

Megatrends Report

The background of the cover features a complex, abstract design. It consists of numerous thin, overlapping lines in a variety of colors including blue, green, yellow, orange, red, and purple. These lines flow and curve across the frame, creating a sense of movement and depth. In some areas, the lines form a grid-like pattern, while in others, they are more chaotic and overlapping. The overall effect is a vibrant, futuristic, and data-driven aesthetic.

vinyl INSTITUTE

Introduction

According to AD Little, megatrends are “an inevitable evolution leading to a change of society, business, economics or environment.” And BlackRock defines them as “powerful, transformative forces that could change the global economy, business and society – have been changing the way we live for centuries. Think electricity, automobile, the Internet.”

The Vinyl Institute surveyed membership, reviewed literature, considered leading thought leaders, and investigated polling to identify trends with the potential to disrupt and transform the vinyl industry over the next 5–10 years. A summary of each trend and some key considerations for the industry are reviewed in the report.

We hope that this report will provide valuable insight in support of your strategic planning efforts and your ESG reporting activities.

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Profits:

ANALYTICS DASHBOARD

ICE FEED:NE ORK

Data Analytics and Digital Connectivity

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SECURITY

72:06

Actual vs Target



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Market Share

Data Availability

KPI:Product

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Customers Satisfaction

Data Analytics and Digital Connectivity

Assembly lines that use wearables during quality inspection are able to send their photos to design engineers in real time through smart sensor technology.

*<https://bit.ly/3AxxUf9>

When Apple unveiled the first Macintosh personal computer in 1984, the device that was greeted with such fanfare had only 512 kilobytes of memory and an 8 MHz processor. Today, a USB charger has more computing power and supercomputers are able to process trillions of bytes of data in mere seconds. The rapid decline in the size and cost of computing means that most people can connect whenever and wherever, and information flows freely across the globe. This means a farmer in Ethiopia can see the price of a latte in London and an oncologist at Memorial Sloan Kettering in New York City can talk to a patient in Norfolk, Virginia. Meanwhile, data scientists are using artificial intelligence and machine learning to look for signals in the noise to spot patterns to predict disease outbreaks, define consumer buying patterns, and track supply chains and alert to disruptions. At the same time, sensors in everything from wearable fitness trackers to smart lights are enabling companies to connect real-time data to understand user behavior, predict problems, and schedule maintenance and repairs.

The same digital prowess that brings the world closer also reveals the downsides of that connectivity. A May 2021 ransomware attack on Colonial Pipeline disrupted gasoline supplies for days along the Eastern Seaboard. And attacks on everything from hospitals and critical infrastructure to financial institutions are on the rise. So too are data breaches, including personal information and business intelligence. Indeed, data analytics and digital connectivity in the 21st century offers both opportunities and threats.

Key Drivers

- Artificial intelligence
- Computing power
- Digital science
- Technology

Considerations for the North American Vinyl Industry

- Increase market trust via an enhanced ability to track and trace products, from raw materials and ingredients (including recycled content) through order fulfillment and delivery.
- Improve worker safety, product quality, and production efficiency through deployment of interconnected devices (i.e., the Internet of Things), including assembly line automation, integrated sensors, robots, wearables, and artificial intelligence.
- Increase awareness about connected devices and how they can be avenues for unauthorized or unintentional access to company data that can be stolen for ransom or misused to create market confusion.
- Update obsolescent technology and inadequate cybersecurity that could fail OEM cyber audits.

Climate Change



Climate Change

For 1.5°C of global warming, there will be increasing heat waves, longer warm seasons, and shorter cold seasons. At 2°C of global warming, heat extremes would often reach critical tolerance thresholds for agriculture and health.

*<https://bit.ly/3EnQWNJ>

The warning issued by the UN International Panel on Climate Change in August 2021 was dire: even under the best-case scenario, global warming will result in more severe heat, more flooding, more sea rise, and new threats to human lives and livelihoods. Achieving even this scenario, which would mitigate the worse consequences of global warming, will require the world to cut emissions to net zero by 2050.

