighboring states and dynamically adjust pricing and production volumes.

For traditional businesses, AI-powered language translation, digital negotiation tools and compliance automation simplify cross-border operations, reducing dependence on intermediaries and improving margins.



5.

Cybersecurity – Digital Personal Data Protection: Rules, their implications and roadmap for compliance

With the Digital Personal Data Protection Act (DPDP Act), 2023, now fully in force and the Digital

Personal Data Protection Rules (DPDP Rules) notified on 13 November 2025, Indian enterprises have decisively shifted from planning to execution. The DPDP Rules introduced a phased compliance runway, beginning with the immediate establishment of the Data Protection Board (DPB) and its obligations, followed by Consent Manager registration and obligations within a year, and Data Fiduciary-related obligations taking effect within 18 months from the date of the DPDP Rules being published. The Rules deliver long-awaited specificity and provide actionable clarity: clear and prospective privacy notice standards, a mandatory 90-day grievance redressal timeline, defined breach-reporting duties and one-year log-retention requirements for the purpose of state security, legal compliance and oversight. Together, the Rules convert the Act's principles into an operational playbook for organizations.

The impact of the DPDP Act and Rules varies across sectors due to differences in data maturity, governance and operational readiness. EY surveyed professionals and regulatory-mature sectors such as financial services and IT are expected to lead adoption, using and enhancing their existing governance models and compliance capabilities, likely setting the pace for industry-wide adoption. In contrast, entities from sectors such as healthcare, manufacturing, shipping, metals, education and insurance are grappling with moderate to low readiness. While many companies have initiated foundational activities, such as conducting gap assessments, identifying and documenting personal data inventory, mapping data flows and identifying processing activities, additional and more advanced capabilities remain limited. These include establishing a privacy framework, formalizing policy and procedures, establishing third-party privacy risk management practices and operationalizing personal data protection controls.

While the DPDP Act and Rules serves as the overarching framework for personal data processing, sector-specific regulations from authorities such as the Telecom Regulatory Authority of India (TRAI), the Reserve Bank of India (RBI), the Securities and Exchange Board of India (SEBI) and healthcare-related bodies remain essential.

These sectorial guidelines define expectations for individual sectors and complement the broader principles established by the DPDP Act and Rules. For organizations looking to strengthen their data protection strategies, it is crucial to understand how these regulations intersect and influence one another. An effective compliance roadmap begins with establishing a dedicated data privacy and data protection focused function, driving organizational awareness and identifying regulatory gaps. This can be followed by mapping and classifying personal data, including third-party systems and cross-border flows, then implementing dynamic consent mechanisms, Data Principal rights workflows and child data safeguards where relevant. Strong governance must be anchored through breach response policies, grievance procedures, security controls and vendor agreements with proper documentation. Conducting a privacy risk assessment and breach simulation exercises build operational readiness. Ongoing success and sustained compliance will depend on continuous policy update, refresher training for staff and staying audit-ready as regulations evolve.

In the end, privacy is no longer a check-the-box compliance obligation; it is a strategic and competitive differentiator. Businesses that proactively embed privacy by design into their data strategy and operations are better positioned to win customer trust, attract global associates and scale responsibly and confidently in a data-driven economy.

India stands at the crossroads of digital transformation, being one of the fastest-growing digital economies with widespread adoption of digital services in fintech, e-commerce and digital services among its young population. This transformation demands a comprehensive data protection policy and framework that fuels innovation while also safeguarding individual's privacy rights. The DPDP Act and Rules aim to establish this balance. For businesses, the Act introduces both opportunities and obligations as they prioritize privacy as a strategic factor. Trust is emerging as a competitive advantage; organizations that effectively implement privacy frameworks are not only better positioned to meet compliance but are also likely to gain customer confidence, strengthen brand integrity and enhance operational efficiency. Seen through this lens, the DPDP Act and Rules can be viewed as an enablers of

positive change in India's digital economy rather than just regulatory requirements. While achieving compliance requires effort, it can ultimately lead to clarity and long-term, trust-based data relationships that yield tangible benefits. As India accelerates its digital transformation journey, the DPDP Act and Rules establish fundamental guidelines for personal data governance. Anchored in principles of robust personal data protection of individuals, combined with clear requirements for companies managing personal data, the Act makes a decisive shift in how personal data is managed across sectors.

