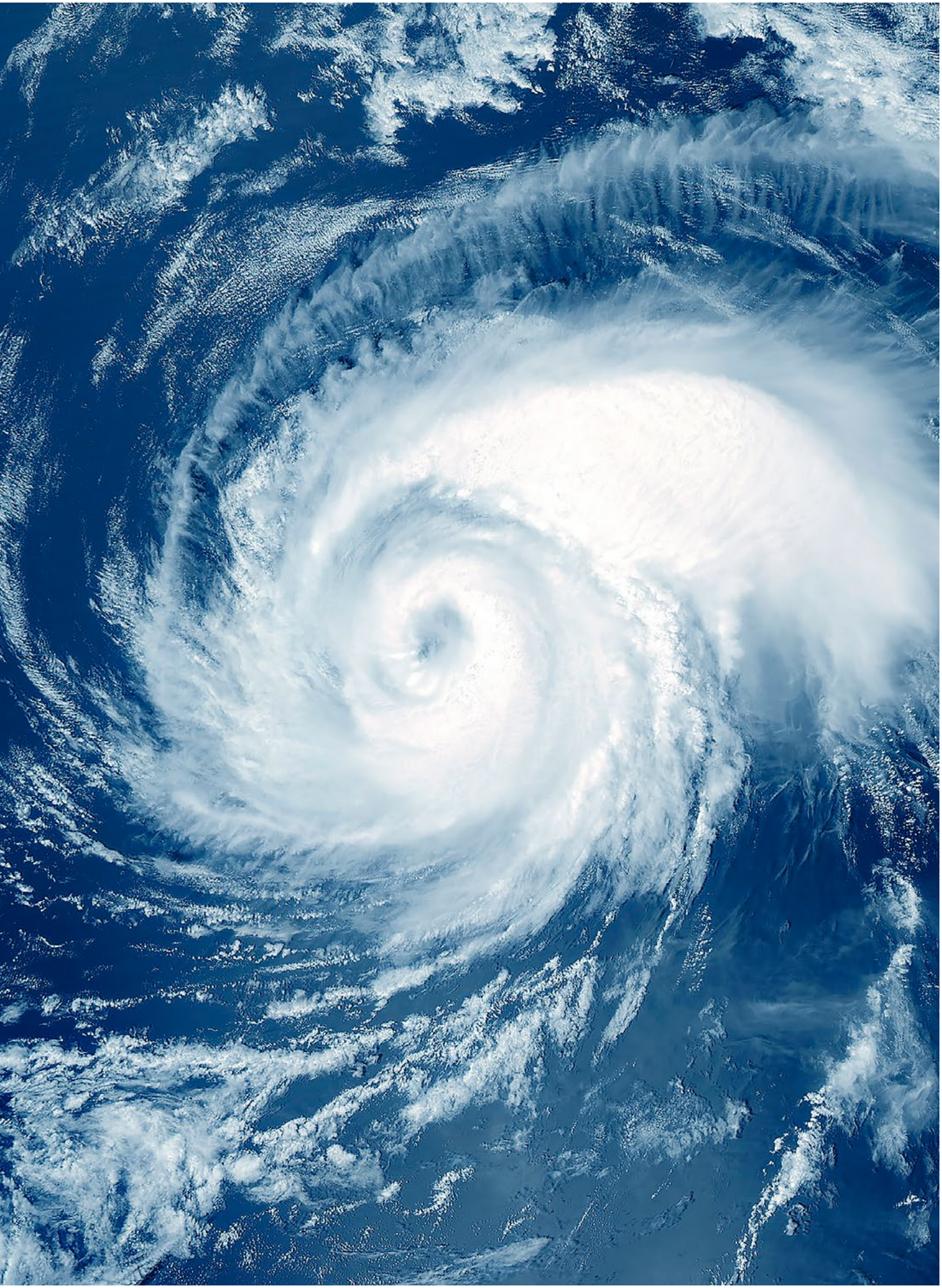
accenture

Operations. Insights
Edition 13 | 2022

Green Ops

Face the inevitable challenge for supply chain & operations

Accenture Strategy & Consulting



Contents

Editorial

Welcome to Edition 13 of Operations.Insights, where operations management meets insights.

"Our house is on fire. I am here to say, our house is on fire." So warned climate activist Greta Thunberg at the 2019 World Economic Forum. The following year, she again addressed the forum, stating, "Our house is still on fire."

Today, the effects of climate change are undeniable. They can be seen and felt worldwide: dry rivers and lakes, floods, wildfires and withered corn fields are only some examples. We must face the facts. Our current business and our actions affect global warming and if we don't act quickly, we will all suffer the consequences. There is only one way out: We have to adapt and meet the challenges, and that includes taking a fresh approach to our supply chains and operations. Consider that our supply chain operations cause the emissions that accelerate climate change and suffer from the resulting scarcities and other social and economic impacts. We can and must act now to turn this equation around and create a win-win situation. That's why this edition of Operations.Insights focuses on Green Ops. We share our thinking and provide some ideas and approaches for managers to transform their supply chain and operations into sustainable practices.

We begin by explaining how to set a course to head in the right direction: The three Rs – relevant, resilient, responsible – are the new guiding stars for our journey.

Next, we dig into "the dirty rest," sharing our view on why and how to address scope 3 emissions.

We follow with two perspectives on one of the most promising business models: the circular economy. The first article explores how cost and sustainability advantages can be achieved within the service and repair area. Second, we show the advantages of a circular product strategy focused on higher product utilization.

We continue our journey by examining how digital twins can be leveraged to achieve a company's sustainability goals.

Since our consumer behavior is one driver of emissions, we provide a perspective on retail, analyzing whether online or offline shopping is better, and how the retail industry can react.

We conclude the edition by showing how most companies can begin to make an impact now by leveraging their existing capabilities for business process management.

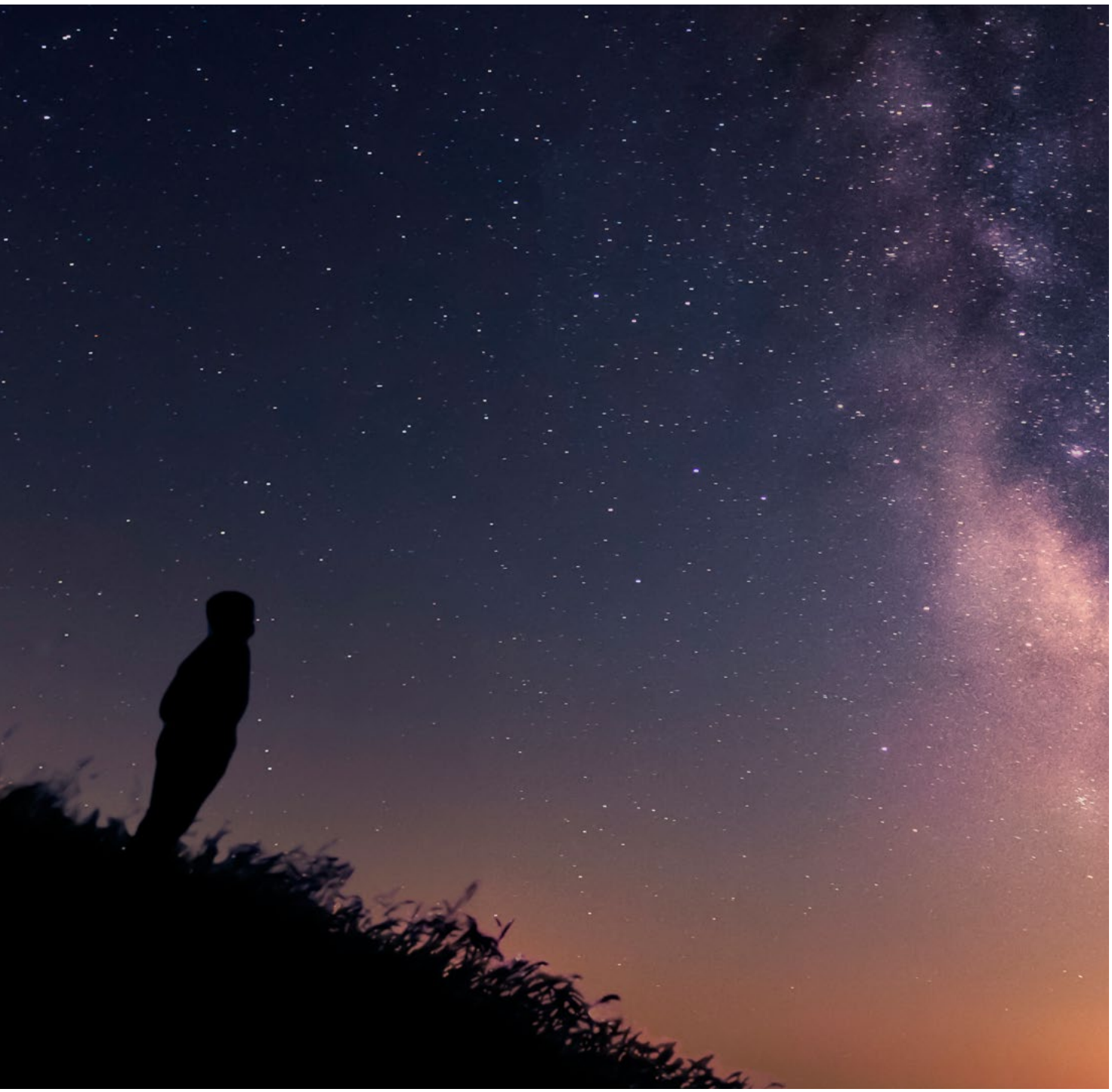
I wish you an insightful read. As always, we look forward to getting your feedback and discussing the challenges you face within the domains of supply chain and operations.

Best regards,

Michael A. Meyer

Relevant, resilient, responsible

How to navigate with the supply chain compass



For centuries, explorers relied on the North Star to navigate through unchartered territories. Then, the compass was invented, enabling the discovery of new countries and trade with other cultures.

For a long time, businesses have used their own versions of the North Star to define their mission, steer their supply chain and find a direction that is in line with their customers' values. Now, a constellation of stars, known as the three Rs (relevant, resilient, responsible), is proving to be a far more effective guide.

This comes at a time when businesses have been having difficulty navigating unpredictable events, including the Ukraine crisis, regulatory changes, natural disasters, energy crisis, cyberattacks and COVID-19. These events revealed just how vulnerable supply chains are to disruptions, which have resulted in stock outages, constrained capacities, material shortages, missing containers, unpredictable delivery times and the dreaded bullwhip effect causing havoc along supply chains.

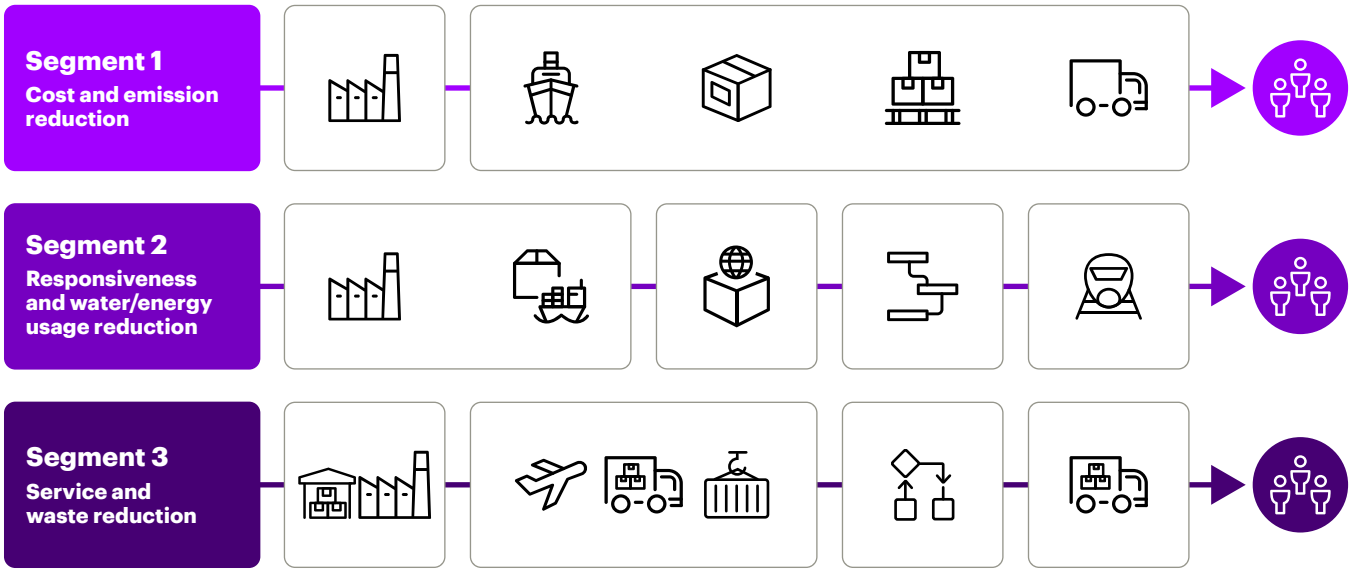
Supply chain problems stemming just from the pandemic sent shockwaves through businesses worldwide, with 94 percent of Fortune 1000 companies saying they experienced disruptions, 75 percent of supply chain executives expressing concerns about supply chain resilience and 45 percent of those executives worried about meeting increased customer expectations.[1] This has put the supply chain and its lack of resilience at the top of the agenda for CEOs worldwide.

The three Rs

The three Rs, created to master the challenges of the supply chain and transform it into an intelligent supply network, embodies three key attributes: relevant to customers and employees; resilient against short- and mid-term operational disruptions; and responsible toward the environment and employees along the value chain.

The three Rs, supported by digital technologies, transform supply chains, enabling them to provide personalized experiences and follow demand shifts in a more resilient way. It can unlock profitability and position companies for growth by allocating scarce resources from a zero-base to where growth is going to originate.

