

Visibility and Traceability

The Twin Engines of Sustainable Supply Chains

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Abstract

Reliability and efficiency were long the top priorities of supply chain management. Now, COVID-19 has thrust resilience into the spotlight. But, to be resilient, supply chains must also be sustainable. Central to achieving sustainable supply chains is the ability of manufacturers to have full visibility and traceability across these chains. New technologies are putting this level of visibility and traceability within reach, but companies will need to collaborate to build the comprehensive systems capable of enabling supply chains that are truly more resilient and sustainable.

This paper is informed by the latest insight from the [Accelerating Digital Traceability for Sustainable Production](#) initiative.

1. Introduction

The goal of sustainable supply chains – those that do no environmental, social or economic damage as raw materials are sourced, converted to products and delivered to market – has long been an elusive one.

For decades, executives have organized their supply chains based on two priorities: reliability and efficiency – a dependable supply at the lowest cost. As a result, the supply chains of today are stretched, inflexible and dangerously opaque. A Bain & Company survey found that up to 60% of executives have no visibility into items in their supply chain beyond their first-tier suppliers.

Even before COVID-19, the supply chain model was under pressure. Global trade tensions, instability, disruptive technologies and the increasingly severe effects of climate change exposed their inflexibility. And, at the same time, calls from customers, employees, regulators and investors for sustainability to move from “nice-to-have” to “must-have” were becoming louder and more unified.

COVID-19 has dealt the final blow to supply chains that prized only reliability and efficiency. The pandemic shattered brittle supply chains around the world and made resilience – the ability to heal, reroute or substitute – the top priority for supply chain executives. This presents an enormous opportunity to achieve the elusive goal of sustainable supply chains because the same tools that support resilience also underpin sustainability.

Resilience and sustainability, however, are nearly impossible to achieve without visibility into how materials and goods enter and move through the supply chain. Companies must be able

to see what is happening everywhere in their supply chain and trace any item in it – from field to factory to customer (and beyond). Emerging technologies are now turning that need into an operational reality.

While such advances put the promise of resilient and sustainable supply chains within reach, no company can go it alone. Supply chains are complex ecosystems with many participants and the need for a resilient network of alternative suppliers may even increase complexity at some points. To truly know what is happening in supply chains, in real time, is only possible if all participants, and even competitors within an industry, are collaborating on a far greater scale than in the past.

2. Progress on sustainability priorities

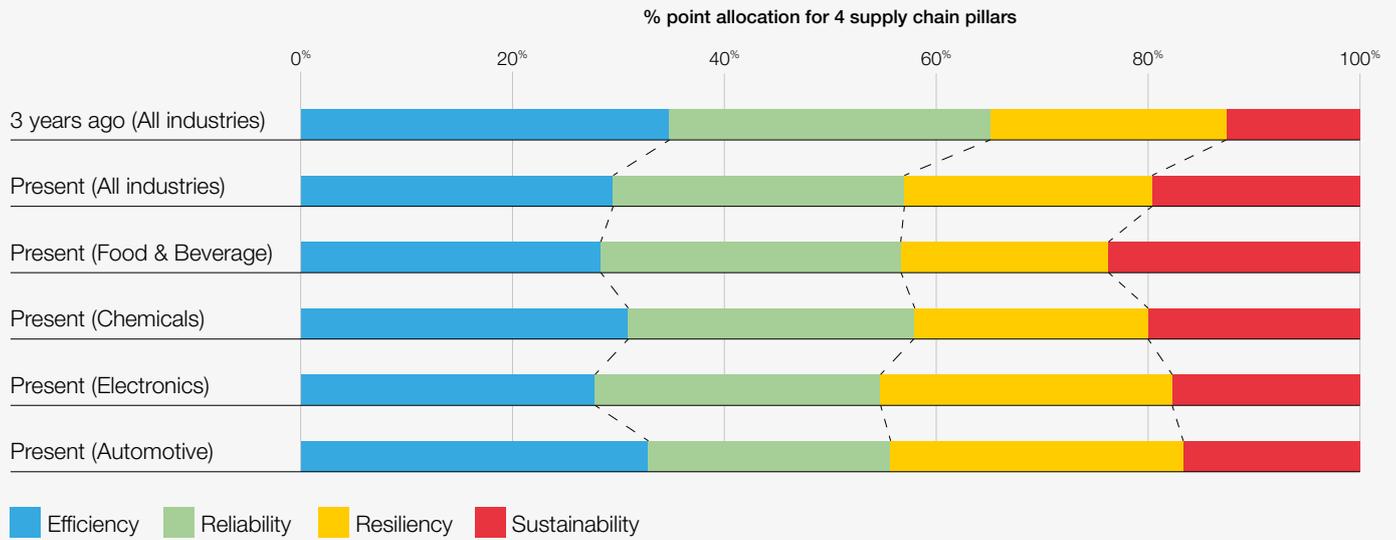
To manage supply chains now, executives need to put the priorities of efficiency and reliability on par with new demands for resilience and sustainability. As part of the World Economic Forum’s ongoing initiative, Accelerating Digital Traceability for Sustainable Production, in collaboration with Bain & Company, we surveyed more than 130 supply chain executives across multiple sectors to better understand how they perceive recent transformations, challenges and opportunities. This survey found that a realignment of priorities is already happening across industries: both resilience and sustainability are growing in importance, with sustainability boasting the highest percentage growth across industries in the last three years (see Figure 1).

