Seizing the digital opportunity

An industrial software action plan

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Seizing the digital opportunity

An industrial software action plan

Our world is undergoing a digital metamorphosis. The way we obtain, produce, and deliver goods and services is increasingly driven by information technology. More people are working remotely. More interactions are digital. And more routine, repetitive, and high-risk operations are automated.

Industrial enterprises are under pressure to adopt a digital-driven approach for their operations and for interacting with markets, customers, and the world around us.

> "There is a heightened need for manufacturers to achieve what the MLC now calls 'digital acumen' in their leadership ranks and digital literacy in their workforces; mastery over the collection, organization, and analysis of data; and the need to understand the potential of advanced technologies to create new business models."
>
> — Manufacturing Leadership Council

At the same time, manufacturing and process industries face accelerating challenges, including supply chain interruptions, the energy crisis, major business disruptions due to the pandemic, intensified sustainability concerns, and a rapidly changing workforce.

As modern industrialists, it's time to make bold moves. Why? Because we will not succeed simply by making existing processes and equipment more efficient and holding on to outdated business practices.

Digital transformation is not only about using digital tools to improve the way we currently work. **Digital transformation is about fundamentally changing the way we do business.** It impacts everything across an organization—from its people and culture to its processes and business model. Companies that undergo holistic digital transformations will be well positioned to prosper among the industries of the future.

According to LNS Research, one-half of industrial enterprises report they have embarked on a digital transformation journey, and these programs are yielding real benefits. LNS found that leaders in **digital transformation are 72% more likely to have grown revenues by more than 10%, and 57% more likely to have reduced Cost of Goods Sold (COGS) by more than 10%** because of these initiatives.

> "Industrial giants rose to dominance by making high-quality physical objects. Lower-cost competition and increasingly complex multistakeholder ecosystems mean this old route to success is no longer sufficient. To survive, industrial firms must move faster, deliver new value to new stakeholders, and respond to the shifting expectations of both their customers and their customers."
>
> — Forrester

Information is the new currency

The primary resource of a modern society is knowledge. Data, when contextualized and combined with human insight, can be elevated to highly valuable, actionable information. Information is now the currency of global enterprises.

Industry 4.0 promises to transform industrial operations by leveraging the massive amount of data generated in an industrial environment with the industrial internet of things (IIoT). But data in its raw form is not intrinsically useful. It is only when data is shown in both historical and structural contexts that it turns into advantageous information. And when processed into actionable insights and placed in the hands of decision makers, it can spark true insight to improve how industries work.

In this era of remote everything, we have seen multiple years' worth of digital transformation compressed into a few months. McKinsey & Company estimates that the pandemic has expedited the adoption of digital technologies by several decades.

Businesses established in the digital age, often referred to as “born-digital”—like Airbnb, Netflix, and Wecash—have proven that not only does digital create more profitable customer relationships but it also knocks out analog competition. They understand that today’s now economy (“I want it now”) places high value on convenience and customer experience.

Digital transformation, deployed through software applications powered by artificial intelligence (AI), are already driving dramatic gains in customer engagement, productivity, sustainability, and cost savings in asset-intensive industries such as manufacturing, utilities, and logistics.

"Organizations that share data, applications, and operations with their industry ecosystem will realize a revenue increase three percentage points higher than nonparticipants."

IDC

TIP: *Software makes the invisible visible. One of the most critical factors that manufacturers need to consider when it comes to competitive success is how fluidly they react to—and even anticipate—dynamic market conditions. The increasing power of industrial software allows us to quickly align products and business practices to ever-changing customer and ecosystem requirements.*

Empowering the digital workforce

Are data analysts and scientists the new Six Sigma Black Belts?

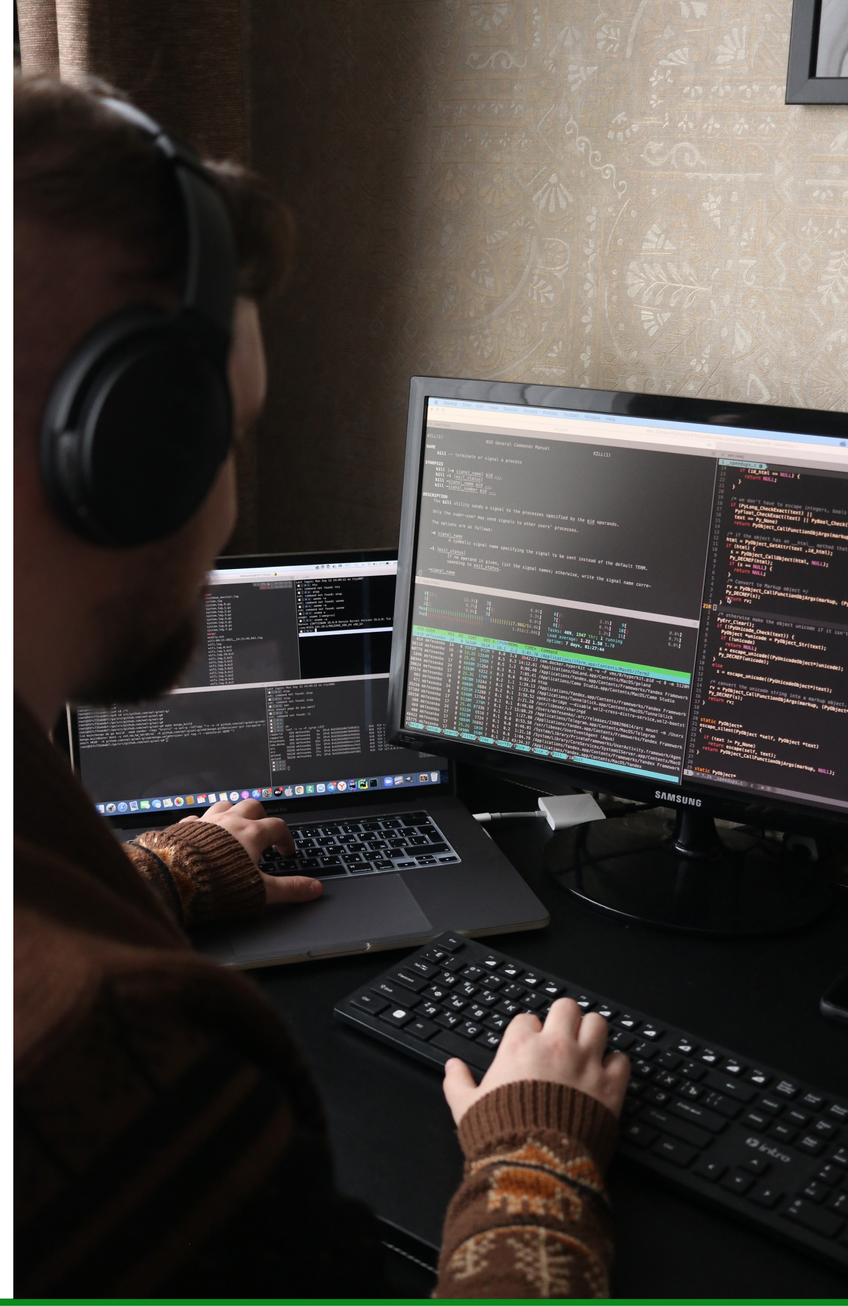
Despite the potential of digital tools to improve productivity and efficiency, there are still some key challenges that manufacturers need to consider when it comes to adopting new technology. One of these is the relationship between machines and humans.

