BEYOND STATUTORY COMPLIANCE: THE IMPACT OF APPRENTICESHIP SCHEME INITIATIVES ON ORGANIZATIONAL SUSTAINABILITY – A STUDY WITH REFERENCE TO LARGE-SCALE AUTOMOTIVE INDUSTRIES IN PUNE DISTRICT

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Abstract
This research explores the transformative role of Government apprenticeship scheme initiatives like National Apprenticeship Promotion Scheme (NAPS) & National Apprentice Training Scheme (NATS) in evolving organizational sustainability within large-scale automotive industries in Pune District, India. Drawing on a mixed-methods approach, the study combines quantitative data from ground surveys and qualitative insights from conversations with HR/ Training managers, apprentices, and sustainability officers across automotive firms. The analysis explores how structured apprenticeship programs (NAPS/ NATS) help to bridge skill gaps, enhance workforce competences, and foster inclusive growth, thereby aligning with the triple bottom line of sustainability—economic, environmental, and social outcomes. The findings reveal that apprenticeship schemes not only improve operational efficiency and positive improvement capacity but also reinforce corporate social responsibility (CSR) by offering equitable employment pathways and supporting community development. Case studies of prominent firms such as Bajaj Auto, Tata Motors, Mercedes-Benz India, Mahindra & Mahindra, Volkswagen/Skoda, Bharat Forge, and Force Motors illustrate viable best practices and their outcomes. The paper concludes with policy and industry recommendations to scale apprenticeship models, emphasizing their strategic importance in building resilient, future-ready organizations and contributing to India's sustainable industrial ecosystem.

Keywords: Apprenticeship, Organizational Sustainability, Automotive Industry, Pune District, Skill Development, Triple Bottom Line, Corporate Social Responsibility

Introduction

Apprenticeship Context in India and Relevance to Sustainability

On global front, India stands at a decisive stage in its economic and industrial development, with a growing youth population and a rapidly evolving manufacturing sector through Production Linked Incentive (PLI) Schemes. The automotive industry, particularly in Pune District, is a foundation stone of this transformation, contributing significantly to national GDP, exports, and youth employment. However, the sector faces persistent challenges: a widening skill gap with improved product features, technological disruptions (such as the vehicle platform shift to electric and various automations), and increasing demands for sustainable business practices.

Apprenticeship schemes have emerged as a strategic lever to address these challenges. Rooted in the Apprentices Act of 1961 and continually reformed through initiatives like (NAPS) and (NATS), these programs aim to bridge the disconnect between academic learning, skill acquisition and industry requirements. By integrating structured on-the-job learning with related theoretical instruction, apprenticeships foster a workforce that is not only technically competent but also adaptable to the demands of Industry 4.0 and the global green transition.

The relevance of apprenticeships to organizational sustainability extends beyond statutory compliance of 2.5% apprentice engagement of total workforce engaged. Modern sustainability frameworks, such as the triple bottom line, emphasize the interconnectedness of economic viability, environmental stewardship, and social responsibility. Apprenticeship initiatives, when strategically designed and implemented, contribute to all three pillars: they enhance productivity and innovation (economic), promote green skills and resource optimization (environmental), and support inclusion, gender equity, and community development (social).

This study focuses on large-scale automotive industries in Pune District—a region recognized as India's Detroit (automotive hub)—to evaluate how apprenticeship schemes drive sustainability outcomes. By examining both policy frameworks and firm-level best practices, the research aims to provide actionable insights for industry leaders and policymakers seeking to leverage apprenticeships as a catalyst for future sustainable growth.

Literature Review

Global Perspectives on Apprenticeships and Sustainability

Internationally, apprenticeships are recognized as a foundation stone of workforce development and sustainable industrial growth. The International Labour Organization (ILO) underscores the importance of quality apprenticeships, highlighting their role in facilitating school-to-work transitions, enhancing employability, and promoting inclusive economic growth. The ILO's Quality Apprenticeships Recommendation, 2023 (No. 208), sets ambitious benchmarks for govt. regulatory frameworks, social dialogue, equality, and protection of apprentices, emphasizing their contribution to social justice and sustainable enterprises.