Figure 1: Segmentation is the way to tailor different parts of the supply chain to reach both traditional and sustainable objectives



Relevant: giving customers what they want, when they want it

Supply chains exist first and foremost to create value for customers, but as the past few years have shown, value is not a fixed proposition. Customers' needs and wants change with the times, so to remain relevant a supply chain must have the flexibility and agility to respond to changes in demand and personalization cost-effectively. A segmentation strategy, which tailors the supply chain so it meets the needs and expectations of different customers, is a proven route to success (see Figure 1). Some customers, for example, may value delivery time above all else, while others may put more emphasis on the sustainability credentials of the products they buy.

The shift toward environmentally friendly products is a prime example of changing customer values. Between 2015 and 2019, the market for sustainable products grew 7.1 times faster than conventional products.[2] This trend will continue as customers believe that "it is important that climate change is prioritized in the economic recovery after coronavirus."[3]

Resilient: seeing where the risks lie

Visibility is key to a resilient supply chain. Knowing in advance where there are potential risks and weaknesses enables companies to prepare for, mitigate and respond to disruptions (see Figure 2). A resilient supply chain must consider short-, medium- and long-term factors. In the short term, this involves gauging the strengths and weaknesses of the supply network.

Accenture partnered with the Massachusetts Institute of Technology to develop a supply chain resilience stress test, which creates a digital twin that can simulate a crisis. It provides a baseline to assess current strengths and weaknesses. The stress test can show where operations will perform well and where there are weak spots. The stress test can also show how a network would respond to a wide range of conditions. Based on the assessment, supply chain leaders can build a resilient framework that defines the organizational capabilities, governance, operating model, and talent that will be needed to create a more robust and resilient supply chain. The framework provides the means to define, measure, manage and develop resiliency over time.

The longer-term vision for resilience involves building a data-driven operating model that connects intelligent technologies, talent, data and analytics. The intelligent operating model provides supply chain leaders with real-time, actionable insights to better predict and respond to the impacts of any disruption. Embedding environmental, social and governance (ESG) considerations across every part of the supply chain is also an essential part of the long-term resilience strategy.

Figure 2: Resilient supply chains go beyond traditional risk management

	Business challenge	Business solution
Operational risk	How can I quickly respond to a sudden change in my supply?	• Risk identification solutions • Visibility and control tower solutions
Tactical risk	How can my supply chain adapt to evolving view(s) of demand / supply plans?	• Scenario planning & modeling as part of S&OP cycle • Risk vs opportunity analysis as part of S&OP
Strategic risk	How can I create flexibility and redundancy across my supply chain to mitigate business risk?	• Footprint / network modeling and simulation • Strategic buffer sizing • Multi-sourcing options
Supply chain resilience	How is my supply chain able to absorb and recover from shock? What are the potential "points of failure?	• Resilience stress test

Responsible: embedding sustainability into the supply chain

Responsible and sustainable go hand in hand. Supply chain sustainability addresses circularity, carbon emissions and human rights issues across the entire value chain. Creating a responsible supply chain is good for the environment and protects the rights of workers along the value chain. It is what customers and investors demand, so it is good for business.[4] Moreover, with 60 percent of global emissions generated by supply chains,[5] it is essential to meet regulations imposed by countries and regions that are working to fulfill their obligations to United Nations' 2030 Agenda for Sustainable Development.[6] These factors have made responsibility a top priority for CEOs globally.

The role of digital technologies

Modern digital technologies are essential to transform supply chains into intelligent networks. To build resilience, reliability and responsibility into operations:

1. **Create a digital twin of your supply chain:** It is essential to understand the network structure and build a digital twin of the supply chain. Then, think of appropriate disruption scenarios and mitigating alternatives.

2. **Run pre-defined scenarios:** Apply the stress test to each disruption scenario and related mitigating alternatives. Calculate the time-to-survive (TTS) for each scenario with and without mitigating alternatives. Then, calculate the resilience score and the impacts of each scenario leveraging TTS and time-to-recover (TTR).

3. **Analyze the outcomes:** The analysis will identify hidden risks and failure points, and it will reveal the nodes that are sensitive to disruptions. The final step is to prioritize improvement areas by balancing the operational versus financial impacts (revenue loss, earnings before interest and taxes [EBIT] and cashflow impact).

As digital technologies mature, they will increase visibility and other capabilities across the supply chain. They will become more effective at monitoring customer needs, segmenting the supply chain based on artificial intelligences and machine learning algorithms, and creating intelligence that allows businesses to weigh decisions against more than one variable. This means they will be able to evaluate how a decision will affect resilience, relevance and responsibility all at once.

Companies that want to avoid past problems must look at the supply chain in a new way. The three R constellation, supported by advanced digital technologies, takes the guesswork out of navigating toward a relevant, resilient and responsible future.

References

[1] Accenture n/d, Supply chain disruption

[2] NYU Stern 2020, Sustainable Market Share Index

[3] BBC 2021, Has coronavirus made us more ethical consumers?

[4] Forbes 2021, Supply Chain Predictions Parts 3: The Demand for Sustainable Supply Chains and Enabling Technologies

[5] Accenture 2022, How sustainable supply chains can unlock net zero emissions

[6] European Commission press release (2022). Just and sustainable economy: Commission lays down rules for companies to respect human rights and environment in global value chains

Key contact

Thomas Mrozek
Managing Director
Supply Chain & Operations
thomas.mrozek@accenture.com

Author

Thomas Mrozek

Interested in more?

Click **here** or follow the QR code for further insights.

The dirty rest

Carbon emissions in the value chain

Most companies have taken action to reduce carbon emissions within their own operations (scope 1 and 2). Companies now need to step up value chain (scope 3) reductions, which are critical to meet climate commitments.

"Net-zero" and "climate-neutral" are probably the most used buzzwords in the context of climate change these days. To ensure these terms are more than just buzzwords — and to support the Paris Agreement — many companies have adopted Greenhouse Gas Protocol standards and science-based emission reduction targets.

The greenhouse gas (GHG) emissions are divided into three scopes: Scope 1 are direct emissions that occur from sources owned or controlled by a company; scope 2 are indirect emissions associated with a company's use of electricity; and scope 3 are indirect emissions that impact a company's value chain (see the Fact box and Figure 1). To date, more than 3,000 companies are working with the Science-Based Target initiative (SBTi), representing more than a third of the global economy's market capitalization.[1] Of these, nearly 1,500 companies have already approved emission reduction targets.

While many companies have reduction roadmaps for their scope 1 and 2 emissions in place or are currently developing them, most emissions occur outside a company's operations. These scope 3 indirect emissions are, on average, 11.4 times higher than direct operational emissions.[2] If companies want to deliver on the Paris Agreement, they must address scope 3 emissions comprehensively and quickly.

Fact box

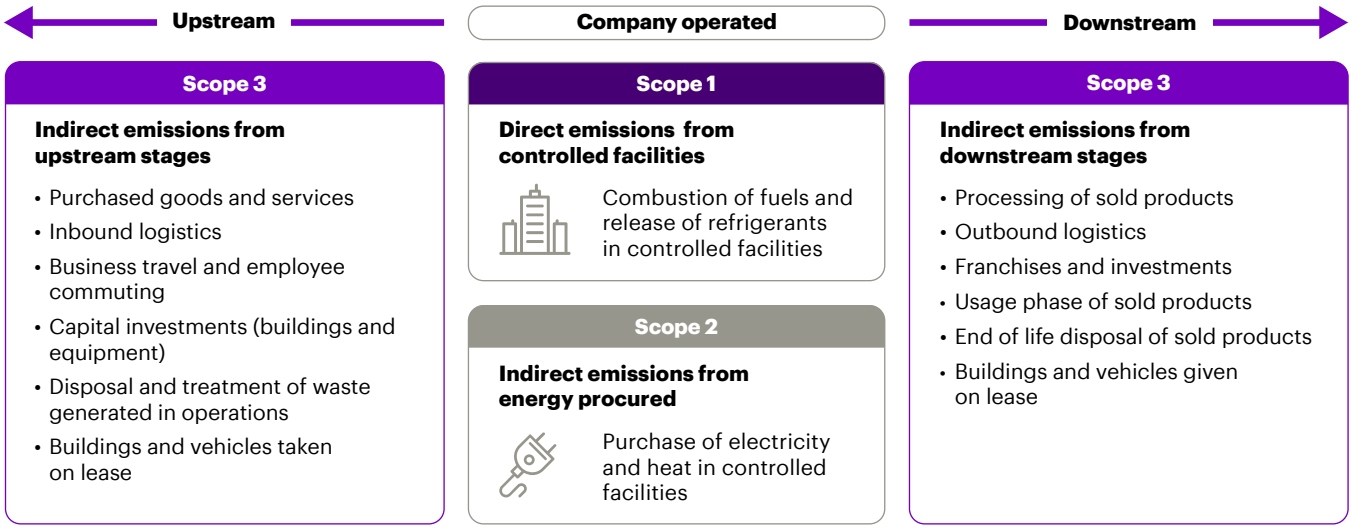
Scopes of emissions

Following the Greenhouse Gas Protocol emissions are typically split into three scopes:

- **Scope 1:** Direct emissions from owned or controlled sources
- **Scope 2:** Indirect emissions from usage of electricity, steam, heat and/or cooling purchased from third parties
- **Scope 3:** Indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions

Latest discussion has been also about introducing a fourth scope: emissions that can be avoided through a product or a service. However, avoided emissions are not considered when accounting for total emissions, under current disclosure standards and cannot be used to counterbalance occurring emissions to reach Net Zero.

Figure 1: Categorization of organization's CHG emissions in scope 1, 2 and 3



However, three major challenges hinder companies from addressing scope 3 reductions: responsibility, transparency and impact. Let's examine why companies face these challenges and how to overcome them.

Responsibility: Why should you care?

Some companies think there is little reason to address scope 3 emissions, because they occur outside their own operations and control. Moreover, every company should be working to reduce its own scope 1 and 2 emissions, which should eliminate the need to address scope 3 for everyone else. This might sound logical in theory. But in practice, not all companies have the same capacities when it comes to the investments and skills required to address and reduce scope 1 and 2 emissions. Therefore, industry leaders must support stakeholders across their global supply chains on carbon reduction. By addressing and acting beyond their own operations, industry leaders also become leaders regarding value chain emissions.

Today, increasing pressure from regulators, investors and customers makes it nearly unavoidable for companies to address scope 3 emissions and take on the responsibility. This responsibility should not be held by just one department, such as the sustainability department. It requires shared responsibility in working groups across functions and value chain partners, including product design, procurement, suppliers and marketing. This cross-functional approach requires investments, and carbon emission reductions are still largely seen as a cost factor. However, COOs can make the business case to their boards by quantifying return on investment along four major business value drivers: revenue increase, brand value increase, cost reduction and risk reduction (see Figure 2).

After agreeing that companies should take responsibility, the next step is to baseline emissions, also outside their own operations, and to identify emission hotspots. However, this often comes with a second challenge: limited transparency.

Transparency: You can only manage what you measure

Compared to scope 1 and 2 emissions, which companies could – and often do – largely measure with primary data themselves, scope 3 emissions rely on proxies and/or measurements by value chain players.[3] The complexity of value chains due to their global stretch makes it very difficult for companies to identify, assess and prioritize scope 3 emission sources. Accenture and the United

Figure 2: Business value driver description

Sustainability initiatives can generate tangible and intangible business value in 4 different ways

