Gartner Research

Manufacturing Insight: How to Position Manufacturing Solutions for Environmental Sustainability

Bettina Tratz-Ryan

18 September 2023

Gartner®

Manufacturing Insight: How to Position Manufacturing Solutions for Environmental Sustainability

Published 18 September 2023 - ID G00800930 - 15 min read

By Analyst(s): Bettina Tratz-Ryan

Manufacturers embrace sustainability, including rapidly decarbonizing and promoting circularity initiatives, to meet stakeholder expectations and avoid future regulatory penalties. Product leaders must position their portfolios to enable collaboration at scale across the manufacturing ecosystem.

Overview

Key Findings

- Sustainability products that are targeting manufacturing customers fail to reach scale in the buy-ins center. This is because they only deliver custom-made answers to corporate sustainability goals instead of offering transparency through dashboards that show key performance indicators (KPIs) across different business functions.
- Product solutions need to be positioned and linked to the diverse and sector-specific material impacts. Differentiation of portfolios is validated based on the ability to capture the environmental footprint across the organization's business outcome.
- Suppliers need to respond to the increasing cost of carbon emissions and scarcity of resources; therefore, supporting customer and other supplier ecosystems toward a circular economy.
- Manufacturers are looking for composable sustainability solutions and product leaders have an opportunity to provide packaged solutions that allow customers to start with data capture and move on to predefined solutions for one or more use cases.

Recommendations

Product leaders undertaking manufacturing product planning and strategy activities must:

- Advance a portfolio approach based on the maturity of customer target markets by building a migration path of initially environmental, social and governance (ESG) reporting capabilities toward more sustainable operations and value management.
- Position sustainability business use cases through a business capability map for decarbonization and circularity, and link them to enabling technologies.
- Develop a competitive advantage by enabling customers to engage in a frictionless way with ecosystems through data platforms and business services.
- Improve competitive scale by offering an open and composable product platform that includes plug-ins and feature extensions that will increase revenue growth with increasing identification of carbon costs and sustainable operations requirements.

Analysis

Position Your Solutions Alongside the Current and Future Sustainability Landscape

Manufacturing industries and transportation sectors are contributing roughly half of all global emissions today. With global manufacturing supply chains contributing 50% of the CO_2 emissions, the vulnerability of the global economy is closely linked to the sustainable commitment of organizations and the industry. Thirty-one percent of all greenhouse gas (GHG) emissions could be addressed by 2030 by applying material and resource efficiency, as well as circularity, in product life cycles. [1]

Manufacturing organizations do not have the luxury of avoiding or delaying business and technology decisions toward more sustainable and climate-aware operations. In fact, the technology and industry expertise of technology and service providers (TSPs) is required to support the manufacturing companies in implementing concrete, scalable and impactful solutions. Based on the context of the industry sector, sustainability decisions will vary in their approach in relation to:

- **Resilience of its material business:** Based on sourcing, the operations' environmental footprint, resource intensity, carbon emission targets, and information and communication technology (ICT) green and sustainability impacts.
- **Corporate responsibility:** Requires an assessment of sustainability and climate change outcomes related to interactions with societal factors, biodiversity, employees and stakeholders, and links to the sustainable development goals.

- **Risk avoidance:** Sustainability priorities used to define risk exposure through climate change and develop broad considerations of financial and regulatory consequences; transparency of risk and its avoidance becomes accountable through environmental reporting governance structures.

All three influences in the decision making need to be standardized in terms of impacts, mapped in progress and reported to ESG reporting frameworks that directly communicate to investors, customers and employees (see A Communicator's Guide to ESG Reporting Frameworks). Figure 1 shows the alignment of sustainability activities of manufacturing organizations with the related ESG focal areas.

