

Driving Sustainable Transformation in Manufacturing and Supply Chain Operations



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Executive Summary

In the midst of an evolving economic landscape, stringent environmental regulations, and supply disruptions, the **role of digital manufacturing is pivotal in shaping a sustainable and resilient supply chain**. Manufacturing organizations in Asia/Pacific, including Japan (APJ), are **shifting to sustainable business practices to meet sustainability metrics**. However, organizations faced several obstacles that resulted in maturity variances in sustainability initiatives within the region.

In response, manufacturers are **investing in sustainability initiatives** and digital factory solutions to track, monitor, report sustainability data, and verify the efficacy of the implemented initiatives. Data-driven approaches provide enhanced visibility and traceability, enabling organizations to optimize processes and resources while improving accuracy and reliability in emission reporting.

Businesses can achieve **positive environmental impact alongside measurable business outcomes** by prioritizing sustainability as a core aspect of operations. This InfoBrief provides insights from manufacturing organizations in APJ, including key investment drivers and challenges, investment plans for applications to support sustainability initiatives, and vendor selection criteria. The report also highlights manufacturers' approaches to sustainable practices and use cases, including regional insights from ASEAN countries and ANZ.



Navigating the Sustainability Horizon: Regulatory and Operational Drivers

The emergence of stringent sustainability regulations across the regions aimed to curb industrial contributions to environmental degradation and greenhouse gas emissions holds significant implications for manufacturers, including:



Regulatory compliance:

Manufacturers must navigate and comply with an evolving set of sustainability regulations across different regions.



Business operations:

There is a need for an integrated approach to address the environmental aspects of business practices, including manufacturing operations, supply chain operations (including Scope 3 emissions), and circular product design.



Risk management:

The regulatory landscape can introduce new risks, such as noncompliance penalties or disruptions due to changes in permitted materials or processes. Companies need to develop strategies to mitigate these risks.



Manufacturers face increasing pressure from stakeholders, including shareholders, investors, and customers, to be **transparent and accountable about sustainability**, leading to the need for **proactive initiatives to improve sustainability metrics**. Finance institutions and investors are now factoring in environmental, social, and governance (ESG) criteria when making investment decisions. In addition, the availability of green financial options and sustainability-linked incentives requires manufacturers to **meet specific sustainability criteria**, integrate circular economy principles, and reduce carbon emissions through sustainable manufacturing and supply chain practices.

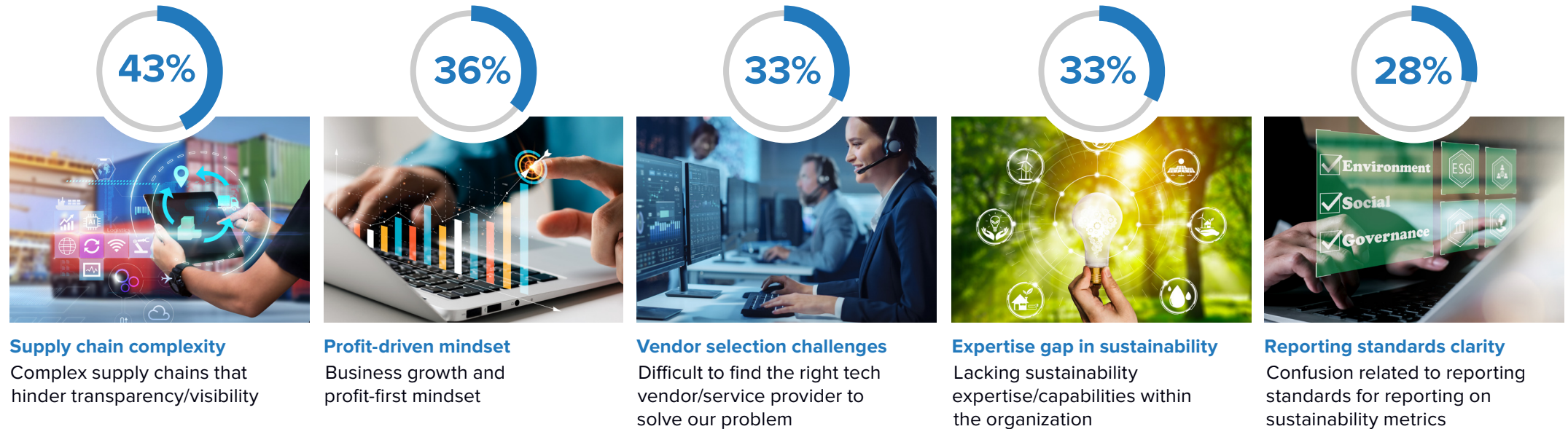
IDC predicts that by 2027, 40% of A2000 companies will be using **comprehensive ecosystem sustainability data** to make decisions across the full range of operations, reducing their carbon footprint by 30%⁽¹⁾. **Investing in sustainable technology** is essential for organizations seeking long-term resilience and cost efficiency. It enables real-time monitoring and optimization from the shop floor to manufacturing supply chain ecosystems, thus aligning operational efficiency with **environmental accountability and fostering sustainable growth**.

