

**5 New Global Megatrends...
*and the Opportunities and Challenges Ahead
for Construction in the Next 5 Years***



Over the past few years, the global construction industry has navigated unprecedented times with high highs and low lows brought on by the unanticipated pandemic. As a result, the dynamic on today's job site has changed, new megatrends have surfaced and businesses have had to reinvent themselves to be prepared for the future.

In this whitepaper, we will outline five megatrends influencing the industry and how each has impacted equipment manufacturers, customers and end-users. This paper will also highlight some of the changes that businesses may need to be on the lookout for on job sites in the future.

Let's dive in...

When we look at what was impacting our industry pre-pandemic (2015-2020), we identified five key drivers:

- 1) Global Marketplace
- 2) Productivity Imperative
- 3) Sharing Economy
- 4) Digital Future
- 5) Urban World

Baked within these top five trends was urbanization, the phenomenon of more and more population moving to urban centers, which was driving demand for product electrification.

When we think about the megatrends for the five years following the pandemic (2021-2025), we see new key influences emerging:

- 1) Shifts in Growth and Trade
- 2) Stronger Societal Deal
- 3) Accelerating Disruption
- 4) Digitally Powered Customer
- 5) New Ways of Working

Let's take a closer look at each of these...

Megatrend #1: Shifts in Growth and Trade

Over the last few years, the world has seen a tremendous shift in economic power. Before the pandemic, the construction industry had become largely dependent on suppliers from a few key countries, which ultimately exposed several long-term risks.

Post-pandemic, it has begun moving towards region-for-region supply chains to create a more diversified supply base, including suppliers from mature, developing and emerging countries, a step toward the industry's long-term evolution.

The influence of emerging and developing economies in the global society will mean big changes for individual businesses but also the industry as a whole.

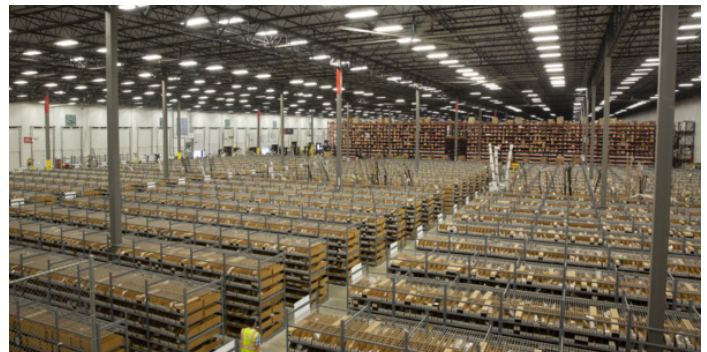
Causes for the Shifts

According to the Institute of Civil Engineers, the global construction market is expected to reach around \$8 trillion by the end of 2030 — driven by infrastructure development across the U.S., China and India. Combined with the dramatic changes in the industry over the last few years, including the new ANSI standards, supply chain disruptions and the push for electrification in access equipment (including mobile elevating work platforms, aka MEWPs, and telehandlers), the construction industry has seen increased demand for equipment at an alarming rate.



That means manufacturers like JLG have had to think differently.

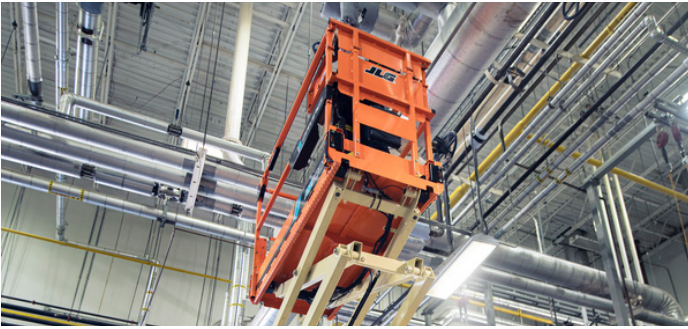
"We've learned that we need to become more geographically adaptive and agile, and as such, are exploring nearshoring opportunities to regionalize our supply chains and push towards a sustained recovery," says JLG's President Frank Nerenhausen in a [recent interview about the State of the Rental Industry](#). "Regionalization of our supply chain is a positive economic move, as it additive and will result in localized business and job growth."