Climate change poses an existential threat to the planet. The challenge for the global community in the 21st century is whether we will, collectively, heed the alarm and finally get serious enough about making changes to safeguard our future. For governments, this means agreeing on strict cuts in greenhouse gas emissions and putting in place the legislative and regulatory frameworks needed to restructure national economies. In the business context, this means building in resilience while at the same time reimagining every aspect of operations, from raw materials to manufacturing processes to recycling and renewal. It also means being responsive to financial markets and institutions rewarding sustainable businesses and penalizing those that neither adapt nor change. Consumers, meanwhile, will need to rethink their way away from fast, cheap, and convenient toward a simpler, less-destructive path forward.

Key Drivers

- Financial risk
- Greenhouse gas emissions
- Globalization
- Industrialization

Considerations for the North American Vinyl Industry

- Take a leadership position in developing a decarbonization strategy that will drive preference for vinyl products to meet the larger demand for resilient construction materials in localities where low-carbon policies are emerging.
- Drive preference for cost-effective PVC pipe and conduit as the solution for outdoor and indoor irrigation to improve food security and for electrification infrastructure to minimize the cost impact of the transition to cleaner energy.
- Enhance your company's appeal to current and prospective employees, customers, and partners by demonstrating a history of consistent ESG reporting.
- Establish a strong comparative data set of low-carbon performance, industry decarbonization roadmap information, and carbon policy strategy to demonstrate the value of vinyl as part of a more sustainable and just future.
- Prepare for more frequent and powerful storms as production facilities will be at risk for more frequent and longer disruptions to plant operations and supply chains.

Decentralized Financing



Decentralized Financing

According to a report by Price Waterhouse Coopers, more than 60 central banks have been exploring digital currencies since 2014, and 88% use blockchain as the underlying technology.

*<https://pwc.to/3nuBzoc>

Even before El Salvador in September 2021 declared Bitcoin its new legal tender, the cryptocurrency was being used for everything from shopping to charitable giving. That's because Bitcoin and other digital currencies enable quick, cheap payments without needing a bank, with claims that it is a "greener" option than the traditional banking system. But what's trendy is also a sign of things to come: more distributed banking networks and less reliance on traditional financial institutions and the high fees they've long exerted for holding, lending, and transferring money. Many central governments have been investigating the launch of their own digital currencies.

Another major shift in the financial power structure has been the emphasis on ESG investing, which has led to the unintended consequence of "greenflation." This is a growing paradox where investment in carbon-heavy industries has slowed due to regulatory and demand pressures, driving up prices for the very materials needed for new and cleaner infrastructure and lowering returns on those investments. Meanwhile, today's sophisticated digital currencies are rapidly gaining adoption over traditional currencies, appreciating in value and serving as safe havens for early adopter institutional investors seeking asset diversification. Indeed, the underlying blockchain technology—a decentralized global ledger or spreadsheet—has created alternative banking systems. For consumers, this facilitates safe, affordable money transfers across town and across borders. For businesses, the rise of digital currencies provides new access to capital, especially in emerging industries and sectors where traditional lenders have been reluctant to take part..

Key Drivers

- Blockchain
- Peer-to-peer lending networks
- Institutional pressure around ESG
- Lack of trust in large institutions, results in new non-governmental banking options

Considerations for the North American Vinyl Industry

- Build genuine transparency and accountability across your supply chain by using decentralized ledgers to track orders, product movements, payments, accounts, production, carbon footprint, and much more.
- Consider using cryptocurrency as a reserve asset for part of your treasury.
- Prepare for increased cyber and malware attacks that cripple systems for long periods of times.
- Monitor regulation of cryptocurrencies and crypto exchanges and advocate for policies that preserve value.
- Adopt triple-bottom-line accounting metrics being developed by leading investment banking institutions and make decisions about business and project valuation based on more than traditional first-cost metrics.

Globalization



Globalization

One of the undeniable advantages of globalization is that new ideas and technologies can quickly spread across the world.

*<https://bit.ly/2XtpEoq>

Globalization is defined by an increasingly integrated global economy marked by the freer flow of goods, services, capital, and labor across borders. The rise of globalization has shifted manufacturing across borders and continents and reshuffled political alliances. The emergence of Brazil, Russia, India, and China (the BRIC nations) as economic powerhouses has also highlighted their political prowess. Meanwhile, recent disruptions to the global supply chain and spot shortages have only exacerbated the interconnectedness and economic challenges brought about by globalization.