⁽¹⁾ IDC Futurescape Worldwide Manufacturing 2024 Predictions: Asia/Pacific (Excluding Japan) Implications #AP50547223

Sustainability Business Challenges for APJ Manufacturers

The combination of external and internal factors is driving APJ manufacturers to **shift to sustainable business practices**. However, organizations face several obstacles related to needing more visibility from a complex supply chain, uncertainties about returns on investment (ROI), and difficulty in sourcing the right service provider to address their problems.

What are the main organizational challenges faced by your organization when attempting to become a sustainable business?

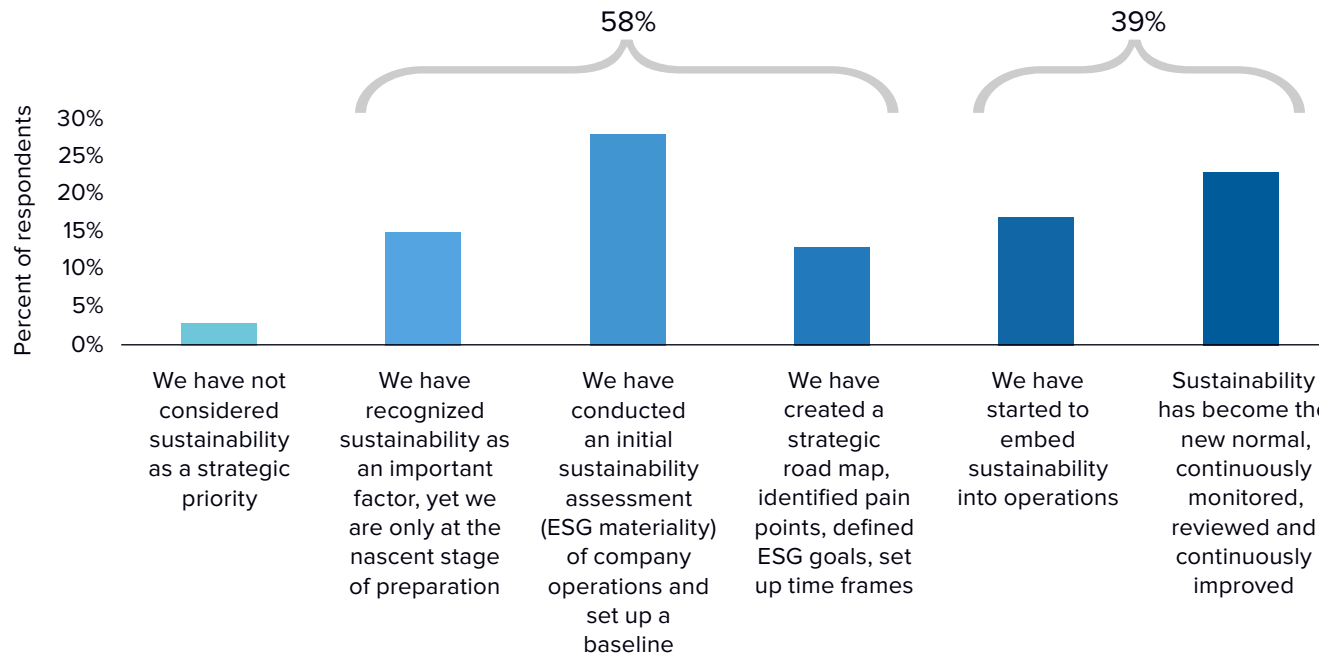


Source: IDC 2023 Sustainability Readiness Index Survey, n (APJ manufacturing) = 88

State of Sustainability Maturity for APJ Manufacturing

In APJ, despite manufacturers acknowledging the **importance of sustainable operations**, 58% of manufacturing organizations are still at the nascent stage of completing an initial assessment to identify pain points and set up frameworks and road maps with defined sustainability goals and metrics. More mature organizations have started to integrate sustainability into their operations.

