Microsoft

Sustainable, smart Manufacturing

Lernreise: Die Fabrik der Zukunft
15th of December 2021

Till Hertwig
Industry Executive, Manufacturing Discrete Industry

Melanie Weber
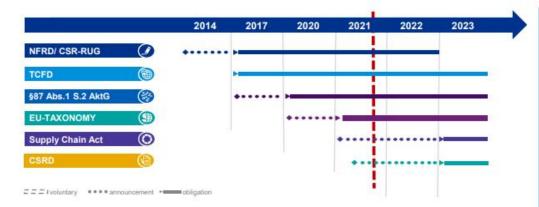Sen. Industry Executive, M&R Process Industry

Agenda

1. An outside-in perspective on Sustainability

2. Microsoft's approach on sustainability in manufacturing

3. Two use cases on:

   a) Production optimization

   b) Sustainable product development

4. Support content & formats for customers

5. Discussion

A planet-sized challenge

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How investors think

BlackRock

Making sustainability our standard

Regulatory pressure increases

Regulatory fundament

	2014	2017	2020	2021	2022	2023
NFRD/ CSR-RUG						
TCFD						
§87 Abs.1 S.2 AktG						
EU-TAXONOMY						
Supply Chain Act						
CSRD						

voluntary   announcement   obligation

Direct Suppliers

Indirect Suppliers

Module suppliers

Component suppliers

Raw material suppliers

System suppliers

Single part suppliers

History of Regulation Measures

- Governments and international organizations initially relied on a voluntary commitment by companies and set up a review mechanism.
- The result: too few companies fulfil sustainable expectations
- Now a sustainable act are about to be introduced
- Most remarkable: EU-Taxonomy and Supply Chain Act starting in 2023.

Content of the laws:
- All **"big" companies** doing business in certain regions (e.g. Germany) should be obliged to comply with **labour and social standards** and **duties of care.**
- They must **report** and **accept liability** and **sanctions** for violations and non-compliance.

Manufacturing industry
Key environmental sustainability challenges

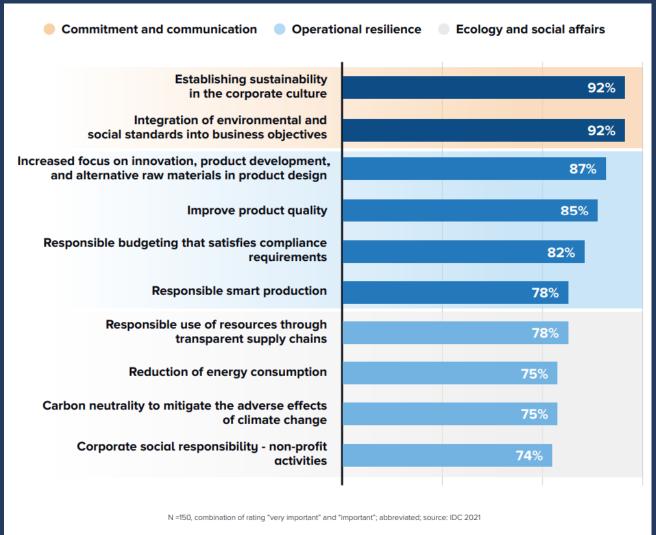**Increase operational efficiency** while reducing environmental impact and improving margins

Reach new customers and **increase competitive differentiation with sustainable goods**

Respond with agility to **regulatory constraints, climate, or geopolitical issues**

Build trust across supply chain and with partners

Integrate Sustainability mindset and targets into **company culture & business objectives**
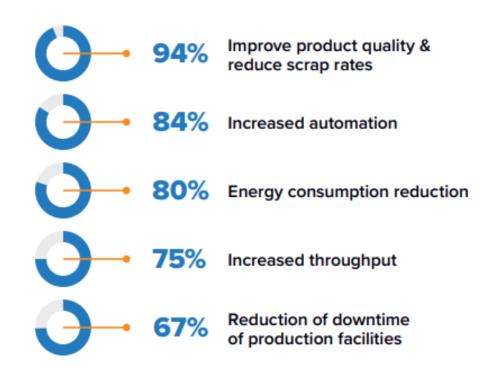
Top 10 most important sustainability goals

Commitment and communication   **Operational resilience**   **Ecology and social affairs**