Digital transformation is more about people than technology. Technology and software exist to augment and enhance human capabilities and safety. They fundamentally improve the way we work and the kind of work we do.

As the next-generation workforce brings with it an engrained digital skillset, proprietary expertise is gradually being replaced by open software, artificial intelligence, and autonomous systems that learn and improve over time. The next wave of the workforce will be data engineers responsible for generating positive business outcomes and performance by controlling processes with digital tools. They will also help identify or invent potential new technologies to improve efficiency and create new business opportunities. This kind of industrial ecosystem, with data sharing at its core, is the foundation of the connected industrial economy, and it's starting to transform how industries work.

Today's digital natives bring the technical and advanced skills needed to work seamlessly in connected teams using shared data. And they expect automated processes, workflows, and digital tools. Soon, everyone from the top floor to the shop floor will have the necessary digital fluency to make informed decisions and improve company performance.

TIP: *Industrial automation and software exist to augment and enhance human capabilities and safety. Advanced technologies like augmented reality, virtual reality, or mixed realities allow users to "see" the information needed to optimize the operation and maintenance of a plant—easily and safely.*



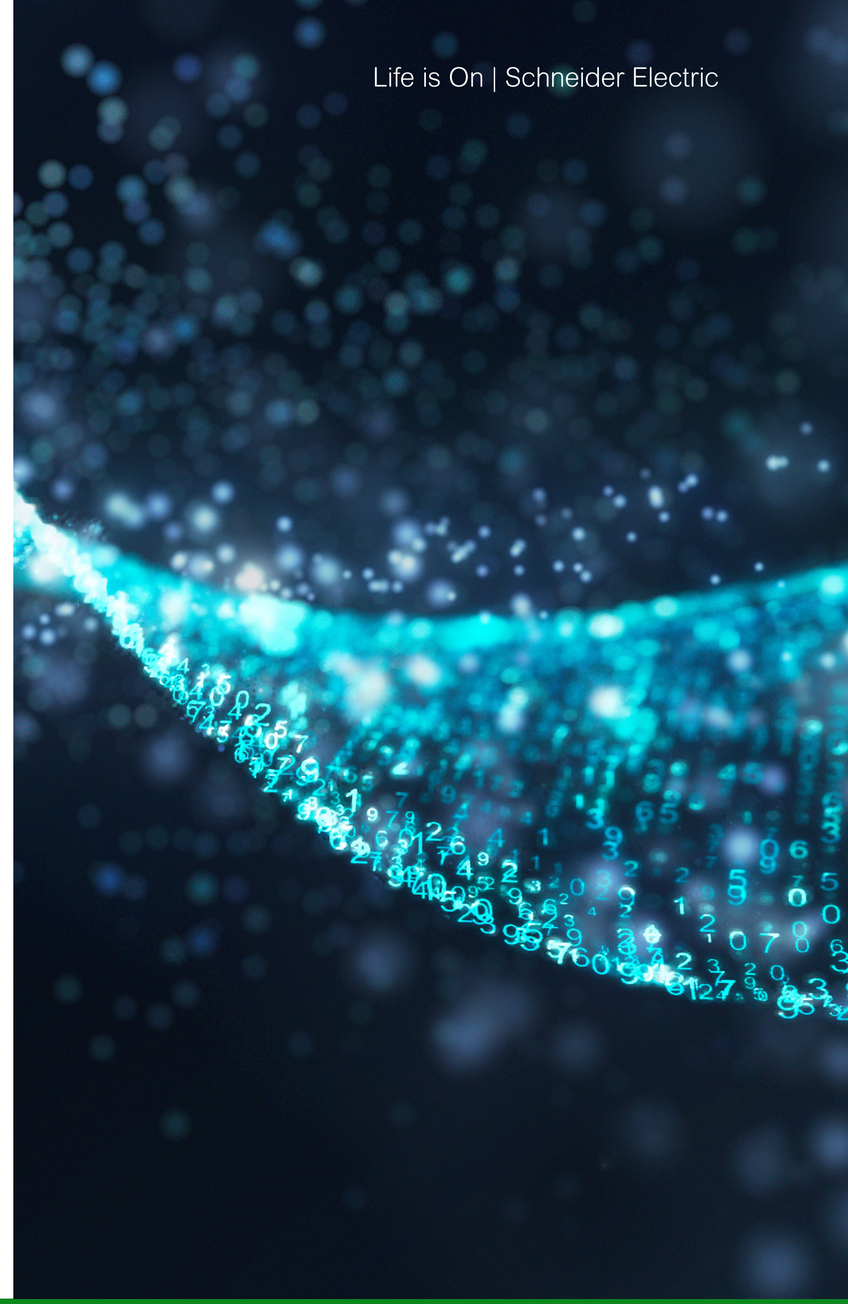
A healthy digital backbone

In the automation world, information technology (IT), operational technology (OT), and engineering technology (ET) are converging. Soon, almost everything will be connected, enabled by 5G, IIoT, and the cloud. As the number of data points continues to balloon, additional inputs can be fed into high quality analytics to generate even more precise predictions for engineering, operational, maintenance, and strategic planning.