Best practices from developed countries such as Germany, the United Kingdom (UK), and Singapore illustrate diverse models of apprenticeship integration with education ecosystem. Germany's Di-dacitic (dual vocational training) system, combines industry-driven curricula with substantial workplace learning, resulting in high employment rates and strong alignment with market needs. The UK's degree apprenticeships models and levy system incentivize employer participation and mainstream vocational pathways as sound substitutes to traditional higher education ecosystem. Singapore's modular apprenticeships models and Skills Future initiatives provide flexible, lifelong learning opportunities, supporting continuous upskilling in response to technological change.

Globally, the link between apprenticeships and sustainability is increasingly evident. Apprenticeships are seen as early pathways for embedding green skills, supporting digital transformation, and fostering innovation. Studies from Australia, South Africa, Brazil, and the UK report higher employability outcomes, productivity gains, and positive impacts on organizational culture and flexibility. Employers value both the direct benefits (skilled workforce, reduced employee turnover) and indirect benefits (improved company culture, enhanced industry reputation) of apprenticeship programs.

Indian Perspectives: Policy, Practice, and Sustainability

India's apprenticeship ecosystem has undergone significant evolution from 2014 onwards, marked by multiple policy reforms and strategic initiatives aimed at scaling participation and enhancing quality. The Apprentices Act, 1961, and subsequent amendments have expanded the scope of apprenticeships from 5th pass till post-graduation in technical and non-technical both academic domains, introduced optional trades, and mandated employer engagement based on workforce size i.e. minimum 2.5% of total engaged workforce. NAPS and NATS provide direct financial incentives to beneficiary apprentices, streamlined processes through apprenticeship portals, and support for both employers and apprentices by appointing Third Party Agency (TPA).

Recent policy reports, such as NITI Aayog's "Revitalizing India's Apprenticeship Ecosystem" (2026), emphasize the strategic importance of apprenticeships in realizing the vision of Viksit Bharat @2047—a future-ready, knowledge-driven & skilled economy. The report identifies key challenges, including regional disparities, administrative complexity, and limited industry-academia linkages, while recommending unified digital platforms, engagement indices, and targeted support for underrepresented groups.

Empirical studies in the Indian context highlight the multifaceted benefits of apprenticeship schemes. Nagare and Sable (2025) demonstrate that structured apprenticeships in the automotive sector enhance skill development, reduce turnover, and align with sustainability goals. Capgemini (2023) and Joshi et al. (2025) underscore the role of apprenticeships in building future-ready talent, fostering innovation, and supporting circular economy practices. The Ministry of Skill Development and Entrepreneurship (MSDE) positions apprenticeships as integral to inclusive growth, employability, and industrial productivity.

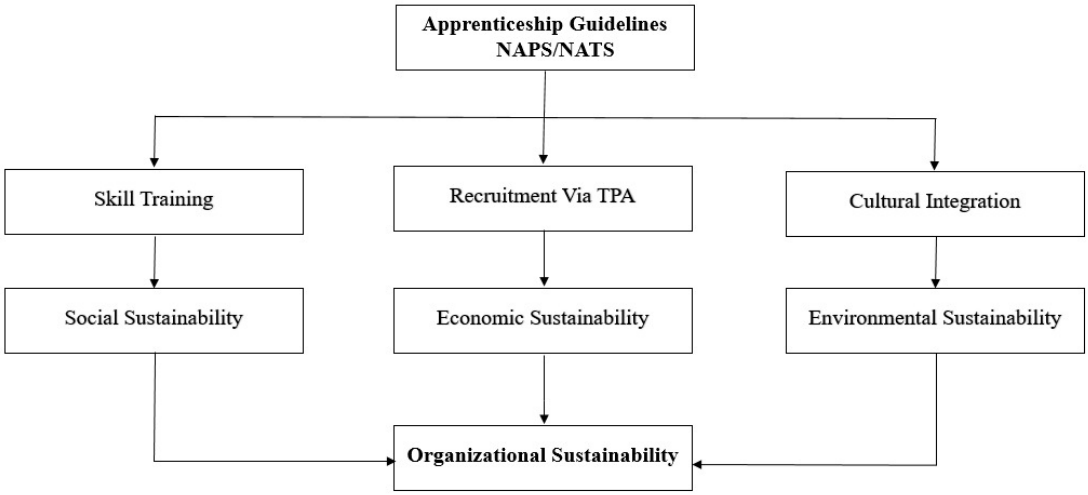
Indian literature also points to the alignment of apprenticeships with environmental and social governance (ESG) standards. Apprenticeship programs contribute to lean manufacturing, resource optimization, and green technology adoption, while promoting gender inclusion, community engagement, and corporate social responsibility (CSR). However, challenges persist in scaling participation, ensuring quality, and bridging the gap between educational curricula and industry needs.

