The Future Manufacturing Enterprise - Sustainable by Design
Abstract

Sustainability is fast acquiring center stage in the global manufacturing industry. Being caught in a tightening web of sustainability regulations, sustainable performance, and climate change resiliency, manufacturers must secure their license to operate, trade, and sell in the future. The increasing focus of investors on environmental, social, and governance (ESG) performance and higher market valuation for sustainable products, adds to this burgeoning need. The risk is enormous, but opportunities are abundant.

We believe that manufacturers need to view sustainability as a strategic function that not only ensures compliance management but also enables new business opportunities which requires redesigning operating models. At TCS, we call this sustainable by design, and it borrows from the principles of a cognitive value chain which senses, responds, and adapts to sustainability triggers. This white paper explores the tenets of the sustainable by design approach, which embraces such ‘neural’ behaviors. It also examines how the approach can help manufacturers unlock significant economic, social, and environmental value and, in turn, also incubate opportunities to participate in new sustainable ecosystem-driven innovative business models.

Sustainability: A compelling necessity for manufacturers

Increasing industrial activities structured on unsustainable development frameworks have stirred an alarming environmental crisis stemming from increased greenhouse gas emissions, industrial waste contamination, and natural resources depletion. As a result, sustainable manufacturing has emerged as an absolute necessity and an imperative tool in this battle against climate change and other environmental and economic disruptions, going forward.

However, sustainability is more than just that; it’s a strategic driver and a competitive advantage for meeting consumer and investor demands, which goes beyond just addressing environmental, social, and governance (ESG) issues and evolving regulations. Evidently, the need to drive strategic outcomes for a competitive edge, improved returns, investor attraction, enhanced brand image, and economic multiplier effects (see Figure 1) has emerged as a lever for adopting sustainability initiatives.

![Figure 1: Enterprises reaping profits through sustainability practices](https://www.weforum.org/agenda/2020/01/how-can-we-accelerate-the-transition-to-a-circular-economy/)

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The benefits of sustainability are enormous and compelling. It stands to reason that companies like Siemens are envisioning eco-efficient operations by 2030 with 10% improvement in energy efficiency through sustainable ecosystems and circular economy-focused business models. Similarly, Safran’s electric hybrid aircraft, lower carbon footprint, and decarbonization goals can help accomplish a target of 30% carbon reduction from its industrial sites worldwide by 2025. It has also increased its adoption of sustainable aviation fuel for civil engine tests – 10% by the end of 2021 and 35% by 2025. Joining this league are organizations like BMW, JLR, ABB, Saint-Gobain, and many others that are actively adopting sustainable alternatives and structural changes that focus far beyond just financial outcomes.

An emerging industry trend is the electrification of the auto power train. Many industry leaders across the auto value chain are considering this emerging space to transform their existing business models. Electric vehicles (EVs) and their variants have considerably lower tailpipe emissions owing to increased usage of renewable energy as their electricity source.

By enabling electrification, multiple partnerships will emerge among extended value chain partners such as original equipment manufacturers (OEMs), battery manufacturers, component suppliers, energy infrastructure providers, and utilities powering EVs with renewable energy to deliver reduced emissions through the life cycle of the vehicles.

Organizations need to rethink their approach and build purpose-centric ecosystems by overhauling their portfolio and positioning to meet the demands of environment-aware consumers and investors. This presents a case for involving sustainability principles at a very early stage in the manufacturing value chain. This is where sustainable by design principles are changing the game for manufacturers.

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Sustainable by design: The road to sustainability and circularity

To become a sustainability leader in the manufacturing industry requires a complete redesign of the touch points where sustainability concerns are typically raised across the extended value chain. Manufacturers must innovate and redesign their current operating models to embed sustainability and circularity principles across processes, production operations, products, and product usage. This can be achieved by pursuing an ecosystem-driven approach that addresses the comprehensive needs from design to usage and further reuse, repurposing, or remanufacturing, and hence, by default also addressing the Scope 1, 2, and 3 compliance needs. The Neural Manufacturing™ framework – which outlines the contours of the 21st century value chain and factory of the future to embed strategic capabilities in enterprises to be resilient and adaptable – can be leveraged to design these new ecosystem business models, where the partners are bound together by a shared purpose of a sustainable future. A sustainable by design enterprise is one which-

- Establishes a core sustainability purpose well integrated with business goals and agenda
- Forms new sustainability driven partnerships to empower sustainable choices for customers
- Strives for sustainable brand positioning, leading to higher market valuation

A sustainable by design manufacturing enterprise must embrace intelligent and insight-driven models. In addition to ensuring a sustainable process, product, and service design, the sustainable by design approach enables circular business models powered by connected value chain operations and purpose-centric ecosystems. Such a well-executed sustainable by design paradigm can enable:

- **New revenue streams through circular business models:** An example of a sustainable business model can be seen in Toyota’s vehicle production, wherein 20% of all plastics used in the production comes from recycled or plant-based plastics extracted through car shredder reuse and recovery methods with 96.9% effectiveness⁵.