The reasons for this shift are obvious: without resilience, a crisis can shut down a business and recovery can take months or even years. Businesses also can be shut out of a market if their supply chain lacks sustainability, either because of regulatory action or simply by consumer choice. At the same time, resilience and sustainability, done well, can deliver a competitive advantage – especially if other companies fail to deliver for their customers.

The survey shows mixed performance on sustainability. Executives feel most positive about the progress they are making to ensure fair labour practices and reduce contamination and pollution. Executives from the electronics industry, for example, report good progress on waste management, a topic that all other industries see as a struggle. Most industries also continue to wrestle with becoming more energy efficient and reducing water usage in their conversion processes. And, despite growing efforts, many companies feel they are falling short on reducing plastic usage and achieving input provenance (see Figure 2).

FIGURE 1 Sustainability has been the fastest growing concern of supply chain executives over the past three years

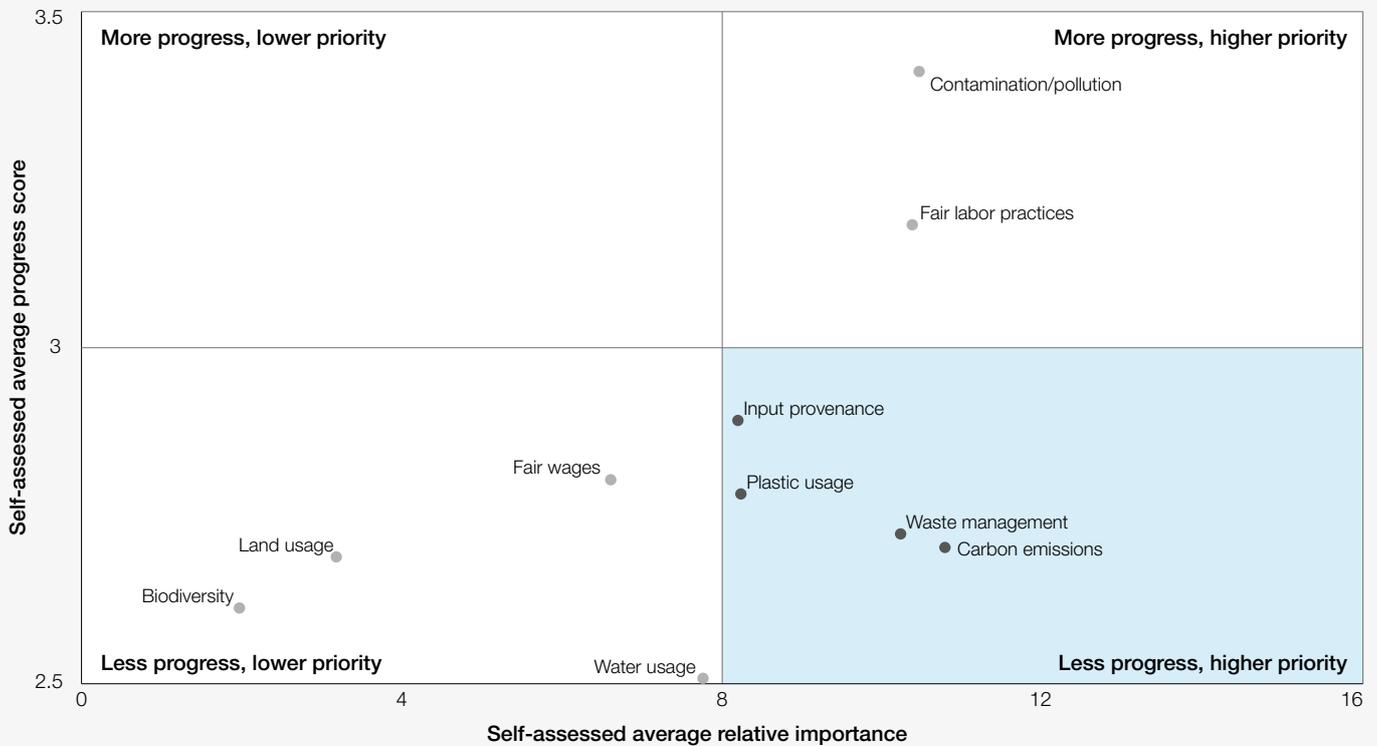
As you think about your supply chain performance and how to leverage traceability tools, which of the following objectives were and are most important?



Adapted from data provided by: Supply Chain Traceability Survey 7/13, N=131 (All Industries). N=33 (Food & Beverage). N=30 (Chemicals). N=26 (Electronics). N=27 (Automotive).

FIGURE 2 Progress on sustainability priorities varies by goal

What is the relative importance of the following sustainability objectives for your company? On a scale of 1–4, how well do you deliver on those priorities?



Adapted from data provided by: Supply Chain Traceability Survey 7/13, N=131

Beyond the fact that sustainability has historically taken a back seat to reliability and cost, one reason for the mixed progress is that sustainability was often treated as a separate or adjacent initiative rather than as an integrated part of core supply chain design. Today, leading companies are recognizing that many sustainability goals are complementary and can actually improve resilience, reliability or cost – or even all three.

3. The twin engines of sustainability

At the heart of sustainable supply chains are visibility and traceability – the capabilities executives need to make the best long-term and short-term decisions. Visibility describes the degree to which a company can see exactly what’s happening within its supply chain, which may include real-time insight and analysis and predictive problem-spotting. Traceability refers to the ability to follow the exact path and process of every input, including provenance and origin information, as well as insight into the conversion process and certifications.