At which stage of sustainability strategy planning is your organization?



Why understanding maturity matters



Guided compliance strategy:

Use current sustainability maturity levels as a baseline to develop targeted strategies for meeting upcoming regulations and industry benchmarks.



Focused improvement efforts:

Insight into current maturity helps organizations prioritize efforts and resources on the most impactful areas for advancement.



Strategic development:

Organizations can plan an approach to adopt advanced sustainable technologies and practices, propelling them to higher levels of environmental leadership.

Source: IDC 2023 Sustainability Readiness Index Survey, n (APJ manufacturing) = 88

Regional Trends: ASEAN

Manufacturers in ASEAN are **prioritizing investment in sustainability initiatives**, driven by the need for cost savings and compliance with the requirements from investors and sustainable law regulations.

Key drivers in investment for sustainability as a strategic business priority



Cost savings

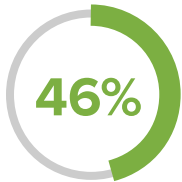


Requirements from investor community

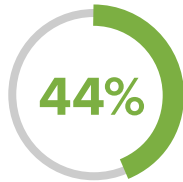


Legislative requirements and high energy prices

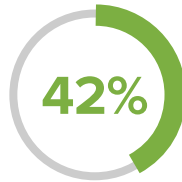
Top future application investments supporting sustainability in the next 12–18 months



Process and decision automation (e.g., robotic process automation (RPA)/intelligent process automation (IPA))



Sales & operation planning (S&OP)/integrated business planning (IBP)



Manufacturing execution systems (MES)

ASEAN: Challenges in executing sustainability initiatives



Unclear ROI and/or financial/budgets constraints



Need to maintain or extend the ability to deliver profits/maintain low cost



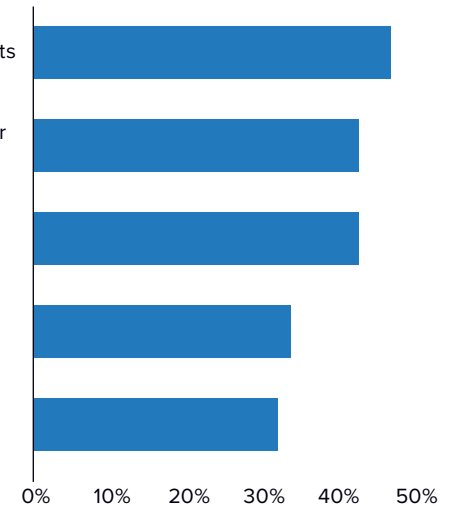
Lack of internal sustainability expertise



Lack of IT tools (data collection, reporting)



We need external help, but don't know whom to engage with



Manufacturers in ASEAN face hurdles such as financial constraints, unclear ROI, priority for profit generation and cost-saving projects, and lack of internal sustainability expertise to support their sustainability initiatives.

Source: IDC Manufacturing Industry Intelligence Survey, 2023, n (ASEAN) = 96,

Regional Trends: Australia and New Zealand (ANZ)

Manufacturers in Australia and New Zealand are **prioritizing investment in sustainability initiatives**, driven by customer demands, compliance with environmental sustainability regulations, and the need to optimize resources to address the shortage of raw materials.

What are the key drivers in investment for sustainability as a strategic business priority?