Modern industrial software gives us access to data from all along the lifecycle, across domains, and even from external sources. This broader, deeper data can be aggregated, consolidated, and fed into analytic applications to provide teams with more complete, accurate, and insightful information so that they can make quicker, data-driven decisions across the full value chain, including procurement, planning, scheduling, production, and distribution.

A company's digital backbone establishes data integrity, continuity, and consistency across the full lifecycle and provides a single source of truth—the lifeline for accelerating outcome-driven ways to capture IIoT business value.

> "… end users are moving into the era of the digital enterprise where all product design, manufacturing processes, services and support, and customer experiences are connected by a digital thread that merges the virtual and physical worlds."
>
> — ARC

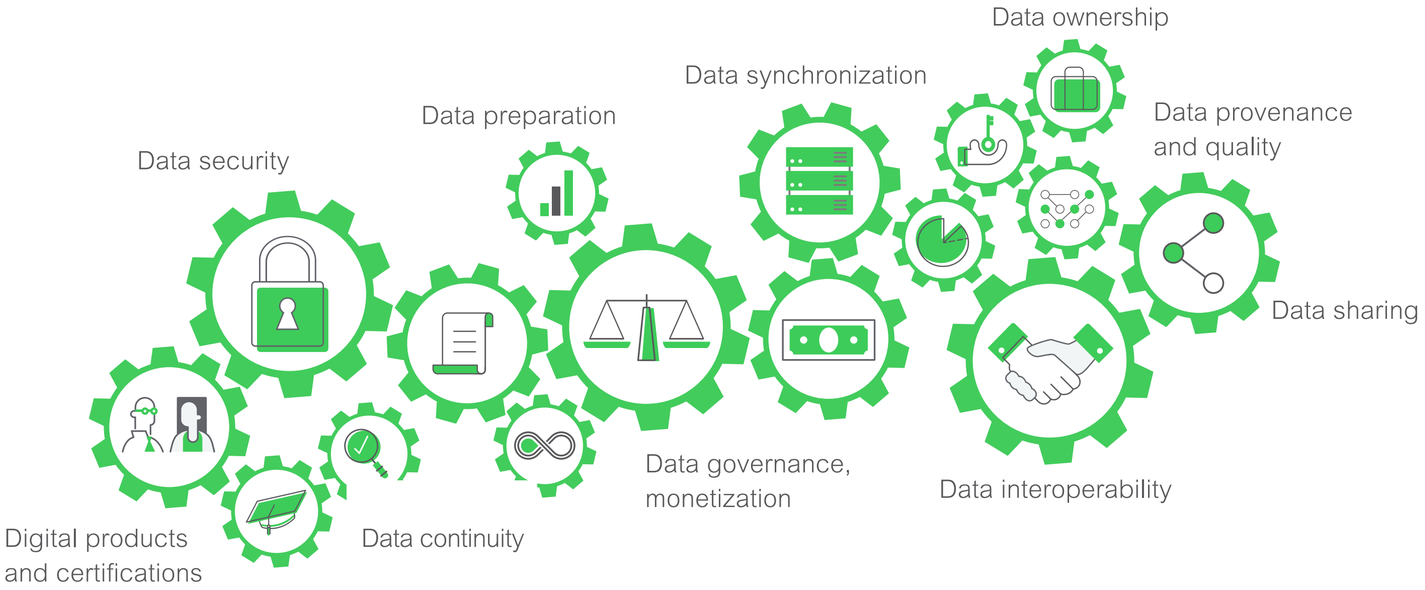


Reliable data is the basis of an organization's ability to deliver high-quality business outcomes. Since data comes from disparate parts of an organization (e.g., lines of business, customer service, and production assets), clear data governance is necessary to create vibrant, validated, and always reliable analytics.

> "By 2026, on average, **30% of Global 2000 company revenue** will derive from industry ecosystem **shared data, applications, and operations initiatives** with partners, industry entities, and business networks."
>
> IDC

So, how do we bring all this data together? Whereas legacy operations have traditionally used data in silos, federated data creates an integrated data thread across all program areas, enabling individual departments, groups, or partners to maintain diversity and uniqueness while also providing interoperability across domains.

Digital backbone



TIP: *Establishing data continuity, quality, and provenance; validating data reliability; and adopting a secure data management approach for your digital backbone are essential elements for tracking and explaining data. The goal is to know what, when, and why something happens in both real time and future states at any given moment.*

Flexible, scalable cloud and SaaS

Traditional OT software is run locally on premises, with limited opportunity for collaboration in a shared environment. This makes it costly and difficult to scale as demand grows or shrinks.

Many industrial companies have started to leverage the power and scale of the cloud to unlock the next level of efficiency, collaboration, and growth for their businesses. A simple first step is to augment existing on-premises systems with cloud solutions to unlock additional business value through cloud-based analytics and data sharing.

Industrial cloud platforms are purpose built for industrial use. By removing organizational silos and replacing them with a shared environment for real-time collaboration and transparent information, industrial cloud platforms create unmatched levels of workforce and operational efficiency.

Using an industrial cloud platform also provides a central location to access software-as-a-service (SaaS). Sometimes called "software on demand," SaaS is quickly becoming the licensing and delivery method of choice around the world. SaaS applications are delivered over the internet via a highly cost-effective subscription model that provides easy and fast updates, scaling as needed, high availability and accessibility, and advanced security. By moving to SaaS, time to value is almost immediate. Companies make a much smaller initial outlay and can immediately access the benefits.