Goal	%
Establishing sustainability in the corporate culture	92%
Integration of environmental and social standards into business objectives	92%
Increased focus on innovation, product development, and alternative raw materials in product design	87%
Improve product quality	85%
Responsible budgeting that satisfies compliance requirements	82%
Responsible smart production	78%
Responsible use of resources through transparent supply chains	78%
Reduction of energy consumption	75%
Carbon neutrality to mitigate the adverse effects of climate change	75%
Corporate social responsibility - non-profit activities	74%

N =150, combination of rating "very important" and "important"; abbreviated; source: IDC 2021

- Sustainability is a corporate culture topic

- Align sustainability goals with business objectives

- Think sustainability from starting point of your value chain → Innovation & Product Design !

- Sustainable, smart production is a key leverage

Manufacturing optimization provides ecological contributions

Classic optimization measures in industrial enterprises can at the same time have a **direct influence on an enterprise's ecological sustainability profile.** Especially those relating to a more efficient use of resources and energy.

Top 5 initiatives for optimization in manufacturing

94% Improve product quality & reduce scrap rates

84% Increased automation

80% Energy consumption reduction

75% Increased throughput

67% Reduction of downtime of production facilities

Source: IDC White Paper "Sustainability in German Industrial Enterprises 2021"; N=150

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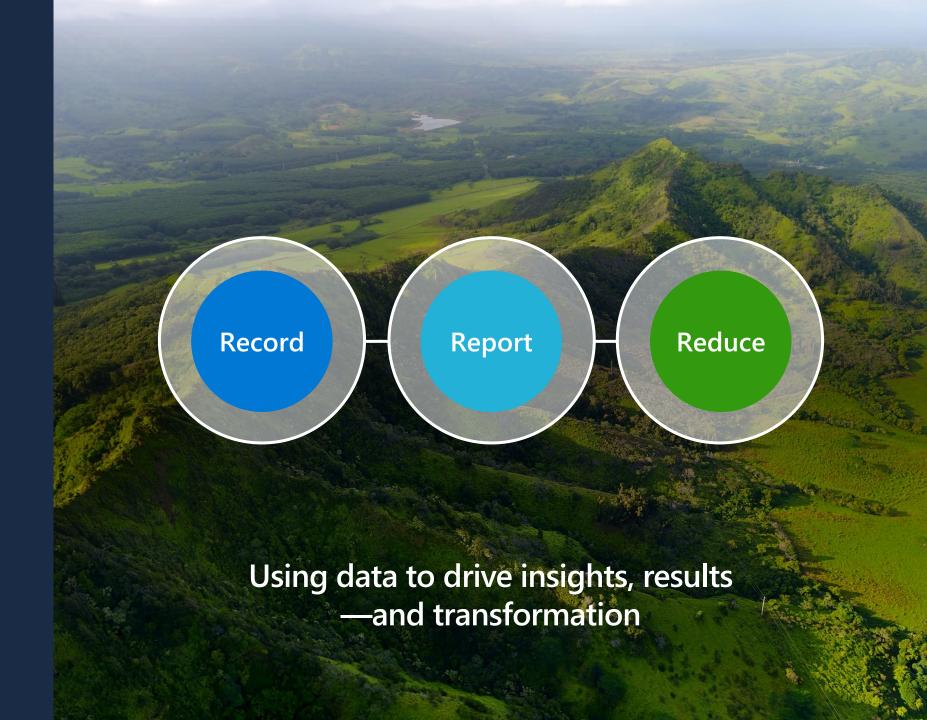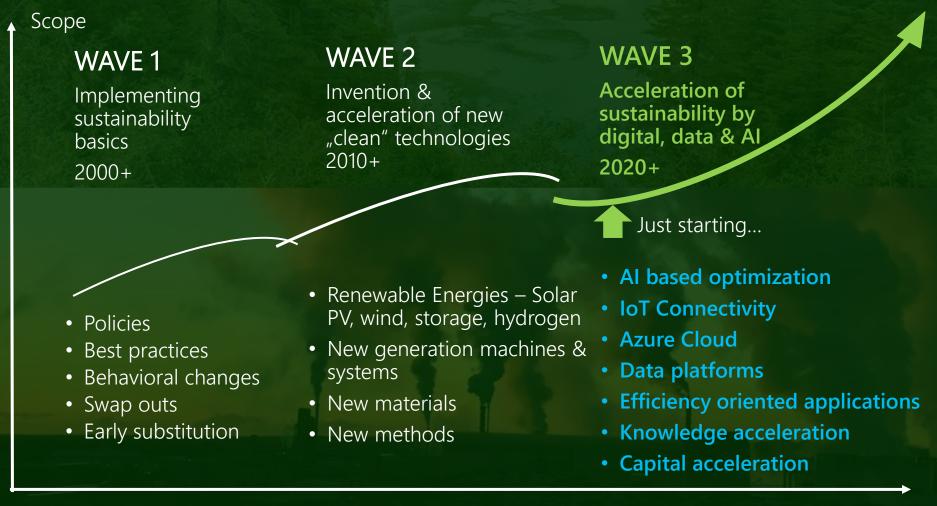
Sustainability is good for business & good for the planet