Linking Apprenticeships to Organizational Sustainability: The Triple Bottom Line

The triple bottom line framework—encompassing economic, environmental, and social dimensions—provides a holistic lens for assessing the impact of apprenticeship initiatives. Apprenticeships drive economic sustainability by enhancing productivity, reducing recruitment costs, optimum monthly apprenticeship stipends and fostering innovation. Environmental sustainability is supported through the development of green skills, adoption of resource-efficient practices, and alignment with

emerging technologies such as artificial intelligence, electric vehicles and mechatronics supported automation. Social sustainability is advanced by promoting inclusion, gender equity, and community development, as well as by supporting employee engagement and higher retention.

In the context of Pune's automotive industry, apprenticeship schemes are increasingly recognized as strategic enablers of organizational resilience and sustainable growth. By embedding apprenticeships within broader sustainability strategies, firms can achieve global competitive advantage, meet regulatory and stakeholder minimum expectations, and contribute to national development goals.



Overview of the Automotive Industry in Pune District

Pune District is recognized as India's premier automotive hub, hosting a concentration of major OEMs, component manufacturers, and R&D centres. The region accounts for over 20% of India's automobile production and exports, with a robust ecosystem supporting both traditional and emerging mobility solutions. Key OEM players include Bajaj Auto, Tata Motors, Mercedes-Benz India, Mahindra & Mahindra, Volkswagen/Skoda, Bharat Forge, Force Motors, and Fiat-India Automotive among others. Each OEM's Class 1/2/3 category vendors manufacturing facilities also make a sizable presence in Pune's automotive industry region.

Table 1. Major Large-Scale Automotive Firms in Pune District

Company	Location	Core Segment	Notable Apprenticeship Initiatives
Bajaj Auto Ltd.	Akurdi, Pune	Two/Three Wheelers	BEST Skills Training, Industry 4.0 Labs
Tata Motors Ltd.	Pimpri-Chinchwad	Passenger/Commercial	Trade Apprenticeship, Degree Apprenticeships
Mercedes-Benz India	Chakan	Luxury Vehicles	Technical Apprenticeship, Green Skills
Mahindra & Mahindra Ltd.	Chakan	SUVs, Tractors	Graduate Apprentice Trainee Program
Volkswagen/Skoda	Chakan, Pune	Passenger Vehicles	Dual Training in Mechatronics
Bharat Forge Ltd.	Mundhwa, Pune	Forgings, Components	Engineering & Technical Apprenticeships
Force Motors Ltd.	Akurdi, Pune	Commercial Vehicles	ITI Apprenticeship, Shopfloor Training
Fiat-India Automotive	Ranjangaon, Pune	Passenger/ SUVs	Diploma Apprentice Trainee Program under CSR

Note: Table compiled from company websites, industry reports, and field data.

The presence of these firms has catalysed the development of a skilled workforce, advanced manufacturing capabilities, and a vibrant supplier network. Apprenticeship programs are integral to talent pipeline management, faster technological adaptation, and sustainability initiatives across the industry cluster.