Effects of the Shifts

With electrification, the transition from internal combustion engines to electric motors, electromechanical actuators and advanced li-ion batteries poses its own challenge to aerial lift manufacturers. Because an electric vehicle powertrain has 79 percent fewer moving and wear parts, such a dramatic change means more time and costs spent in research and development.

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Further still, other modern technology changes, like more sophisticated software, telematics and advances in autonomous operation, have accelerated the unique pairing of manufacturing and technology. As a result, outside technology and electronic companies are now entering the industry value chain.

Staying Resilient

Throughout the changing climate of the construction industry, manufacturing leaders like JLG have looked to new technologies and emerging trends to remain competitive. Nerenhausen says, "Our ultimate goal is to stabilize our supply chain without a compromise to product quality."

That shift in direction has opened the door to new partnerships, industries and economies, especially as tech continues to change the nature of global commerce.

That notion is something that Nerenhausen echoes, saying, "Maintaining a high degree of customer satisfaction amid inflation, supply chain and labor challenges is something that manufacturers have continued to focus on in 2022 as we emerge from what some may refer to as the most chaotic period in our industry's history."

At A Glance: Shifts in Growth & Trade

- Manufacturers like JLG are looking to new technologies and emerging trends to remain competitive
- Technology continues to change the nature of global commerce
- Opportunities emerging for new partnerships, industries and economies
- JLG's goal is to stabilize its supply chain without compromising product quality

Megatrend #2: Stronger Societal Deal

Sustainability has been at the forefront of product development for quite some time, with the world moving toward electric vehicles, clean energy and reducing gas and noise emissions. While being more environmentally friendly could be considered the focal point of the movement, other initiatives such as increasing efficiencies and improving productivity are equally as important.



"Connected and sustainable technologies are two of the trends we have really seen take off in the last couple of years," says [Nerenhausen in his 2022 State of the Rental Industry interview](#). "People are being asked to do more with less, in tighter spaces, under stringent time and budget demands in a manner that is minimally disruptive to the environment."

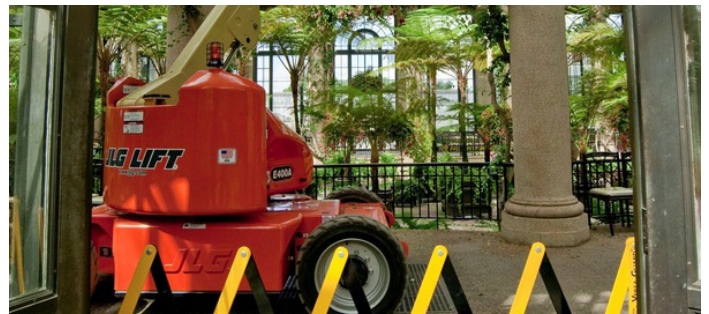
To meet the demands of these geopolitical issues, the construction equipment industry has shifted its intentions and goals, focusing heavily on sustainability, with the aerial market expanding its own narrative.

Breaking Down Sustainability

Sustainability is often described as "saving the planet" or "climate change," and it recognizes that the environment is an exhaustible resource. But, it's also made up of three other pillars: Planets, Profits and People.

"An interest in alternative energy solutions is a growing focus area across many industries, including the construction industry. JLG sees a varying degree of shift towards clean energy solutions with a focus on decarbonization," Nerenhausen continues.

Combining those three pillars into their "going greener" mission, JLG has sought out and embraced ways to be more sustainable in every aspect of its operations, including producing environmentally friendly access equipment.



"Looking at sustainability from an aerial industry perspective, improving air quality by reducing machines' CO2 emissions will significantly contribute to protecting the environment," says Barrie Lindsay, JLG's Director of Engineering for the EMEAIR region in his "[Operating Sustainably, Transforming Tomorrow](#)" presentation to IPAF.

According to Lindsay, utilizing sustainable resources as much as possible in the design, manufacture and marketing of eco-friendly products will help customers who need more "green" solutions to meet new legislation and regulations on emission reductions.

"How can we as a manufacturer respond to the growing pressure our customers are getting from local, regional and country governments for more sustainable job sites? By saying 'yes' to electrification," he adds.