Core requirements of the DPDP Act and Rules

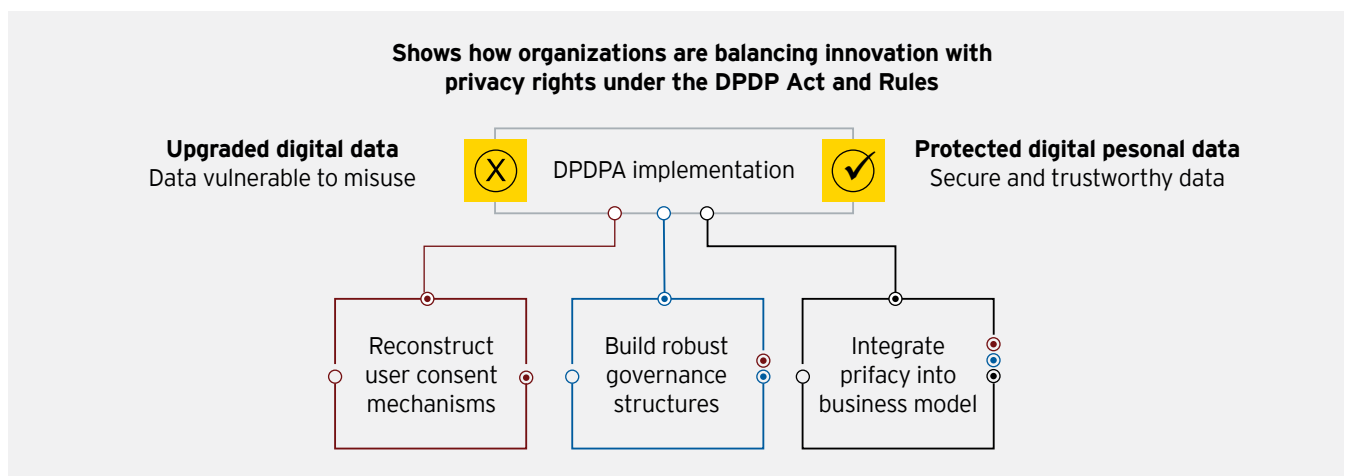
The Act operates on several fundamental requirements that reshape personal data governance practices:

Explicit consent framework: Businesses are required to obtain explicit and affirmative consent to process personal data. Commercial entities may need to redesign their approach to obtaining and managing Data Principal consents accordingly. Organizations should review historical

data collection practices to confirm whether valid consent exists. If prior consent already meets the Act's standards, no re-consent is needed. However, if consent was never obtained, is incomplete, or does not align with the Act's requirements, providing updated notices and obtaining fresh consent becomes mandatory. Additionally, the Act requires organizations to focus on redesigning consent journeys and modernizing interfaces so that obtained consent is meaningful and truly empowers the Data Principals.

Data Principal Rights: The Act grants complete authority to Data Principals to manage their personal data through the following rights:

- Right to transparent access to their data
- Right to correct inaccuracies and data deletion under specified conditions
- Right to nominate another person to act on their behalf in the event of their death or incapacity
- Right to grievance redressal
- Right to withdraw their consent for processing data for the specified purpose



Businesses would need to develop appropriate and scalable frameworks, models, mechanisms and processes to respond to these Data Principal requests effectively and within defined timelines.

Breach management: In the event of a breach, the DPDP Act and Rules mandate reporting to the Data Protection Board (DPB) and the impacted Data Principals without undue delay, followed by a detailed report to the DPB within 72 hours of observing the data breach incident. Companies would therefore need to establish protocols for:

- Timely notification to affected parties
- Disclosure to the DPB
- Implementation of corrective actions

These requirements translate long-standing security best practices into explicit formal compliance expectations.

Significant Data Fiduciary (SDF) compliance requirements: The Act uses factors such as data volume, sensitivity and organizational role to determine whether an entity qualifies as an SDF and to define its essential obligations. All designated entities qualified to be SDFs are required to appoint Data Protection Officers (DPOs) who have the following responsibilities:

- Ensuring internal compliance
- Serving as a point of contact with the regulatory authorities and the Data Principals

- Promoting privacy awareness within the organization
- Ensuring data protection oversight in accordance with this requirement

Additionally, SDFs are also required to appoint an independent auditor to carry out annual data privacy audits, evaluate the organization's compliance with regulatory obligations and conduct annual Data Protection Impact Assessments (DPIAs) to identify and mitigate any risks to the rights of the Data Principals. The key findings from the audit and DPIA must be reported to the DPB by the SDFs. These requirements set up a structured framework for continuous oversight of data protection, enabling SDFs to maintain a proactive and demonstrable commitment to privacy compliance. While it is not clear who will get notified to be an SDF, there will be increased focus and scrutiny on these entities once notified. From our point of view, large banks, insurance companies, telecom operators, large hospitals, etc., may get notified to be SDFs and can benefit from proactively preparing to comply with the obligations of an SDF.

Data protection obligations for B2B organizations: Business-to-Business (B2B) companies share significant responsibility for protecting personal data, even when their primary customers are other businesses. In every B2B engagement, personal data - such as employee details, user credentials and vendor information - is inevitably processed. Additionally, they may also be processing clients' end-customers' personal data. Obligations around transparency, purpose limitation, security safeguards and responsible data sharing apply. With B2B vendors sitting deep inside a client's technology stack or business flow, even a single lapse can impact multiple organizations and their users, making strong data governance, privacy-by-design, minimum security safeguards and demonstrable compliance essential. Ultimately, B2B companies must treat data privacy as a core accountability and not merely a contractual formality.

Data protection obligations for B2C organizations: Business-to-Consumer (B2C) companies carry an even more heightened responsibility for protecting personal data because they interact directly with individuals whose privacy expectations, rights and vulnerabilities are greater. These organizations typically collect higher volumes of personal and identity information, contact details, behavioral insights, transaction histories, preferences and consent logs. This increases expectations around transparent notices, valid and granular consent, purpose limitation, data minimization, secure processing, defined retention policies and mechanisms to honor individuals' rights (access, correction, erasure, grievance redressal). B2C entities must also manage higher regulatory scrutiny, heightened risk of individual harm and

the need for strong customer-facing privacy practices. With the final DPDP Act and Rules now officially notified, India has entered the implementation phase. The Rules provide the operational clarity that organizations had been awaiting and formally begin the 18-month compliance window.