Requirements from customers

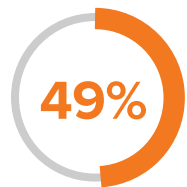


Legislative and regulatory requirements

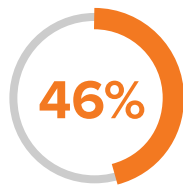


Lack of raw materials/assurance of supply

Top future application investments supporting sustainability in the next 12–18 months



SCM applications (supply chain network planning, supplier management, control towers, logistics (transportation management systems))



Ecosystem platforms/marketplaces to support sustainable sourcing and supplier integration



Sales & operation planning (S&OP)/integrated business planning (IBP)

Source: IDC Manufacturing Industry Intelligence Survey, 2023, n (ASEAN) = 96,

ANZ: Challenges in executing initiatives to support sustainability



Lack of internal sustainability expertise



We need external help, but don't know whom to engage with



Lack of executive support



Lack of IT tools (data collection, reporting)



Unclear ROI and/or financial/budget constraints



Manufacturers in ANZ face challenges stemming from a lack of internal sustainability expertise, uncertainty about external expertise, and no executive support for their sustainability initiatives.

Manufacturing Shift to Digital Factory: Key Drivers and Sustainability Initiatives

Manufacturers are increasingly **shifting to digital factories as a strategic response to sustainability challenges**. Digital factories leverage technologies such as cloud, Internet of Things (IoT), artificial intelligence (AI), and data analytics to help manufacturers collect, track, and monitor their sustainability initiatives' performance in areas such as:



Energy efficiency:

Digital factories optimize energy use through AI and IoT, significantly reducing power consumption.



Emissions control:

Continuous monitoring with digital twins, data analytics and AI/machine learning (ML) allows for the real-time management of carbon emissions.



Material traceability:

Leveraging cloud-based platforms facilitates tracking recyclable materials throughout the supply chain.



Sustainability reporting:

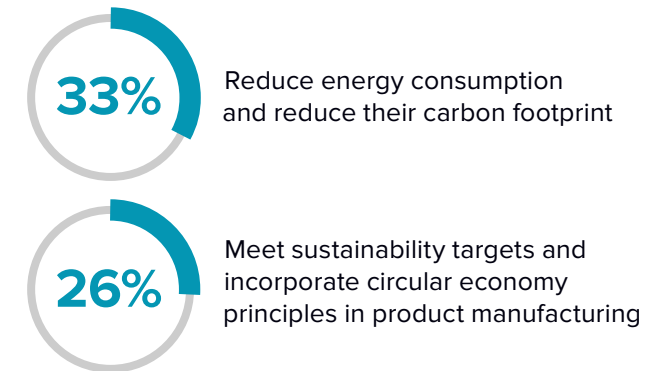
Automated reporting tools enable accurate sustainability reporting, improving transparency and compliance.

Digital factories also enable manufacturers to **improve supply chain visibility**, helping them make **informed decisions** about ethical **material sourcing, emissions, and inventory management**. Manufacturers can improve demand forecasting capabilities by **analyzing data** on order demand, customer buying behavior, and sustainability regulations, allowing them to be **more agile and responsive** to changes in the market and **addressing sustainability outcomes, transparency, and compliance**.



Sustainability is driving digital factory investment

APJ manufacturers are driven to invest in the digital factory to:



Source: IDC Manufacturing Intelligence Survey 2023, n= 265

Data-Driven Sustainability Operations

As manufacturers continue to evolve and **strive for sustainable data-driven operations** through information technology (IT)/operational technology (OT) convergence, IoT and shop floor automation are pivotal in enhancing carbon emission tracking, improving productivity, enabling cost savings through waste reduction and energy consumption, and deploying circular economy principles.

Benefits of data-driven sustainability operations



Enhanced visibility and traceability that enables accurate and reliable emissions reporting.



Data-driven approaches enable organizations to identify areas where processes and resources can be optimized, resulting in efficient use of raw materials, water, and energy.



Monitoring sustainability performance continuously with real-time insights enables organizations to make timely and informed decisions.



Challenges in data-driven sustainability operations



Poor data quality integrity from inconsistent or inaccurate data can lead to flawed analyses and reporting errors.



Fragmented data and silos create barriers for holistic processes and resource monitoring and management.



Lack of digital skills among employees to implement sustainable data-driven operations results in reduced productivity and operational inefficiency.