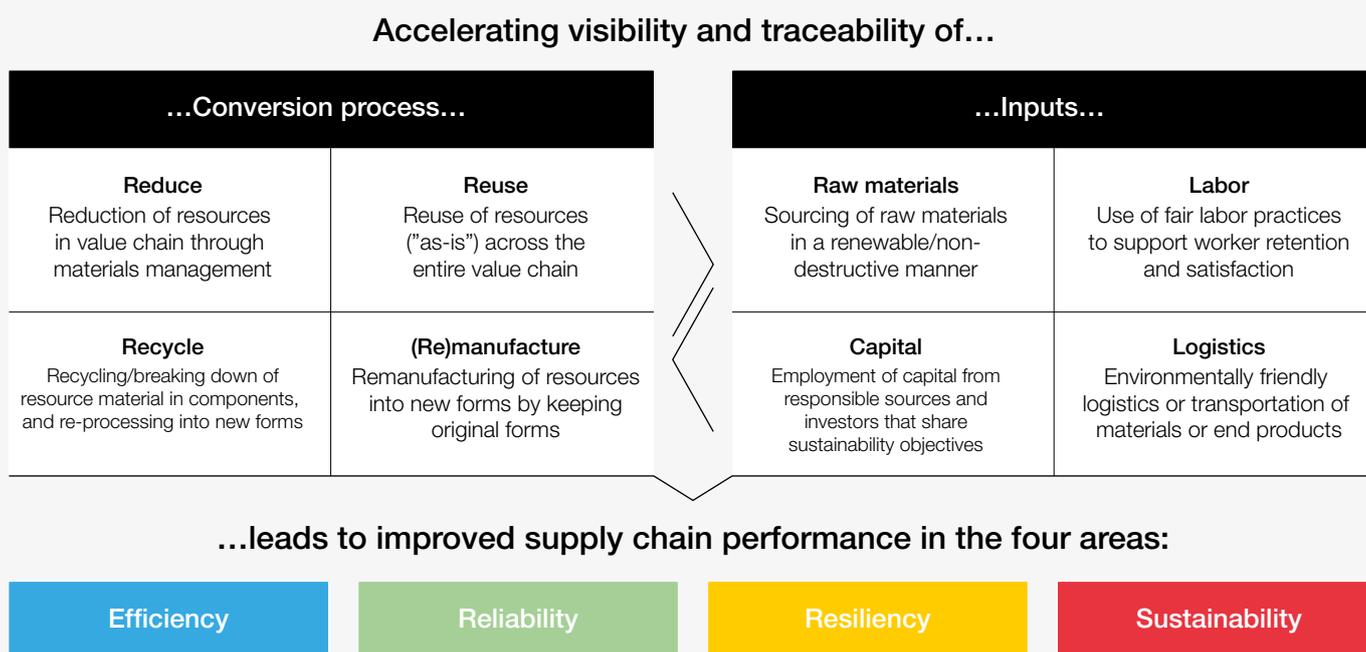
To achieve visibility and traceability, companies are adopting “control towers” with the goal of creating resilient, self-healing supply chains and seamless collaboration among the players along the chain. Control-tower solutions range widely in technical sophistication: Some provide real-time data across the full supply chain and can predict sub-optimal events or disruptions, while less-sophisticated ones focus on limited portions of the supply chain, with batched data, and less ability to predict. With the right data, control towers can provide much of the information needed to understand sustainability across supplier tiers, during the conversion process and all the way to the customers. Using the same tool to manage the operations, economics and sustainability of supply chains means that sustainability becomes an integral part of the overall supply chain decision-making process (see Figure 3).

Among many encouraging examples is the way in which Unilever is seeking to eliminate deforestation related to palm oil and achieve a deforestation-free supply chain by 2023. To do this, it will increase traceability and visibility using emerging digital technologies, including satellite monitoring, geolocation tracking and blockchain. Similarly, Ralph Lauren aims at eliminating all hazardous chemicals in the manufacture of its products by 2025. It adopted Zero Discharge of Hazardous Chemicals (ZDHC) standards to guide the way its supply chain selects, purchases and manages chemicals and has adopted chemical inventory management tools to help suppliers track and directly report the chemicals used in production.

The increasing push for circular supply chains that recapture and reuse raw materials at the end of a product’s lifecycle depends heavily on traceability. Tracing materials throughout the product life cycle is a prerequisite for feeding them back into the conversion process for reuse, recycling or remanufacturing. Each cycle reduces the consumption of raw input materials. These circular supply chains are not limited to circularity within a single company’s value chain. Often, materials are recycled by third parties and later fed into another sector’s value chain as substitutes for the virgin raw materials once required. Visibility into supply and demand also are critical for companies to seize these opportunities.