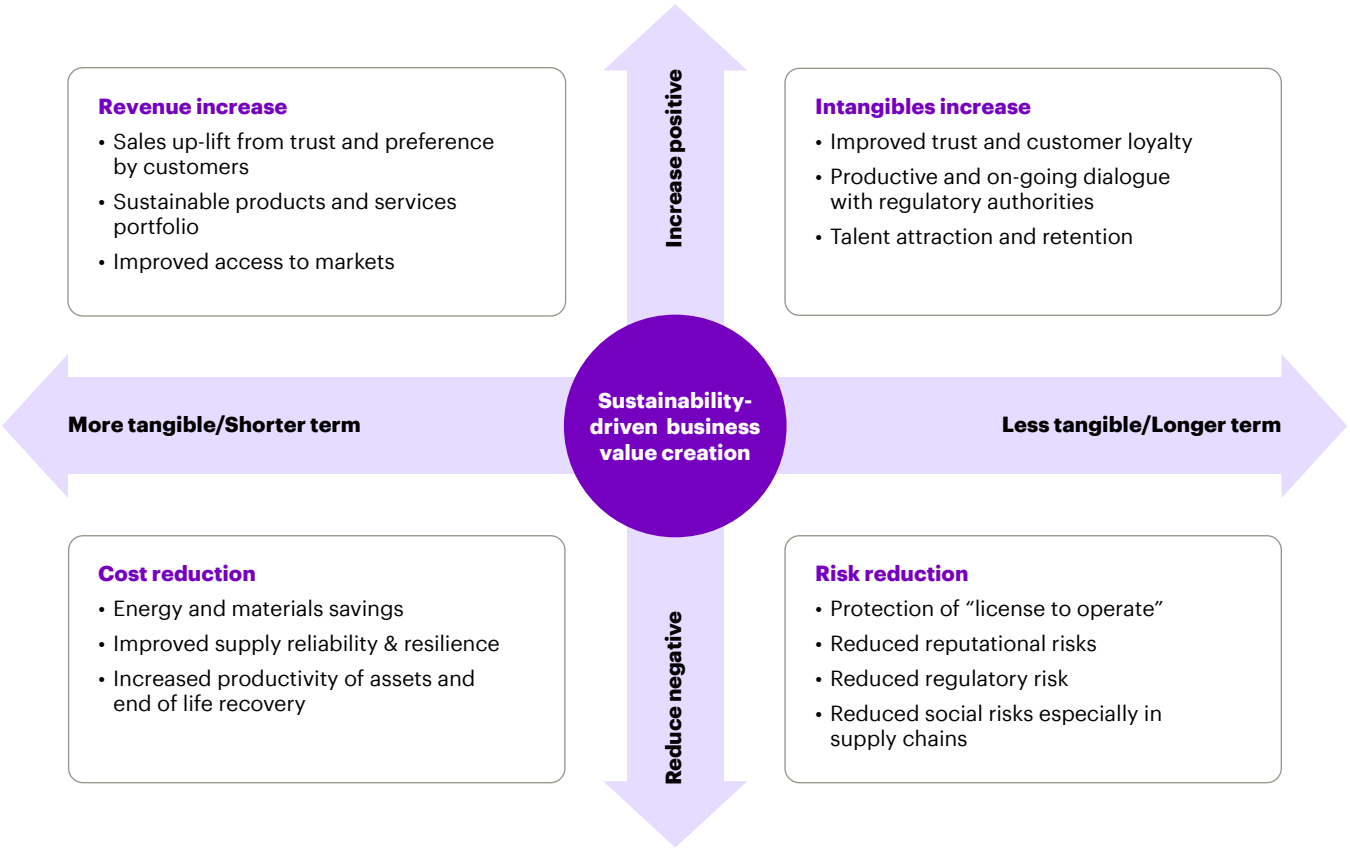
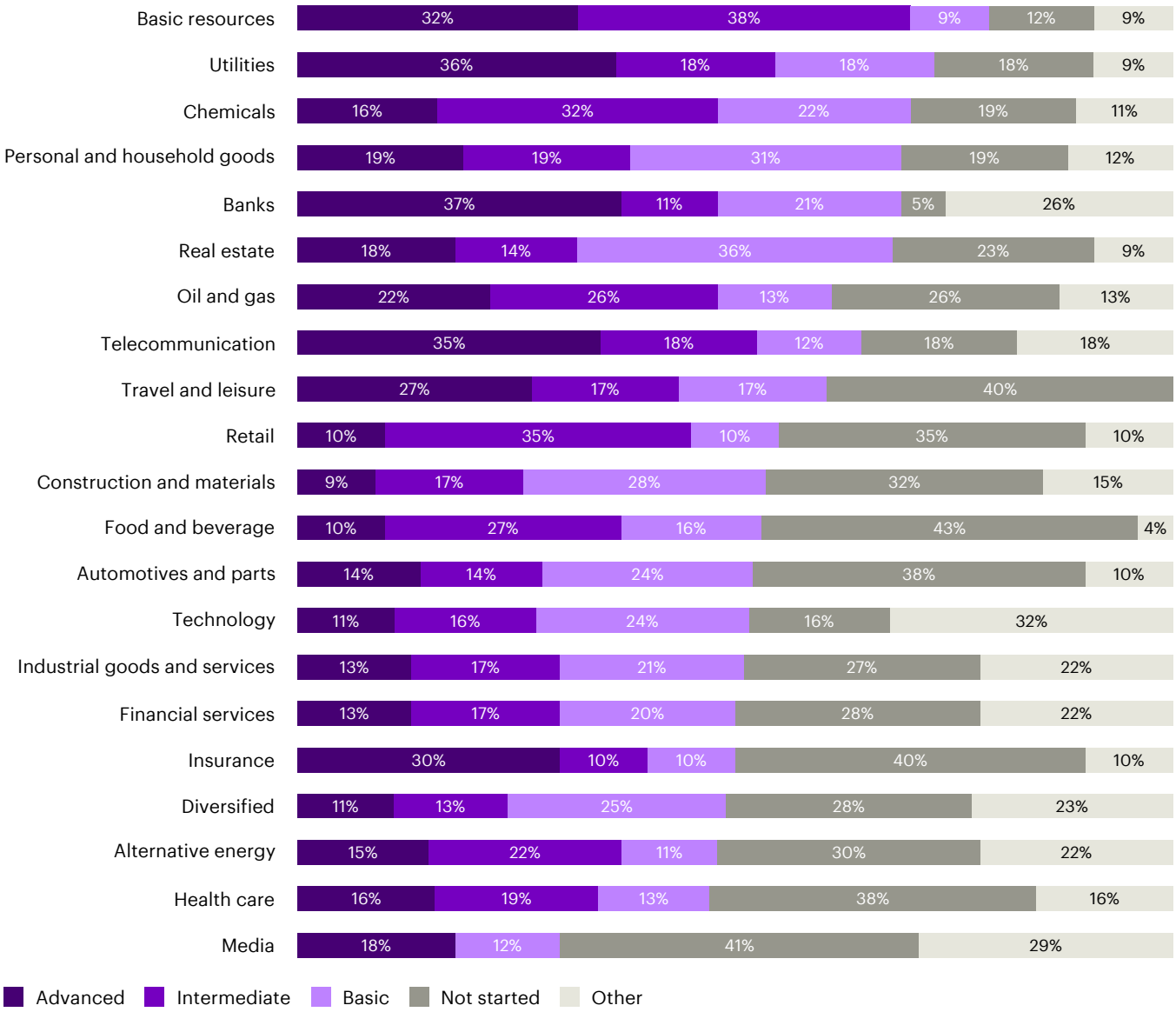


Figure 3: Business maturity on measuring and reporting scope 3 GHG emissions, by industry



Note: figures may not sum up to 100% due to rounding

Nations Global Compact (UNGC) asked more than 1,200 CEOs worldwide how mature their companies are when it comes to measuring and reporting scope 3 emissions. On average, only roughly 20 percent of CEOs believe their companies are advanced in this field. For a detailed overview of the maturity level by industry, see Figure 3.

To overcome the immaturity in scope 3 transparency, carbon accounting following internal standards (GHG Protocol) and Lifecycle-Assessments (LCA) are essential. The resulting initial estimates on product carbon footprints and company emission profiles are then used to identify largest emission sources and set priorities. Even though this sounds very straightforward, the reliability and lack of data can make it challenging.

One recent example on how to overcome these challenges shows Accenture's work with Salesforce to enable Mastercard to address scope 3 emissions. The solution uses Salesforce Sustainability Cloud, a platform that provides robust capabilities to track, analyze and act on supplier-level carbon emissions data. With the cloud, Mastercard built a comprehensive overview of the carbon footprint in its supply chain, enabling the company to achieve its SBTs. SAP and Microsoft offer similar solutions in this field.[4]

Improving transparency through data quality and measuring scope 3 emissions as comprehensively as possible is a key enabler. However, it is even more important to identify reduction levers and take action to reduce a company's scope 3 emissions. This comes with a third challenge: limited impact.

Impact: Engage your suppliers and ecosystem

As mentioned above, companies are already performing well when it comes to emission reduction in scope 1 and 2. For scope 3 emissions, the entire value chain must be tackled, which comes with a twofold challenge. First, existing suppliers may lack financial and human resources – or the mindset and prioritized carbon agenda – to address their own emission reductions. Second, switching suppliers is often not an option if other possible suppliers are not addressing carbon emissions. Therefore, to reduce scope 3 emissions, it is important to truly engage with value chain partners along this journey.

The impact on scope 3 emissions often ends where a company's expertise and vision along the value chain ends. From our experience, most companies identify carbon reduction levers that add up to 10 to 30 percent of their total carbon baseline across scopes 1 to 3. Some companies may excel and find up to 40 percent. This already includes external effects, such as an energy mix shift to more renewable sources within the countries they operate.

Most of these identified reduction levers address scope 1 and 2, including operational efficiency measures and specific product demands. With scope 3, companies often have limited reduction initiative expertise up and down their value chains as it is not part of their day-to-day business and requires specialization. And even if companies had full sight, a major share of emission reductions must come from scaling innovations that are not or only partly known today. Therefore, the reduction levers accounting for the remaining 60 to 90 percent of emissions can only be resolved in a reasonable time horizon by bringing together value chain actors and ecosystem players for systematic joint-innovation platforms.

The collaboration between companies and their value chain partners should be versatile and vary within industries. It could include collaboration with R&D and product design labs, co-investment in asset-heavy low-carbon technologies, and joint funding of start-up incubators. Consider one recent example from the pharma industry: 10 leading pharma companies have partnered in the "Energizer" program to engage with their suppliers on the implementation of renewable energy and the purchase of Power Purchasing Agreements (PPAs).[5,6] By directly addressing the suppliers' scope 2 emissions, this has a positive impact on the pharma companies' scope 3 emissions.

Climate represents one of the biggest challenges the global economy has ever faced and can only be addressed successfully if actors work together. Leading companies must overcome the challenges discussed above to meet the Paris 1.5 degrees Celsius target and to keep their license to operate. It is also essential for us to continue thriving in our economies and societies as we progress.

References

[1] The SBTi is a partnership between CDP, the United Nations Global Compact, World Resources Institute (WRI) and the World Wide Fund for Nature (WWF). The initiative was established in 2015 to help companies to set emission reduction targets in line with climate science and Paris Agreement goals.

SBTi 2022, Scaling Urgent Corporate Climate Action Worldwide – SBTi Annual Progress Report 2021

[2] CDP 2022, 4 steps for reducing Scope three emissions and accelerating action through your supply chain

[3] Sustainability Leaders 2021, The challenge of reducing scope three emissions and how companies are addressing it

[4] Accenture 2021, CLIMATE LEADERSHIP IN THE ELEVENTH HOUR – The 2021 United Nations Global Compact–Accenture CEO Study on Sustainability

[5] Power Purchasing Agreements is a long-term contract under which a business agrees to purchase electricity directly from a renewable energy generator

GlobeNewswire 2021, 10 Global Pharmaceutical Companies Launch First-of-its-Kind Supplier Program to Advance Climate Action

[6] The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard

Key contact

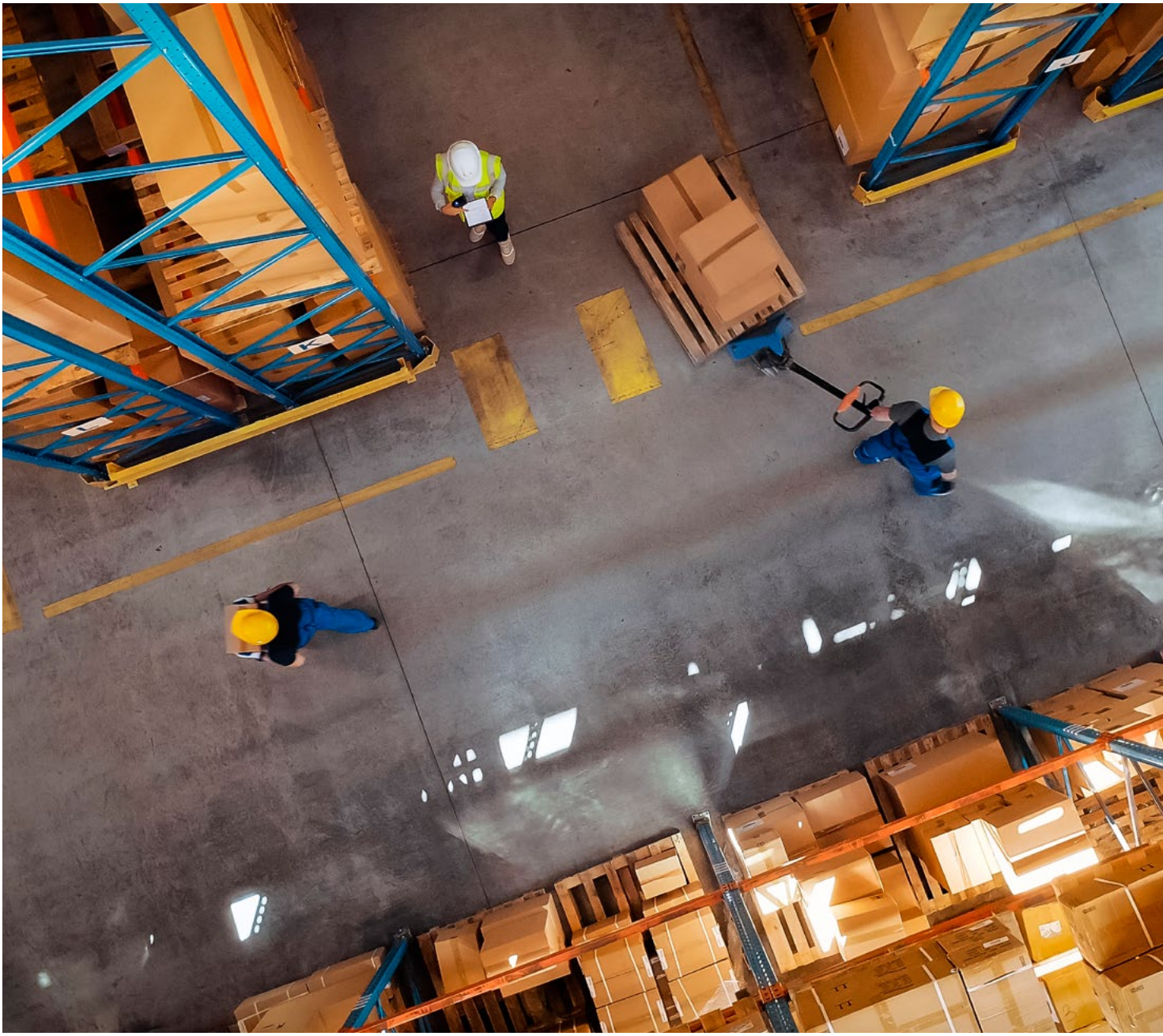
Alexander Holst
Managing Director
Sustainability Strategy & Services
alexander.holst@accenture.com

Authors

Eike Haas, Julia Janka, Alexander Holst

Interested in more?

Click **here** or follow the QR code for further insights.



The reduction levers accounting for the remaining 60 to 90 percent of emissions can only be resolved in a reasonable time horizon by bringing together value chain actors and ecosystem players for systematic joint-innovation platforms

From waste to value

How to save cost and enhance sustainability in service

Companies that adopt a circular economy approach, designed to reduce waste, can improve their maintenance and repair operations. They will also meet sustainability demands from stakeholders and realize significant cost savings.

As stakeholders continue to pressure companies to act on environmental, social and governance topics, firms must adjust their processes and operate more sustainably.[1] As a result, the circular economy (CE) framework is gaining relevance as a solution to tackle these challenges.[2] CE aims to transform value chains by reducing waste and creating restorative systems,[1] eliminating the "take-make-dispose"[2] mentality. CE also embraces product use extension through design considerations, repairs, reconditioning, upgrades and resale for second use.[1] This approach reduces the environmental harm from the production of parts and end-products, including the respective resource use, and improves a company's sustainability goals and reputation.[1]

When applied to the area of maintenance and repair, the potential environmental benefits of the CE approach are huge. What's more, an economical value may be generated by applying CE: Service costs can be significantly reduced, another incentive for companies to begin thinking "green."