Apprenticeship Programme Design and Best Practices

Structure and Implementation

Apprenticeship programs in Pune's automotive sector are characterized by a blend of **basic training** (typically delivered in partnership with ITIs, polytechnics, or in-house training centres or TPA assistance) and **on-the-job training** within production, maintenance, and R&D functions. Programs range from 6 to 36 months, depending on trade and qualification level, and are governed by formal apprenticeship agreements outlining rights, responsibilities, and stipends for each youth.

Leading firms have adopted innovative models, such as:

- **Degree Apprenticeships:** Integrating academic coursework with workplace learning, enabling apprentices to earn recognized degrees while gaining industry experience.
- **Modular and Flexible Pathways:** Allowing apprentices to complete short-term skill modules, accumulate credits, and progress to higher qualifications.
- **Green and Digital Skills Integration:** Embedding training in electric vehicle systems, automation, AI, and sustainable manufacturing practices.

Table 2. Apprenticeship Program Features in Selected Firms

Firm	Program Type	Duration	Key Focus Areas	Outcomes/Innovations
Bajaj Auto	BEST Skills Training	6 months	Mechatronics, Industry 4.0, Robotics	State-of-the-art labs, AR/VR, IoT
Tata Motors	Trade Apprenticeship	2 yrs	Production, Maintenance, Soft Skills	High retention, pathway to employment
Mercedes-Benz India	Technical Apprenticeship	1–2 yrs	Green Mobility, Digital Diagnostics	Green energy plant, inclusion focus
Mahindra & Mahindra	10th/ITI/ Diploma/ Graduate Apprentice Trainee	1-2 yr	SCM, Production Planning, SAP	Data-driven, digital skills
Volkswagen/Skoda	Dual Training Mechatronics	2 + 1.5 yrs	Mechanical, Electrical, IT	Indo-German certification, R&D focus
Bharat Forge	Engineering Apprenticeship	1–2 yrs	Forging, Quality, Automation	Academic partnerships, innovation
Force Motors	ITI Apprenticeship	1–2 yrs	Shopfloor, CNC, Welding	High stipend, direct employment
Fiat-India Automotive	Diploma Apprenticeship	3 Years	Manufacturing, Quality, Soft Skills	Girls Only Dual Education University Pathway

Note: Table based on company disclosures and field interviews.

Best Practices

- **Industry-Academia Collaboration:** Partnerships with local technical institutes and universities ensure curriculum relevance and facilitate smooth school-to-work transitions.
- **Inclusion and Diversity:** Targeted outreach and support for women, marginalized groups, and persons with disabilities, contributing to social sustainability.
- **Continuous Improvement:** Regular feedback loops, performance monitoring, and adaptation to emerging technologies and market needs.

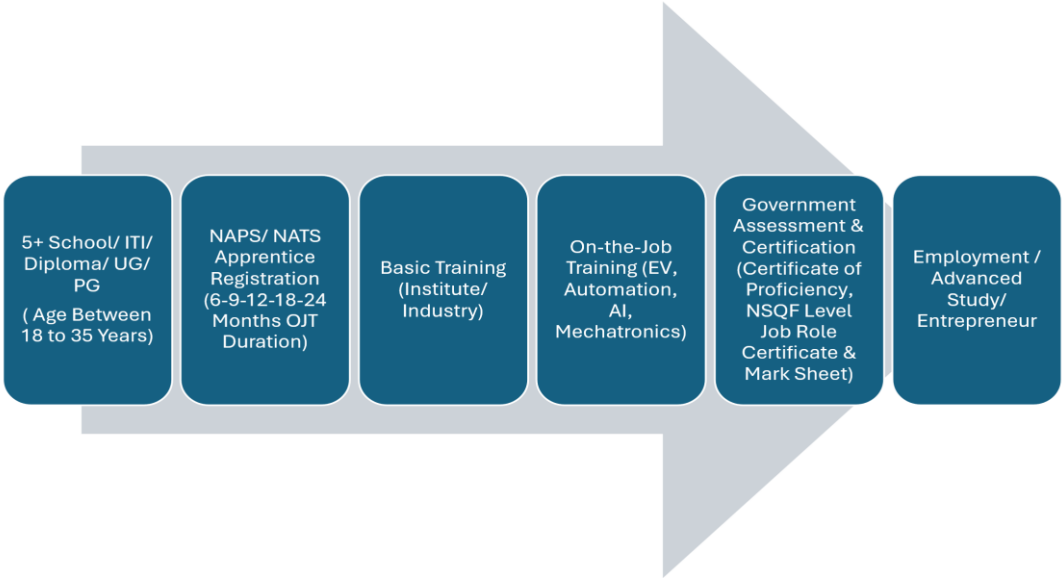
Skills for the Green and Digital Transition