TIP: *Perpetual license software often requires a big investment up front and additional budget for maintenance and upgrades. The costs of pay-as-you-go SaaS models are flexible and predictable and provide faster returns on investment.*

Software storage and access

On-premises software is installed on a company's in-house privately-owned computers and servers.

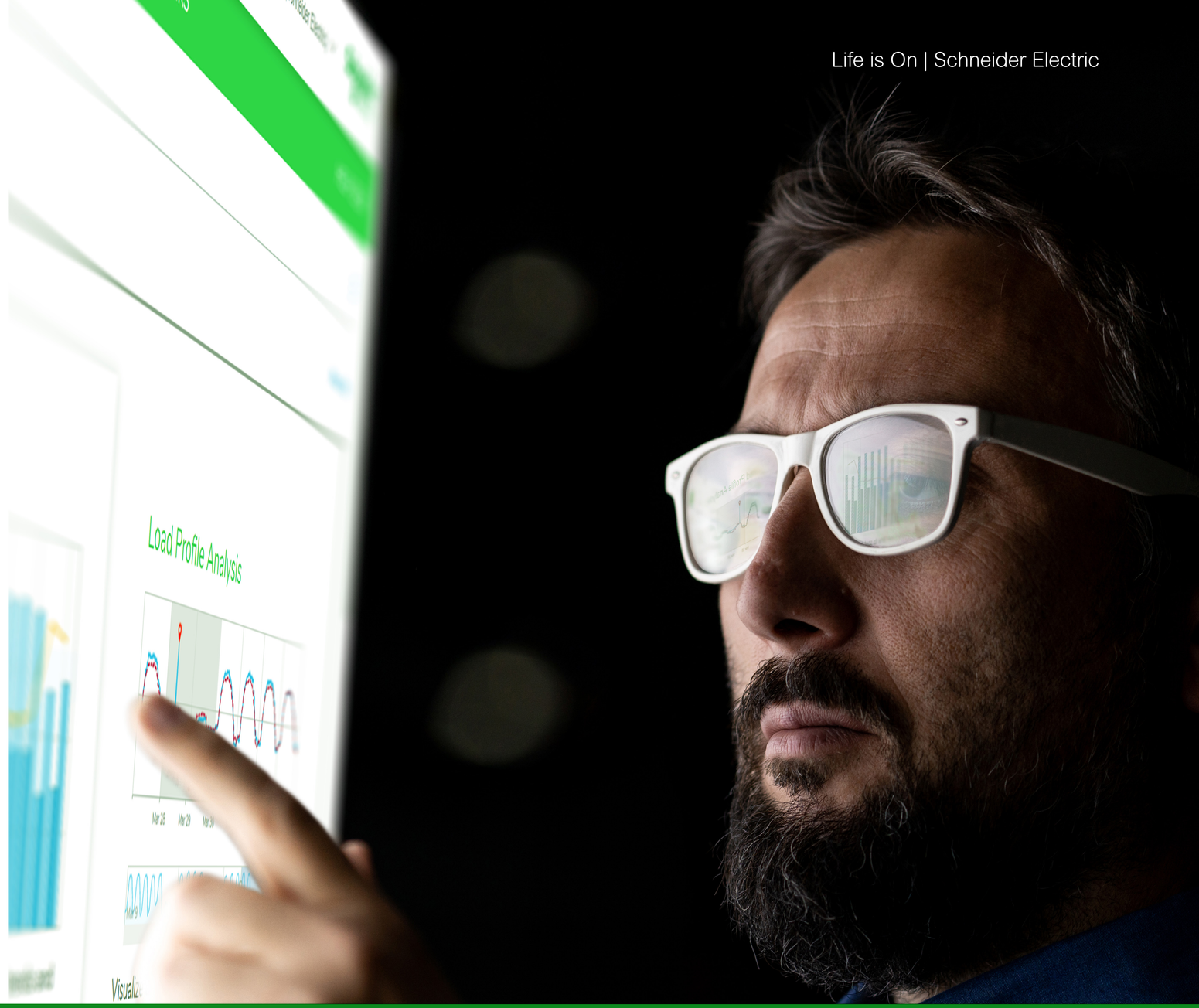
Cloud software is hosted on a vendor's servers and accessed via a web browser.

Software can also be stored in a **hybrid cloud**, which may include a combination of public and private clouds, and a mix of in-house resources and cloud services.

Cybersecurity is everyone's business

Most companies have business continuity plans in place to help them prepare for and overcome a crisis. But with nearly 40 billion devices online globally, almost everyone and everything is connected. Not making cybersecurity a critical, integral part of business planning jeopardizes a company's ability to respond to rapidly changing business dynamics.

This is particularly true when a global crisis wreaks havoc on communities, supply chains, and entire industries and economies. Cybercriminals are quick to take advantage of global events, exploiting vulnerabilities and gaps wherever they can be found and leaving companies exposed.



Our new digital ecosystem empowers us to be more productive and efficient. However, that ecosystem is only effective if we have trust in it. But where to begin?

The first step is to ensure cybersecurity is at the foundation of your overall risk management and risk assessment strategies and matrix. By understanding your risk threshold, you can develop a holistic strategy that addresses the dynamics of your unique environment.

Security is everyone's business, but some companies find they simply do not yet have either the expertise or the resources to fully take on cybersecurity by themselves. Because the stakes are so high, it is best to find a partner who has the expertise to help you design and implement a program that works for you. In most cases, you will need monitoring, maintenance, and training services. In addition, you'll need technical expertise to help integrate your existing technology, especially if it is from multiple vendors.

The goal is a holistic, dynamic program that will continually identify, assess, and minimize your risks and threats. Then you will have the people, processes, and technology in place to reduce the potential impact that a cyber incident could have on your business performance.