Innovation will continue to drive globalization in the 21st century, and everything from blockchain ledgers to drone deliveries to the Internet of Things will open up opportunities and emphasize our connectedness. In the business context, globalization runs the gamut from global supply chains to offshore manufacturing and production. For consumers, it means on-demand access to a made-in-everywhere panoply of food, clothes, appliances, electronics, and household goods. At the same time, more and more consumers are awakening to the downsides of globalization as concerns over everything from jobs to sustainability have led to a push for fair trade labels, greater transparency across supply chains, and movements to buy fresh and buy local.

Key Drivers

- Deregulation
- Economic integration
- Labor markets
- Technology

Considerations for the North American Vinyl Industry

- As third world nations continue to improve and middle classes continue to grow, expect demand for U.S.-produced PVC to also grow due to the advantages of low-cost natural gas supplies and strict regulations that ensure better environmental outcomes.
- Monitor for and act quickly on inaccurate and unscientific claims that can spread quickly across the globe due to advances in connectivity and a siloed information ecosystem.
- Prepare for climate-related supply chain interruptions and overcapacity of the logistics infrastructure which may cause delays and congestion in a globally reliant supply chain.

Health and Wellness



Health and Wellness

Most people spend 90% of their time indoors.

[*https://bit.ly/2Ylfy3q](https://bit.ly/2Ylfy3q)

From biomarkers to biohacking, the drive to understand our genetics and control our destinies has been a predominant theme of being human. When the World Health Organization declared a public health emergency on January 30, 2020, the focus on health and wellness ramped up even more. From hand sanitizers to nutraceuticals, the markets for products that protect and provide immunity soared. Trapped in their homes, people looked more closely at where and how they lived. The Facebook Group “View from My Window” quickly garnered 2.3 million members.

At the same time, people overall are living longer thanks to improvements in medicine, nutrition, and quality of life. Our modern lifestyles mean we spend more and more time indoors, a trend likely to increase under the impacts of a changing global climate. Health and wellness is a trillion dollar industry that impacts every sector of the economy. For governments, it’s about health care, pandemic preparedness, pollution abatement, and understanding how to house and feed a growing aging population. For businesses, it’s about creating well buildings and healthy living spaces for residents and employees alike. For individuals, it’s about living well—physically, mentally, and socially—and not just living longer.

Key Drivers

- Lifestyles
- Longevity
- Science & medicine

Considerations for the North American Vinyl Industry

- As people spend more time indoors, prepare for an increased demand for information about potential exposures from products.

- Expect an increase in demand for materials and products that improve the resiliency of a system against new public health threats (e.g., products that can withstand harsh cleaning requirements).
- Prepare for more spending on medical devices, universal design, and new senior living communities to facilitate managed-and self-care within the aging U.S. population.
- Expect the trend toward funding of single-hypothesis studies targeting the presence of chemical substances to continue, which could lead to extra-regulatory standards and certifications based on this research.

Population Shifts



Population Shifts

There were 703 million people globally age 65 or over in 2019. By 2050, that number is projected to double to 1.5 billion.

*<https://bit.ly/3kzf4on>

Aging cohorts, lower birth rates, political and social unrest, economic opportunity, climate change, and other factors are causing seismic population shifts—and the impacts will reverberate across the 21st century. Urbanization brings with it strains on essential public resources, including housing, clean water, primary education, and accessible health care. The movement of more and more people into population centers expands their limits as development encroaches on natural habitats, including forests and wetlands. Aging populations means declining tax bases and rising health costs as a percentage of GDP.

In the business context, infrastructure will be key: modernized transportation, affordable housing and health care, and a rethinking of “smart cities” that facilitate economic and environmental quality of life. The more that companies can build for resilience, the more likely they are to be positioned to take advantage of the impacts of migration and other population shifts.