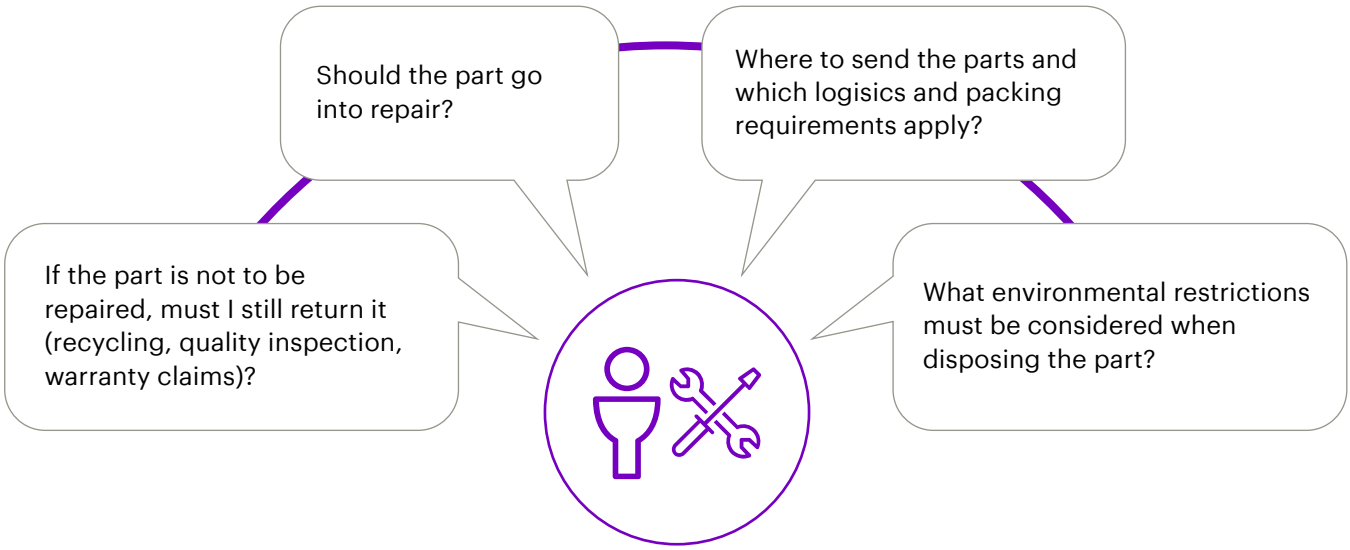
With these benefits in mind, we present a CE solution for maintenance and repair that addresses the handling of parts and materials that are left over once a repair or maintenance has been performed. These can be either defective parts that have been exchanged, new parts that were intended to be used or other operating materials such as oils and lubricants.

Technicians face challenges deciding how to handle leftover parts

Currently, most companies rely on technicians to make the right call on how to handle parts that are left over following repair or maintenance. These decisions may be challenging for technicians, especially since requirements change over time depending on the lifecycle of the respective part.

We have observed how our clients handle parts and found that several practices have a negative economical, ecological and regulatory impact (see Figure 2). The root cause for these five challenges mainly resides in the lack of knowledge. Technicians are only provided with general instructions on how to handle defective parts, such as "dispose at location" or "bring back to the warehouse". Often, there is no adequate solution for the respective part, undermining the possibility that a part can either be disposed and repaired properly or sent and tracked to the correct location.

Figure 1: Typical technician questions



The benefits of automated decision making

To identify the best possible solution for any individual part in real time, we have established a logic that can be embedded in the maintenance workflow. To apply this logic and provide proper guidance for technicians in real time, however, it is essential that standards and up-to-date master data on the handling of defective parts are defined ahead of time by the company. Here is how the logic system works.

A technician identifies the part that has been left over after a repair or maintenance and enters its condition into the field service management system as part of the repair reporting (see Figure 3).

Then, the systems checks whether the possibility of repair exists, taking into consideration factors such as the claimed condition of the part and its lifetime, and the current overall demand for the part including end-of-life considerations and regulatory constraints for repair. Next, the logic evaluates whether a repair would be economically reasonable and, if not, whether the part should still be repaired according to ecological targets. Take, for instance, a case within the steel industry. At first sight, the repair of parts might be more expensive than buying new parts. However, when adding the costs for CO_2 compensation for a new product, repair would still be the better option for economic and ecological reasons.

If a repair of the defective part is suggested based on all the criteria, the logic evaluates the best return-to location and the carrier for environment-safe and cost-efficient transport. In addition, packaging advice is provided to avoid further damaging the part. If the logic determines that disposing the part is the best option, the technician is informed on how and where to dispose of the part.

A technician's lack of knowledge is compensated by the infused knowledge of the logic. It solves the challenges that technicians are usually confronted with, as the proper recipients of parts (OEM warehouse, screening center, supplier, quality department, or recycler) are identified. Parts are packed correctly and traceable throughout their journey in the system including all required documentation such as discard notices. In addition, the residual value of exchanged service parts is utilized. The automated system speeds up the process and gives technicians more time to focus on core tasks.

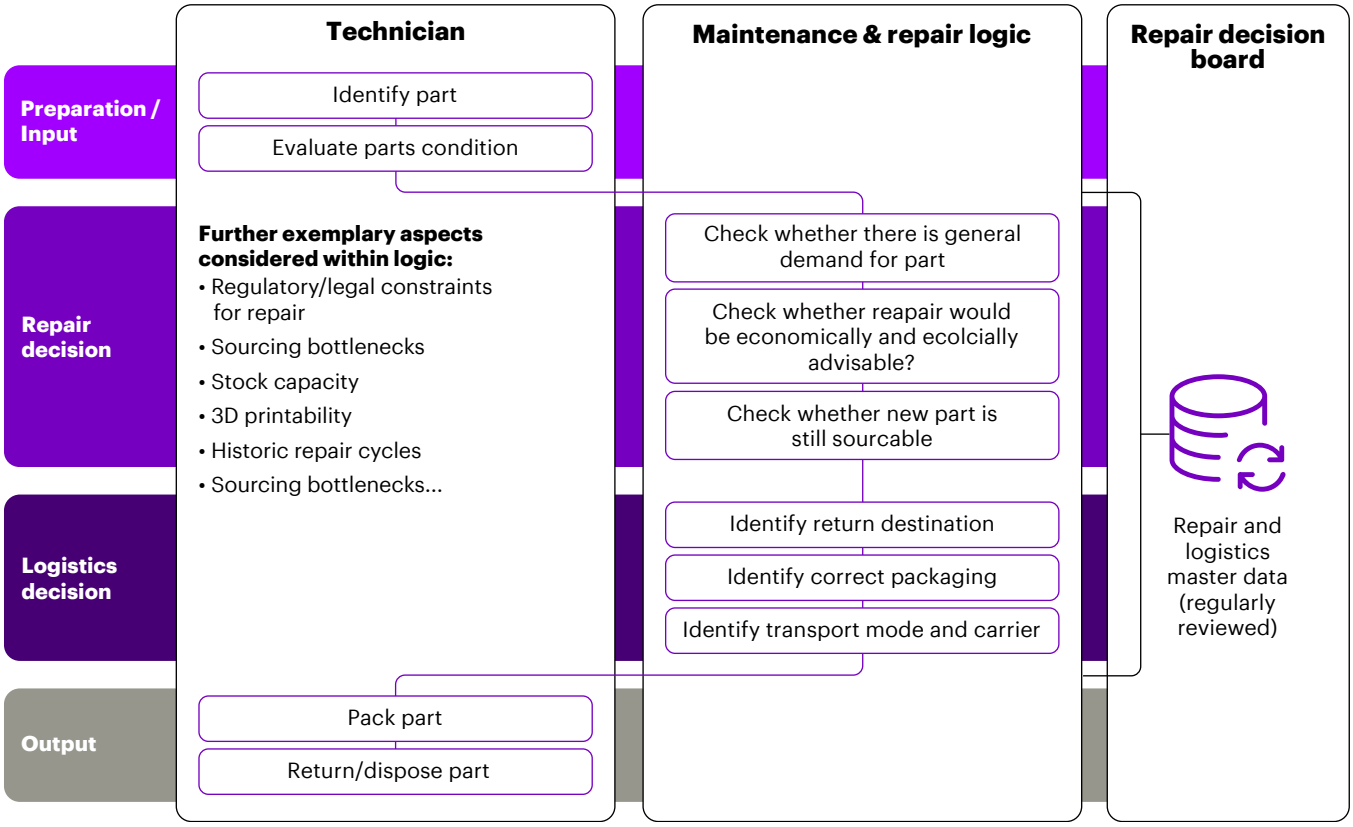
Value created through CE in maintenance and repair

This logic supports CE; parts that have the potential to be reused will gain a second life. Ecologically, the negative impact of producing a new replacement part is reduced. Within the automotive industry, for instance, feeding back modified and reconditioned components into the manufacturing process leads to 88 percent material savings with an associated decrease in emitted CO_2 of 53 percent and 56 percent lower required energy.[4] Moreover, Accenture identified an overall global opportunity worth USD 4.5 trillion that was up for grabs by redefining the concept of "waste" as a valuable resource.[5] With regard to maintenance and repair, a use case with a USD 30 billion high-tech customer has shown that cost savings of USD 55 million in five years can be realized by ensuring proper return compliance

Figure 2: Typical misconducts in maintenance and repair

	Potential impact		
Often observed misconducts	**Economical**	**Ecological**	**Regulatory**
1. Parts scrapped per default even though (technically and economically) repairable	Destruction of residual value	Increased environmental burden	
2. Parts inadequately disposed	Destruction of recycling value	Increased environmental burden	Penalties for non-compliance
3. Parts utilize inefficient return logistics	Increased transportation costs and longer lead times	Increased CO2 emissions	
4. Parts not adequately packed	Additional costs for new part and transportation	Additonal CO2 emissions for production and transport	
5. Parts traceability not ensured	Loss of residual value		Penalties for non-compliance

Figure 3: Simplified illustration of maintenance and repair logic



of defective, repairable components. Furthermore, extending the life of parts helps to reduce the hazards of supply chain sourcing bottlenecks. When parts cannot be newly ordered from suppliers in time due to bottlenecks, companies can use recycled parts. Further, the logic enables a company to track and trace return parts throughout their journey.

How to get started

As mentioned above, the logic is deeply dependent on an extensive set of up-to-date parts master data. Thus, the first step is to clearly define data governance and ensure that the relevant data are regularly reviewed and updated. Once standards on when, where and how to dispose and repair parts are clearly defined, the logic is ready to be embedded in a company's maintenance and repair system, and it can begin to generate great ecological and economical value.

References

[1] Accenture Research 2022

[2] V. Julianelli et al. 2020, Interplay between reverse logistics and circular economy: Critical success factors-based taxonomy and framework

[3] S. Harris, M. Martin and D. Diener 2021, Circularity for circularity's sake? Scoping review of assessment methods for environmental performance in the circular economy

[4] European Commission 2020, Remanufacturing Market Study

Key contact

Till Habel
Principal Director
Supply Chain & Operations
till.habel@accenture.com

Authors

Till Habel, Elena von dem Bongart

Interested in more?

Click **here** or follow the QR code for further insights.

Optimized product utilization

Consider circular economy strategies beyond lifecycle extension to improve your products' ecological footprint

Many companies with sustainability targets think about prolonging the duration of their products' life. But optimizing a product's utilization within its initial lifecycle is an interesting alternative.

The circular economy (CE) relies on a variety of strategies that are arranged along the value chain in the Accenture framework (see Figure 1).[1] The focus of this article is outlining the three CE strategies that aim to optimize the product use phase: product lifecycle extension (PLE), product as a service (PaaS) and shared platforms (SP). We will explain the interdependencies of these strategies and their potential to contribute to companies' sustainability efforts by optimizing product utilization.

Product lifecycle extension

PLE aims to make products last longer with, for instance, maintenance/repair offerings. From a business perspective, this decreases the demand for new products but also allows the company to charge a premium and creates opportunities for used product markets. From an environmental perspective, PLE has a positive impact because it decreases production volumes. Exceptions include products that are disposed independently of the actual product life span or condition because of safety regulations or habits. In such cases, the utilization rate may decrease because of PLE measurements. Refurbishment is typically considered to be a sub-strategy of PLE but deserves a deep dive because the mechanism for optimizing utilization varies.

Refurbishment

Refurbishment decreases signs of product use, making used products competitive with new(er) versions. Because of the high effort and costs associated, refurbishment is typically applied to exhibits, test objects and other cases with only minor signs of use. Promising candidates for refurbishment are products that raise safety concerns when purchased secondhand, such as outdoor gear, or quickly decrease in value, like smartphones and other electronics. Interesting facts about refurbishment in the telco industry are summarized in Figure 2.