Enhance efficiencies

Improve margins and revenue

Build brand trust

We're on a common, connected journey

Record — Report — Reduce

Using data to drive insights, results —and transformation
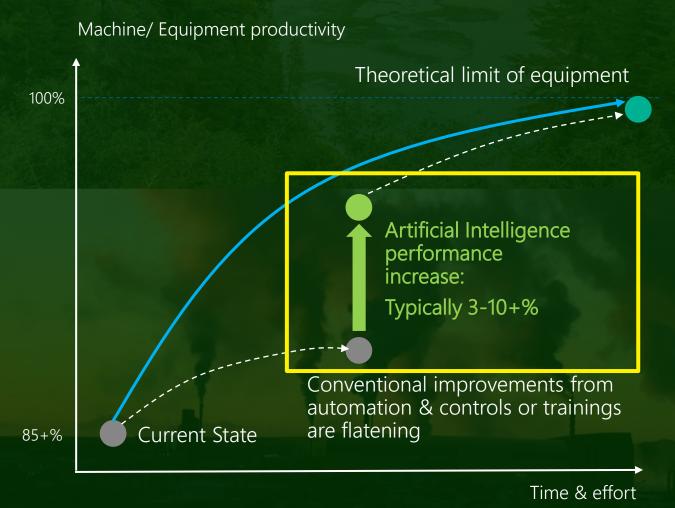
Sustainability is actually in its third wave – thanks to digital, data & AI, accelerated growth is now possible

Scope

WAVE 1
Implementing sustainability basics
2000+

WAVE 2
Invention & acceleration of new „clean" technologies
2010+

WAVE 3
Acceleration of sustainability by digital, data & AI
2020+

Just starting…

- Policies
- Best practices
- Behavioral changes
- Swap outs
- Early substitution

- Renewable Energies – Solar PV, wind, storage, hydrogen
- New generation machines & systems
- New materials
- New methods

- **AI based optimization**
- **IoT Connectivity**
- **Azure Cloud**
- **Data platforms**
- **Efficiency oriented applications**
- **Knowledge acceleration**
- **Capital acceleration**

Time

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Artificial Intelligence allows incremental production performance boosts

Machine/ Equipment productivity

Theoretical limit of equipment

100%

Artificial Intelligence performance increase:

Typically 3-10+%

Conventional improvements from automation & controls or trainings are flatening

85+% Current State

Time & effort

Source: McKinsey

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Outokumpu: A sustainable stainless steel giant with a data-driven mindset

"What we have achieved here in the last 14 months is unmatched. Not just in the metals industry, but probably in any industry."
Jan Hoffman, Outokumpu EVP for Business Transformation and IT

Microsoft

Digital Manufacturing is enabling a step change in efficiency and sustainability

Increased yield and improved sustainability with reduced cost.

Enhancing decision making through real time data analytics.

Improved quality through automatic identification and classification in the inspection process.

Outokumpu company vision: Customer's first choice in sustainable stainless.

Data-availability in between Outokumpu sites will drive efficiency globally.

Product & Footprint tracking will enable customers to value our superior sustainable product.