Figure 1: Alignment of ESG to Sustainability in Manufacturing and Asset-Heavy Industries

Sustainability and Climate Change in Manufacturing and Asset-Heavy Industries

Source: Gartner
ESG = environmental, social and governance
745939_C

Gartner

ESG focus alone will not provide manufacturing buying centers with sustainable operations capabilities. Instead, product leaders who are addressing the manufacturing and heavy-asset industries are increasingly facing buying centers that need to support sustainability on a corporate or operational level or act on sustainability macro trends. They should:

- Segment buying centers, CIOs and IT leaders into sustainability maturity by benchmarking sustainability strategies, ESG reporting and business opportunities through sustainability, while leveraging the unique characteristics of their organizations. Create a checklist to tailor messaging and tools.

- Support customers to pivot from ESG reporting toward a sustainable leadership throughout complex mission-critical priorities of customers and fragmented/diverse markets, based on the material impacts (see Acronym Key and Glossary Terms) of sustainability and climate change.

- Understanding the organization's sustainability footprint, leverage best practices for customers and demonstrate credibility about sustainability messages and strategies.

Product leaders targeting the manufacturing industry have to decide how to offer a flexible or composable product offering for different material impacts of their buying centers that have different priorities for operations management. They need to enable data capture for ESG reporting support as well as sustainable operations management. That includes data on resource efficiency, biodiversity-related footprint based on science-based targets (see Note 1), pollution and air quality, social sustainability and net-zero carbon emissions.

Close the Sustainability Gap With Your Solution

In order to prioritize the systematic environmental impacts on manufacturing organizations, product leaders have to rationalize the sustainability decision of their target market against business objectives, risks and responsible outcomes of their buying centers.

There are two common objectives toward manufacturing sustainability that apply across any industry vertical:

- **Circularity** — The aim of the circular economy is to decouple raw material consumption from growth. This requires the use of fewer raw materials and efficient product streams through effective end-of-life management strategies where there is constrained supply. Through the circular economy, product life cycles can be improved by either reclaiming materials or by creating new digital product differentiations (see The Complete Guide to a Sustainable Device Life Cycle Using the IT Circular Economy).

- **Decarbonization** — Indirect emissions from purchased heat and electricity and industrial processes contribute approximately one-fifth of global emissions. Scope 1, Scope 2 and Scope 3 emissions need to be met with new technologies to improve industrial processes and policies on carbon pricing and turn to renewable energies. [2] All emission reductions will support net-zero targets of organizations while decarbonizing the economy. For organizations, this means a direct impact on resource efficiency for water and materials, reduction of scrap and waste, and new alternative business opportunities.

With those two common objectives defined, product leaders can now support their manufacturing customers in building the roadmap of material issues and determining the effect on their manufacturing sustainability strategy. Figure 2 highlights examples of key material issues that should be included. Depending on manufacturing culture, market and supply chain pressures, and corporate responsibility, those can vary in operational execution, depth of digital requirements and their contribution toward sustainable outcomes.

As an example, a food and beverage organization will put emphasis on KPIs of sustainable sourcing and food production, while a mining company will be deeply impacted by the carbon intensity of its operation fleet.

Figure 2: Key Material Issues in Manufacturing Environmental Sustainability

The differentiated impacts of the material issues are providing a runway of marketing and positioning opportunities for product leaders. It even calls for a consultative approach to creating roadmaps and gap assessments for manufacturing customers. Many resource-intensive manufacturing organizations have focused part of their resource procurement on the pricing and availability of electricity, water and raw materials. Now they need to enhance their views on pricing to include the wider sustainability impacts on their business and market operations. Changing use of production resources could be an example.

As product leaders who are addressing the manufacturing and heavy-asset cross-industries, you should:

- Leverage your own supplier disclosure of carbon and environmental footprints to show you have experience in the assessment of Scope 3 impacts and that you can assist your customers in this. This delivers credibility.