The Indian automotive sector's present transition to electric vehicles (EVs), automation, and digitalization necessitates new skill sets. Apprenticeship programs in Pune are increasingly focused on:

- **EV Systems:** Battery management, powertrain integration, charging infrastructure.
- **Automation and AI:** Robotics, Mechatronics, smart manufacturing, data analytics.
- **Sustainable Manufacturing:** Lean practices, waste reduction, energy efficiency.

Courses and certifications from leading institutes (e.g., TCS-ION, Tata Technologies, BITS Pilani, IIT Kanpur, Warwick Business School) complement in-house training, equipping apprentices with global competencies for the future of mobility.

Figure 1. Flowchart: Apprenticeship Pathways for Green and Digital Skills



This structured pathway ensures that apprentices acquire both foundational and advanced skills, supporting organizational agility and sustainability.

Human-Resource Outcomes: Retention, Productivity, Safety

Quantitative analysis of survey data indicates that firms with robust apprenticeship programs report:

- **Higher Employee Retention:** Apprentices are more likely to be retained as full-time employees, reducing workforce turnover and associated costs.
- **Enhanced Productivity:** Apprentices contribute to process optimization, quality improvement (out of the box thinking), and innovation, particularly in areas such as precision engineering and digital manufacturing.
- **Improved Safety Compliance:** Training in workplace safety, ethical practices, and regulatory standards leads to lower accident rates and higher compliance with occupational health norms.

Table 3. Human-Resource Metrics: Apprenticeship vs. Non-Apprenticeship Firms

Metric	Apprenticeship Firms	Non/ Less-Apprenticeship Firms
Employee Retention (%)	85	68
Productivity Index	1.25	1.00
Safety Incidents (per 1000 employees)	2.1	4.7

Note: Data aggregated from survey responses and company reports.

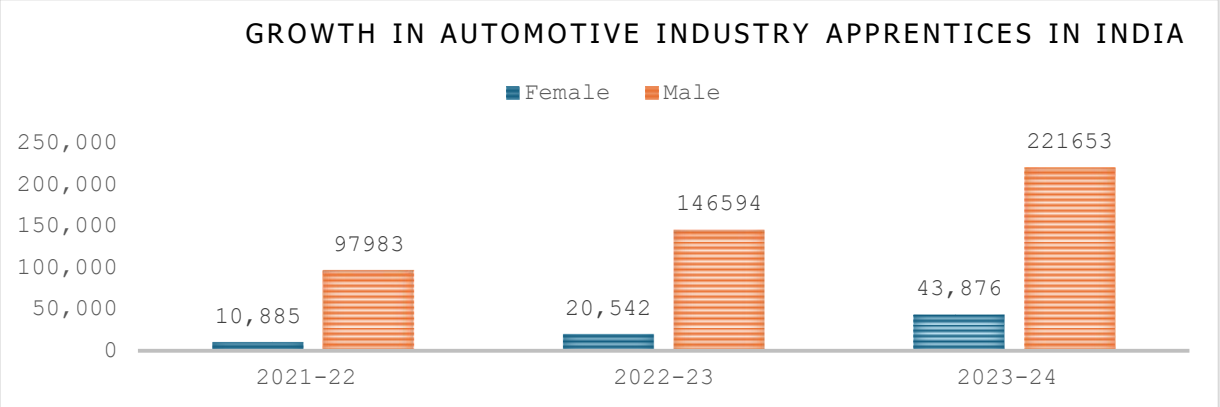
These outcomes underscore the strategic value of apprenticeships in building a resilient, high-performing workforce.