TIP: ***Cybersecurity*** *risks related to systemic events are dynamic; they change every day. Therefore, the best approach to reducing and even eliminating current and future risks is to establish a strong cybersecurity foundation that includes your people, processes, and technology.*

Getting smart with advanced technologies

The power of artificial intelligence

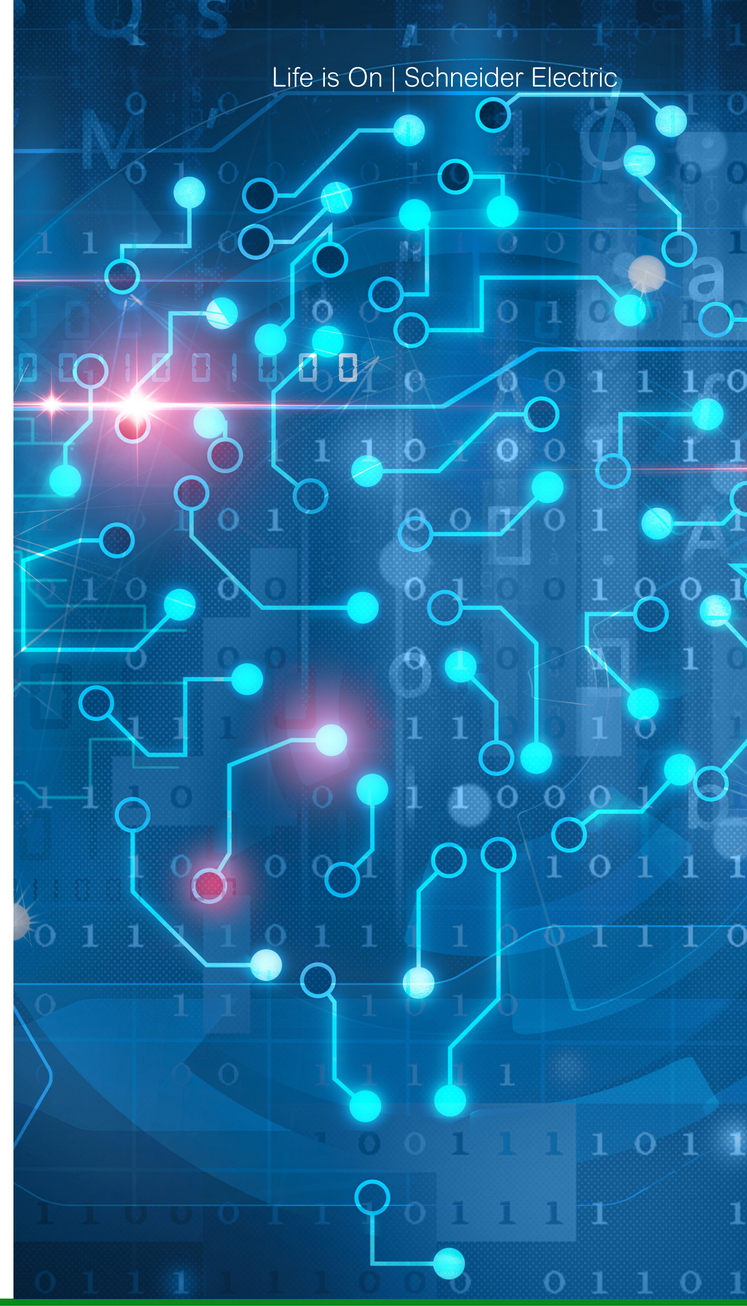
Influential organizations worldwide have adopted artificial intelligence (AI) and automation to not only improve their processes and products but also to strengthen their competitive positions.

Industrial AI technologies mitigate business and operational risk, improve workforce safety and efficiency, and reduce energy consumption and waste—resulting in a more reliable and sustainable enterprise.

"State-of-the-art artificial intelligence technologies improve industrial processes, proactively detect and solve problems, and provide guidance for risk-based decisions, resulting in significant cost savings and improved competitiveness for the enterprise. Artificial intelligence is disrupting industrial markets and forcing enterprises to reevaluate how typical work is performed, including:

- Workforce training
- Process engineering
- Maintenance and repair
- Operations forecasting and scheduling"

— AVEVA



Better decisions with prescriptive analytics

Predictive and prescriptive analytics help us get more out of our factories and processes. Predictive analytics forecast what will happen in the future based on historical data and statistical modeling. Prescriptive analytics also predict future states and then prescribe the optimal course of action needed to generate a desired outcome.

Plant maintenance has traditionally been based on current circumstances. When something breaks, it gets fixed. Maintenance can also be time-based for regular upkeep, or condition-based where personnel react to an alert. More advanced predictive maintenance solutions provide early warning notifications and diagnosis of equipment issues days, weeks, or even months before failure.

Prescriptive maintenance, the most advanced form of maintenance, uses machine learning and artificial intelligence to both predict whether something is going to go wrong in the future and provide the intelligence needed to avert failure. This helps asset-intensive organizations reduce equipment downtime, increase reliability, improve performance, and enhance safety, while also reducing operational and maintenance expenditures.

TIP: *State-of-the-art artificial intelligence technologies improve industrial processes, proactively detect and solve problems, and provide guidance for critical decisions, resulting in significant cost savings, reduced risk, and improved competitiveness for the enterprise.*

Meet your digital twin

A digital twin is the virtual representation of the key attributes of a physical asset, plant, or process that can be tracked and updated along its lifecycle. It is a dynamic data-supported framework used to achieve design, operational, and business efficiencies.

"A generally understood definition of the digital twin is that it comprises a virtual representation that serves as the real-time digital counterpart of a physical object or process. … The concept of the digital twin now permeates most of our daily lives in the form of digital maps on our smartphones, allowing us to navigate our way across the planet with relative ease."

— AVEVA

Photo courtesy of Hubei Sanning Chemical Industry Co., Ltd.

Industrial operators and machine builders are already using digital twins to virtually test and validate processes and assets before they even exist in the physical world. It is far easier to verify the performance of designs in the digital world to make sure they work as intended before implementation onsite. This makes continuous improvement activities far more efficient and effective.

Digital twins also help keep people safe (e.g., virtual training of dangerous scenarios with no physical risk) and enable companies to tap into top talent through more work flexibility.

Synchronization between the physical product and its digital representation is crucial to the success of a digital twin. Built on reliable, continuous data, a digital twin makes design, commissioning, and implementation easier while improving productivity and operations across the digital value chain, including the customer service experience.