Microsoft

outokumpu

The Digital manufacturing roadmap Tornio
Tornio to become most digitized and cost-competitive stainless steel mill

1   Gemba Walks & Pain Points interviews

2   Digital & IT Readiness assessment
and identification of growth potentials

3   Use cases and enabling capabilities identified
and prioritized with the key stakeholders

4   "Aligned Selection" of highest value cases
for the roadmap

5   Detailed plans, governance model and overall
roadmap for agile delivery & execution of those plans

Microsoft   outokumpu
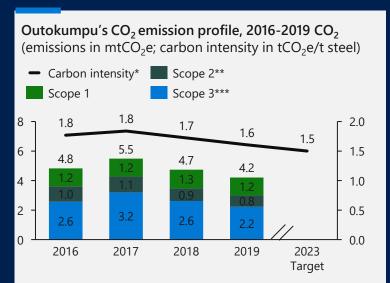
Outokumpu is committed to carbon neutrality by 2050 – addressing direct, indirect, and upstream emission drivers, focusing especially on improving circularity in its stainless steel manufacturing

Outokumpu have reduced their footprint and continue to lessen their carbon intensity ...

... Which is a result of initiatives to improve across their production (direct), electricity / energy consumption (indirect) and upstream emission drivers (use of materials)

Outokumpu's CO_2 emission profile, 2016-2019 CO_2 (emissions in $mtCO_2e$; carbon intensity in tCO_2e/t steel)

- ── Carbon intensity*
- ■ Scope 2**
- ■ Scope 1
- ■ Scope 3***

Year	Total	Scope 1	Scope 2	Scope 3	Carbon intensity
2016	4.8	1.2	1.0	2.6	1.8
2017	5.5	1.2	1.1	3.2	1.8
2018	4.7	1.3	0.9	2.6	1.7
2019	4.2	1.2	0.8	2.2	1.6
2023 Target					1.5

The steel industry is a significant CO_2-emitter, making steel plants strong candidates for decarbonization through a focus on production and electricity emissions (scope 1 and 2 respectively), as well as upstream emissions in terms of mainly use of materials and transportation (scope 3).

* Carbon intensity across all scopes; ** Location based; *** Upstream emissions
Source: Outokumpu

Outokumpu's key climate focus areas, selected examples

STEEL MILLS AS RECYCLING FACILITIES	ENERGY EFFICIENCY AND YIELD OPTIMIZATION	SUSTAINABILITY IN THE SUPPLY CHAIN
Target 90% recycled content in stainless steel	Target 20 % reduction by 2023 vs. '14-'16 baseline	Target reduction of 23% in scope 3 intensity

REDUCE EMISSIONS INTENSITY TO 0.92TCO_2 PER TONNE CRUDE STEEL BY 2050 - CLMATE NEUTRAL BY 2050

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Bridgestone + Azure HPC
Virtual Tyre Development

BRIDGESTONE
Solutions for your journey

By creating a *digital twin of a tyre*, virtual tyre development technology enables us to accurately *predict a tyre's performance* without producing and physically driving it

Bridgestone EMIA is the regional Strategic Business Unit of Bridgestone Corporation, a global leader in tyres and rubber building on its expertise to provide solutions for safe and sustainable mobility.

Headquartered in Zaventem (Belgium), Bridgestone EMIA employs more than 20,000 people and conducts business in 40 countries across the region.

Bridgestone EMIA operates 15 tyre plants, a major R&D centre, and a proving ground, and serves its customers in an extensive retail network with thousands of touchpoints.

Sustainability

1

Around 200 prototype tyres saved for each project and approx. 40,000 km of physical testing cut, leading to around 60% of raw materials and CO_2 emissions saved

Efficiency

2

Tyre development can be cut by up to 50% using a virtual environment and reduces vehicle's time to market

Flexibility

3

Enabling many more tyre variants to be tested to ensure that chosen tyre is the ideal fitment

Accuracy

4

Physical testing at the end of the tyre development period gives aligned results

Let's look at the product optimization side...

Smarter simulations
Go beyond traditional simulation techniques using data modeling and analysis.

"Thanks to the cloud, we have found the right solution to the challenge of storage capacity and computing. We can now focus entirely on the development and safety of our technical solutions for automated and autonomous driving."

–Adrian James, Head of Automated Driving Safety, AUDI AG

Insightful research results
Derive more meaningful and informative insights by testing multiple data models.