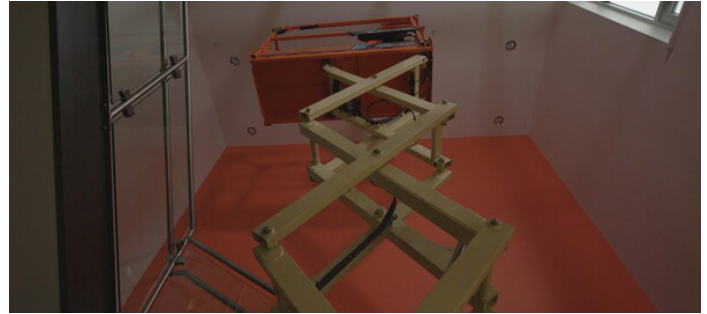


Going Electric

Aerial equipment manufacturers like JLG have been offering electric vehicles for more than two decades. In fact, JLG's first hybrid model was introduced more than 25 years ago. And in recent years, demand for both hybrid and electric machines has grown steadily as the industry has looked for ways to respond to existing and future legislation on emissions and noise and to drive down the total cost of equipment ownership (TCO).

These drivers have changed the aerial market, sparking more interest than ever in owning and operating aerial equipment equipped with the latest electrification technologies, direct drive and/or lithium-ion batteries.

While there's been no shortage of equipment introductions lately that tout these features, only a few have taken a truly innovative approach to address this demand. One example is the [JLG AE1932 DaVinci™ scissor lift](#), the industry's first all-electric machine. It is fully electric with every component optimized, allowing it to be powered with a single lithium-ion battery. It also is engineered with zero hydraulics so there are no potential leak points, which means less maintenance and more productivity, and with zero emissions to help reduce job site pollution. And, it offers many other benefits that users may not even consider, such as simplified control systems and increased precision.



With the introduction of the DaVinci lift, Lindsay concludes that "...the aerial industry has started its transition to fully electric machine functionality, eliminating the reliance on hydraulics and fuel systems, and thereby, becoming more sustainable."

The Future of Electrification

As we move forward, the construction industry will continue to innovate new products and technologies that will inspire change in sustainability practices. Things like batteries, energy recovery, common machine components, such as the motor and control system, and charging systems will all dictate the machines of tomorrow.

At A Glance: Sustainability in the Construction Industry

- The world is moving toward clean energy and reduced emissions
- New legislation and regulations are accelerating efforts
- New products and technologies are inspiring changes

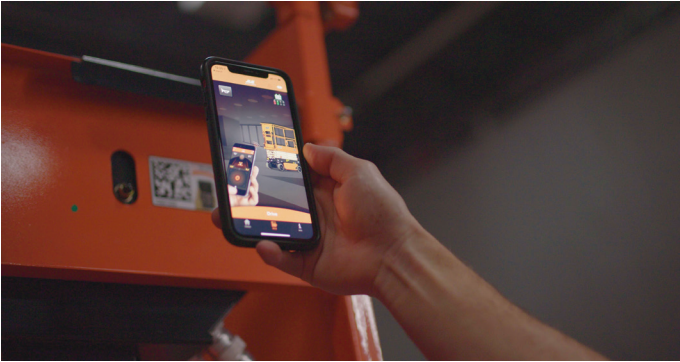
Megatrend #3: Accelerating Disruption

Technology acceleration, creation and utilization have all been at the forefront of the digital boom. However, while both technology and digitalization advance at an astounding pace, the heavy equipment industry has continued to lag, adopting trends in some instances 10+ years after they have been adopted in other industries.

While the construction industry has been traditionally slower to adopt than adjacent industries, as we move into the post-pandemic era, companies and manufacturers are thinking about "what's next" and have begun focusing more on automating processes and technologies.

Next-Generation Augmented Reality

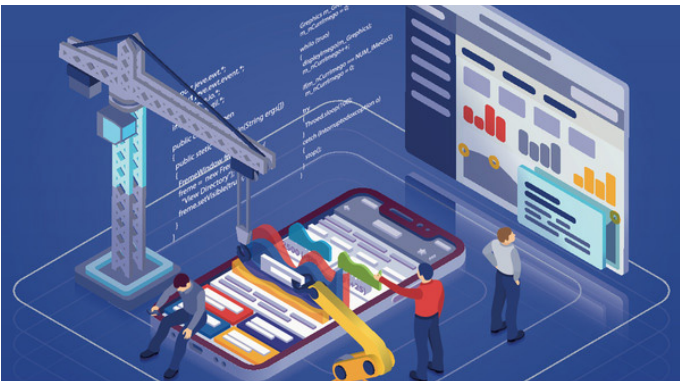
One of the advancements changing construction today is augmented reality (AR), a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. While AR can be used with tablets, helmets or glasses, construction professionals can utilize this technology right from their phones.