Figure 1: Circular economy along the value chain

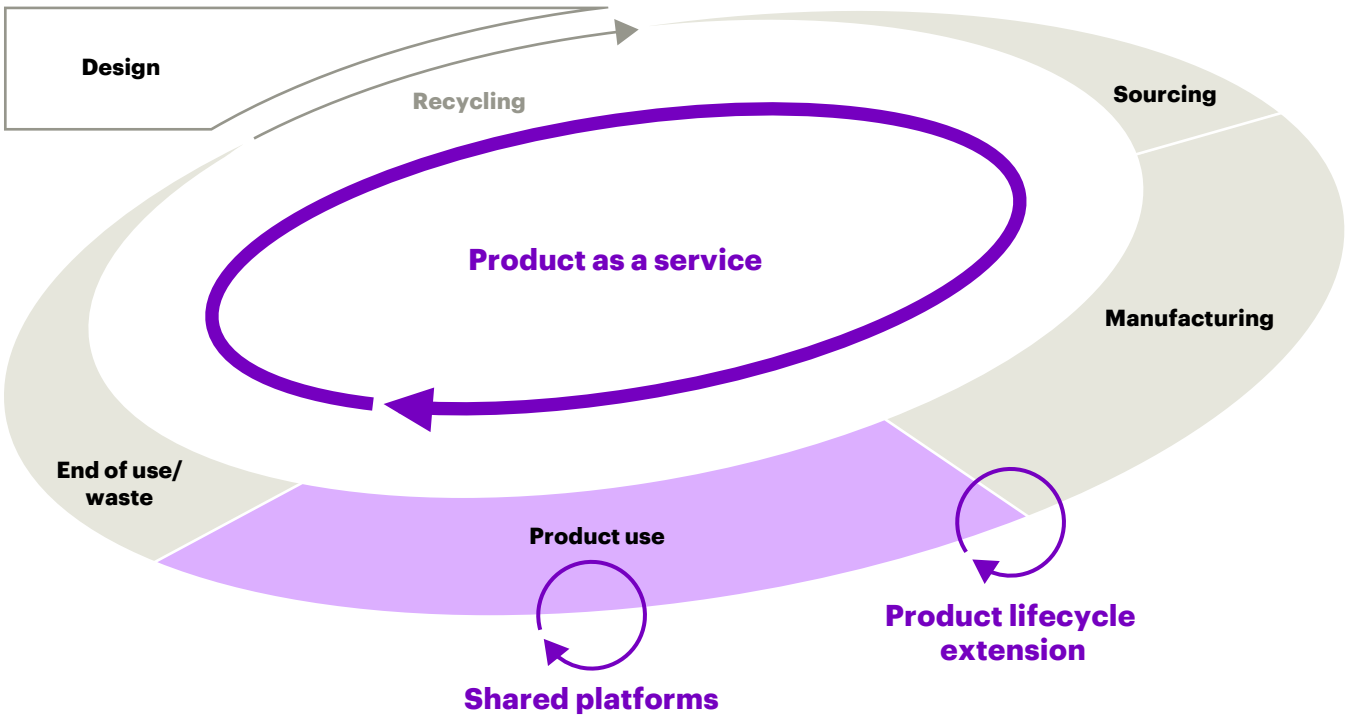
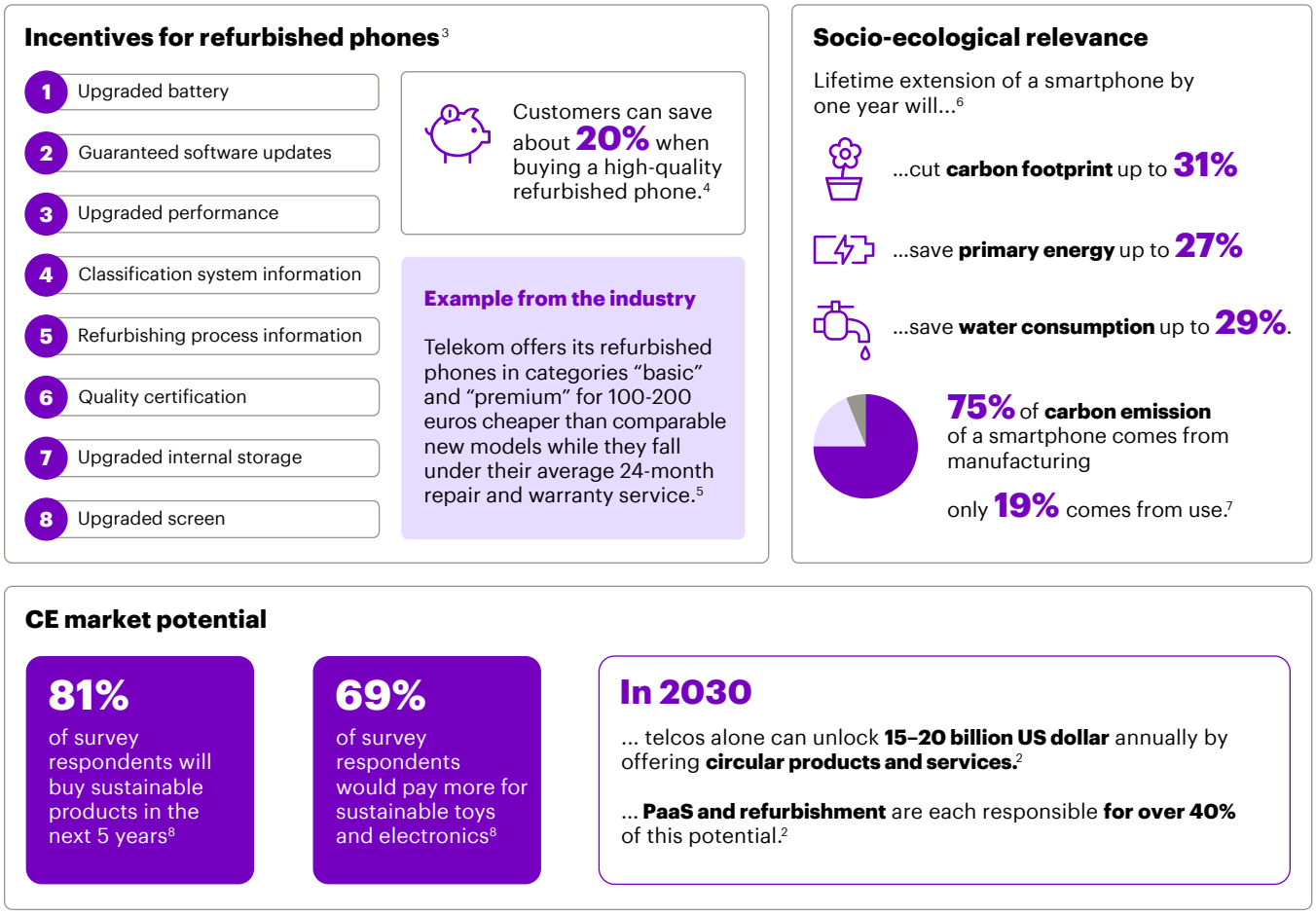


Figure 2: Telco deep-dive box



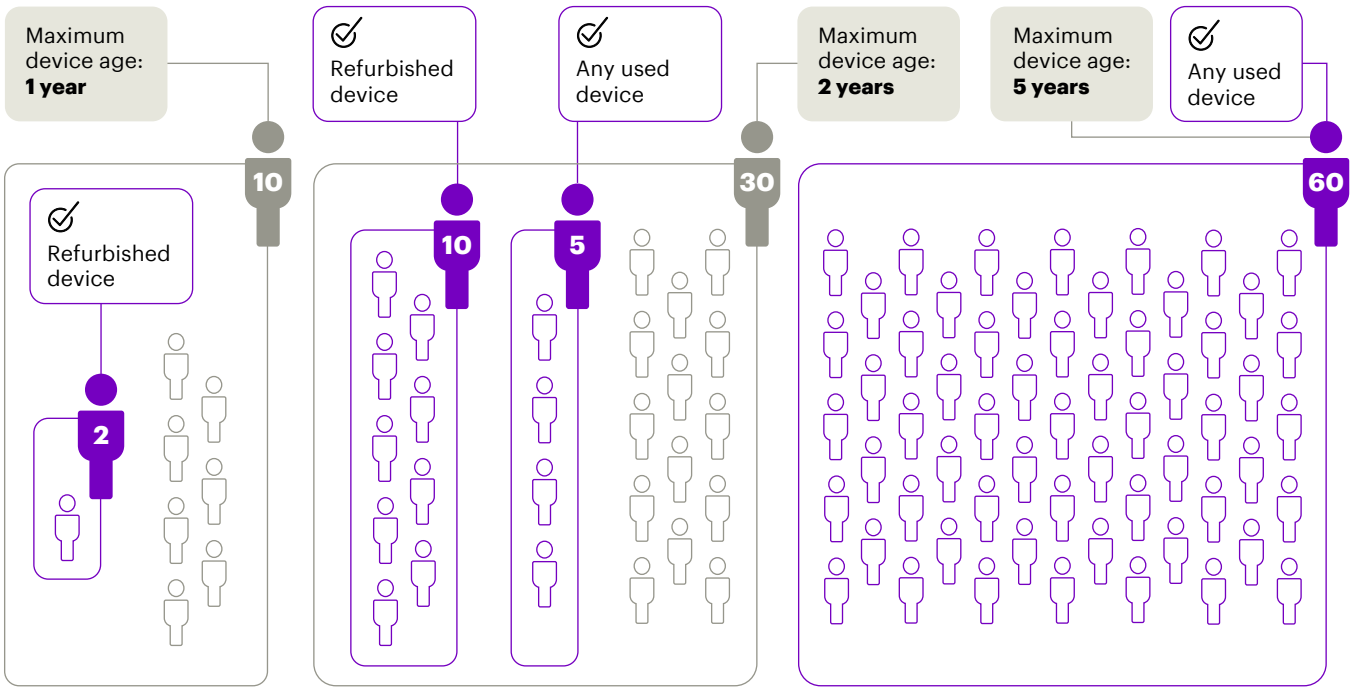
Refurbishment sometimes optimizes utilization of a product by prolonging its lifecycle. This is the case for the top incentives for buying a refurbished phone: battery upgrades, guaranteed upgrades and upgraded performance (see Figure 2). However, refurbishment may not lead to prolonged device duration if it only incorporates pure beautification, such as switching the screen and/or scratch removal. In cases refurbishment does not lead to PLE, one may wonder why there is nevertheless a positive sustainability effect. An example may help to explain how refurbishment can optimize utilization in a different way than other PLE sub-strategies. It will show that outweighing heterogenous consumer preferences may decrease the demand for brand new devices.

Exemplary refurbishment effect

Assume for simplicity that smartphones work for 5 years and 100 users whose preferences are displayed in Figure 3 are buying them. If the 100 users purchase new devices and trash them when they no longer match their preferences, then 370 new smartphones must be produced over a period of 10 years. The number of produced smartphones could be reduced by roughly 40 percent once a secondhand market is established. If enough refurbished smartphones were available, only 155 devices would have to be produced to meet the demand during the 10-year period.

An obvious bottleneck of this simple example is the availability of almost-new devices that consumers are willing to pass on to a second owner. In previous projects, we identified this to be a problem. A root cause is that many consumers keep their old smartphone. A survey found that 21 percent of consumers always keep their old device because they like to have a substitute available for emergencies, have data security concerns or simply consider the effort for disposal or sale too high.[8] Of the 64 percent respondents that discarded or sold a smartphone in at least one instance, only 17 percent returned their phone to the manufacturer or retailer. Flexible leasing options that remove barriers for customers to switch phones frequently according to their preferences are key to increasing the supply of almost-new devices because they allow consumers to upgrade smartphones on an annual or even more frequent basis.

Figure 3: Heterogenous consumer preferences



Product as a service

Leasing, besides rental and other pay-for-use arrangements, is a PaaS sub-strategy that optimizes product utilization in different ways. Within the framework of Figure 1, PaaS plays a central role as it is relevant to all phases of the value chain. The producer or reseller that retains product ownership remains in control and can, for instance, manage utilization preference, maintenance/repair measures and leverage scale effects.

PaaS transfers perceived risks from the customer to the producer or reseller and, as a result, more people are open to leasing a refurbished smartphone than to buying one. Indeed, the market for refurbished smartphone leasing is growing. With startups such as Everphone, MusicMagpie, Ooodles and Raylo, consumers can choose either a new or refurbished device and pay a monthly leasing fee based on the smartphone's retail price. After a set period, they can continue to lease the device for a cheaper monthly fee or upgrade to a new(er) model.[9] For example, Telekom, in collaboration with Samsung, offers its business customers second-life leasing options that, according to the company, saves approximately 50 kg of CO_2 emissions per device due to the extended lifetime of the devices.[10,11]

The mobility industry has been a forerunner for PaaS strategies. Flexible leasing options are a new trend: SIXT+[12] and Volkswagen's Auto Abo[13] allow customers to switch between a variety of car models at any time. This decreases the total number of vehicles and increases their utilization rate.

For instance, an urban family who prefers using an electric vehicle within the city but still wishes to be flexible for out-of-town trips might end up with two cars without such a flexible lease option. Similar flexible leasing options could be designed for other industries.

To sum up, PaaS optimizes utilization indirectly by supporting refurbishment and other PLE measures. It also has a direct positive sustainability effect when the utilization rate per product is increased.

Shared platforms

SP are enabled by new technologies and tools that let consumers share ownership, usage, and access to products. For instance, in all cities, a variety of shared cars, mopeds and scooters are available. Providers such as Moia can encourage people to use shared mobility platforms and refrain from car ownership. This would result in the number of produced vehicles going down while the utilization rate per vehicle goes up. However, unclear responsibilities for maintenance/repair and less careful treatment of other people's property may mitigate the positive affect. Airbnb provides a SP model in the housing industry, and there is potential for many other industries to adopt SP.

Figure 4: Optimization potential per strategy

	PLE	Refurbishment without PLE	PaaS	SP
Extended lifetime	↑	→	↗	↘
Decreased time product is unused	↘	↗	↗	↑
Decreased preference for new product	↗	↑	↗	↗

CE potential

The discussed CE (sub-)strategies that address the product use phase have synergy effects and optimize product utilization in different ways (see Figure 4).

CE strategies of the product use phase that do not prolong a product's lifecycle typically require more substantial changes to existing business models and are consequently chosen more often by startups than by established companies. However, given the increasing importance of CE, all companies should explore more options to optimize product utilization.[1] After all, only approximately 9 percent of the overall global economy is circular while it is predicted that within 10 years, CE will be the dominant business model.[14]

References

1 Accenture 2020, The Circular Economy Handbook

2 Accenture and Telia Company 2021, The shift – The role of telcos in the circular economy

3 Journal of Cleaner Production 2017, How to sell refurbished smartphones? An investigation of different customer groups and appropriate incentives.