Although all industries need efficient, reliable, resilient and sustainable supply chains, the priority use cases for implementing traceability and visibility solutions tend to be industry-specific. While this creates an opportunity for companies in the same industry to work together to tackle sector-wide challenges and to define their own traceability standards, it makes it more difficult to enable cross-sector solutions. First movers within these industries will have a tremendous advantage as they will help shape the traceability and sustainability protocols and standards that other players eventually will be forced to adopt.

FIGURE 3 Traceability and visibility improve supply chain performance across the board



4. The path to visibility and traceability

This is an exciting time for the evolution of supply chain visibility and traceability. The availability of data continues to increase at near exponential rates and the adoption of emerging technologies like artificial intelligence (AI), the internet of things (IoT), blockchain and 5G is making it easier to gather and operationalize such information in real time.

Still, most companies have a long way to go. According to the survey, fewer than 15% of executives feel their current capabilities allow them to deliver traceability-related use cases

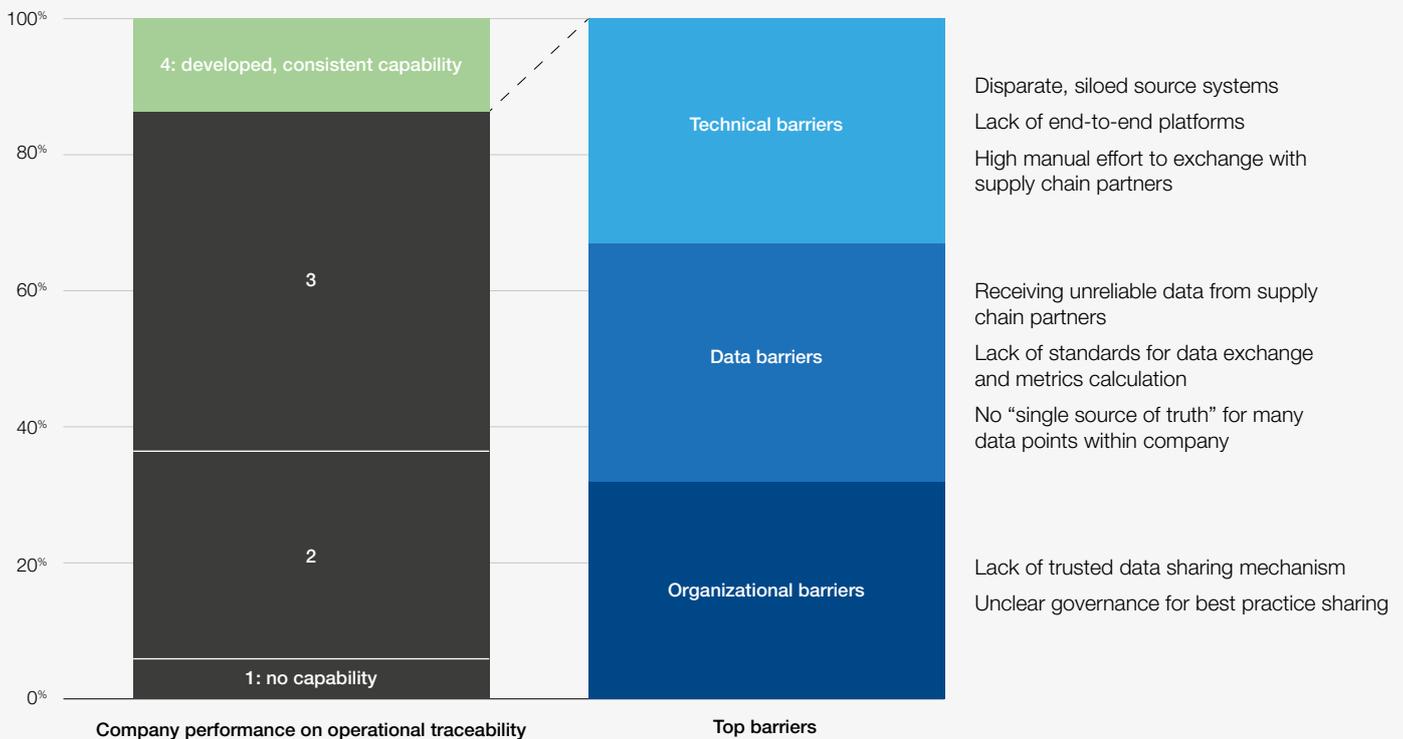
consistently. While most companies have started to build some traceability capabilities, they struggle to integrate them or consistently create value. The most common reasons were data barriers, followed by technical and organizational barriers (see Figure 4).