"We get peace of mind with automated machine learning, knowing that we are exhausting all the possible scenarios and using the best model for our inputs."

–Mercia Silva, Data Scientist, BP

Faster time-to-solution
Get into the market faster with innovation that sets your business apart.

"With Azure, we have access to sophisticated data science services in a real-time, on-demand basis, which helps us innovate faster."

–Chris Patti, Chief Technology Officer, AccuWeather

AMD	Vestas	DEHN	FLSmidth	LIBERTY UNIVERSITY	Shell	REPSOL	Holmes	NI	Altair
Manufacturing	Energy	Manufacturing	Manufacturing	Higher Education	Energy	Energy	Professional Services	Health Provider	Manufacturing
AMD IT satisfies an insatiable appetite for capacity, scalability, and	Vestas supercharges its wind farm control models for sustainable energy	DEHN: Lightning strikes the cloud	FLSmidth transcends on-premises limitations with Azure high-	How Liberty University is fighting COVID-19 using Microsoft Azure	Shell speeds oil exploration and reduces carbon footprint with cloud-	Repsol uses the cloud to help make decisions faster	Fire safety engineering firm ignites simulation speeds with Azure	Cure for Alzheimer's and Parkinson's draws closer with neuron simulation	Altair Engineering democratizes HPC access using the cloud

... More stories on "why Azure HPC" at customers.microsoft.com

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Microsoft in Manufacturing: Production Optimization

SPS : Smart Production Solutions - Messeheft

- "...reliable and scalable reference implementations for the most immportant tasks in manudacturing industry..."

Microsoft offering for reference implementation in production

- Microsoft in Manufacturing: Schnellere Digitalisierung von Fabriken durch fertige Referenzimplementierungen | News Center Microsoft

1. **Automatische Qualitätskontrolle**
   Ein automatisches Qualitätskontrollsystem hilft beim Überprüfen von Produktionsprozessen sowie der Übertragung der anfallenden Daten in Systeme wie LIMS („Labor-Informations- und Management-System"), ELN („Electronic Laboratory Notebook"), MES („Manufacturing Execution System") und ERP („Enterprise Resource Planning").

2. **Overall Equipment Efficiency (OEE)**
   Die Gesamtanlageneffizienz, auf Englisch „Overall Equipment Efficiency" (OEE), ist eine betriebswirtschaftliche Kennzahl zur Messung der Produktivität von technischen Anlagen oder Maschinen. Sie misst Verfügbarkeit, Leistung und Qualität im Verhältnis zur Produktionszeit.

3. **Prozessinformationmanagementsysteme**
   Prozessinformationsmanagementsysteme (PIMS) sind die Datenplattformen einer Fabrik. Sie integrieren und visualisieren Daten aus verschiedenen Quellen.

4. **Anomalie-Erkennung**
   Das automatische Erkennen von Anomalien durch Algorithmen und künstliche Intelligenz ist ein wichtiger Baustein für die vorausschauende Wartung („Predictive Maintenance") und damit für mehr Effizienz beim Einsatz von Maschinen und Anlagen.

5. **Vibrationsüberwachung**
   Die kontinuierliche Überwachung von Schwingungen bei Maschinen und Anlagen dient der Vorhersage von Ausfällen und zur Optimierung der Verfügbarkeit.

6. **Zustandsüberwachung**
   Die Zustandsüberwachung („Condition Monitoring") von Fertigungsanlagen ist eine notwendige Voraussetzung für die vorausschauende Instandhaltung („Predictive Maintenance"). Dabei werden unterschiedliche Parameter permanent in Echtzeit erhoben, um die vorausschauende Wartung an einem günstigen Zeitpunkt zu ermöglichen.

7. **Energieverbrauch**
   Die Fertigungsindustrie ist eine energieintensive Branche. Um mehr Nachhaltigkeit und Effizienz zu erreichen, muss der Energieeinsatz optimiert werden. Deshalb kommt der Messung des Verbrauchs, der Ermittlung von Verlusten und der Suche nach den richtigen Gegenmaßnahmen eine entscheidende Bedeutung zu.