Enforcement timeline: The enforcement timeline is structured across three phases:

- Immediate (effective 13 November 2025): Establishment of the DPB and commencement of associated obligations.
- Within one year of the publication of Rules: Registration and obligations for Consent Managers.
- Within 18 months of the publication of Rules: Compliance with Data Fiduciary obligations.

Strategic implications: The DPDP Act and Rules represent more than regulatory obligations; they shape how enterprises compete, operate and build trust in a digital economy. They set up data protection requirements that can affect operations, leading companies to treat data protection as a necessary legal standard and an essential business priority. Actively implementing these modifications would allow companies to build trust with consumers while establishing compliance as a strategic and competitive advantage. Organizations operating across multiple countries must comply with the data protection regulations of each jurisdiction, which, while presenting compliance challenges, are a regulatory necessity. Adherence to these standards is essential for global alignment, trust-building and the facilitation of streamlined cross-border data flows, the attraction of international collaborators and investors and the support of scalable global operations.

Non-compliance with the DPDP Act and Rules may lead to substantial financial penalties, harm to reputation, risk of business disruption and increased regulatory scrutiny. These risks further highlight the importance of proactive preparedness and effective governance.

India is at the fulcrum of digital transformation, and through this Act, aims to achieve a balance between innovation and the protection of Data Principal rights. Appropriate implementation of this Act necessitates collaboration between businesses, regulators and the public to develop a privacy-based data system that promotes India's digital transformation agenda in a responsible way.

Interpretation to execution: With the final DPDP Rules notified and the compliance window formally underway, organizations can no longer rely on a wait-and-watch approach. The period of uncertainty that accompanied the draft rules has ended. Regulatory expectations are now explicit. Enterprises that had

paused major activities such as detailed gap assessments, personal data inventories and systems remediation must now accelerate these efforts to align with the 18-month implementation timeline.

Third-party governance is also moving to the forefront. Many organizations had previously identified their external vendors but had not completed privacy risk assessments or executed updated contractual safeguards. The final Rules make it clear that Data Fiduciaries are accountable for ensuring that all Data Processors implement required security controls, retention schedules, log-maintenance obligations and breach-reporting processes. This raises the urgency of conducting structured third-party assessments and formalizing Data Processing Agreements to mitigate downstream compliance risk.

Similarly, critical activities such as establishing a formal privacy governance structure, identifying data-collection touchpoints requiring notice or consent and developing integrated operational policies had been deferred by several smaller companies pending regulatory clarity. With the Rules now final, these actions must be prioritized. Organizations will need to adopt a sequenced implementation plan – gap assessment, mapping data flows, establishment of policies and procedures, embedding consent and retention controls, updating notice mechanisms, conducting training and awareness and ensuring sustained rollout and monitoring.

The shift is clear: the DPDP Act and Rules have moved from interpretation to execution and organizations that proactively advance their compliance programs now would be far better positioned to meet regulatory timelines and build enduring trust with their stakeholders.

Survey: The implications of the DPDP Act and Rules differ significantly across sectors, driven by varying levels of data maturity, governance and operational readiness among companies. To examine the same, EY surveyed nearly 150 professionals, including senior leaders, mid-level managers and executives across various industries, providing a comprehensive understanding of the diverse approaches companies are adopting at various organizational levels. This survey reflects a cross section of perspectives from different organizations, including financial services, technology services, consumer and retail, healthcare, manufacturing, telecom, media and entertainment, education, auto mobility and many others at different stages of their compliance journey. The broad representation of this survey offers a comprehensive view of DPDP Act and Rules readiness across India's key economic verticals.

30%

The survey reveals varied levels of understanding among participants regarding the DPDP Act and Rules.

Approximately 30% have moderate or lower awareness of the Act and its implications, highlighting significant gaps in knowledge at both leadership and execution levels. Despite this, India Inc. is clearly mobilizing and preparing for compliance with the Act, as it becomes a key business imperative, though the levels of impact, maturity in readiness and implementation vary across sectors.

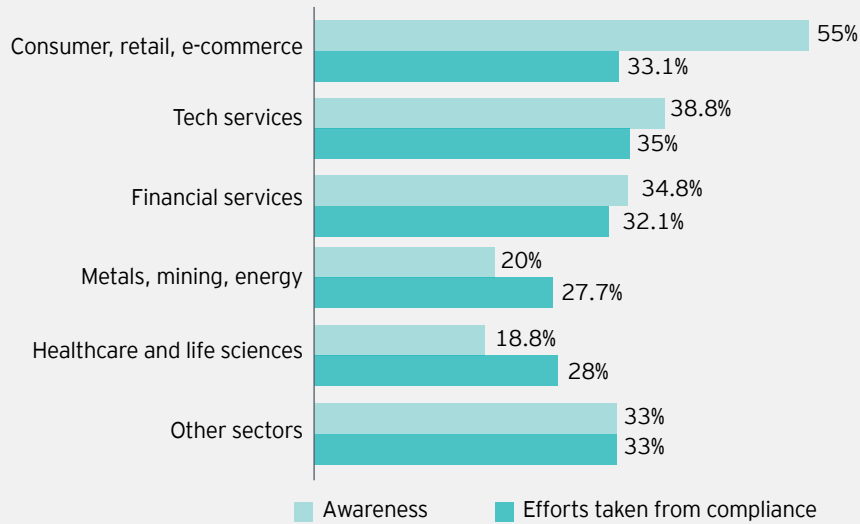
Sectors with a high degree of customer interaction or heavy reliance on customer data are likely to see the most impact of the DPDP Act and Rules. However, the level of awareness among such sectors differs significantly at present. For instance, companies in financial services and tech services have elevated awareness due to their high use of customer data and digital systems, and are already regulated landscape or governed by contractual and global compliances, leading them to adopt stronger data governance practices.