4.1 Data barriers to traceability

Companies need to understand which data to collect, where to source it or capture it, and whether it is trustworthy. Despite vast amounts of siloed, partially structured data, companies often find the data they need doesn't exist in internal systems – or isn't available at all. They must learn how to integrate external data sources and how to begin collecting critical data that isn't available.

FIGURE 4 Barriers to supply chain traceability

How well are you able to deliver on operational traceability, and what are the barriers you face?



Source: World Economic Forum/Bain & Company Supply Chain Traceability Survey, 13 July 2020, N=131

Designing a data model can help make this process more manageable by clarifying what information will be collected and how it will be stored. A good data model also clearly describes the relationship between data elements and ensures that the right business events and information will be captured to support business analysis.

Accuracy of data – both internal and external – poses another barrier. One of the goals of a sustainable supply chain is to provide consumers with certifications about the sustainability of the product they're purchasing. But many companies struggle to gather such data, reducing certification efforts to attestations about procedures and policies instead of actual performance and compliance. When we asked executives how they felt about their own suppliers' sustainability certifications, fewer than 15% said they feel confident about them or trust that suppliers could meet the certification requirements on an ongoing basis.

4.2 Technical barriers

Most companies lack a platform designed to provide visibility and traceability across the entire supply chain. They typically try to combine legacy ERP solutions with home-grown visualization and analysis. But these systems weren't built for that purpose and their ability to automate traceability and visibility with multiple ecosystem partners is limited.

At the same time, making a large technology investment in this rapidly evolving space carries risks of its own, with technology providers entering the supply chain market with solutions from a host of different angles: information-led, certification-led, software-led, service-led etc. Adding to the complexity, companies face a mix of for-profit and not-for-profit players offering a wide range of solutions focused on everything from visibility to strategy. In the end, a compelling ecosystem will likely include elements from each of the various solution types.

4.3 Organizational barriers

Full supply chain traceability and visibility requires coordination among many departments, individuals and systems within a company, and they often have conflicting priorities. Those tasked with sustainability may find themselves at odds with those focused on cost reduction. Some business units may prize sustainability while others lack the motivation to make the effort.

Likewise, building visibility and traceability into supply chains can involve significant investment. A project that demands both substantial funding and cross-organization coordination can easily be supplanted by simpler, cheaper opportunities. Senior leadership must set a strong vision for traceability to guide stakeholders with varying priorities and perspectives.

Effective data aggregation and sharing starts within each company. Companies need to overcome siloes between departments to create a single source of truth for relevant data. They must establish processes, systems and talent for data collection, cleansing and analysis that can turn data into insight capable of fuelling business decisions. Only then can they determine the most appropriate way to share data and make choices about which data to share and with which ecosystem partners.

Most companies have found that external data-sharing is hard – not for technical reasons, but because of privacy concerns, because the data they receive in return isn't valuable or trustworthy, or simply because there is no trusted party coordinating the effort.

This, in turn, presents new questions about the level of data aggregation, the sharing frequency and lifespan of the data. Companies must consider who owns the shared data and the resulting analyses, all while ensuring strict protections for the source data. While this paper and the Accelerating Digital Traceability for Sustainable Production initiative focus on how these issues connect directly with visibility and traceability in supply chains, a comprehensive look at the role of data-sharing in manufacturing can be found through the Forum's [Unlocking Value in Manufacturing through Data Sharing](#) initiative.