8. **Automated Guided Vehicle (AGV)**
   Autonomes Fahren ist auch für die Fertigungsindustrie eine wichtige Zukunftstechnologie. In hochautomatisierten Fabriken können fahrerlose Transportsysteme, auf Englisch „Automated Guided Vehicles" (AGV), die Maschinen und Anlagen mit Bauteilen oder Rohstoffen versorgen. Das kann bis zu „Lights-out-Fabriken" gehen, die keine Beleuchtung benötigen, weil Roboter die Arbeit erledigen.

9. **Abfallmanagement**
   Bei jedem Fertigungsprozess fallen Ausschuss und Nebenprodukte an. Die Nutzung von Daten hilft, den Ausschuss zu minimieren und die Produktion zu maximieren. Der Aufbau intelligenter Ökosysteme für die Fertigung eröffnet den Kunden neue Möglichkeiten, ihre Nebenprodukte als Rohstoffe an andere Unternehmen zu verkaufen. Das geschieht häufig in der Chemie-Industrie.

10. **Bottleneck Analysis**
    Engpässe treten in der Fertigung auf, wenn Maschinen auch bei maximaler Durchsatzleistung ihre Produktionsquote nicht erfüllen können und der Arbeitsfluss dadurch verzögert oder gestoppt wird. Analysen solcher „Bottlenecks" helfen, die Produktion effizienter zu gestalten.

Empowering manufacturers with key capabilities

Operational Visibility
Improve visibility across connected factory assets and processes to increase productivity of equipment and labor across sites

Asset Productivity
Improve visibility across connected factory assets and processes to increase productivity of equipment and labor across sites

Production Operations
Increase production efficiency and quality, by advising, assisting, and augmenting factory workers with AI and autonomous systems

Connected & Frontline Worker
Empower your workforce with digital tools and modern devices that offer the best experiences for collaboration and productivity

Planning & Optimization
Increase service levels and reduce cost, with the flexibility to run planning and execution in the cloud and at the edge

Learning & Knowledge Management
Identify skills gaps, improve how training is delivered, and accelerate access to knowledge across the organization

Supply Chain Visibility
Leverage demand and supply signals to minimize risk and capitalize on future opportunities

Health & Safety, Wellness
Improve visibility across connected factory assets and processes to increase productivity of equipment and labor across sites

Activate Digital Selling
Increase margins with digital solutions for quote to cash, configure, price, quote, and contract lifecycle management

Product Twins
Accelerate evolution of connected products with remote monitoring through digital threads and feedback loops, and simulation of outcomes

Always on Service
Help agents, dispatched technicians, and virtual assistants monitor connected products, and engage remotely with customers and experts

Central diagram labels:
AGILE FACTORY OF THE FUTURE
WORKFORCE TRANSFORMATION
SUPPLY CHAIN RESILIENCE
SECURITY & COMPLIANCE
DATA
SUSTAINABILITY
DIGITAL INNOVATION
CUSTOMER ENGAGEMENT

Industry Specific

Data Models   –   Connectors and APIs   –   Partner Ecosystems

Microsoft Cloud

Sustainability with MTC Germany

The Microsoft Technology Center enables innovation and business outcomes through immersive experiences and deep technical cross solution engagements

How we can help

Strategy / EBC Session – Explain and discuss our sustainability approach and how we can help customers on their own journey.

Envisioning Sessions – Design Thinking led workshops to explore challenges and jointly ideate and prioritise technically feasible opportunities.

Architecture Design Sessions – Technical deep dives using proven methods to explore business objectives and requirements for designing a technical solution.

Practical Sessions – Empowering through doing. Bringing you closer to our technology and services in workshops or hackathons.

Sustainability Success Stories

- Supporting multiple customers with their **smart building** ambitions

- Helping a large chemicals company **monitor and reduce energy consumption**

- Prototyping an AI based tool to **reduce impact** of hydropower **on marine life**

- Delivered envisioning sessions for **water and waste management**

- Providing technical guidance for systems to **maintain renewable energy infrastructure**

- Supporting the design of multiple systems to **reduce materials and energy in use**

Get in touch to arrange your MTC sustainability engagement (remote or in the MTC)

New white papers and reports:
IDC: Sustainability and IoT Signals report

Whitepaper: Sustainability in German Industrial Enterprises 2021 (microsoft.com)

IoT Signals Report 2021: Die – zunehmend – wichtige Rolle von IoT-Projekten für Unternehmen (microsoft.com)

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