4 Consumer Reports 2019, Should You Buy a Refurbished Phone?

5 Telekom 2022, ReUse MyMobile: Ressourcen erhalten und Geld sparen

6 Fraunhofer Institut für Zuverlässigkeit und Mikrointegration 2022, Life cycle assessment of the fairphone 4

7 Everphone GmbH 2022, Mobile Device Sustainability Report 2022

8 Bitcom 2020, Deutsche horten fast 200 Millionen Alt-Handys

9 YourMoney 2022, Could renting a smartphone save you money?

10 Telekom 2022, Green offers for business customers

11 Telekom 2021, Telekom und Samsung kooperieren für eine grünere Zukunft

12 SIXT 2022, Auto Abo von SIXT+

13 Volkswagen Financial Services 2022, Auto Abo: Flatrate abschließen

14 Circle Economy 2021, The Circularity Gap Report 2021

Key contact

Till Habel
Principal Director
Supply Chain & Operations
till.habel@accenture.com

Authors

Maria Kuper, Charlotte Pretz

Interested in more?

Click **here** or follow the QR code for further insights.

As the example shows, outweighing heterogenous consumer preferences may decrease the demand for brand new devices.

Green digital twins

How digital twins help companies achieve sustainability goals

Real-world use cases in several industries demonstrate how technology provides a proactive way to reduce the negative environmental impact of business production and consumer consumption.

Our planet is suffering from the negative environmental impact of our current models of production and consumption. We already feel the alarming effects across all our ecosystems. If we continue on this path, we increase the risk for irreversible environmental damage.

Acting now is not an option, it is a must. Companies must identify and embrace sustainability goals. The only question is whether companies are reactive and only implement changes to comply with relevant legislation or take a proactive approach and use the benefits of core technologies to accelerate their sustainability goals.

Digital twin technology provides untapped opportunities to reduce operational costs and proactively drive sustainable, circular, end-to-end disruption in value chains. Real-world use cases show the benefits of adopting a proactive approach now.

Digital twins can unlock more than 7.5 gigatons of CO_2 emissions through 2030 in construction and cities, consumer packaged goods, transportation and mobility, life sciences and high-tech industry.[1]

What is a digital twin?

A digital twin is a virtual representation of a physical asset, product, or process (see Figure 1). It integrates several data inputs and provides a bi-directional data linkage between the virtual world and the physical one. By connecting the physical and digital world, companies gain data-based insights about a physical object and its conditions. Digital twins can drive "then-what" and "what-if" questions that would be expensive, slow or impossible to investigate using the physical object. Data synchronization is crucial to the digital twin to display any changes in the state of the physical object.

The global digital twin market size was valued at USD 3.1 billion in 2020 and is projected to reach USD 48.2 billion by 2026.[1]

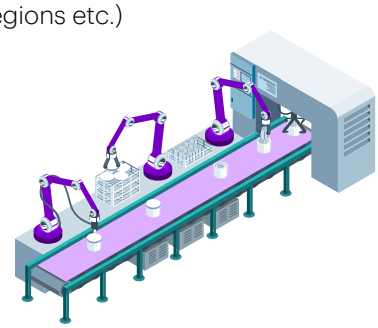
How digital twin drives sustainability

With a better understanding of the technology, let's be proactive and apply digital twins in the context of sustainability. It is a fact that the implementation of digital twins takes some time and requires a significant budget, training and change management. However, they can have a positive impact on your sustainability agenda.

Figure 1: Physical and process digital twin

Physical digital twins
Focus on individual assets, products, people etc.

Process digital twins
Focus on the relationships between and across multiple components (e.g. transactions across products, equipment, systems, business units, regions etc.)



Accenture typically focuses on three key elements to drive sustainability into value chains: being greenhouse gas neutral (net zero) and reaching a circular and trusted value chain. These elements are explained in Figure 2.

How can digital twin technology contribute to the implementation of our three sustainability elements? From a product lifecycle perspective, Figure 3 illustrates 10 theoretical digital twin use cases and three real-world implementations (discussed in the next section), showcasing tackled sustainability levers.

Figure 2: Key elements of sustainable value chains

Real-world digital twin implementation

Design example (Use case A)

Digital twin creates an "as-built 3D model," which enables unlimited sustainable innovation options and improves product standardization. A global computer manufacturer achieved its sustainability goals by decreasing its product's footprint through low-carbon product design. Their new computer has a 47 percent lower carbon footprint compared to the previous generation, and the computer's shell is made from 100 percent recycled materials.[1]

Simulation example (Use case B)

Digital twin simulates the asset or product across all stages of its lifecycle supporting what-if analytics. This improves decision making, productivity and efficiencies, and leads to cost cuts and fewer resources required per unit of output. A fast-moving consumer goods company optimized its manufacturing plant by reducing its production waste. The digital twin helped in the decision process to remove bottlenecks and assign the correct materials to the right orders, reducing waste by more than 42 percent.[1]

Operations example (Use case C)

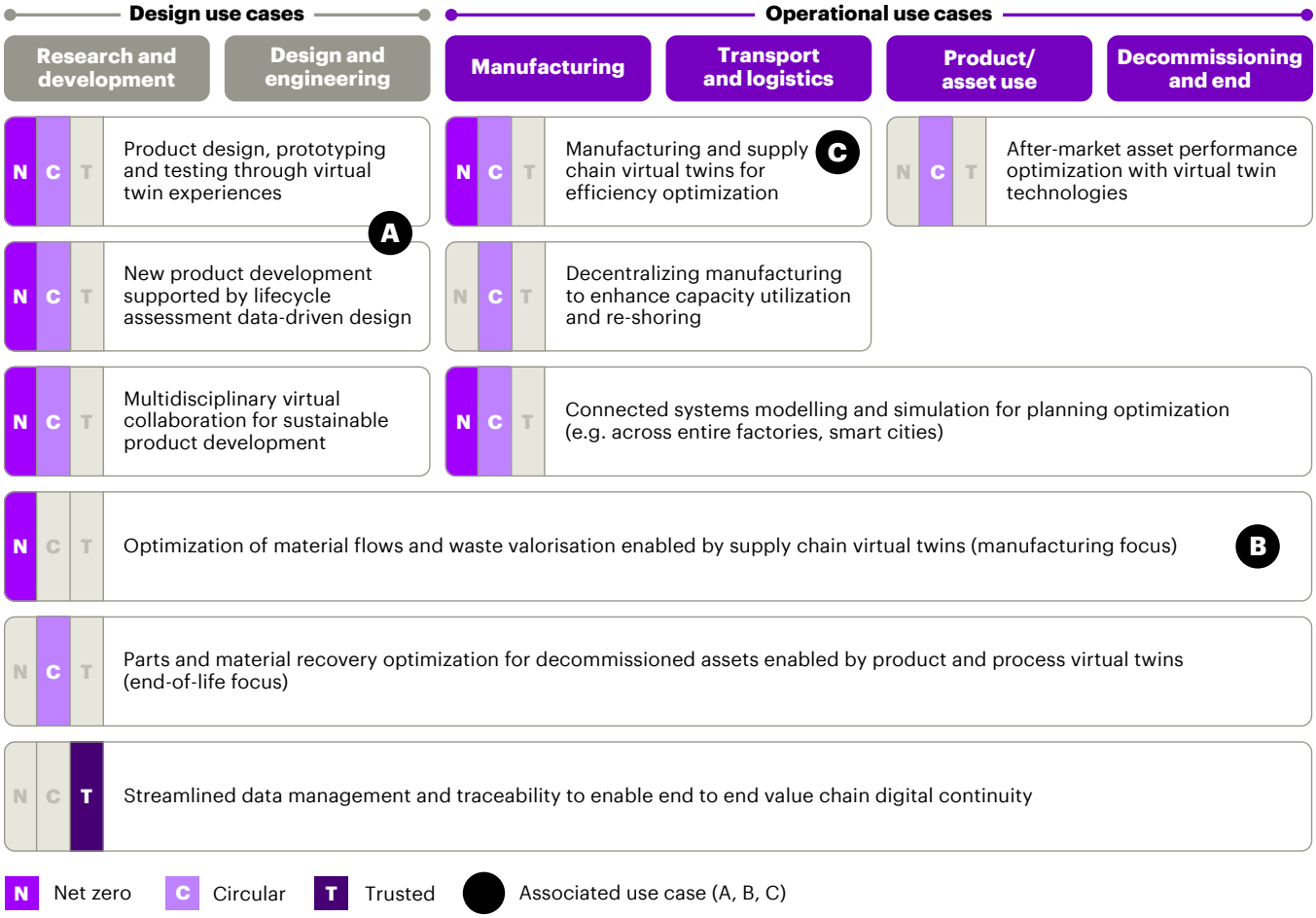
Digital twin provides transparency on real-time conditions, which enables predictive maintenance and optimizes asset utilization benchmarking and identification of optimal parameter deviations. A consumer goods company optimized its plant energy consumption. With interconnected sensors across 30-plus sites and more than 10 distribution centers, energy consumption for its production equipment were benchmarked against their peers and deviation from their optimal parameter could be tackled. The digital twin solution yielded a 38 percent energy consumption reduction.[4]

Key recommendations for success

The number and variety of use cases goes far beyond the examples mentioned above, and therefore, make digital twins a great lever in achieving your sustainability goals.

To gain the benefits of a digital twin quickly, a pragmatic approach is recommended: First, prioritize your use cases and align them with your company business priorities and sustainability goals. Second, do not re-invent the wheel but begin with a proof of concept leveraging existing digital twin solutions within your company or implementing a mature solution available in the market to speed up benefits. Scaling up will come naturally once the benefits of such a solution have been proven both on the sustainability and business value side.

Figure 3: Sustainable pillars tackled with digital twins during product lifecycle



Digital twins are uniquely positioned to help achieve sustainability goals. Transparency through real-time data about conditions of physical objects enables your company to make decisions that matter. Begin now to identify how digital twin technology will contribute to your journey of achieving a net zero, circular and trusted value chain.

References

1 Accenture & Dassault Systemes 2021, The critical role of virtual twins in accelerating sustainability

2 AspenTech 2022, Make Digital Twins an Integral Part of Your Sustainability Program

3 IEEE 2020, Digital Twin: Enabling Technologies, Challenges and Open Research

4 World Economic Forum 2020, Global Lighthouse Network: Insights from the Forefront of the Fourth Industrial Revolution

Key contact

Laurent Delsaux
Senior Manager
Supply Chain & Operations
l.delsaux@accenture.com

Authors

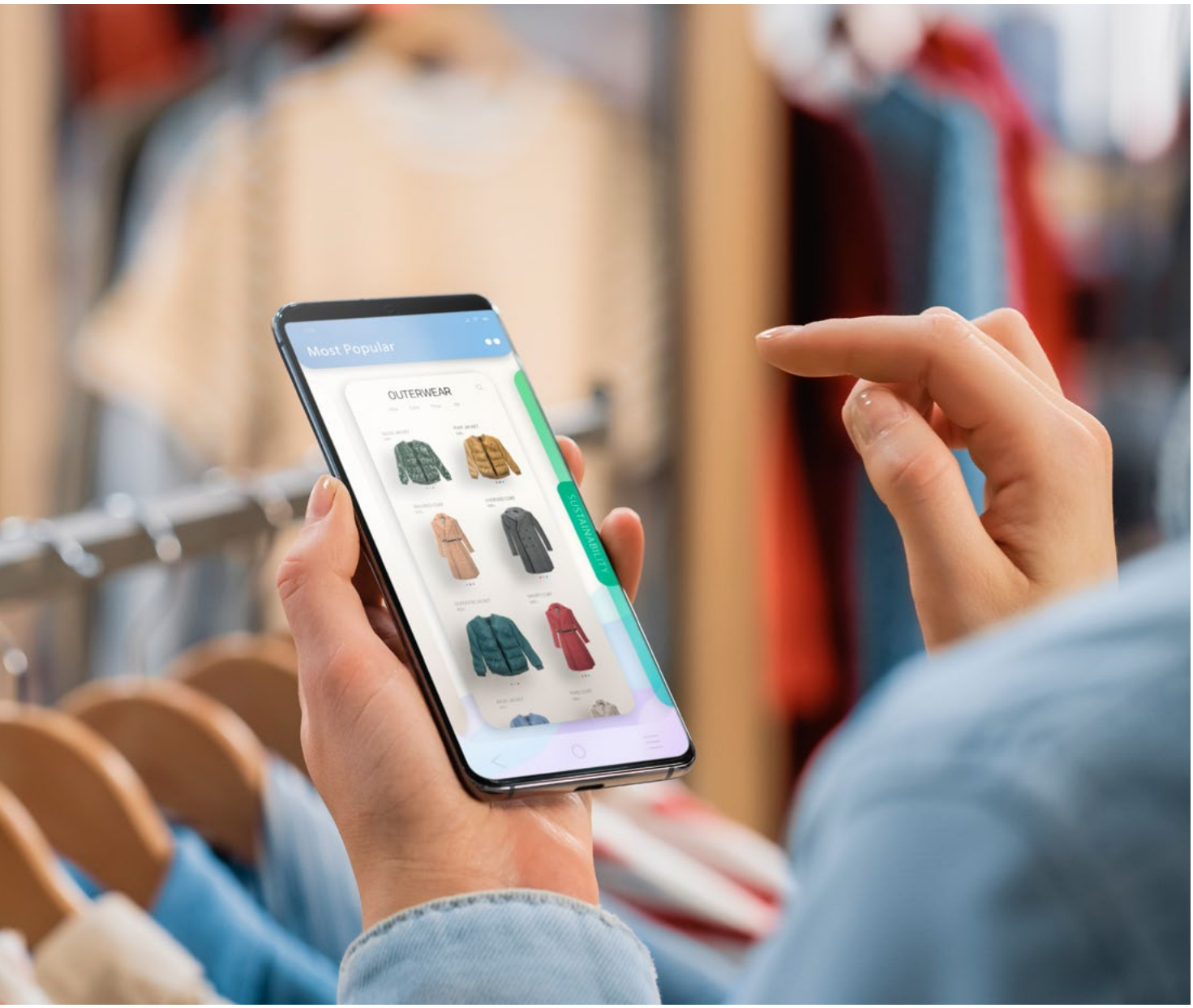
Laurent Delsaux, Sebastian Lutz, Yves Schroff

Interested in more?

Click **here** or follow the QR code for further insights.

The last-mile sustainability dilemma

Which is better for the environment: Online or offline shopping?



A new study found that buying fashion items online causes less greenhouse gas emissions.