5. Multistakeholder collaboration as an accelerator

Overcoming many of these hurdles will require collaboration among multiple stakeholders within a sector, both to set standards and fund platform-type investments, and to focus resources, share costs and gain traction. If multiple players can align on critical traceability bottlenecks and desired outcomes, all will benefit from accelerating the ability to link resilience with new models of reduce, reuse, recycle and remanufacture.

There is precedent for this sort of effort: The creation of generally accepted accounting principles allowed companies to report common financial metrics and gave investors and other stakeholders a way to reliably benchmark financial performance. Similarly, the automotive industry agreed more than 40 years ago to use electronic data interchange (EDI) as the standard for planning and delivery schedules to support lean manufacturing and just-in-time delivery.

In recent years, several sectors have combined forces to accelerate traceability and visibility. For example:

- IBM's Food Trust, founded 2017, addresses the need for smarter, safer and more sustainable food supply systems by connecting an ecosystem of producers, suppliers, manufacturers, retailers and other stakeholders. The blockchain-powered solution helps ecosystem participants eliminate supply chain bottlenecks, enhance their reputation for quality, ensure safety and regulatory compliance and build a sustainable supply chain with less waste and spoilage.
- The MediLedger Project, launched in 2017, brings together pharmaceutical manufacturers and wholesalers in a working group to explore the potential of blockchain to meet Drug Supply Chain Security Act requirements for a track-and-trace system for US drugs. The project became the MediLedger Network, a fully decentralized network that aims to inspire industry players to develop multiple solutions based on current business issues.

Despite the challenges of building such networks, many industry leaders agree that, in the future, companies will share data across a supply chain and their sector, and work together to continuously improve the supporting technology and analytical engines to ensure efficient, reliable, resilient and sustainable supply chains.

To realize this future, industry leaders – moving ahead of regulators – will need to push the initial development of collaborative platforms and set the standards, and only then will be joined by other industry players who see the value. The participation of those additional players will further enhance such platforms, networks and the community at large. We expect industry leaders will be prescient enough to avoid the potential paralysis that comes with too broad a scope and instead focus pilots on solving prioritized and specific critical issues.

Below, we look at four key steps industry leaders will need to consider and act on in order to develop the visibility and traceability platform and practices necessary to support sustainable supply chains:

1. Creating collaboration-friendly environments

Realizing the potential resilience and sustainability that can be unlocked through supply chain visibility and traceability will inherently require players across supply chains and, in some cases even competitors, to work together. However, our recent survey revealed that only 6% of executives feel comfortable sharing information with competitors. Overcoming this barrier will likely require the involvement of trusted neutral entities, such as industry associations, to establish a foundation that could lead to sector-wide adoption of visibility and traceability solutions. Two-thirds of executives told us that they are comfortable sharing operational data with industry associations.

Additionally, not-for-profit organizations, including industry associations and international organizations, are critical for encouraging the sharing of experience and best practices. For example, GS1, a not-for-profit organization, helps everyone involved in making, moving and trading goods automate and standardize their supply chain processes using the common language of GS1 global standards. GS1's

FIGURE 5 Top 10 sustainability metrics identified by supply chain executives

Sustainability category	Sustainability metric
Water usage	Percentage of change in water efficiency
Plastic usage	Percentage of packaging made up of recyclable, reusable or compostable materials
Fair wages	Average full-time wage compared with benchmark
Carbon or greenhouse gas emissions	Percentage of overall emissions reduction per ton of production
Land usage	pH concentration (or other chemical imbalances) of soil that our operations impact
Input material and component provenance	Percentage of suppliers that adhere to internal supplier code of conduct
Water usage	Percentage of water abstraction per ton of production
Fair and healthy labour practices	Total recordable frequency rate for safety
Fair and healthy labour practices	Lost time injury incidence rate
Product safety	Percentage of expired product unsold

standard library includes the GTIN standard, which provides different globally recognized ways to add an identifier, such as a barcode, to a product. Trusted neutral entities also can spur the development of a standard data model for measuring KPIs, which may vary by sector to account for specific needs but share a common framework for capturing, analysing and comparing information (see Figure 5).