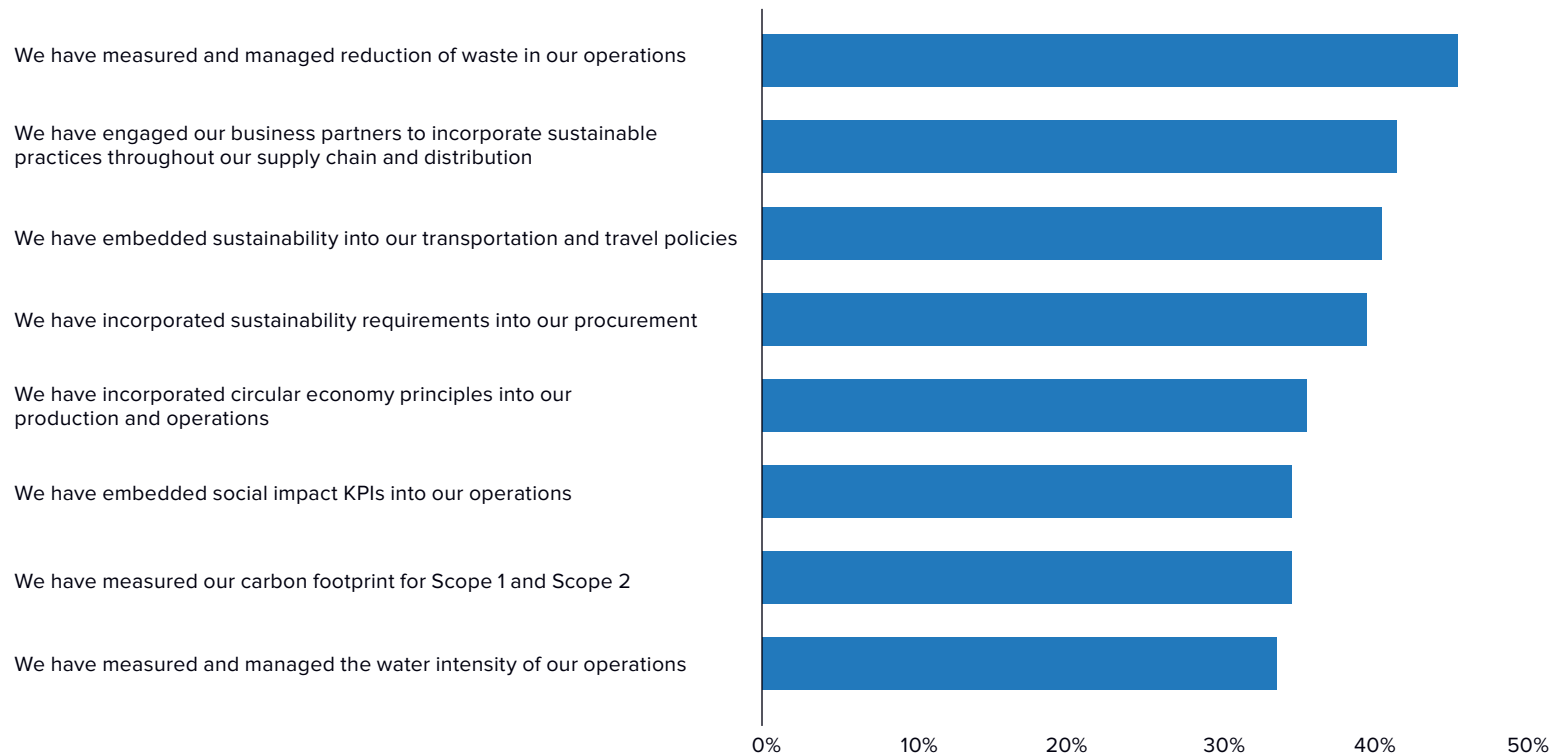
“By 2027, 40% of A2000 companies will use comprehensive ecosystem sustainability data to make decisions across the full range of operations, reducing carbon footprint by 30%.”¹

¹IDC Futurescape Worldwide Manufacturing 2024 Predictions: Asia/Pacific (Excluding Japan) Implications #AP50547223).

APJ Manufacturing Practices for Sustainability

In APJ, manufacturers **prioritize tangible environmental impact measures**, such as carbon and water intensity management, embedding sustainability at the core of operational and procurement strategies, which requires the integration of requirements, collection of sustainability-related data across the ecosystem, including partners, and reporting sustainability performance to ensure regulatory compliance.

Which of the following sustainability related operational practices do you follow?



Source: IDC Manufacturing Sustainability Survey, 2023, n (APJ manufacturing) = 88

Examples of best practices

Energy efficiency programs: Use high-efficiency motors, smart thermostats, and renewable energy. Use smart meters and IoT to gather data for targeted improvements.