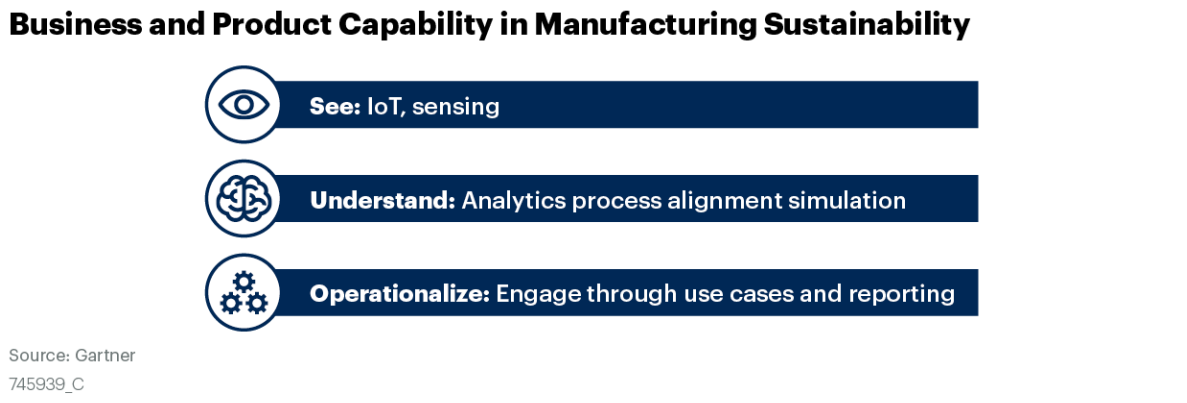
- Be ready to answer, first, on your own company's sustainability footprint, and second, on how your products and offerings will support the reduction of the environmental and carbon footprint of your customers. Invest in the sustainability capacity and scale.

Communicate How to Address Material Issues Through Your Portfolio

In all our research on products and platforms on sustainability or ESG reporting, many applications focus primarily on the reporting requirements, which solve the challenges of the digital aggregation of data. Aligning to sustainability insights that product leaders need to develop is the connection between data and the more holistic carbon abatement or circularity strategy. Product leaders have the option of using three capabilities to connect to the holistic understanding of energy efficiency, carbon abatement and regulatory concerns, and operationalization; for example, through a product life cycle assessment or digital product passport. Frequently, this is a blind spot of product management.

The capability for product leaders' positioning strategy can be seen in Figure 3.

Figure 3: Business and Product Capability in Manufacturing Sustainability



Business and product capabilities can be separated into three different layers:

1. **See:** Product and solutions need to ingest or interpret structured and unstructured data from different devices and Internet of Things (IoT) architectures. They need to capture resource efficiency and visualize routes and transitions in production and supply chains. This data can also convert energy to carbon based on locations and third-party events.

2. **Understand:** Data analytics, assessment and machine learning (ML) capabilities allow the alignment to service-level agreements within the Industrie 4.0 or operations environment, with a cap on carbon emissions, material input or the utilization of renewable or refurbished resources. Virtualization and simulation of effects and replacement will come in, as well as the product life cycle assessment.

3. **Operationalize:** Product leaders have the option, based on the market development, regulation or maturity of the customer and buying center, to develop multiple execution-driven solutions in a real-time and data-orchestrated way. For instance, solutions could include triggering alerts or workflows based on certain data insights or CO_2 thresholds. On the other hand, this option will provide — with existing enterprise asset management systems, energy management, environmental, health and safety (EHS), cloud and edge artificial intelligence (AI) (see Note 2) — a valid base for data orchestration and alignment at the factory or workplace level (see also manufacturing issues in Leverage Digital Initiatives to Enable Sustainability in Manufacturing Organizations). Lastly, product leaders can provide engagement models and workflow and collaboration tools by employing business use cases, templates or Scrum-type DevOps for sustainability solutions and outcomes.

As product leaders, you should:

- Adapt your product marketing in alignment with the digital maturity of ongoing digitalization initiatives of many manufacturing organizations, and where appropriate, develop know-how about applying sensors, analytics or other technology approaches to develop digital sustainability solutions.
- Develop advisory and consultative offerings to support the ROI, procurement and technology leverage between different procurement decision makers in the customer's organization so they can work with common objectives and goals.

Table 1 describes the options for product leaders in supporting material manufacturing sustainability issues, which are issues that have a major impact on the financial, economic, reputational and legal aspects of a company.