Key Drivers

- Climate Change
- Economic opportunity
- Political & social unrest

Considerations for the North American Vinyl Industry

- Focus on vocational education in place of formal educational channels in sectors where skilled workers are needed to support market demand and industry objectives.
- Leverage urbanization trends to drive procurement policies that protect vinyl products in smart cities—including cabling infrastructure, perishable food packaging, essential medical

products, and indoor irrigation—to enhance livability and public health.

- Expect infrastructure investment opportunities that support community resilience and adaptability to increase as urbanization and migration grow.
- Be aware that artificial intelligence and automation could contribute to a shrinking workforce at the same time as workers skilled in these technologies become more expensive for companies to hire.
- Urbanization and migration will result in a greater need to address environmental justice concerns.

Resource Constraints



Resource Constraints

40% of the world's population is affected by water scarcity, with as many as 700 million people at risk of being displaced by 2030 as a result of drought.

*<https://www.unccd.int/actions/drought-initiative>

Conflicts about natural resources are nothing new. For over a century there have been confrontations and wars fought over water, oil, and other natural resources. These challenges are exacerbated as extreme weather events and the COVID-19 pandemic exposed weaknesses in the global supply chain. Shortages of everything from copper and iron to resin and semiconductors have slowed production and caused a cascading impact of price spikes and supply constraints. A September 2021 coup d'état in Guinea further highlighted the world's dependence on rare-earth minerals and other scarce natural resources. Prices for aluminum soared as political uncertainty raised economic concerns over production levels in the world's largest exporter of bauxite.

Climate change is only accelerating these resource constraints. Droughts are creating water shortages; snowmelt, tsunamis, and hurricanes are flooding farmlands. Fires are burning the world's forests. As these forces continue, companies will increasingly be proscribed by laws, regulations, and consumer demand to do more with less. Those industries and brands that reduce their greenhouse gas emissions and pivot toward recyclable and renewable resources will position themselves for long-term viability.

Key Drivers

- Extreme weather
- Political conflict
- Regulation
- Resource depletion

Considerations for the North American Vinyl Industry

- Accelerate research on alternative, renewable, and/or regenerative feedstocks, processes, and energy sources.

- Accelerate research on more stable PVC molecules and compounds that maximize recycled content, allowing the market to do more with less material.
- Be aware that shortages of traditional and alternative feedstocks, ingredients, and energy could lead to inconsistent quality and unreliable process uptimes.
- Be aware that resource availability could drive new environmental regulations and end-of-life producer responsibility.

Social Responsibility

A black laptop is shown from a low angle, resting on a dark wooden surface. The laptop lid features a vertical strip of social media icons on the left side, including Facebook, Twitter, YouTube, and others. To the right of these icons, the words "DO MORE." are printed in a large, bold, grey font. The background is dark and out of focus, with a hexagonal pattern visible in the upper right corner.

DO
MORE.

Social Responsibility

In 2021, 52% of consumers—up from 43% in 2019—said it is “important for me to buy from companies whose values match my own.”

*<https://bit.ly/3q4RcMQ>

In 2021, companies are making a statement. The software app Calm supporting athletes who prioritize their mental health is just one example of how large brands are increasingly willing to weigh in on the social, political, and economic issues of the day. Whether it’s voting rights, women’s rights, racial justice (#BLM), environmental justice, gender and pay equality, or the #MeToo movement, consumers are increasingly demanding that companies take positions and be accountable for their actions. Meanwhile, citizen scientists are scouring data on everything from air quality to automobile congestion to understand and report on the impacts of community and corporate activity.

The era of the responsible brand is here, and business as usual will no longer cut it. COVID-19 didn’t create inequality, but it exposed economic and health disparities. Social networks didn’t create harassment and discrimination, but they allowed people to share their stories, compare notes, and understand the systemic nature of many of the issues undergirding the U.S. and global economies. The result is that shareholder value will increasingly be but one metric of corporate worth as investors and consumers alike demand and reward transparency around business values and social good. The vinyl industry is committed to clean air, clean water, a safe and clean food supply. We want to protect our communities. Our safety record is better than the chemical industry. This commitment to socially responsible positions the industry well for the future.