Sustainable material sourcing: Use eco-friendly raw materials and analyze their sustainability with data analytics to reduce impact.

Waste reduction strategies: Reuse, recycle, and reduce waste through waste management programs. Optimize reduction strategies with waste sensors.




ASEAN Regional Insights: Embracing Circular Solutions in a Data-Driven Manufacturing Landscape

ASEAN manufacturers are **addressing sustainability goals alongside inflation pressures and supply shortages**. They focus on optimizing resources and reducing waste to drive cost efficiencies by embracing circular economy principles. Simultaneously, organizations are increasingly adopting track and trace platforms to support carbon emission tracking across the product life cycle and sustainability/ESG information reporting to meet customers' and stakeholders' requirements.

Top 5 key use cases to execute sustainability initiatives

- 
-  Reduction in waste and driving cost efficiencies
 -  Reduction of carbon emissions/CO2 footprint
 -  Incorporating circular economy principles into operations
 -  Track and trace platforms for carbon emissions across the product life cycle
 -  Reporting sustainability and ESG information with financial results to meet customer requirements

Challenges in deriving value from data-driven operations

-  Difficulties with integration of operational data sources resulting in poor and inconsistent data access or quality
-  Issues with integration of other software or data sources resulting in poor or inconsistent data access or quality
-  Complications with integration of ERP resulting in poor or inconsistent data access or quality






Source: IDC Manufacturing Industry Intelligence Survey, 2023, n (ASEAN) = 96

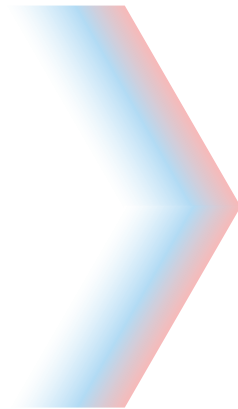


ANZ Regional Insights: Navigating Sustainability and Data Complexities in Modern Manufacturing




ANZ manufacturers focus on **incorporating circular economy principles into their operations** and product life cycle development. This comprehensive approach includes designing products with durability, repairability, and recyclability in mind, using eco-friendly materials, and refurbishing products to extend their life span and reduce waste. Sustainability/ESG and financial reporting is another critical priority for manufacturers to meet customer and stakeholder requirements. Additionally, manufacturers are investing in energy efficiency assets and switching to renewable energy sources to reduce their carbon emissions and CO2 footprint.

Top 5 key use cases to execute sustainability initiatives

-  Incorporating circular economy principles into operations
-  Reporting ESG information with financial results to meet customer requirements
-  Investment in energy efficient assets
-  Reduction of carbon emission/CO2 footprint
-  Reduction of water consumption



Challenges in deriving value from data-driven operations

-  Difficulties with integration of operational data sources resulting in poor and inconsistent data access or quality
-  Unable to create business models that generate revenue/monetary returns based on data collected
-  Issues with integration of other software or data sources resulting in poor or inconsistent data access or quality



Source: IDC Manufacturing Industry Intelligence Survey, 2023, n (ANZ) = 37

Digital Manufacturing: Driving Business Outcomes through Sustainable Use Cases

Data-driven manufacturing and supply chains offer a unique opportunity to **integrate sustainable practices into business processes**. By prioritizing sustainability as a core aspect of operations, businesses can achieve positive environmental impact alongside measurable business outcomes.

Sustainability metrics/ transparency



KEY: Automating sustainability data collection to enable manufacturers to benchmark emissions and utilization, offering transparent reporting and environmental accountability.

Continuous planning and forecasting



KEY: Leverage real-time data and predictive analytics to enhance forecasting accuracy and agility, reducing environmental impact through efficient resource allocation and enabling rapid response to market fluctuations with sustainability in mind.

Inventory intelligence



KEY: Adopting smart inventory management with real-time tracking via digital twins reduces excess stock, lowers costs, and minimizes environmental waste by aligning production with demand sustainably.

Carbon tracking and footprint management



KEY: A unified platform for sustainability data that enables organizations to streamline carbon tracking, meet regulatory demands, and drive actionable insights for greener operations.

Cognitive root cause



KEY: Integrating quality management systems with advanced analytics supports sustainable operations by reducing defects and resource waste through automated, AI-enhanced root cause analysis and real-time process adjustments.