Conversely, companies in the healthcare, metals, education sectors, etc., have lower familiarity with the Act with the newly notified Rules, which translate the Act's principles into actionable requirements.

Some organizations in these sectors are preparing for compliance, while many others remain at a level of basic understanding of the Act's implications. Given the varying levels of understanding, greater effort is required to increase internal awareness and employee training and to develop policies around data protection and identifying and documenting personal data.

Among the sectors surveyed, manufacturing, infrastructure and shipping displayed the least familiarity with the DPDP Act and Rules. These industries are often characterized by legacy systems, limited digitization or narrower regulatory exposure. To bridge this knowledge gap, targeted support and public awareness programs are essential to overcome compliance challenges.

Industry awareness and compliance efforts towards DPDP Act and Rules



Other sectors include manufacturing, media and entertainment, auto and mobility, telecom, education, hospitality, infrastructure and governance

Source: EY Research

Within organizations, it is important to understand the level of awareness among employees at different levels to identify areas of strength and existing gaps. Such insights can, in turn, lead to tailored and role-based training, effective communication and allocation of resources with the aim of strengthening compliance and building an overall culture of being highly aware of data privacy.

Functions directly engaged in compliance, such as legal, cybersecurity and risk management exhibit higher awareness due to their inherent role in interpreting and managing regulatory requirements. Technology and Information Security teams also demonstrate strong awareness, as data privacy aligns closely with their existing responsibilities in cybersecurity. In contrast, operational functions like HR,

finance, manufacturing and business operations exhibit significantly lower levels of awareness. Although these teams routinely handle personal data, they may lack dedicated training or clarity on privacy responsibilities, posing potential compliance risks.

The gap highlights the need for organization-wide privacy education, consistent awareness campaigns and stronger cross-functional coordination to enable full compliance with the DPDP Act and Rules.

While organizations are at varying maturity levels in their efforts to comply with the DPDP Act and Rules, most organizations have started focusing on key areas, as indicated in the graph below.

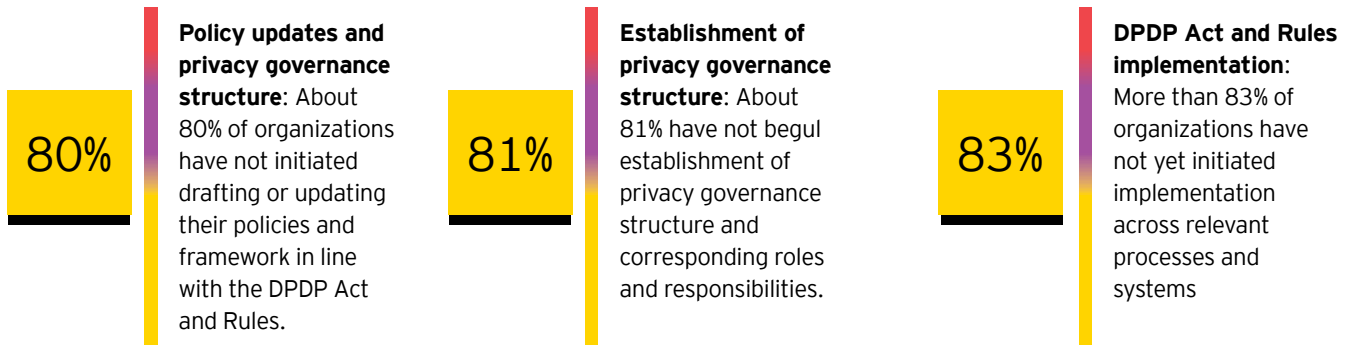
Organizational progress in DPDP Act and Rules compliance



Source: EY Research

Close to 50% organizations have undertaken the first step of conducting a gap assessment, while the other compliance activities would follow.

Low priority areas in DPDP Act and Rules compliance are evident in several critical activities that organizations have not widely adopted



Currently, many organizations are focusing on achieving initial compliance maturity before addressing advanced requirements. Therefore, some activities, such as third-party privacy risk assessments and periodic privacy audits, are largely not undertaken across sectors.

Sector-wise maturity

Financial services, consumer and retail, e-commerce and technology services: These sectors have made more substantial progress than others in core compliance tasks, including gap assessments, data flow mapping and processing documentation. Their advantage stems from higher regulatory exposure, client obligations, data governance frameworks and greater investments in privacy readiness.