Table 1: Impacts of Environmental Material Issues in Manufacturing Sustainability

(Enlarged table in Appendix)

Material Issue	Definition	Digital Solution	Outcomes
Climate Mitigation and Adaptation	▪ Lowering the impact while working with the new situation	▪ Analytics ▪ Digital twin ▪ Simulation	▪ Resilience and agility toward climate-induced interferences ▪ Reduction in uncertainty
Alignment to Sustainable Development Goals	▪ U.N. Call to Action on Corporate Responsibility to end poverty, protect the planet and ensure equality	▪ Reporting ▪ Ecosystem management ▪ Supply chain management	▪ Mission to society ▪ Contribution to social cohesion
Carbon Emissions	▪ Reduction of the amount of greenhouse gasses released into the atmosphere	▪ Carbon emissions accounting reporting ▪ Carbon offsets ▪ Real-time sensing	▪ Net zero without offsetting ▪ Carbon pricing independence ▪ Operational sustainability
ESG Reporting/Compliance	▪ Set of standards for a company's operations that investors/regulators use to assess risk	▪ ESG/compliance reporting software ▪ Analytics ▪ Risk simulation	▪ Risk simulation ▪ Transparency ▪ Reporting database
Resource Efficiency	▪ Reducing energy intensity ▪ Improving energy performance ▪ Raw materials optimization	▪ Bill of materials ▪ Recipe management ▪ Digital twins ▪ Energy management operations system	▪ Investment in renewable energy ▪ Water management and recycling ▪ Alternative designs
Waste/Circularity	▪ Wastewater disposal ▪ Landfill emissions ▪ Municipal waste ▪ Solid waste disposal ▪ Incineration	▪ Capture ▪ Avoidance management ▪ Waste to energy ▪ Life cycle management/product life cycle management	▪ Focus on alternative materials, biodegradables ▪ Reduction of scrap ▪ Waste reduction
Reverse Logistics/Reclaiming Materials	▪ Reuse, second life cycle for products ▪ Take back ▪ Right to repair	▪ Automatic data capture for product analysis ▪ Analytics ▪ Visual inspections ▪ Blockchain	▪ E-waste reduction ▪ Abolishing designed product obsolescence ▪ Recycling
Biodiversity	▪ Protection of the variety of living species and plants from man-made influences and activities	▪ Location analytics ▪ Geospatial analysis ▪ Pollution monitors	▪ Rainwater harvesting ▪ Protection of endangered species ▪ Reversing soil erosion ▪ Protecting infrastructure and habitats
Air Emissions/Pollution	▪ Contamination of the indoor or outdoor environment	▪ IoT ▪ Location analytics ▪ Monitoring platform ▪ Life cycle assessment	▪ Reduction of outdoor contamination ▪ Improvement of air quality ▪ Leakage protection
Water Stewardship	▪ Reduces or efficiently manages water in offices and in product manufacturing and protects water quality	▪ Water management platform ▪ IoT ▪ Water metering	▪ Reduction in water consumption ▪ Water reuse

For definitions, please see Acronym Key and Glossary Terms at the end of the document.

Sources: Carbon Disclosure Project, Gartner, Intergovernmental Panel on Climate Change (IPCC), The United Nations Environment Programme, The United Nations Sustainable Development Goals

Product leaders tend to focus on the compliance- and governance-related ESG material issues, as risk management is a first priority for many buying centers. As product leaders, you have positioning opportunities:

- Investigate how to position your product features to address business issues that relate to relevant material issues such as resource efficiency, pollution or reverse logistics.
- Leverage product portfolios that can either build on an existing platform and extend product features like sustainability analytics, or add new products or approaches such as IoT or digital twins to capture and simulate material impacts on a customer issue.

Regional mandates like the Green Deal in Europe will require traceability for products in the form of a digital product passport. [3] Track-and-trace capabilities, together with the ability to connect product life cycles across product development until the end of life, will become a requirement and a product differentiation. Therefore, digital transformation, Industrie 4.0 or smart manufacturing will be tightly aligned to outcomes toward manufacturing sustainability.