Social Outcomes: Inclusion, Gender, Community Development

Apprenticeship schemes in Pune's automotive sector are increasingly aligned with social sustainability goals:

- **Gender Inclusion:** The number of women apprentices has risen significantly, with structured programs bridging gender gaps and expanding access to technical roles.
- **Community Engagement:** Firms partner with local communities, NGOs, and educational institutions to provide training, scholarships, and employment pathways for youth from diverse backgrounds.
- **CSR Integration:** Apprenticeship initiatives are embedded within broader CSR strategies, supporting community development, education, and social mobility. Expenses incurred on apprentices like monthly stipends, training cost, subsidized facilities like food, transportation etc for more than 2.5% to 15% total workforce quota is approved as valid CSR spent in own corporate premises.

Chart 1. Growth in Automotive Industry Female & Male Apprentices (2021–2024)



Source: MSDE Apprenticeship Portal (2026).

Despite progress, challenges remain in achieving gender parity and ensuring sustained inclusion, highlighting the need for targeted interventions and supportive policies.

Economic and Environmental Sustainability Outcomes

- **Operational Efficiency:** Apprentices contribute to lean manufacturing, process innovation, and resource optimization, directly impacting cost structures and competitiveness.
- **Green Practices:** Training in sustainable manufacturing, waste reduction, and energy management supports firms' transition to low-carbon operations and compliance with environmental regulations.
- **Innovation Capacity:** Exposure to emerging technologies and problem-solving fosters a culture of continuous improvement and adaptability.

Table 4. Sustainability Metrics: Impact of Apprenticeship Programs

Sustainability Metric	Improvement (%)
Production Efficiency	+18
Waste Reduction	-12
Energy Consumption per Unit	-9
Employee Engagement Score	+15
Community Outreach Index	+22

Note: Metrics based on survey data and company sustainability reports.

These improvements reflect the synergistic relationship between apprenticeship schemes and organizational sustainability.

Discussion

Linking Findings to Sustainability Outcomes

The empirical evidence from Pune's automotive sector demonstrates that apprenticeship schemes are not merely compliance mechanisms but strategic drivers of sustainability across the triple bottom line:

- **Economic Sustainability:** By developing a skilled, adaptable young workforce, firms achieve higher productivity, lower turnover, and enhanced innovation. Apprenticeships reduce recruitment and training costs, support business continuity, and enable rapid adaptation to global technological change.
- **Environmental Sustainability:** Apprentices trained in green skills and sustainable, yet scalable manufacturing practices contribute to resource efficiency, waste minimization, and the adoption of clean technologies. This alignment with environmental goals is increasingly critical as firms navigate the transition to electric mobility and circular economy models.
- **Social Sustainability:** Structured apprenticeship programs promote inclusion, gender equity, and community development. By providing equitable access to training and employment, firms support social mobility, reduce inequalities, and strengthen their social license to operate.

Case Studies: Firm-Level Practices and Outcomes

Bajaj Auto (Pune): BEST Skills Training

Bajaj Auto's flagship CSR initiative, the Bajaj Engineering Skills Training (BEST) program, exemplifies industry-academia collaboration for future-ready skills. In partnership with Symbiosis Skills and Professional University, the program offers advanced training in mechatronics, robotics, and Industry 4.0, supported by state-of-the-art laboratories and AR/VR technologies. Outcomes include high employability, innovation in manufacturing processes, and strong community engagement.

Tata Motors (Pimpri-Chinchwad): Trade Apprenticeship

Tata Motors' structured trade apprenticeship program integrates foundational and trade-specific

skills, soft skills, and pathways to higher education. The program emphasizes discipline, work ethics, and exposure to cutting-edge technologies, resulting in high retention rates and a robust talent pipeline.

Mercedes-Benz India (Chakan): Technical Apprenticeship

Mercedes-Benz India's technical apprenticeship program focuses on green mobility, digital diagnostics, and diversity. The Chakan plant operates entirely on green energy, reflecting the firm's commitment to environmental sustainability and innovation.