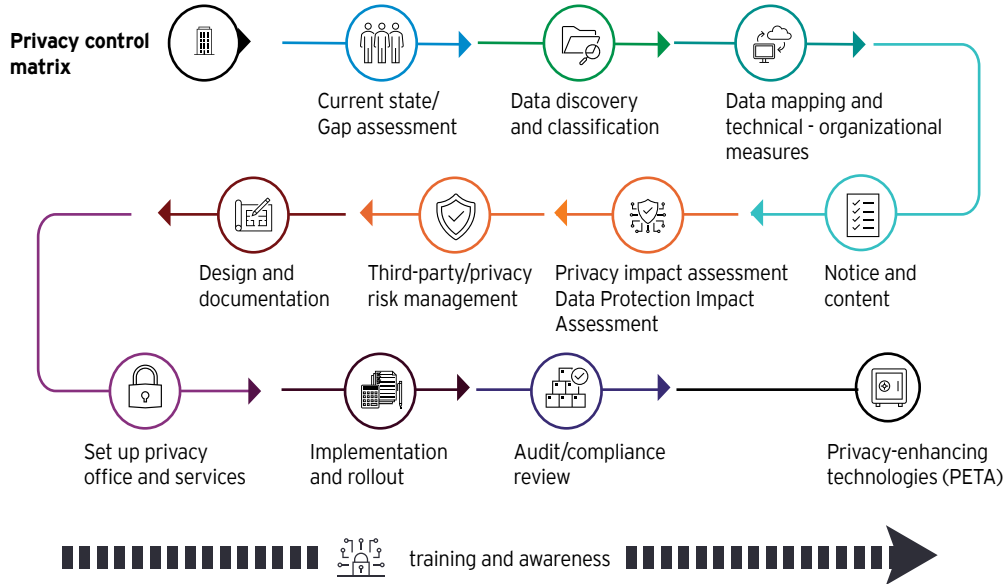
Education and healthcare: They face more pronounced challenges and show limited progress across most compliance areas. One of the biggest barriers includes highly sensitive personal data spread across fragmented systems and legacy infrastructure. Combined with constrained budgets and limited in-house expertise, these factors delay the structured adoption of privacy practices.

Suggested approach: To address the challenges and accelerate readiness, organizations can prioritize streamlining high-risk data flows, investing in centralized data governance and phasing compliance efforts in line with operational realities. Collaboration with industry associations and leveraging modular privacy tools can also reduce the burden of managing complex compliance requirements.

Readiness and progress in meeting DPDP Act and Rules requirements

Strong data protection practices enable organizations to safeguard the confidentiality, integrity and availability of personal data throughout its lifecycle. These requirements can be structured into basic, intermediary and advanced levels, allowing organizations to build capability in a phased and scalable manner. Each tier strengthens governance, operational resilience and the ability to prevent unauthorized access, detect anomalies, respond to incidents and maintain operational resilience.

Illustrative roadmap to ensure compliance to Act and its Rules



Basic requirements constitute the mandatory controls that every Data Fiduciary and any Data Processor acting on its behalf must implement for secure and accountable personal data processing. At a minimum, organizations must:

- Implement appropriate data security measures such as encryption, masking, obfuscation, tokenization, or similar techniques.
- Establish strict access controls to systems and computer resources so that only authorized personnel (including processors) can access personal data.
- Maintain visibility into access and processing activities through logs, monitoring mechanisms and periodic reviews, enabling detection, investigation and remediation of unauthorized access.
- Enable continuity of processing in case of a breach of confidentiality, integrity, or availability, including appropriate data-backup mechanisms and recovery procedures.
- Retain relevant logs for at least one year.
- Ensure contracts with Data Processors impose

obligations to implement reasonable security safeguards consistent with the Act.

- Conducting periodic vulnerability assessments, configuration reviews and security audits.
- Adopt other suitable technical and organizational measures to implement required safeguards effectively and prevent the recurrence of security failures.

Intermediary requirements go beyond statutory minimum to strengthen and operationalize protections by establishing structured governance, expanded monitoring and systematic security practices. These also represent good industry practices for organizations with growing data volumes or operational complexity. Typical additional expectations include:

- Implementing data classification-based controls, including structured encryption policies, tiered access and defined retention rules.

- Deploying formal information security policies, standards and role definitions (e.g., data owner, custodian, approver).
- Strengthening identity and access management, including privileged access restrictions and periodic access-recertification.
- Enforcing Secure Development Life Cycle (SDLC) practices, change management and timely patch management.
- Establishing formal backup-testing routines, secure data-transfer protocols and environment segregation (dev/test/prod).
- Implementing more structured logging, anomaly detection and incident-reporting workflows with defined responsibilities and SLAs.
- Deploying advanced cryptographic controls, enterprise-grade key-management systems and organization-wide Data Loss Prevention (DLP) implementations.
- Adopting Zero-Trust Architecture principles, including continuous identity verification, micro-segmentation and strict least-privilege enforcement.
- Automating retention, deletion, archival and backup processes, including versioning and immutable storage. Conducting regular penetration testing, red-team exercises, adversarial simulations and continuous security validation.
- Establishing geographically distributed disaster-recovery environments and robust business-continuity scenarios.
- Embedding security-by-design in architecture, procurement and development processes.
- Instituting board-level oversight, security-risk reporting and integration of data-protection metrics into enterprise risk management.

Advanced requirements reflect mature, predictive and intelligence-driven protection capabilities. These measures are expected in data-intensive or highly regulated environments where proactive risk reduction is critical. Advanced practices additionally include:





6.

Sunrise sectors and Telangana rising

To translate its long-term DeepTech ambitions into durable economic and strategic outcomes, Telangana proposes a comprehensive Public-Private Partnership (PPP) architecture that integrates frontier research, industrial deployment, capital formation, talent development and governance into a unified innovation system.