Product leaders need to become sustainable business partners who understand the long-term vision of circularity and decarbonization, while connecting the priorities of the material issues.

Background and Context

The global society is debating the right measures and strategies to curb climate change impacts and the move toward sustainability. The multilateral Paris Climate Accords in 2015 fixed goals of 2 degrees Celsius, and preferably 1.5 degrees Celsius, to limit global warming compared to preindustrial levels. The 2021 United Nations Climate Change Conference (COP 26) [4] further calls for drastic acceleration of the alignment and collaboration between industry and society to transform toward sustainable communities and habitats by unlocking finance tools for developing and developed economies to invest toward net zero globally.

The Sustainable Development Goals (SDGs) [5] of the UN provide a comprehensive umbrella of social, economic and environmental sustainability objectives for a better future for the global community. Many industrial organizations tackle the climate change pressures as they are increasingly exposed to resilience and supply chain issues impacting their operations. Environmental sustainability issues like carbon emission targets, energy efficiency, pollution and end-of-life drive are driven by mandatory compliance with the government regulations and frameworks. That includes the Green Deal in Europe, or the reset by the World Economic Forum. [6]

Conclusion

Product leaders who want to develop products, technology or solutions for manufacturing sustainability should ensure that they have “a license to play” through their own sustainability activities. Ensure that those are transparent and do not entail any greenwashing (see Acronym Key and Glossary Terms). The market entry is different by region or country, and language for some of the regulatory issues, and needs to be addressed the same as the preferences for different reporting mechanisms.

Data from operations and the environment are key and are much more streamlined when those are available through a smart manufacturing or Industrie 4.0 program. Therefore, connecting those digital sustainable transformation messages together will enable cross-selling along the value chain, including small subcontractors or supply chain partners.

Acronym Key and Glossary Terms

Greenwashing	Greenwashing is a communications practice that makes misleading claims about the environmental credentials of a product, service, market or enterprise. It can be intentional or unintentional.
Material impact	Describes the climate change and sustainability impacts that will provide a material and critical impact on the business of an organization.
Climate adaptation (IPCC)	Adjustments to reduce the vulnerability of communities, regions or activities to climatic change and variability. Adaptation is important in the climate change issue in two ways: the assessment of impacts and vulnerabilities, and the development and evaluation of response options.
Climate mitigation (IPCC)	Climate change mitigation involves actions that reduce the rate of climate change. Climate change mitigation is achieved by limiting or preventing greenhouse gas emissions and by enhancing activities that remove these gasses from the atmosphere.

Evidence

[1] Net Zero by 2050: From Whether to How, page 12, European Climate Foundation.

[2] Decarbonization: The Race to Zero Emissions, Morgan Stanley.

[3] A European Green Deal, European Commission.

[4] 26th UN Climate Change Conference of the Parties, including the Breakthrough Agenda— Launching an Annual Global Checkpoint Process in 2022.

[5] The 17 Goals, UN Department of Economic and Social Affairs.

[6] The Great Reset, World Economic Forum.

Note 1: Science Based Targets

The Science Based Targets initiatives (SBTi) is a project started by a group of private-sector companies that are setting commitments to reduce their environmental footprint and to meet science-based carbon emissions targets.

Note 2: Capgemini Research Institute

The Capgemini Research Institute shows how new technology approaches such as AI can support the modeling and the impact assessment of climate change and environmental footprint on an organization and on society.

Document Revision History

Manufacturing Insight: How to Position Manufacturing Solutions for Sustainability - 17 November 2021

Recommended by the Author

Some documents may not be available as part of your current Gartner subscription. A

Communicator's Guide to ESG Reporting Frameworks

The Complete Guide to a Sustainable Device Life Cycle Using the IT Circular Economy

Maverick* Research: Water Will Become the World's Most Precious — and Disruptive —Commodity

Leverage Digital Initiatives to Enable Sustainability in Manufacturing Organizations

---

Table 1: Impacts of Environmental Material Issues in Manufacturing Sustainability