Collaboration requires not only a common language, but also a strong operating model that clarifies expectations and benefits for all parties involved. This model needs to be flexible enough to scale up from a pilot setting to sector-wide solutions. Multiple stakeholders will need to be fairly represented in the decision-making and direction and aligned on whether and how they will participate and share the ongoing costs of operating and scaling up of solutions. All participants will need attractive incentives – the strongest incentives will be those that directly improve the sustainability, efficiency, resiliency or reliability of the participants’ supply chains.

2. Bringing digital platforms to life

Multistakeholder efforts across a sector will depend on digital platforms that offer safe spaces for collaboration. Given the rapid pace of innovation in the supply chain visibility and traceability solution market, it’s likely that technology companies will need to shoulder the ongoing hosting and development of such platforms, then commercialize the solutions after the value has been proven in pilots. Digital platforms should be able to sit on top of existing company-specific supply chain and analytics solutions and integrate with them as needed, allowing users to visualize key information and enable decision support.

3. Maximizing the power of certifications

Certifications play a pivotal role in building trust between companies and customers, but also between companies within a supply chain. By partnering with the digital platforms like those discussed above, certification providers can either certify the inputs and processes of each platform

participant, the digital platform itself or the analytical results it produces. Certifications that can be used for communications and marketing offer additional incentives for companies to participate. This is no doubt easier said than done; certifications have existed for decades and continue to struggle not just with getting accurate data, but also with driving real change. By creating opportunities for digital traceability solution providers to collaborate directly with certification providers, an environment can be enabled wherein certifications can be built directly into the traceability data flows, while certification providers can be sure they have the most accurate information by which to issue their certifications.

4. A toolkit to mobilize and create value

Creating end-to-end supply chain visibility and traceability through multistakeholder collaboration will be hard and require significant investment from every participant. It will be easy to get lost in the details or end up being spread too thin. To mitigate this risk, every company should develop a toolkit to guide their in-house and collaborative visibility and traceability efforts.

The toolkit should include a playbook for how to build the required capabilities in terms of people, systems and processes; guidance on how to benchmark performance, progress and development against sector; and clear roles and responsibilities for deriving business value and sustainability from newly available insight. But companies don’t have to shoulder this effort alone. Multistakeholder collaborations can support the creation of frameworks that guide the tailored toolkits to meet the needs of specific companies.

Companies should not think of efficiency, reliability, resilience and sustainability as inevitable trade-offs. As supply chains become more transparent, executives will be able to leverage this new comprehensive understanding and visibility to improve their design, resulting in fewer trade-offs and offering opportunities for these elements to complement, rather than conflict with each other.

Creating a new, balanced supply chain requires a two-track approach. Companies must accept the uncertainty that comes with innovation and approach the challenge both present-forward and future-backward. That means pursuing 2-3 opportunities that solve today's key challenges so they can realize immediate value and learn from each opportunity. At the same time, companies must think hard about the future. What would an ideal supply chain and supply chain capabilities look like 10 years from now? Companies must adopt a clear future vision and then work backwards to determine which capabilities are most critical.

Finally, supply chain executives should look to engage and collaborate beyond their own four walls. By identifying organizations within their sector – as well as across sectors – that are wrestling with these same issues and actively trying to solve them, executives can begin to solve challenges that would have been impossible to take on alone. Companies that take the lead in collaboration today will have the advantage. Those that sit on the sidelines will have to be content with whatever the industry ultimately adopts. Those that seize the opportunity now, however, will set the standards, both within their industry and across sectors.

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