Unlike conventional sectoral policies or incentive-driven programs, this architecture is designed as a platform model – capable of sustaining long-gestation technologies such as artificial intelligence, quantum computing, microelectronics, biotechnology, climate technologies and advanced manufacturing. The objective is not only to enable innovation but also to institutionalize pathways from research to commercialization at a national scale, positioning Telangana as India’s most advanced DeepTech testbed.

At the center of this model is the recognition that frontier technologies require shared infrastructure, anchor demand, translational research capacity and continuous evaluation – elements that can only be delivered through structured, long-term public-private collaboration.

6.1 Bharat Pradnya Sankul: DeepTech districts as growth engines

A foundational pillar of this architecture is the establishment of Bharat Pradnya Sankul, a network of six dedicated DeepTech spaces focused on AI, quantum technologies, microelectronics, biotechnology, fusion energy and climate mobility.

Each Sankul is conceived as a place-based innovation cluster, anchored by a formal consortium comprising industry leaders, the state government, leading universities, global collaborators and T-Hub as the ecosystem platform operator. Rather than functioning as isolated technology parks, these districts are designed as district-scale economic engines, integrating R&D, manufacturing pilots, startups, skilling and commercialization within a single geography.

The performance of each Sankul is measured against global benchmarks, with explicit targets for GSDP contribution, patent generation, startup creation and employment. Importantly, success is defined not merely by aggregate revenue but by the emergence of globally scalable specialist firms, deep local supply chains and a sustained pipeline of innovation talent.

Anusandhan Research functions as the R&D backbone across all Sankuls, enabling joint laboratories, shared testbeds, open-data pilots and structured research-to-market pathways.

6.2 Telangana as a national living laboratory for AI

Through the Telangana Kavach AI Maha Abhiyan, the state positions itself as India’s national testbed for applied artificial intelligence across healthcare, agriculture, logistics, governance and industrial systems.

Structured as a large-scale, multi-stakeholder PPP, the initiative integrates government departments as anchor pilot customers, private AI platform providers and T-Hub-led talent and model acceleration programs. This design enables rapid piloting of AI solutions in real-world settings while enabling alignment with public interest objectives.

Beyond economic impact, the initiative is explicitly framed to establish Telangana as a “living laboratory” for AI governance, including regulatory sandboxes, ethical frameworks and responsible AI benchmarks. Revenue is generated through AI services, data exchange frameworks and training programs, while Anusandhan Research supports foundational model development, impact assessment and policy-aligned innovation.

6.3 Strategic platforms: Quantum, compute and digital sovereignty

Telangana's DeepTech PPP architecture includes nationally strategic platforms in quantum computing, AI compute infrastructure and hardware sovereignty, recognizing these as critical enablers of future economic and national security capabilities.

The Rashtra Quantum Shakti flagship PPP aims to establish India's first scalable quantum computing ecosystem by 2030, combining quantum-as-a-service offerings, open testbeds and international pilot collaborations. This platform is designed to anchor quantum research, hardware development and manufacturing capabilities within the state.

Complementing this is the GyanAI Mahafactory, a large-scale AI compute and training hub developed through PPP with global cloud providers. The Mahafactory provides industry-grade AI infrastructure to startups, enterprises and government agencies, enabling rapid scaling of AI solutions while establishing best practices in AI governance and production.

In parallel, the Swaraj Micro Quantum Bharat initiative positions Telangana as a national testbed for microelectronics and quantum hardware, spanning chip design, pilot fabrication, secure digital systems and resilient supply chains. Together, these platforms strengthen India's digital and hardware sovereignty while anchoring high-value R&D and manufacturing within Telangana.

6.4 Capital, commercialization and industrial deployment

To enable continuity from research to market, the PPP architecture integrates dedicated mechanisms for capital formation, commercialization and industrial adoption.

The Vikas Udyam DeepTech Startup Fund provides a recurring, performance-linked PPP investment vehicle supporting startups, university spinouts and regional founders. This fund is designed to address early-stage capital gaps while aligning private investment with long-term innovation outcomes.

The Parivartan Anuvansh Innovation Transfer Accelerator addresses structural bottlenecks in technology transfer by scaling patent commercialization, shared IP pools and industry-university collaboration frameworks so that research outputs translate into market-ready products.

For deployment at scale, the Sangram PPP enables large-scale adoption of DeepTech solutions across robotics, automotive, chemicals, med-tech and advanced manufacturing. Government procurement and anchor industry pilots are used to de-risk adoption, build local SME supply chains and accelerate the diffusion of advanced technologies into the real economy.

6.5 Talent, governance and system-wide accountability

Talent development is addressed through the Shiksha Bharati DeepTech Talent Manthan, a decade-long PPP strategy integrating universities, EdTech platforms and industry coalitions to produce 1,00,000 next-generation DeepTech professionals by 2035. Curriculum co-creation, faculty exchange and applied research pathways enable continuous alignment with industry needs.

System-wide accountability is facilitated through Drishti Samiksha, an independent monitoring and evaluation PPP embedded within Telangana's Vision Management framework. All initiatives undergo structured milestone reviews covering time, cost, quality and long-term impact, with transparent reporting and mandatory corrective action cycles.