Key Drivers

- Citizen scientists
- Consumer activism
- Social justice movements
- Social networks
- Trust in institutions

Considerations for the North American Vinyl Industry

- Close the workforce skills gap by hiring a more diverse workforce, broadening opportunities, and minimizing “group think.”
- Undertake company community initiatives that promote social equity.
- Employ a diverse workforce and take measured positions on social issues to strengthen customer loyalty across the supply chain.
- Partner with local organizations to discuss community environmental health and safety concerns.

Transparency



Transparency

78% of consumers said they would trust a manufacturer or product more if it included “complete product label information (ingredients, nutritional information, or allergens.”

*<https://bit.ly/3od7m4z>

The ease of access to information from commodity prices to box scores has put consumers in the driver’s seat. They know they can find things out—and they expect companies to make that sleuthing easier or unnecessary. The companies that do so have opportunities not only to earn customer loyalty but also to reap benefits in investor confidence and their bottom line.

In the business world, transparency has become synonymous with a willingness to provide consumers with information about you—where you operate, how you operate, and how your product is designed, manufactured, and sold. This starts with adopting and publicly sharing corporate commitments to good governance, to invest in local communities, worker health and safety, and other social impacts, and to environmental standards and activities that reduce carbon footprints and increase resilience. It also includes openness about your supply chain as well as disclosures about materials and manufacturing processes.

Key Drivers

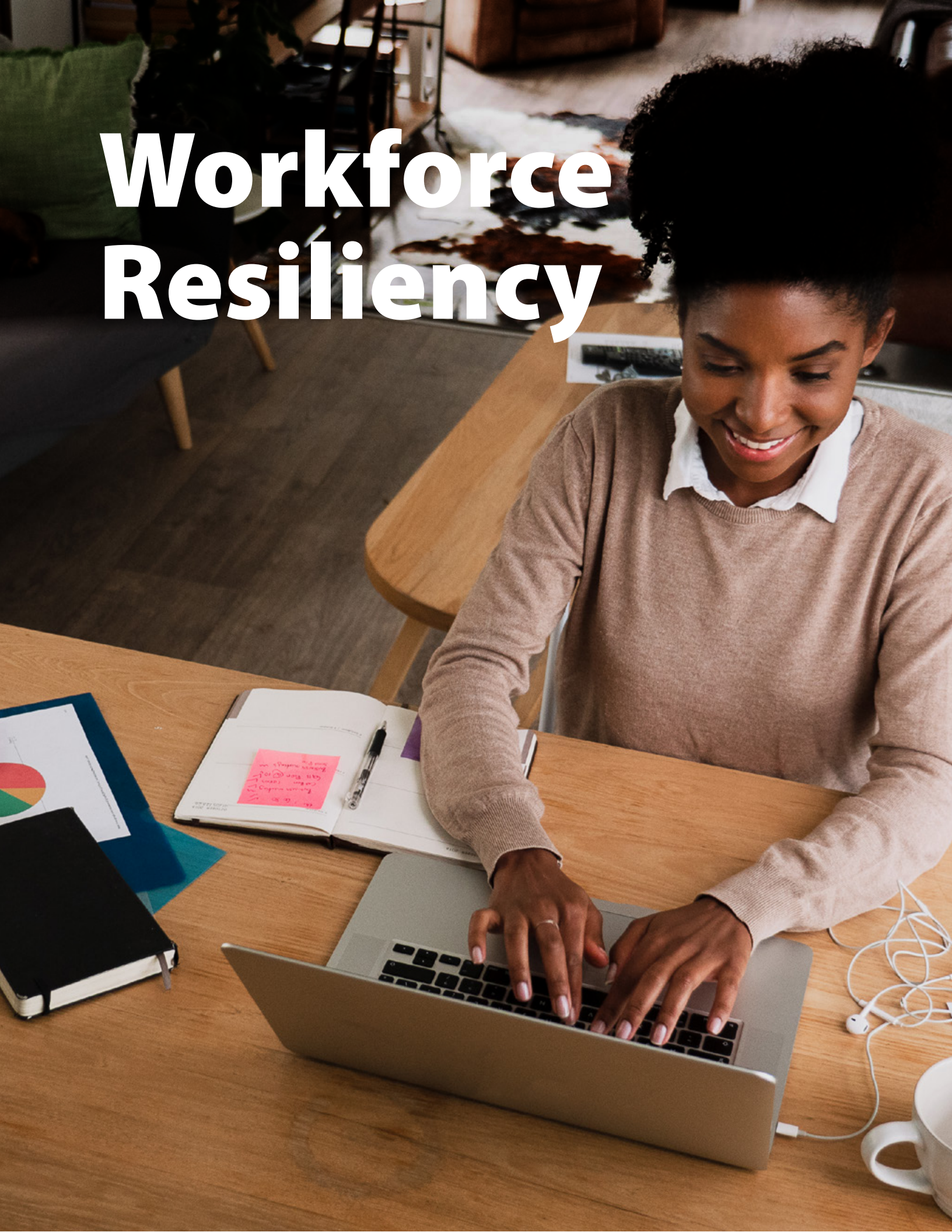
- Trust
- Consumer demand
- Financial sector decision making
- Regulatory requirements
- Blockchain