TIP: *A successful digital twin strategy depends on an organizational culture and operating model that can align processes and workflows with digital fluency across lines of business and technologies.*

By 2025, **80%** of industry ecosystem participants will leverage their own product, asset, and process digital twins to share data and insight with other participants.

IDC

It’s time for universal automation

UNIVERSAL AUTOMATION.ORG

Until now, the industrial world has worked with closed proprietary architectures and hardware-dependent applications. Yet, in a software-driven world, interoperability is essential.

Portability is already a standard in most other market sectors. For example, mobile applications are developed to run across different smartphone vendors, enabling rapid advances through collective innovation. Now it’s industry’s turn to release the constraints of closed, proprietary systems. It’s time for universal automation.

Universal automation is the world of plug-and-produce automation software components enabled by the IEC 61499 standard. Think of it as an app store for automation. Working to common, open standards is vital to ensuring multivendor interoperability and seamless interfaces — from supply chain through manufacturing and to the end customer.

UniversalAutomation.org is an independent, not-for-profit association that manages a reference implementation of a shared source IEC 61499 standard-based runtime for automation. For the first time, vendors, end users, OEMs, and academics from across industry are sharing a common automation software layer across their automation technology—regardless of brand.

> “This technological collaboration is driving the development of an ecosystem of portable, interoperable, universal automation solutions. UniversalAutomation.Org is open to any new member willing to change the game of automation.”
>
> — UniversalAutomation.org

TIP: *Universal automation enables businesses, no longer constrained by a single-vendor automation model, to optimize cost/performance by integrating heterogeneous components into flexible, agile operational models that deliver step-change improvements we could only dream of a decade ago.*

The green future of industrial sustainability

Achieving sustainable operations is one of the most important challenges that manufacturing and process industries have ever faced.

As modern industrialists, we are experiencing mounting pressure from governments, society, and investors to demonstrate sustainability practices. Today's buyers demand eco-efficient brands, green products, responsibly sourced materials, and sustainability-focused solutions and services.

Traditionally, industrial operators have been blamed for climate change, resource scarcity, and harm to the environment and the society around them — and with good reason.

Today, industry contributes 32% of the world's CO_2 emissions and more than 73% of greenhouse gases come from energy use. The water sector alone consumes 7% of the world's energy and generates 3-10% of total greenhouse gases. Energy intensive industries, especially, can no longer remain indifferent when it comes to embracing global sustainability efforts, nor can they afford the operational cost of energy waste.

At the same time, many of the most energy intensive industries produce the essential building blocks of society and the key components of our modern world.

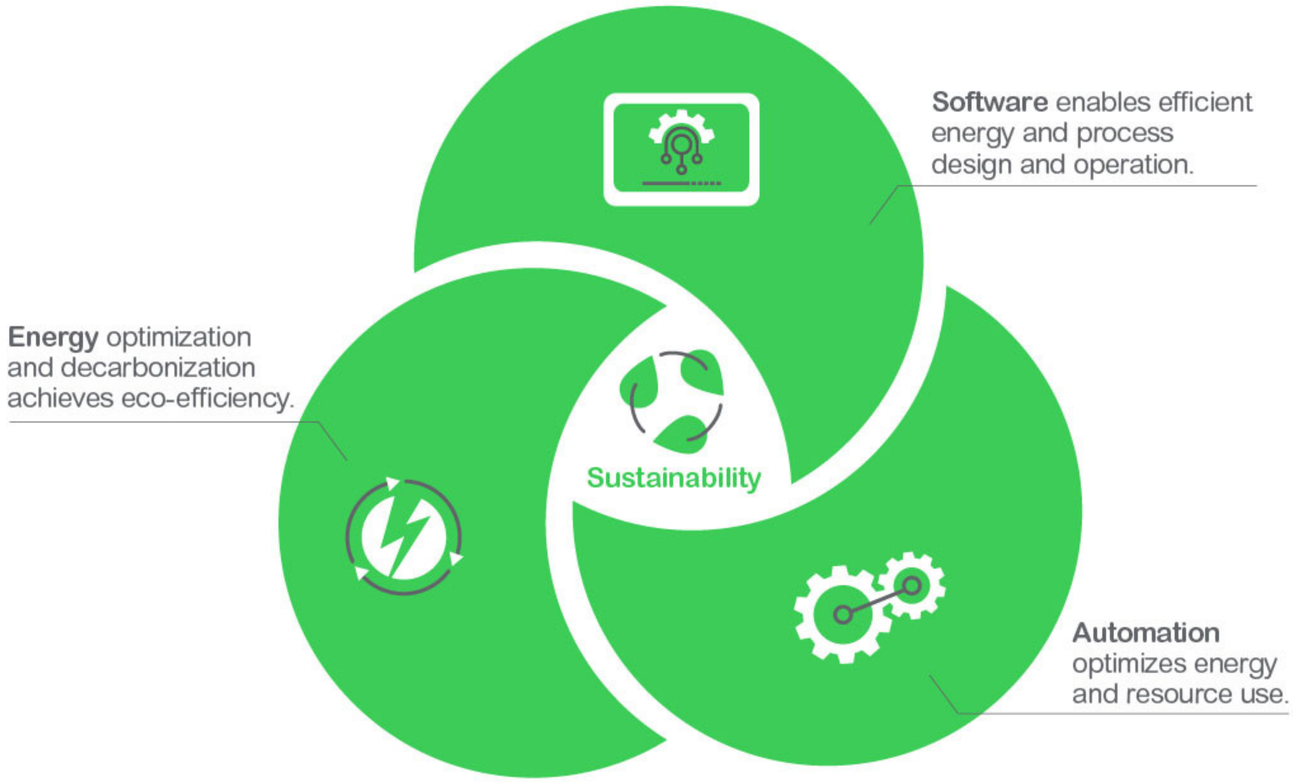
That means that industry is poised to have the greatest impact on solving sustainability problems. *And we already have what it takes.*

> "Industrial digitization supports corporate sustainability, promotes decarbonization and circularity, reduces material waste, prolongs equipment lifetime, and enables better emissions monitoring."
>
> — Bloomberg

By embracing innovative technologies alongside achievable sustainability goals, companies can easily accommodate business and market needs while also reducing their climate change impact, conserving energy and resources, and safeguarding people and the natural environment.