6.6 An integrated model for long-term impact

Across the entire PPP suite, Anusandhan Research functions as the unifying R&D catalyst – co-designing foundational research, enabling cross-project knowledge sharing and maintaining digital knowledge repositories aligned with Telangana Vision 2047.

Governance is anchored through joint steering committees, milestone-based funding triggers and T-Hub-led ecosystem coordination. Importantly, outcomes are measured not only in financial terms but also in ecosystem depth, talent retention, IP creation, startup scale and district-level innovation capacity.

Taken together, this DeepTech PPP architecture positions Telangana not merely as a technology adopter but as India's premier platform for building, testing and scaling frontier technologies of national and global relevance.

6.7 Strategic materials for a DeepTech economy: Graphene vs. uranium

Graphene and uranium represent two very different strategic materials, but for Telangana's DeepTech ambitions, graphene is the true frontier enabler. As a single-atom-thick carbon lattice, graphene offers extraordinary electrical conductivity, thermal performance and mechanical strength, making it one of the most promising materials for advanced electronics and nanoscale engineering. Its applicability spans microelectronics, quantum devices, advanced sensors, 6G systems and clean-energy technologies, directly aligning with Telangana's microelectronics, semiconductor and quantum-hardware roadmap. Its compatibility with existing semiconductor fabrication and room-temperature manufacturability further position it as a strong candidate for sovereign chip innovation and reduced dependence on global supply chains.

Uranium, while essential for high-density, low-carbon baseload power in nuclear energy systems, can play a different role. Its energy density enables long-duration, stable electricity generation crucial for national energy security, not specifically for Telangana's DeepTech hardware stack. As compute-intensive infrastructure like AI gigafactories and quantum research clusters grow, such high-stability energy sources remain relevant at a national level, even if not directly embedded in Telangana's PPP initiatives.

In effect, graphene can be more useful as the DeepTech material with the highest direct impact on Telangana's innovation ecosystem – supporting next-generation electronics, quantum R&D and semiconductor advancement – while uranium may remain part of the broader energy-security landscape.



7.

Future roadmap

Based on analysis and case studies, the following phased roadmap is designed to fit MSME realities:

a) Phase 0 (0-6 months): Readiness + quick wins

- Run AI readiness diagnostics (data, machines, cyber, skills) and launch 2-3 pilots per cluster: quality vision, energy optimization, predictive maintenance, planning copilots.
- Establish minimum governance aligned with National Institute of Standards and Technology's (NIST) AI Risk Management Framework (basic model risk tiers, human-in-the-loop for safety/compliance decisions).

b) Phase 1 (6-18 months): Scale proven use cases across MSMEs

- Create sector "Factory AI Playbooks" and replicate them across MSMEs with standardized connectors and templates.
- Strengthen risk practices using AI lifecycle risk guidance (ISO/IEC 23894) and embed DPDP controls into data pipelines and vendor contracts.

c) Phase 2 (18-36 months): Integrate for customer-centric growth

- Move from inside-the-factory gains to value-chain differentiation: promise-date engines, supplier quality analytics, warranty prediction, end-to-end scheduling optimization.

- Institutionalize privacy operations (rights handling, retention enforcement, incident response), increasing audit readiness.

d) Phase 3 (3-5 years): Semi-autonomy (guard railed, human-led)

- Implement closed-loop improvements with safety guardrails: process auto-correction within parameter windows, autonomous maintenance planning, digital twins for stability and throughput improvement.

e) Phase 4 (5-7 years): Sunrise convergence (space/quantum/advanced manufacturing)

Build space-grade traceability and quality systems, pilot quantum-assisted optimization with collaborators and strengthen advanced electronics/semiconductor manufacturing analytics to become sunrise-supply-chain ready.

8.

Talent, skills and future workforce: Upskilling agenda

Telangana is entering a phase where the pace of economic growth is no longer constrained by investment or infrastructure, but by workforce readiness. With a state economy already close to US\$200 billion¹ and projected to nearly double by 2030, sustaining about 12%¹ growth trajectory will depend critically on how effectively education converts into productivity.

The state has recorded one of the highest real growth rates among Indian states in recent years and now ranks at the top in per capita income. Growth at this income level requires skill intensive sectors, faster technology adoption and higher labor productivity.

Demographics amplify both opportunity and risk. Around 72%² of Telangana's population is of working age – a strong demographic advantage. Yet global experience shows that demographic dividends pay off only when education and skilling systems are tightly aligned with in-demand courses and curriculum coupled with future skills.

Telangana is expected to generate approximately 16 lakh new jobs by 2030¹, with nearly one third coming from life sciences, IT, renewable energy, electric mobility, and aerospace and defense. These sectors demand specialized technical curricula, practical and applied learning and continuous upskilling, not just academic credentials.

Economies with high academic specialization to impart knowledge and skills in line with in-demand specialized sectors at the secondary level – often above 40% to 50%³ – have resilient pipelines of job ready talent. For Telangana, the implication is clear: skilling should move from the margins to the core.

Telangana's growth momentum creates a window of opportunity. If delayed, the state risks skill shortages in high growth sectors and underemployment among educated youth. If done well, Telangana can turn human capital into a durable competitive advantage.

8.1 Current state: Strong access, weak conversion

Telangana's education ecosystem is built at scale: over 43,000 schools⁴, 31 universities⁵, 2,500 colleges⁶, 280 ITIs⁷ and 2608 polytechnics. Participation rates are above national averages and higher education enrolment places Telangana among the top five states. Yet the conversion of access into employability remains inconsistent.