- **Resilience to climate and linear business model risks:** In the face of depleting natural resources and changing legislative priorities, manufacturing companies that adopt sustainable by design models stand a better chance at business continuity and profitability.

- **Access to green finance and lower capital rates:** In order to achieve its sustainability targets, Finnish paper company UPM issued its €500 million second green bond earlier this year⁶. The net proceeds from this bond will be used in climate-positive products and solutions, sustainable forest management, pollution prevention and control, and waste management.

- **Cost and operational efficiency:** Simplified packaging, energy-efficient lighting, and water recycling in plants are some examples of how sustainable design will result in operational and cost efficiency. When coupled with Lean best practices of optimizing idled or below-capacity use of machinery and human resources, a comprehensive approach to sustainable manufacturing emerges.

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⁵ Plastic Expert; Which car manufacturers use the most recycled plastic?; https://www.plasticexpert.co.uk/which-car-manufacturers-use-the-most-recycled-plastic/

Sustainable by design: Dynamic capabilities

Numerous capabilities work cohesively to accelerate the potential payoff of embracing the sustainable by design model. Increased focus on transparency and visibility across the value chain can support the track-and-trace of existing sustainability data, materials, and events. This paves the path for an integrated sustainability data model, powered by cognition and intelligence, that can generate insights and provide proactive responses to anomalies. These insights, along with sustainability performance reporting, can bring sustainability aspects to the core of business decisions.

Manufacturers need to invest in product and process innovation leading to circular product designs and sustainable manufacturing initiatives, eventually supporting their decarbonization goals. Such decarbonization levers support an organization’s carbon neutrality goals coinciding with region-specific goals.

Furthermore, with connected value chains and circular ecosystems, organizations need to use technologies to weave in the right amount of agility and flexibility with decisions made at the edges of the network. Ecosystem-level decisions are based on seamless data collaboration and insights. Such a connected, cognitive, and collaborative ecosystem built using this approach can facilitate ecosystem orchestration for new or alternate business models.

On the flip side of opportunities, sustainability governs business survival and continuity through aspects such as access to capital, product valuation, and regulatory compliance. Manufacturers need to embrace this compounding risk, govern, and effectively communicate their sustainability strategy and performance to their business stakeholders.

At the intersection of technology, data, and ecosystems

Sustainable by design capabilities require an organization to have a multi-pronged strategy to survive the sustainable imperative and unlock business potential with circular ecosystems. Such capabilities can be enabled through the convergence of a top-down leadership focus, policy change bringing sustainability innovation to the core, and bottom-up changes with product innovation, process automation, and embedded innovation culture. A focused approach encompassing organization, process, and technology change can foster such transformation for an organization.
Ecosystems, digital technologies, and data collaboration are the key foundational pillars for sustainability leadership for future manufacturing enterprises. The benefits of the sustainable by design approach can be unlocked in phases. This begins with envisioning and defining a sustainable by design strategy for identifying new business opportunities, followed by designing and building a digital core supported by a neural information fabric. Lastly, manufacturers can scale and operate with automated cognitive business operations and handle risk management with sustainable platforms.

**The moment to bring in change is now**

The manufacturing industry stands at an inflection point, where sustainability converges with humanity, technology, and innovation, thereby altering the course of business. Manufacturing businesses must cater to dynamic economic, environmental, and social risk management. Becoming sustainable by design will give them the default license to operate, survive, thrive, and recover profits in the industry.
About the author

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Manasi Agarwal is the Initiative Lead for Sustainability and Circular Economy for Manufacturing at TCS. She comes with over 18 years of experience in sustainability and climate change initiatives, energy management, digital strategy formulation, plant operations, and technical services. Her current focus is to consult and enable customers for future sustainability and circular economy needs, unearthing new business models driven by sustainable ecosystems, data, and technology. She supports the development of cutting-edge sustainability offerings for her customers. Manasi holds a master’s degree in Chemical Engineering from Jadavpur University, Kolkata, India. She is also part of the Strategic Transformation Advisors Program from INSEAD and is a certified Energy Auditor in India.
Awards and accolades

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