Considerations for the North American Vinyl Industry

- Build consumer trust and brand loyalty by proactively disclosing climate-related issues as they relate to governance, corporate strategy, and supply chain risk management practices.
- Improve employee morale and retention, and attract new talent, by developing and publicly communicating ESG goals and performance.

- Operate with transparency to build trust for your business and the vinyl industry.
- Expect more transparent ESG reporting to increase consumer demand and interest from the ESG investment community.

Workforce Resiliency



Workforce Resiliency

Artificial intelligence, automation, and robotics will make this shift as significant as the mechanization in prior generations of agriculture and manufacturing.

[*https://mck.co/3Avxtso](https://mck.co/3Avxtso)

The global pandemic largely upended work as we know it. From shuttered factories and office buildings to virtual meetings and meetups, how we work shifted overnight. The unemployment that followed only heightened the fragility of many business models and the need to rethink how we work.

The future of work in the 21st century will be one of workforce resiliency—the agility needed by organizations to continuously adjust, retool, rebuild, and adapt and train their workforce to meet the needs of their customers and changing work environments. Two key trends—automation and hybrid work—offer clues to what might come. In the manufacturing sector, companies hit hard by COVID-19 shutdowns and infections are already starting to incorporate more robotics and automation into their systems to buffer against personnel absences and shortages. And smart businesses are also rethinking plant sites, deploying artificial intelligence, and putting in place new protocols to identify risks and protect operations from weather-driven stoppages. Meanwhile, more and more workers who can work from home are opting to stay there permanently—and companies are creating hybrid approaches to the time employees spend in and away from the traditional office. At the same time, globalization and technology are facilitating the recruitment and retention of the best and brightest across the country and around the world.

Key Drivers

- Artificial intelligence
- Global pandemic
- Robotics
- Technology
- Advanced mobility

Considerations for the North American Vinyl Industry

- Retrain and or upskill employees to reduce attrition.
- Implement hybrid work and job sharing to attract younger workers.
- Consider the dynamic and rapidly evolving job markets that can challenge your company's ability to recruit and retain production and installation workers.
- Adapt capital-intensive, location-specific, and on-site manufacturing to emerging work styles and norms.

Long Links

Climate Change

<https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/>

Data Analytics and Digital Connectivity

<https://www2.deloitte.com/us/en/pages/energy-and-resources/articles/manufacturing-industry-outlook.html>

Decentralized Financing

<https://www.pwc.com/gx/en/industries/financial-services/assets/pwc-cbdc-global-index-1st-edition-april-2021.pdf>

Globalization

<https://ideascale.com/how-does-globalization-impact-innovation-strategy/>

Health and Wellness

<https://www.epa.gov/iaq-schools/why-indoor-air-quality-important-schools>

Population Shifts

<https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Highlights.pdf>

Resource Constraints

<https://www.unccd.int/actions/drought-initiative>

Social Responsibility

<https://valassis.com/consumer-intel-report/>

Transparency

<https://www.digimarc.com/docs/default-source/default-document-library/whitepaper-product-transparency.pdf?sfvrsn=4>

Workforce Resilience

<https://www.mckinsey.com/featured-insights/future-of-work>