Reducing energy consumption is a critical step in increasing sustainability and business stability. Ideally, a process uses as little energy as possible. Simulation software helps optimize the process by improving the visibility and management of power, fuel, water, raw materials, and equipment utilization.

TIP: *A more sustainable world is a more digital and electric world. Software can drive safety, lower operating costs, and improve an industrial enterprise's sustainability outlook.*



The Industrial Sustainability Triad

Digital transformation case studies

At Schneider Electric, we are accelerating digital transformation with our industrial focused software offers called EcoStruxure Advisors. Our strong agnostic software portfolio and partnerships with world-leading independent software companies, including our strategic partner AVEVA, empower users with a seamless and collaborative dataflow across an entire lifecycle—from design and build to operate and maintain.

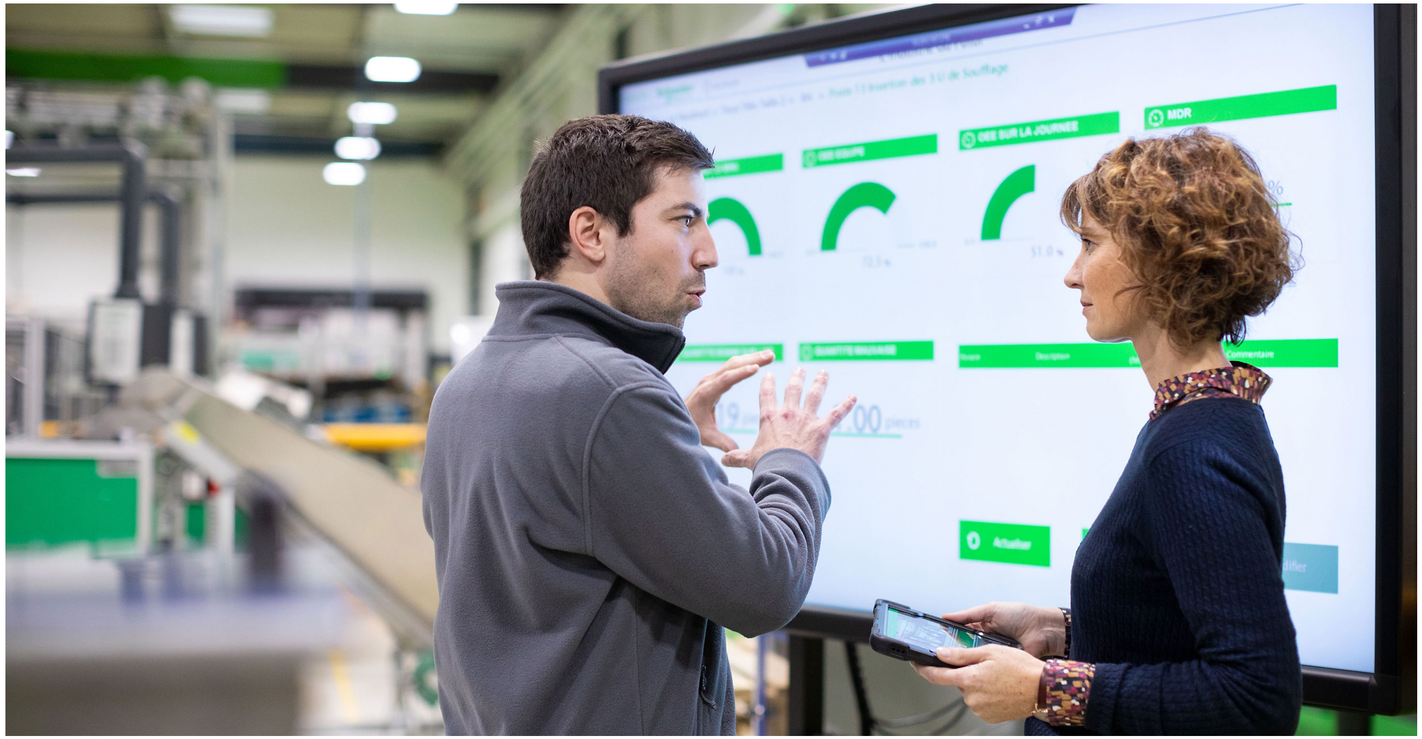
- Covestro
- Enel
- Granado Pharmacia
- Kunming CGE Water Supply
- Livetech
- Mataura Valley Milk
- Nestle Waters
- Sanning Chemical
- Shell
- Sophim

How to pick your software partners

Whether you are the CEO, CTO, or a project owner, a lot is at stake when selecting software partners. Implementing the wrong software, or even deploying good software the wrong way, can set your business up for failure before you even get started.

Choose your digital partners carefully.

> “In the industrial sector, where software frequently requires deep domain expertise, the quality of the support users get when acquiring subscription software can dramatically impact the outcomes they get from the software.”
>
> — ARC



Not all software is created equal and not all software providers have deep domain expertise in industrial operations. When selecting a software partner, ask about:

- ✓ Trusted and proven domain knowledge in your specific industry
- ✓ Flexible and scalable software-as-a-service (SaaS) solutions
- ✓ Seamless dataflow across the entire lifecycle—from design and build to operate and maintain
- ✓ Federated data that enables you to unlock the power of the connected industrial economy
- ✓ Integrated and intuitive user experience across systems
- ✓ Fully combined artificial intelligence and digital twin capabilities
- ✓ Extended reality (virtual, augmented, and mixed reality) and data visualization
- ✓ Smart analytics onsite, in the cloud, and remote
- ✓ Ecosystem of collaboration partners
- ✓ World-class industrial services

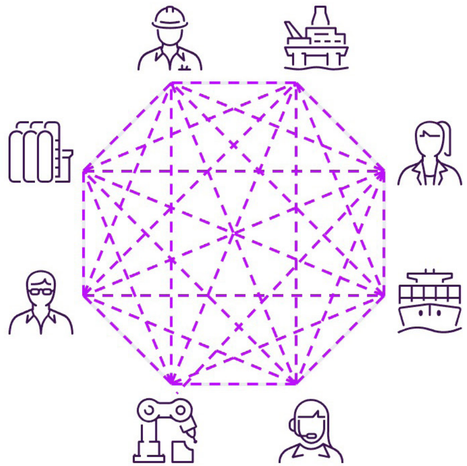
Shaping your future

Industries of the future will be highly agile and flexible operations powered by data-driven insights. The complete value chain will be digitally connected with a seamless experience—from e-commerce front ends to inventory tools, plant floor systems, digital supply chains, and partner company systems.