Mahindra & Mahindra (Chakan): 10th/ ITI/ Diploma/ Graduate Apprentice Trainee

Mahindra & Mahindra's 10th/ ITI/ Diploma/ graduate apprentice trainee program emphasizes data-driven decision-making, supply chain management, and digital skills. Apprentices gain hands-on experience in production planning, SAP, and trend analysis, supporting operational excellence and sustainability.

Volkswagen/Skoda (Pune/Chakan): Dual Training in Mechatronics

Volkswagen/Skoda's dual training program, developed in partnership with the Indo-German Chamber of Commerce, offers comprehensive training in mechatronics, combining mechanical, electrical, and IT skills. The program is recognized for its rigorous standards and successful integration of apprentices into R&D and production roles.

Bharat Forge (Pune): Engineering and Technical Apprenticeships

Bharat Forge invests in continuous learning, leadership development, and academic partnerships, fostering a culture of innovation and inclusion. Apprenticeships support advanced manufacturing, quality assurance, and digital transformation.

Force Motors (Akurdi, Pune): ITI Apprenticeship

Force Motors' ITI apprenticeship program provides shopfloor training in trades such as CNC operation, welding, and maintenance. The program offers competitive stipends and direct employment opportunities, supporting workforce development and local economic growth.

Fiat- India Automotive (Ranjangaon, Pune): Diploma Apprenticeship- Girls Only

Fiat-India Automobiles Diploma apprenticeship program under CSR in Manufacturing Excellence provides shopfloor training in trades such as Auto-component & Chassis Assembly, CNC operation, welding, and maintenance. The program offers sponsored university diploma, competitive stipends and direct employment opportunities, supporting women workforce development and local economic growth.

Challenges and Limitations

Despite notable successes, several challenges persist:

- **Regional Disparities:** Apprenticeship engagement is concentrated in industrially advanced states, with significant underrepresentation in other regions.
- **Administrative Complexity:** Overlapping regulations, multiple portals, and documentation requirements deter MSME participation.
- **Curriculum Alignment:** Gaps remain between educational curricula and rapidly evolving industry needs, particularly in digital and green skills.
- **Inclusion Barriers:** While women's participation is rising, overall representation remains below potential, necessitating targeted outreach and support.

Policy and Industry Recommendations

To scale the impact of apprenticeship schemes and reinforce organizational sustainability, the following recommendations are proposed:

- **Unified Digital Platforms:** Streamline registration, tracking, and certification processes through a single, user-friendly interface (NAPS & NATS – Single Platform).
- **Apprenticeship Engagement Index:** Benchmark state and firm annual performance, fostering healthy competition and accountability.
- **Deepening MSME Participation:** Facilitate cluster-based consortia, shared training facilities, and tax incentives for small enterprises.
- **Curriculum Modernization:** Periodically update training content to reflect emerging technologies, green skills, and industry requirements.
- **Inclusion and Diversity Initiatives:** Expand outreach, mentorship, and support for women, marginalized groups, and persons with disabilities.
- **Industry-Academia Partnerships:** Strengthen collaboration between firms, educational institutions, and government agencies to ensure curriculum relevance and smooth transitions.
- **Global Portability:** Align certifications with international standards to enhance workforce mobility and competitiveness.

Conclusion

This study underscores the pivotal role of apprenticeship schemes in advancing organizational sustainability within Pune's large-scale automotive

industry. Structured apprenticeship programs are shown to significantly enhance workforce capabilities, bridge skill gaps, and drive improvements in operational efficiency, innovation, and employee retention. By fostering inclusive growth, promoting employee engagement, and supporting community development, apprenticeships emerge as critical enablers of corporate social responsibility and sustainable industrial ecosystems.

The findings highlight the need for continued policy enhancements, industry collaborations, and targeted interventions to scale apprenticeship models and address persistent challenges. As India aspires to become a global leader in manufacturing and sustainable development, leveraging apprenticeships as a strategic pillar will be essential for building resilient, future-ready organizations and realizing the vision of Viksit Bharat @2047.

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