- Secondary dropout: Negligible at primary, but sharply higher at secondary.
- Learning outcomes: On national benchmarks, Telangana trails leading states; scores are less than half of top performers.
- Higher education mismatch: Despite about 40% GER⁶, graduate unemployment is elevated, especially in urban areas.
- Vocational education utilization: Nearly 47%⁴ of government secondary and higher secondary schools offer vocational courses, yet formal alignment with qualification frameworks is low and ITIs operate at approximately 50%⁹ capacity.
- Labor market structure: Over half the workforce is self employed and many salaried workers lack job security.

Telangana has built access and infrastructure; AI can be the catalyst that converts participation into learning and employment outcomes – at lower marginal cost and higher speed.

8.2 Way forward

1. Alignment

With approximately five lakh jobs expected in emerging sectors by 2030, Telangana can become a preferred talent hub if curricula and credentials evolve with industry. AI driven course and curriculum engine can ingest job postings, sector reports and global standards to recommend curriculum updates so that institutions keep pace.

2. Fixing transitions

Drop offs at secondary and higher secondary are major leakage points. AI enabled transition analytics can identify students at risk, recommend modular bridges (foundation STEM, English for work, digital basics) and auto enroll them into targeted supports.

3. Unlocking existing assets

Trainer quality, equipment and placement linkages are the biggest unlocks for ITIs. AI can assess trainer skill gaps, suggest personalized upskilling, simulate industry tasks on low cost devices and match graduates to openings beyond local geographies.

8.3 The core challenge can be execution at scale

Fragmented initiatives and input focused programs will not close outcome gaps. Telangana needs a system level, outcome oriented framework with AI embedded end to end – from pedagogy and assessment to placements and continuous learning – underpinned by strong governance, data privacy and equity safeguards.

8.4 From headroom to leadership

Telangana's advantage is clear: strong growth, high participation in education and a diversified economic base. The constraint is equally clear: conversion from education and skilling to employability is inconsistent – secondary dropout remains elevated, learning outcomes lag the best states and skilling infrastructure is under utilized.

By embedding AI across alignment, immersion, delivery quality and outcomes, Telangana can unlock this headroom. The state can raise learning mastery, reduce dropouts, modernize vocational education, accelerate placements and support micro entrepreneurship. If done well, this shift can support millions of jobs over the decade, improve job quality and position Telangana as a national lighthouse for AI enabled education to employment transformation.



9.

Conclusion

Manufacturing is entering a decisive decade where customer expectations (speed, customization, quality transparency, serviceability) and cost pressures (energy, scrap, downtime, inventory) are rising simultaneously. In this “smart AI age,” growth will belong to enterprises that can convert shop floor and supply chain signals into faster decisions, fewer defects, higher uptime and more reliable delivery promises – without compromising security, privacy or workforce trust.

For India’s MSMEs and traditional businesses, AI is no longer a futuristic luxury – it is the most practical path to compete with scale: digitize what matters, automate what repeats, predict what fails and optimize what constrains throughput. The opportunity is especially compelling in manufacturing clusters where repeatable playbooks (quality vision, predictive maintenance, energy optimization, planning copilots) can be replicated rapidly to deliver quick payback and build momentum toward integrated, value-chain intelligence.

However, responsible deployment is the multiplier. As AI usage expands, organizations should treat cybersecurity, privacy and ethics as foundational infrastructure – particularly when solutions touch personal data (workforce systems, biometric access, CCTV analytics, HR screening). India’s Digital Personal Data Protection Act, 2023 makes it essential to adopt privacy-by-design practices such as data inventories, purpose limitation, retention discipline, rights management and vendor governance – creating trust and reducing compliance risk as digitalization grows. [indiacode.nic.in], [dsci.in]

In parallel, India’s labor reforms – operationalized from 21 November 2025 – signal a more formal, health-and-safety-forward workforce environment. This is where AI can play a positive role: improving shop floor safety monitoring, strengthening training compliance, reducing ergonomic risk and enabling productivity-linked growth while supporting modernized HR and compliance processes.

9.1 Why “Telangana rising” can be a credible accelerator

Telangana’s ecosystem provides a practical platform to make this roadmap real: a dedicated AI framework and state strategy roadmap, ecosystem builders and mission-led capacity building that can help MSMEs access data, talent and compute-backed experimentation.

Notably, the Telangana AI Mission ecosystem (with collaborators) has documented strong research depth and a forward plan to expand AI compute availability for startups and SMEs – exactly the kind of shared infrastructure MSMEs need to adopt AI affordably.

Additionally, innovation institutions such as T-Hub strengthen startup-industry-government collaboration, improving the “time to value” for industrial AI solutions.

9.2 Federation of Telangana Chambers of Commerce and Industry (FTCCI’s) role

FTCCI can catalyze this transformation by convening cluster-based adoption, publishing sector playbooks, enabling shared AI sandboxes, promoting responsible AI and DPDP readiness and scaling a workforce upskilling agenda that prepares operators, supervisors and engineers for AI-augmented work. The winners will not be those who “use AI,” but those who deploy AI responsibly to deliver superior customer outcomes – at industrial scale.

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EYIN2602-024

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