Current notions of cost point, time to implementation, efficiency, and sustainability will be completely transformed.

The technical evolution for industry will accelerate and the next evolution, Industry 5.0, will be about the way we live with our environment. It's going to be about machine to machine, people to machines, and people and machines to the environment.

Data is the accelerator of industries' value and growth. Imagine if all participants in your value chain could optimize in parallel?



AVEVA

Will your industrial business be part of the eco-efficient, agile, and resilient industries of the future?

As a world leading impact company and a global manufacturer with an end-to-end network of smart factories and smart distribution centers, including five designated by the World Economic Forum as Advanced Lighthouses and two as Sustainability Lighthouses, Schneider Electric is on a mission to make industries of the future eco-efficient, agile, and resilient through open, software-centric industrial automation.

> "Future factories will be high-tech, software-driven engines of customized mass production. They will be more automated, more connected, and integrated, and more information-intensive than ever before. They will be organized for greater speed, flexibility, productivity, and efficiency. The people who work in them will have advanced skills and technical competency with the ability to work cross-functionally across the connected enterprise."
>
> — Manufacturing Leadership Council

Glossary

Artificial intelligence (AI): A branch of computer science that uses computer systems or machines that mimic human intelligence to perform tasks and then progressively improve based on knowledge gained over time.

Augmented reality (AR): Technology used to create an enhanced version of reality to overlay digital information on an image of something being viewed through a device.

Born-digital company: An organization founded after 1995, whose operating models and capabilities are based on the internet and digital technologies.

Circularity: An economic model where systems, procedures, facilities, and practices are created and managed to continue indefinitely, without exhausting natural resources.

Cybersecurity: Measures taken to protect computer systems against unauthorized access or harm.

Data engineer: A person responsible for designing and building data pipelines and systems to aggregate and integrate information from different sources at scale to enable data-driven decision making.

Decarbonization: The removal of carbon and carbon dioxide (CO_2) emissions from production through a process or technology.

Digital backbone: An enterprise-wide architecture that manages the storage, aggregation, analysis, and provision of data across an organization.

Digital native: A person who grew up in the era of information technology; includes Generation X, Millennials, Generation Z, and Generation Alpha.

Digital transformation: Integrating digital technologies and solutions into all areas of a business to improve efficiency, value, agility, sustainability, innovation, and competitiveness.

Digital twin: A virtual representation of real-world objects and systems created from real-time data, simulation, and artificial intelligence.

Eco-efficient: Optimizing the efficiency of an operation for sustainability by reducing resource use and environmental impact.

E-commerce: Buying and selling goods and services via the internet.

Engineering technology (ET): The tools and technologies used by engineers to provide scientific and mathematical knowledge and best practices in the design of new products, processes, and solutions.

Federated data: Data stored in a heterogeneous set of autonomous data repositories that is made accessible to others as one integrated data store with on-demand data integration.

Industrial cloud platform: Enables on-demand delivery of computing services over the internet (“the cloud”). Industrial cloud platforms are heavily customized to fit a specific industry to accommodate the business, operational, legal, regulatory, and security needs of a business.

Industrial internet of things (IIoT): The use of internet of things technology (connected machines, devices, and sensors) in industrial applications.

Industry 4.0: The fourth industrial revolution, which is associated with the rise of automated systems and data exchange technology within manufacturing industries.

Industry 5.0: The fifth industrial revolution, which is associated with the expansion of technology to augment and enhance human capabilities and safety in the next-generation workforce.

Information technology (IT): The technology involving the development, maintenance, and use of computer systems, software, and networks for the processing and distribution of data.

Mixed realities: A technology that closely blends physical reality and the digital world.

Operational technology (OT): Programmable systems or devices that interact with the physical environment to monitor and control industrial equipment, assets, processes, and events.

Predictive analytics: Using artificial intelligence, data, and advanced analytics to forecast future scenarios.

Prescriptive analytics: Using artificial intelligence, data, and advanced analytics to determine the best course of action and provide recommendations to achieve a desired outcome.

Risk threshold: The risk-bearing capacity of an individual or organization.

Risk assessment: The process of analyzing potential events that may result in loss.

Risk management: The process of identifying, assessing, and controlling threats to an organization's capital and earnings.

Single source of truth: Data warehousing with either a single centralized database or distributed synchronized databases, which stores all of an organization's data in a consistent and non-redundant form.

Six Sigma: A data-driven methodology using statistical analysis to reduce errors or defects in products and processes. Six Sigma quality means 3.4 defects or less per million opportunities. Six Sigma views all work as processes that can be defined, measured, analyzed, improved, and controlled.

Software-as-a-service (SaaS): Applications delivered over the internet via a subscription model to provide easy and fast updates, scaling, and consistent costs.

Time to value: Measurement of the time it takes from purchasing a product/service to begin realizing benefits and start deriving value.

Universal automation: The world of plug-and-produce automation software components, based on the IEC 61499 standard, that solves specific problems in a proven way - think of an “app store” for industry.

Virtual reality (VR): An artificial environment that is experienced through sensory stimuli (e.g., sight and sound) provided by a computer, where the user’s actions partially determine what happens in the environment.

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To learn more information about the
Schneider Electric visit

se.com

Schneider Electric
35 rue Joseph Monier
92500 Rueil-Malmaison, France
Tel : +33 (0)1 41 29 70 00

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