The COVID-19 pandemic accelerated the rise of online retailing. On a global scale, retail e-commerce sales reached a volume of 4.9 trillion US dollars in 2021 and are forecasted to rise to 7.4 trillion US dollars in 2025.[1] As e-commerce gains in importance, there are growing concerns and discussions about its environmental consequences. Some critics of online shopping argue that it leads to an increase of parcel deliveries and thereby intensifies the environmental impacts due to additional traffic, air pollution and cardboard waste.

Proponents, in contrast, argue that online shopping substitutes for personal shopping trips and thereby benefits the environment by reducing traffic and decongesting overloaded traffic systems and town centers. Research tried to evaluate whether online shopping is more or less sustainable from an environmental perspective considering energy consumption and greenhouse gas (GHG) emissions, but different studies came to different conclusions.[2,3,4,5] This can be attributed, in part to the fact that some research excluded key variables, including browsing trips or trip chaining in the offline channel and failed deliveries or returns in the online channel.

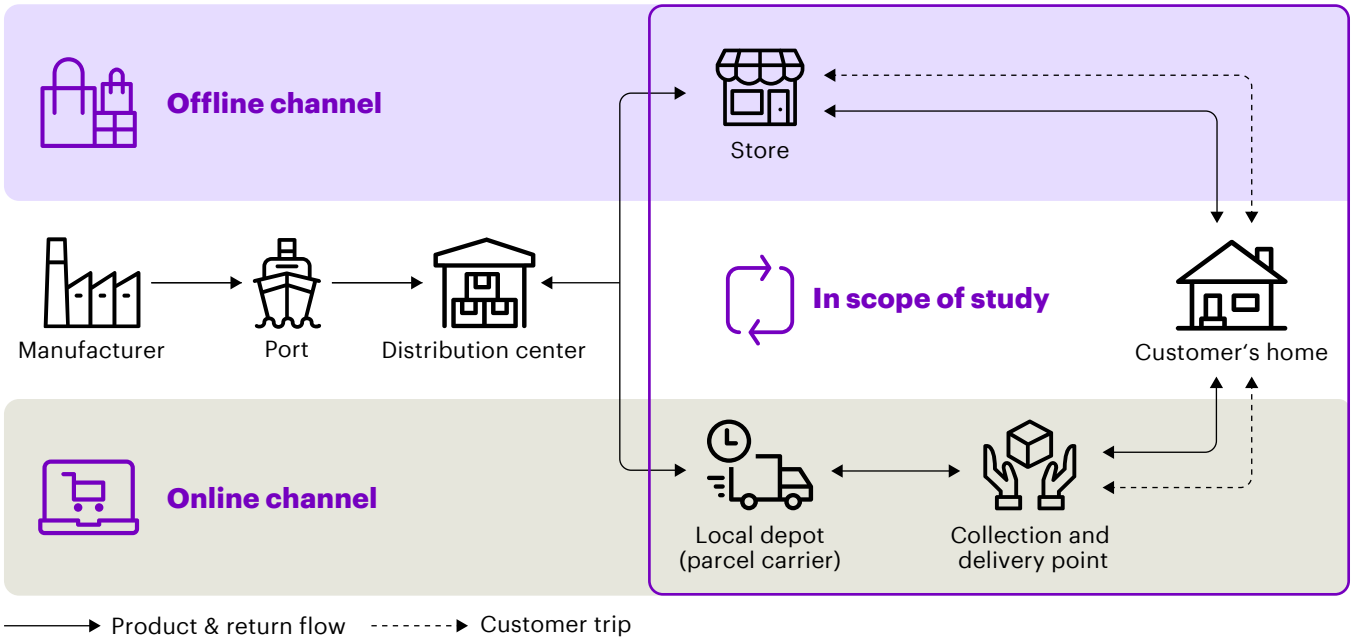
Customer behavior and GHG emissions

To address these arguments, Accenture collaborated with the University of Cologne to examine customer behavior in the purchasing process of fashion items and its impact on the individual carbon footprint. To narrow the scope, the study covers the last mile distribution of fashion items in Germany (see Figure 1).

The activities in the offline channel include everything from display in the store to the return of unwanted items by the customer. Main contributors of GHG emissions are customer trips and energy consumption in the store.[3] The online activities include delivery from local depots to the customer's home or to collection points. Main contributors of GHG emissions are last mile delivery, returns, last mile packaging and the energy consumption for placing an order.[3]

The study identified six offline and four online customer types with clearly distinct characteristics for the main contributors of GHG emissions of the purchasing process (see Figure 2).

Figure 1: Simplified fashion supply chain



The study found that the online purchase of fashion items causes less GHG emissions than the offline purchase, which could change the way we look at online shopping as a viable alternative toward a more sustainable future. The average offline purchasing process of fashion items causes 550g CO_2e per item while the average online purchasing process induces 42 percent less.

A customer type specific analysis reveals that GHG emissions strongly depend on customer behavior, especially for offline shoppers: The "Green Shopper" with 285g CO_2e walks or cycles to the store and carries mainly the energy consumption in the store. The "Long-distance Shopper" with 1.920g CO_2e lives in the countryside and drives by car into the city several times before a shopping decision is taken. Returns also play a role in addition to the energy consumption in the store. Key factors influencing the environmental impact of the offline purchasing process are the choice of transport mode, roundtrip distances and the amount of item bundling. The impact of the online purchasing process is mainly driven by the amount of item bundling and the number of returns.

Considering the average offline purchasing process (see Figure 3), half of the GHG emissions are caused by the energy consumption in the store for lighting, heating, cooling and electrical equipment, while the other half is caused by customer shopping and browsing trips. Returns are identified as a rather small contributor to the total GHG emissions and the impact of last mile packaging is negligible.

Considering the average online purchasing process (see Figure 4), half of the GHG emissions are caused by last mile delivery and returns. The other half is equally split between last mile packaging and the required energy consumption to place the order online.

Figure 2: Offline and online customer types

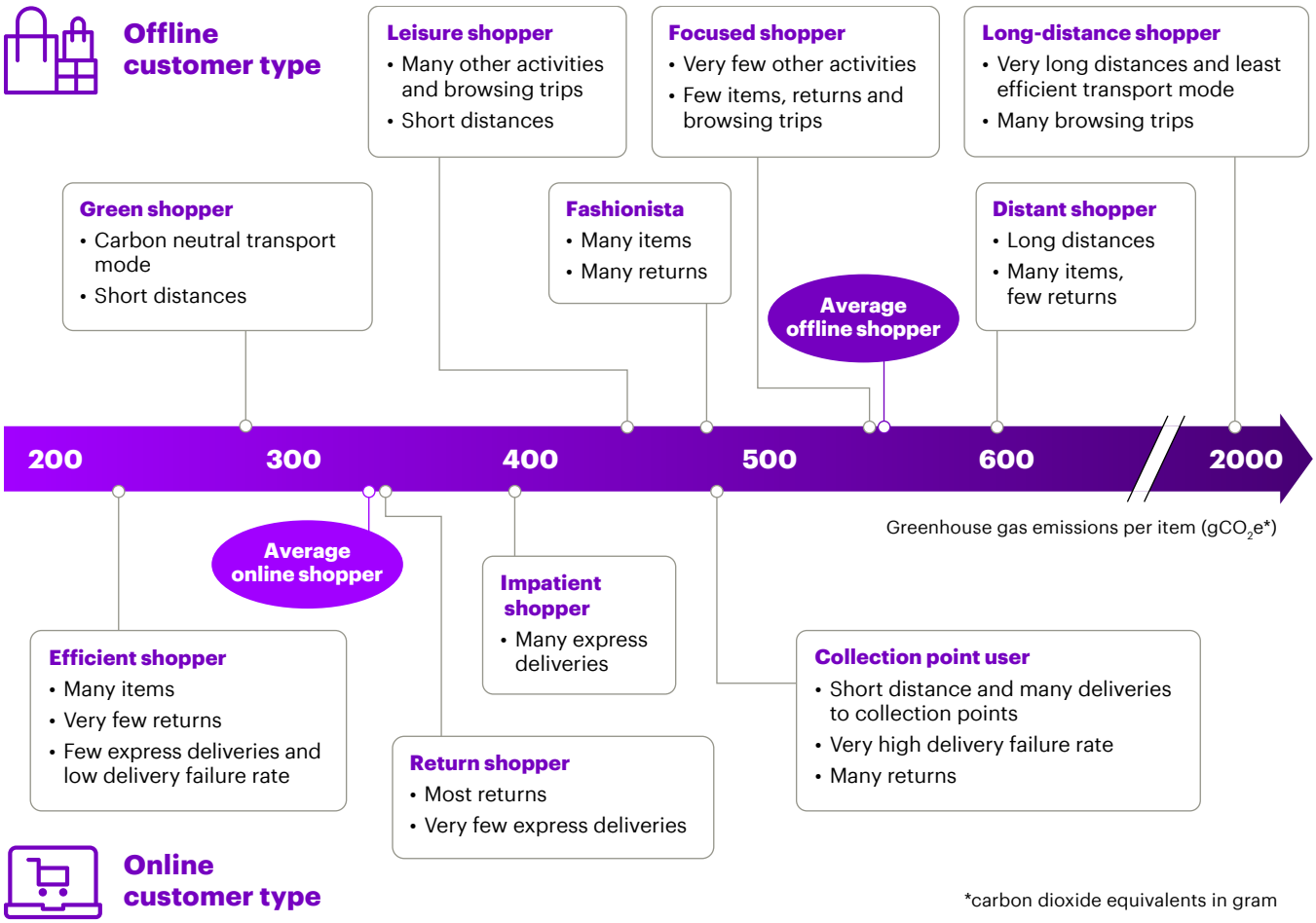


Figure 3: Breakdown of greenhouse gas emissions for offline customer types (gCO_2e)

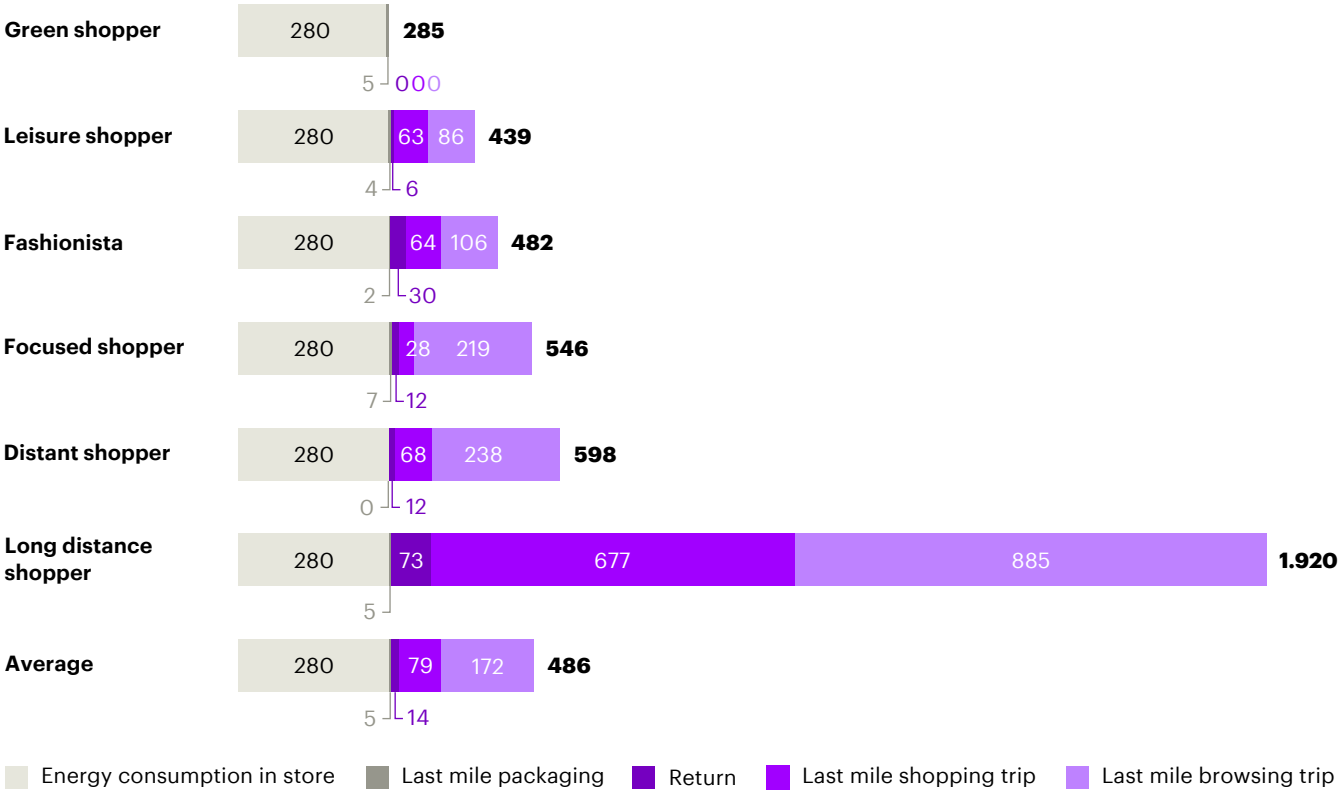
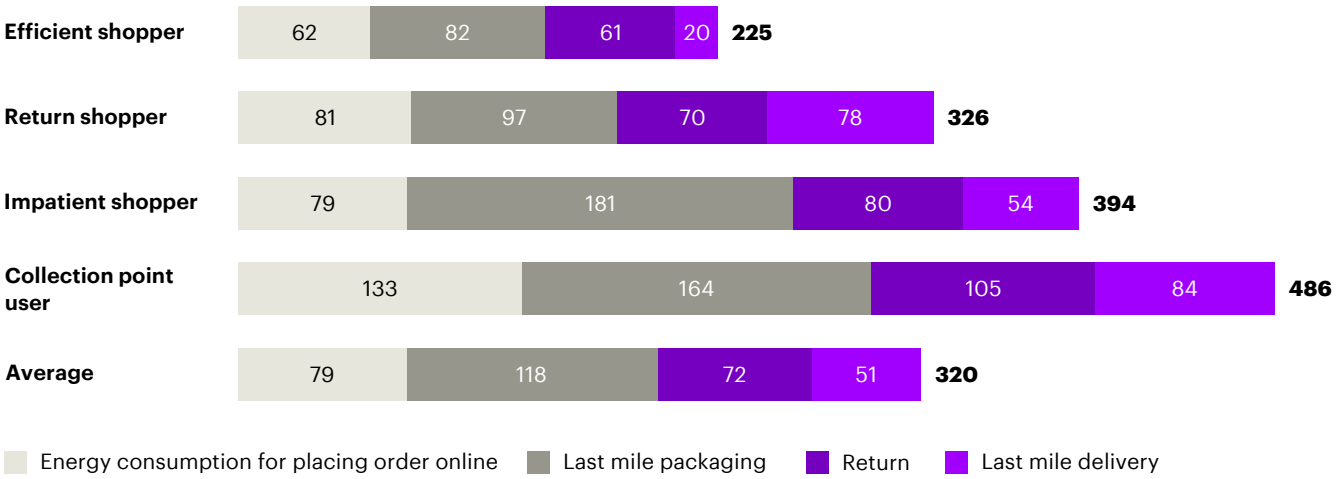


Figure 4: Breakdown of greenhouse gas emissions for online customer types (gCO_2e)



Toward greener shopping experiences

While the study concludes that online shopping is more sustainable, many consumers still want an instore experience. Accelerated by recent macro trends, the future of fashion retail is omnichannel. Driven by changing customer demands for convenience, entertainment and sustainability, as well as increasing online sales volumes,[6] retailer transform traditional physical stores into new store concepts like flag ship stores, where the focus is on product presentation and customer experience, while the actual fulfillment happens online.[7]

Combining traditional retail with online channels leads to higher customer satisfaction and enables sustainable last-mile delivery concepts. Organizations transitioning to a greener shopping experience should consider the following points:

- **Put a price on GHG emissions.** An internal price for greenhouse gas emissions helps to make the environmental impact of supply chains measurable and incentivizes both the company and customers to make a difference by changing their behavior in the purchasing process.[8] Accenture research shows that industry leaders are introducing an internal price on greenhouse gas emissions to leverage societal pressure toward sustainability as a competitive advantage and to be prepared for future changes in government policy.