Vendor Selection Criteria

The selection of **digital factory solutions** vendors is a key strategic decision and plays a critical role in digital factory implementation — it can determine the **success of an organization’s operational transformation and operational efficiency in navigating sustainability challenges.**

Important considerations:



Strategic vendor selection:

Choosing the right digital factory solutions vendor is crucial for ensuring successful operational transformation and enhancing operational efficiency in the face of sustainability challenges.



System integration:

A suitable vendor offers seamless end-to-end integration with existing systems, facilitating an effective and comprehensive approach to sustainability within the organization.



Expertise and support:

The vendor should provide a strong partner network and access to domain experts with a proven success record, which is vital for confident operational management.

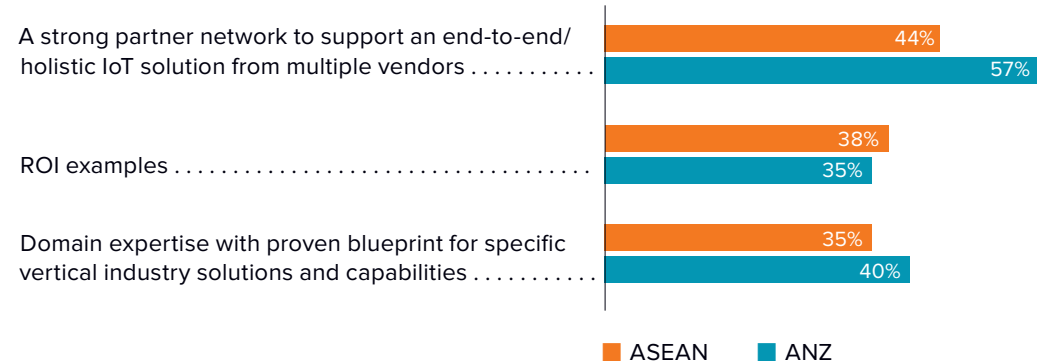


Achievement and value maximization:

The right partnership empowers manufacturers to drive innovation, exceed sustainability goals, and maximize the return on investment in digital factory solutions.



Key criteria for ASEAN and ANZ manufacturers



Source: IDC Manufacturing Industry Intelligence Survey, 2023, n (ASEAN) = 98, n (ANZ) = 37

The Quality of Data: Variety and Variation Challenges in Sustainability Reporting

Background

Sustainability reporting is increasingly crucial for companies to demonstrate their ESG impact. However, ensuring accurate and reliable reporting can be hindered by challenges related to both the variety and variation of data collected from the related ecosystem stakeholders. The absence of universally accepted standards for measuring and reporting sustainability metrics makes comparisons between companies and industries difficult. This can lead to confusion for stakeholders and potential greenwashing concerns.

The challenge

To establish a secure data platform and Life Cycle Assessment (LCA) calculation method for measuring the environmental impact of manufacturing processes across the value chain.

The solution

A high-performance material manufacturer has engaged a digital factory solutions provider to establish infrastructure and connectivity to support digitalization in its manufacturing processes. The company has developed a unified process for data collection and scaled quickly across multiple sites.

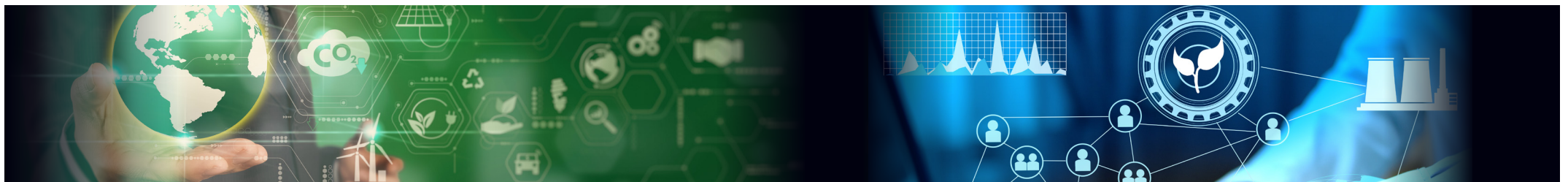
The company has leveraged a blockchain-powered digital data platform integrated with the proprietary LCA calculation method to collect and trace primary data on environmental impact, such as greenhouse gas (GHG) emission data and carbon footprint, across the process value chain.