Material Issue	Definition	Digital Solution	Outcomes
Climate Mitigation and Adaptation	■ Lowering the impact while working with the new situation	■ Analytics ■ Digital twin ■ Simulation	■ Resilience and agility toward climate-induced interferences ■ Reduction in uncertainty
Alignment to Sustainable Development Goals	■ U.N. Call to Action on Corporate Responsibility to end poverty, protect the planet and ensure equality	■ Reporting ■ Ecosystem management ■ Supply chain management	■ Mission to society ■ Contribution to social cohesion
Carbon Emissions	■ Reduction of the amount of greenhouse gasses released into the atmosphere	■ Carbon emissions accounting reporting ■ Carbon offsets ■ Real-time sensing	■ Net zero without offsetting ■ Carbon pricing independence ■ Operational sustainability
ESG Reporting/Compliance	■ Set of standards for a company's operations that investors/regulators use to assess risk	■ ESG/compliance reporting software ■ Analytics Risk simulation	■ Risk simulation ■ Transparency ■ Reporting database

		■	
Resource Efficiency	■ Reducing energy intensity ■ Improving energy performance ■ Raw materials optimization	■ Bill of materials ■ Recipe management ■ Digital twins ■ Energy management operations system	■ Investment in renewable energy ■ Water management and recycling ■ Alternative designs
Waste/Circularity	■ Wastewater disposal ■ Landfill emissions ■ Municipal waste ■ Solid waste disposal ■ Incineration	■ Capture ■ Avoidance management ■ Waste to energy ■ Life cycle management/product life cycle management	■ Focus on alternative materials, biodegradables ■ Reduction of scrap ■ Waste reduction
Reverse Logistics/Reclaiming Materials	■ Reuse, second life cycle for products ■ Take back ■ Right to repair	■ Automatic data capture for product analysis ■ Analytics ■ Visual inspections ■ Blockchain	■ E-waste reduction ■ Abolishing designed product obsolescence ■ Recycling

Biodiversity	■ Protection of the variety of living species and plants from man-made influences and activities	■ Location analytics ■ Geospatial analysis ■ Pollution monitors	■ Rainwater harvesting ■ Protection of endangered species ■ Reversing soil erosion ■ Protecting infrastructure and habitats
Air Emissions/Pollution	■ Contamination of the indoor or outdoor environment	■ IoT ■ Location analytics ■ Monitoring platform ■ Life cycle assessment	■ Reduction of outdoor contamination ■ Improvement of air quality ■ Leakage protection
Water Stewardship	■ Reduces or efficiently manages water in offices and in product manufacturing and protects water quality	■ Water management platform ■ IoT ■ Water metering	■ Reduction in water consumption ■ Water reuse
For definitions, please see Acronym Key and Glossary Terms at the end of the document.			

Sources: Carbon Disclosure Project, Gartner, Intergovernmental Panel on Climate Change (IPCC), The United Nations Environment Programme, The United Nations Sustainable Development Goals

Actionable, objective insight

Position your IT organization for success. Explore these additional complimentary resources and tools for CIOs:

Research

Digital-Outcome-Driven Metrics for Manufacturing

Use this framework to identify and measure your objectives and outcomes.

Download Research

Infographic

2023 CIO Agenda Insights for the Manufacturing Industry

Discover top industry tech trends, challenges and priorities in 2023.

Download Infographic

Research

Manufacturing CIOs Are Using Intralogistics Smart Robots to Proliferate Smart Factories

Evaluate how changing market dynamics impact automation levels.

Download Research

Research

Focus on Business Outcomes and Tech Innovations to Enhance Industrial IoT Edge

Explore recommendations to strengthen the use of edge deployment.

Download Research

Already a client?
Get access to even more resources in your client portal. Log In

Connect With Us

Get actionable, objective insight that drives smarter decisions and stronger performance on your mission-critical priorities. Contact us to become a client:

U.S.: 1 855 811 7593

International: +44 (0) 3330 607 044

Become a Client

Learn more about Gartner for IT Leaders

gartner.com/en/it

Stay connected to the latest insights

Gartner®