

Sustainability and Innovation for Small Scale Industry: LEAN, ZED, and Tech-Enabled MSME Consulting Roles

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Abstract: MSMEs are the backbone of India's economy, driving employment, GDP, and export growth. Sustainability and innovation in operations would be essential to remain competitive globally for such industries. The research paper analyzes the key contribution of Lean manufacturing, Zero Defect Zero Effect (ZED) certification, and technology-driven MSME consulting to promote sustainable development and quality excellence among India's MSMEs. The paper promotes initiatives by the government, such as the Prime Minister's call for large-scale implementation of the ZED scheme, complementing national visions like Viksit Bharat (Developed India) by 2047 and Atmanirbhar Bharat (Self-reliant India). The paper provides updated facts on MSME registrations, certifications, and sectoral composition, and identifies strategic objectives to make Indian MSMEs quality-focused, sustainable global suppliers by 2030 and beyond.

Keywords: MSME, Sustainability, Innovation, Lean Manufacturing, ZED Certification, India, Atmanirbhar Bharat, Viksit Bharat

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) are the backbone of the Indian industrial economy, contributing over 30% of the nation's GDP and nearly 40% of exports. Though their immense contribution cannot be overstated, MSMEs continue to grapple with product quality, process efficacy, and environmental concerns. In order to tackle these and enhance their international competitiveness, Indian MSMEs are embracing paradigms like Lean manufacturing, Zero Defect Zero Effect (ZED) certification, in addition to technology-enabled consulting. These paradigms inject dimensions of continuous improvement, quality improvement, and environmental stewardship—substantive drivers for industry growth sustainability.

India is currently the world's 4th largest economy by GDP and is ambitiously working towards becoming a fully developed or "Viksit Bharat" by its centenary year in 2047. This vision is backed by strategic initiatives across multiple sectors aimed at enhancing economic productivity, technological innovation, and sustainability.

Adding to this dynamic economic landscape, India also boasts the 3rd largest startup ecosystem globally, with over 1.87 lakh recognized startups as of mid-August 2025. This robust entrepreneurial environment fosters innovation and provides a fertile ground for MSMEs to adopt advanced manufacturing practices like Lean and achieve quality certifications such as Zero Defect Zero Effect (ZED). The growth of such startups complements the formal MSME sector's push towards becoming globally competitive while adhering to sustainable manufacturing standards. This synergy between economic scale, startup vitality, and MSME transformation is central to India's broader development goals and forms the backdrop of this study.

2. Overview of Lean Manufacturing and ZED Certification

2.1 Lean Manufacturing

Lean manufacturing is an organized methodology for cutting waste and optimizing processes to provide greater value while utilizing fewer resources. Derived from the Toyota Production System, Lean is centered on eliminating inefficiencies, equipping the workforce, and promoting the Kaizen spirit of continuous improvement. For MSMEs, Lean is not merely cost reduction; it is about creating nimble and sustainable operations crucial in today's fluctuating market environments. Lean adoption results in shorter production cycles, higher quality products, and reduced environment footprint by reducing material waste and energy usage.

2.2 Zero Defect Zero Effect (ZED) Certification

The ZED certification is a quality and environmental sustainability flagship program initiated by the Ministry of MSME, Government of India. Its two-fold aim is to achieve 'Zero Defect' through manufacturing faultless products and 'Zero Effect' by minimizing the environmental footprint of manufacturing activities. The scheme promotes MSMEs to improve processes, adopt waste reduction practices, employ cleaner technologies, and raise standards of quality. ZED certification is provided at hierarchical stages—Bronze, Silver, Gold—representing incremental advancement in quality and environmental standards.

This initiative instrumentally facilitates the goal of transforming Indian MSMEs to be globally competitive and eco-friendly. The Prime Minister has invoked the MSME sector to pursue ZED certification aggressively in order to improve the quality of products and environmental sustainability, which are essential towards making India a global manufacturing powerhouse.

3. MSME Sector Overview and Status of Certification in India

3.1 MSME Registration and Sectoral Distribution

As of March 2025, more than 6.2 crore MSMEs are registered in the Udyam portal, indicating a quick formalization of the sector. Maharashtra tops with around 80 lakh registered units. Amongst total MSMEs, micro enterprises account for nearly 98.6%, small enterprises 1.24%, and medium enterprises 0.12%. MSMEs as a whole contribute immensely towards India's industrial production and export economy, with a reported exports value in excess of ₹12.39 lakh crore during FY 2024-25.

3.2 ZED Certification Progress

The ZED scheme has seen remarkable adoption across MSMEs with 545,016 MSMEs registered to date under the program. Out of these, a total financial commitment of ₹465.66 crore has been pledged as money support to encourage improvements in quality and sustainability. The distribution of certification under the scheme by mid-August 2025 is as follows:

- Bronze level: 350,947 MSMEs certified
- Silver level: 1,879 MSMEs certified
- Gold level: 2,528 MSMEs certified

These numbers indicate growing commitment and consciousness of Indian MSMEs to adopting high-quality and eco-friendly manufacturing practices. This momentum puts India's MSME industry on a solid trajectory to international competitiveness, in line with national policy goals like Atmanirbhar Bharat and Viksit Bharat.

3.3 Lean Adoption and Certification

Although there are fewer systematic reports on formal Lean certifications, Lean manufacturing concepts find wide promotion and uptake across India's MSME system. Numerous MSMEs have made the shift to Lean operations through technology-enabled consulting services, government capacity development initiatives, and industry-led programs focusing on process efficiency and waste minimization.

4. Role of Technology-Enabled MSME Consulting

Technology-enabled consulting has become a critical facilitator for MSMEs to adopt Lean manufacturing processes and attain ZED certification. Such services give access to expert diagnostics, automation tools for processes, digital training packages, and real-time analytics support. Technology-supported consulting enables MSMEs to overcome geographical constraints and resource issues, enabling increased adoption of quality and sustainability standards through distant mentoring, virtual sessions, and monitoring of performance.

5. Government Initiatives and National Vision Alignment

India Government schemes encourage MSME competitiveness, quality improvement, and sustainability adoption as core pillars of national economic transformation objectives:

- **Vision 2030:** Seeks to have a strong, innovation-led MSME ecosystem in which a large number of firms attain ZED certification and apply Lean concepts for quality and sustainability.
- **Viksit Bharat 2047:** The India centenary vision is focused on creating a globally admired manufacturing sector that is free of defects and environmentally neutral, making the nation a developed industrialized country.
- **Atmanirbhar Bharat (Self-Reliant India):** Is concentrated on making Indian MSMEs autonomous, high-quality makers who can compete globally, with ZED certification and Lean manufacturing as critical facilitators.

6. Challenges and the Way Forward

Though progress has been made, Indian MSMEs still struggle with issues such as low technical awareness, costs of certification, lack of skills, and addressing complicated implementation processes. Policy initiatives to streamline processes, enhance subsidies, expand consulting outreach, and enhance labour force training will play a crucial role in scaling up impacts.

7. Conclusion

Lean production, ZED certification, and technology-facilitated MSME consulting are the promoters of sustainability and innovation in India's MSME sector. The large number of MSMEs that have been registered and certified and the huge financial commitments made indicate an increasing shift towards quality-orientated and eco-friendly industry. Ongoing policy support in harmony with India's Atmanirbhar Bharat and Viksit Bharat objectives will help MSMEs become world leaders in sustainable production.

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