This collaboration work creates end-to-end technology integration, connecting disparate systems, breaking down data silos, allowing real-time visibility across the entire manufacturing ecosystem, empowering manufacturers to track, monitor, report, and validate sustainability performance, and ensuring compliance with environmental regulations.

Outcomes

This platform empowers businesses with unprecedented transparency and traceability of sustainability data across their entire value chain. By leveraging blockchain technology for data standardization and verification, the platform guarantees the credibility and accuracy of all reported information.

Customers and ecosystem stakeholders gain the power to make informed decisions that align with their sustainability goals. They can directly select materials or opt for recycled alternatives during the design phase. The platform provides crucial details of environmental impact, including the origin of recycled materials and GHG emissions associated with different material choices.



Guidance and Recommendations

Establishing a sustainable digital manufacturing supply chain is a critical strategic objective for organizations seeking to bolster their business resilience, reduce environmental impact, and comply with regulatory standards. To get started on the journey to sustainable operations, consider the following guidance:

1

Strategic road map for the sustainability journey: Begin with a detailed assessment that measures your current sustainability practices against industry benchmarks and identifies critical areas for digital transformation. Consider utilizing partner expertise to develop a strategic road map that integrates sustainability requirements into your operations, ensuring these initiatives support your business goals and use technology to scale sustainability efforts. Establish clear, actionable steps to align your operational processes with sustainable outcomes, focusing on energy efficiency, waste reduction, and responsible sourcing within the context of digital advancement.

2

Implement comprehensive emissions tracking: For manufacturers aiming to enhance sustainability, implementing an advanced digital framework to track and report all emissions categories — Scope 1 (direct), Scope 2 (indirect from purchased energy), and Scope 3 (all other indirect emissions in the value chain) — is crucial. This involves deploying sensor technology and analytics across operations and the supply chain for real-time monitoring. Utilize AI to analyze data for actionable insights, enabling strategic decisions to effectively reduce carbon footprint and meet global sustainability standards.

3

Establish robust data collection capabilities: Strategically architect a data strategy framework that leverages technologies for real-time data acquisition across your manufacturing landscape. Implement a robust data analytics platform to process and analyze environmental impact data, enabling precision in tracking emissions and resource utilization. Integrate these insights with ERP and supply chain systems to ensure data accuracy, enhance supply chain visibility, and support informed decision-making for sustainable operations.

4

Enable circular economy practices: To foster circular economy practices, deploy digital solutions that manage the product life cycle from inception to end-of-life, emphasizing the reuse and repurposing of materials. Leverage data collection technologies to feed into product life-cycle management (PLM), advanced analytics, digital twins, and AI to enhance product designs for longevity and recyclability. Such strategies should focus on reducing waste and facilitating the reintegration of materials into new production cycles, aligning operational tactics with sustainability targets.

5

Continuously optimize for business and sustainability outcomes: Adopt a continuous improvement cycle by leveraging advanced technologies to visually represent physical processes and predictive analytics for precise demand forecasting and operational enhancements. Regularly assess and adjust manufacturing workflows to optimize efficiency, reduce waste, and enhance product quality, ensuring your processes evolve in line with technological advancements and market demands.

About the IDC Analysts



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Stephanie Krishnan is an associate VP responsible for producing, developing, and growing the IDC Manufacturing and Energy Insights programs in Asia/Pacific. Within Manufacturing Insights, Stephanie conducts supply chain and Industry 4.0 research that supports clients with global sourcing (profitable proximity and sustainable outcomes), transportation, logistics, warehousing, and more. In addition, her contributions to subscription products and custom research span ecosystems, value chains, and the supply chains of industrial industries. In this role, she delivers a research agenda that supports technology buyers in their strategies and buying decisions as well as vendors in terms of market trends and intelligence.

[More about Stephanie Krishnan](#)



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Wai Yee Lee is a research manager for IDC Manufacturing Insights and is responsible for Asia/Pacific manufacturing and supply chain trends and best practices. In her role, she helps semiconductor manufacturers and their partner organizations maximize the benefits of their digital transformation journeys. Her primary research focuses on technology adoption in addressing industry challenges for the entire manufacturing value chain. She has a particular interest in semiconductor and electronics manufacturing.

[More about Wai Yee Lee](#)

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