- **Let the customer decide.** The ability to choose between different delivery and pick-up options gives customers a sense of self-determination. It also reduces operating costs and the overall carbon footprint by eliminating unnecessary delivery attempts.

- **Rethink asset use.** Local micro-fulfillment centers, automated lockers and click-and-collect points reduce emissions and traffic congestion due to shorter distances. In combination with dynamic route planning, time spent in traffic can be reduced, resulting in faster deliveries and lower fuel and vehicle maintenance costs.

References

1 eMarketer. 2022. Global Ecommerce Forecast 2022

2 Journal of Industrial Ecology 2007, Comparative Energy, Environmental, and Economic Analysis of Traditional and E-commerce DVD Rental Networks

3 Journal of Industrial Ecology 2010, The Energy and Climate Change Implications of Different Music Delivery Methods

4 Journal of Physical Distribution & Logistics Management 2010b. Comparative analysis of the carbon footprints of conventional and online retailing: A "last mile" perspective. International

5 Transportation Research Part D: Transport and Environment. 2012, Transport-related CO_2 effects of online and brick-and-mortar shopping: A comparison and sensitivity analysis of clothing retailing.

6 Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen 2018, Handelsszenarien Nordrhein-Westfalen 2030

7 Centre for Retail Research 2018, Retail At Bay

8 United Nations Global Compact 2015, Executive Guide to Carbon Pricing Leadership

Key contact

Dr. Michael Dittrich
Managing Director
Supply Chain & Operations
michael.dittrich@accenture.com

Authors

Klaus Hügle, Florian Mätzing, Franz Eschke

Interested in more?

Click **here** or follow the QR code for further insights.

While online shopping proofed to be more sustainable, consumers still want an instore experience. Combining traditional retail with online channels leads to higher customer satisfaction and enables sustainable last-mile delivery concepts.

Demystification of green business process management

How companies can start executing their sustainability agenda right now

Companies have the tools to incorporate sustainability into traditional business process management. Here is how to develop a strategy that boosts performance.

Sustainability, which includes environmental, social and governance goals, is more than a nice-to-have objective. It is a C-level priority, because being a sustainable company is essential to operate in today's business environment. Consumer and employee preferences are pushing companies to provide sustainable products and services and establish sustainable operations.[1] Based on this priority, companies are establishing new sustainability roles, creating career models and employee incentive systems, and fostering a sustainability mindset and culture.

KPI selection

There are many ways to address sustainability in a business environment. Processes, which are the lifeblood of a company, provide a good starting point. Begin by identifying the sustainability goals and targets that are right for your company. Just as for any other key performance indicator (KPI), sustainability KPIs must be in line with the corporate strategy and quantified targets set by management. That means sustainability targets may differ substantially across industries, by business division within a company or by business processes. So, companies may follow the same approach, just the mindset and goals behind it differ, leading to completely different outcomes. For example, if your company's sustainability strategy is focusing on becoming carbon negative by 2030 (like Microsoft), the process strategy goals and KPIs should reflect that. If your company aims at 360-degree sustainability (like Grohe), your set of KPIs will be much wider, including not just environmental but also social- and governance-related KPIs. If you don't know which KPIs to consider, a study by the University of Rome Tor Vergata may serve as a quick start guide. It suggests a set of environmental, social and economic KPIs.[2] Figure 1 shows an extract of environmental KPIs.

Transparency

Once the KPIs are defined, creating transparency on the performance tracked by the KPIs depends on having the correct tools to create business intelligence out of sustainability data and the availability of sustainability data. The good news is that companies have the tools. Business intelligence solutions, including large, big data software solutions such as SAP, Oracle, IBM or Microsoft, analytics apps like Qlik, Tableau or PowerBI, and process and task mining tools like Celonis, Signavio and UiPath, can be used to create transparency on sustainability. These tools don't care if you feed them with data on, say, profitability, efficiency and risk, or with sustainability data.

Figure 1: Sustainability performance indicators – extract for environmental KPIs[3]

Environmental

Reduction of natural resources consumption

- Energy intensity
- Electricity consumption
- Gas consumption rate
- Soil use rate
- Water use rate

Reduction of gas emissions

- Emission of ozone-depleting substance rate
- Emission of greenhouse gases rate
- Percentage of emission other environmentally affecting gases
- Carbon footprint rate

Improvement of use of renewable

- Renewable energy rate
- Reusable/recycled materia rate
- Renewable energy rate
- Renewable electric sources rate
- Sustainable water use rate

The availability of sustainability data may look challenging at first for some companies. Some sustainability data is likely available in the company's database. This is typically the case for more tangible data, including resources consumption, use of renewables and employee diversity rate. Other types of sustainability data may not be available but may be collected with reasonable effort. This typically includes data such as employee satisfaction ratings or volunteer hours provided to the local community. Then there is sustainability data that can't be collected internally. In this case, there is often the option to fill the gap with external reference data. Companies may, for example, purchase sustainability data on suppliers from sustainability companies, such as EcoVadis or Planetly. Funding for external data should be available since sustainability is on the C-level agenda.

Let's have a closer look at the combination of tools and data to create transparency. Process mining tools to create end-to-end visibility of business processes are being used by more than 50 percent of Fortune 500 companies and that is forecasted to grow by 40 to 50 percent in the upcoming years.[3,4] Process mining tools enable transparency, identification of inefficiencies and optimization approaches related to sustainability, just as they do for traditional business and process optimization goals, such as speed and efficiency. In addition to the known information on objects in the process (orders or purchase requests, for example), time stamps and process steps, you can integrate available attributes that relate to sustainability, such as CO_2 emissions and waste.

In the simplified example in Figure 2, we see that 124 sales orders were created but only 115 of them were checked for material availability. This resulted in wrong information about the ability to deliver on-time and in full and had an impact on scheduling. As a result, four shipments were shipped partially causing unnecessary CO_2 emissions. Process mining identified the increased CO_2 emissions and helped trace them back to the root cause of missing material availability checks. Fixing this issue helped reduce CO_2 emissions and reduced cost for unnecessary splits of shipping.

Figure 2: Simplified example for CO_2 reduction potential identified using process mining

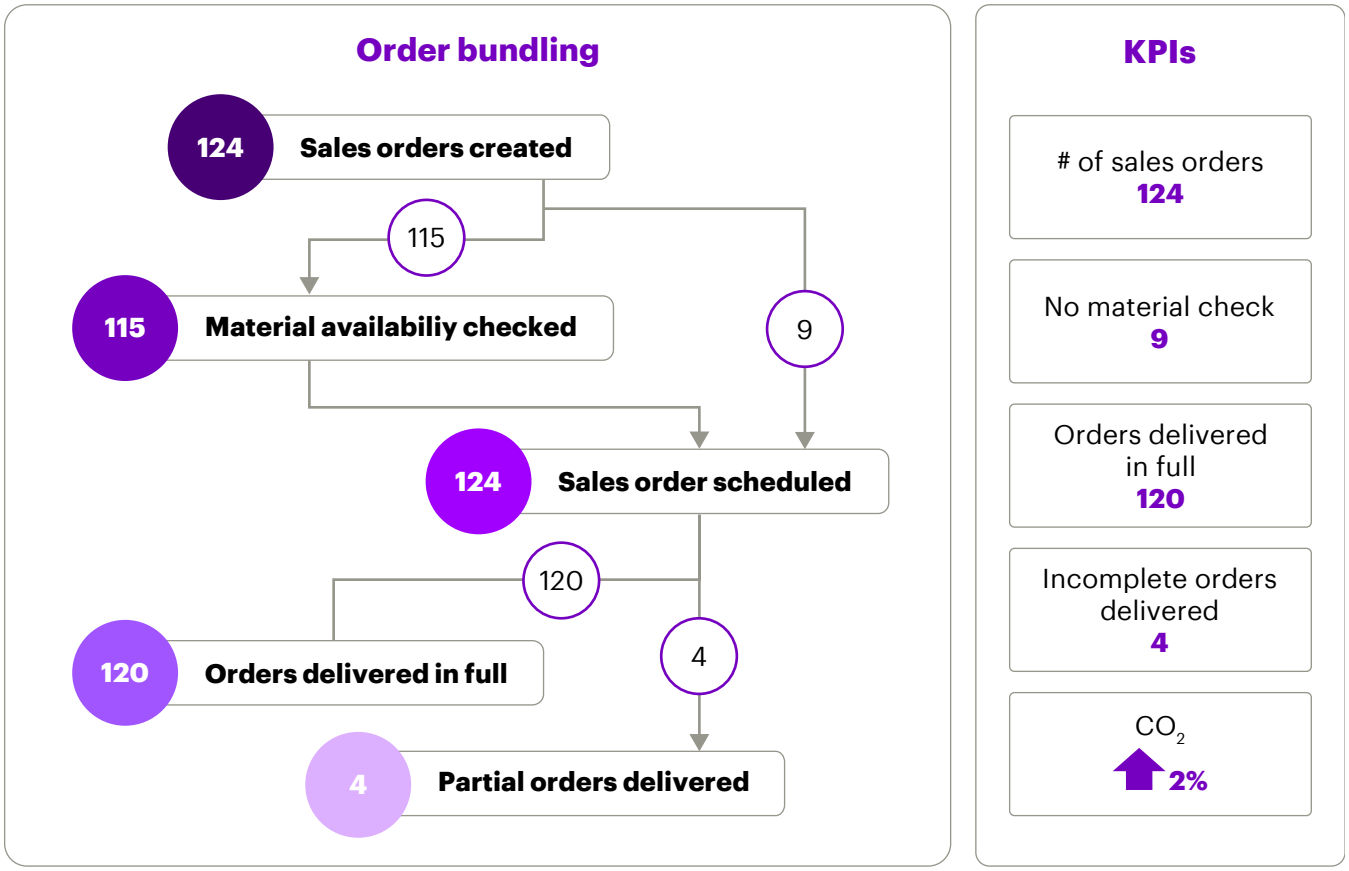


Figure 3: Average energy consumption for different freight transport modes – simplified[5]

Another typical example is last-minute air freight. In this example, process mining helped discover many last-minute changes of delivery channels, from slower means of transportation, such as trains, to air, which increased the CO_2 footprint and natural resource consumption for transportation significantly. See Figure 3 for a general comparison of energy consumption between surface freight transport modes performed by experts from Universidad Politécnica de Madrid, Spain. Assessing the company's organization revealed that delivery channels often changed shortly before delivery. The root cause was general blocks of orders for credit checks, delaying the process and making a faster delivery necessary to deliver on time – even though more than 90 percent of customers had always paid on time.

Key takeaway

Most companies have C-level support for sustainability and the tools and methodologies to measure and improve sustainability performance. Every company can —and should— bring their sustainability agenda to life right now.

References

[1] PAFnow by Celonis 2021, Process Mining & Order-To-Cash

[2] Sustainability 2019, The Role of Sustainability Key Performance Indicators (KPIs) in Implementing Sustainable Strategies

[3] Celonis, The Process Mining Buyer's Guide

[4] Gartner 2021, Market Guide for Process Mining

[5] Journal of Intelligent Transportation Systems Technology Planning and Operations 2012, Energy Consumption and Carbon Dioxide Emissions in Rail and Road Freight Transport in Spain: A Case Study of Car Carriers and Bulk Petrochemicals

Key contact

Markus Deisenberger
Principal Director
Supply Chain & Operations
markus.deisenberger@accenture.com

Authors

Markus Deisenberger, Michelle Enríquez Flor, Rimo Aman, Sergio Perdomo Gutierrez

Interested in more?

Click **here** or follow the QR code for further insights.

About Accenture

Accenture is a global professional services company with leading capabilities in digital, cloud and security. Combining unmatched experience and specialized skills across more than 40 industries, we offer Strategy and Consulting, Technology and Operations services and Accenture Song—all powered by the world's largest network of Advanced Technology and Intelligent Operations centers. Our 721,000 people deliver on the promise of technology and human ingenuity every day, serving clients in more than 120 countries. We embrace the power of change to create value and shared success for our clients, people, shareholders, partners and communities. Visit us at accenture.com.