A variety of mobile applications are now available to harness the power of AR, including the [JLG Augmented Reality \(AR\) App](#), designed for construction crews looking to better interpret machine data, improve productivity and increase equipment utilization. It provides users with five important functions: Machine Visualization, Accessory Visualization, Operation Guidance, Decal Viewer and Inspection Assistant. Using the JLG AR app, users get on-demand, digital access to information specific to a machine without ever leaving the job site.

Chasing Autonomy

The hunt for autonomous machines and technologies is not new; however, users have been slow to adopt them, showing a preference for partial "moments of autonomy" instead.



Due to consumer hesitation, even the automobile industries have been slow to fully introduce their self-driving cars, instead opting to release autonomous features like adaptive cruise control.

In the construction industry, autonomy can aid in repetitive construction tasks that may result in an overuse injury. Now more than ever, manufacturers are searching for ways to boost safety and efficiency using automated solutions.

In early 2022, JLG announced a developmental partnership with RE2 Robotics to advance the integration of robotics with access equipment to deliver improved operator safety and enhanced productivity on job sites.



The initial project the companies are working on together is to produce a remote-controlled aerial lift, with no platform, to install solar panels.

According to Rob Messina, JLG's Senior Vice President of Product Development and Product Management, in [an interview with Access International magazine](#), the project with RE2 Robotics represents the first real step toward autonomous aerial lifts. "It is a bridge to autonomy," he says, "which is [currently] aspirational. But we've seen over the last five years, a tremendous number of companies try to mature technology in the autonomy space."

And, in the not-too-distant future, that time will come for the construction sector, Messina adds, "these technologies will get closer and closer to being within reach for the construction industry. "We're at an early stage, although there's a tremendous amount of interest because if we can be successful here, there's a clear case for a robot in this application."

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While the construction industry hasn't moved to fully autonomous equipment yet, there have been plenty of flashes of innovation with equipment offering steps toward autonomy.



An example of this is [JLG's unique self-leveling chassis technology](#), which allows the JLG 670SJ boom lift to automatically level on slopes up to 10 degrees, enabling operation on uneven job site terrain. This innovative technology promotes safe operation and increases maneuverability, eliminating constant repositioning and saving time.

Heading into the Future

As we move into the future of construction, manufacturers, companies and consumers alike must work to embrace new technologies despite the learning curve.



Technologies like connected solutions and telematics, provide valuable data to facilitate business growth and advance job sites; remote control systems and mobile apps; and sensors, cameras and alert systems. Even newer technologies like exoskeletons and 3-D printing will drive change.

"There is substantial observation happening at the job site level to identify the 'jobs-to-be-done' that semi-autonomous and eventually fully autonomous equipment will be the solution for," Messina says. "There's still a lot of work to be done in this area before we see mainstream use of fully autonomous solutions."

Regardless, he finishes, advancements will continue to make their mark in the industry — one that is always looking for new ways to innovate and improve processes.

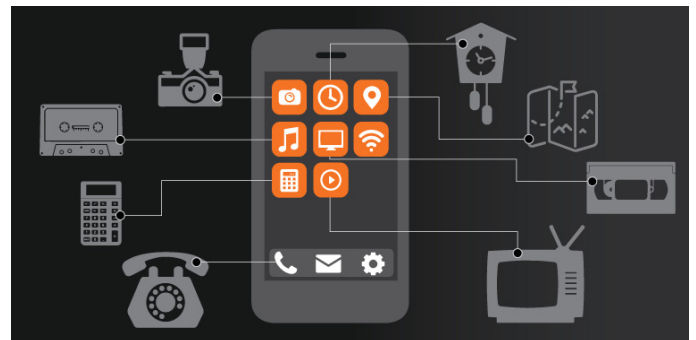
At A Glance: Acceleration of Technology Adoption

Advances in technology allow the industry to take advantage of massive improvements in:

- Safety
- Efficiency
- Productivity

Megatrend #4: The Digitally Powered Customer

These days, everything is connected to the internet including equipment and other construction-related devices. Because of this, all the associated data is moving to the cloud, making real-time data and information accessible anytime and anywhere.



For the construction industry, that means equipment is becoming smarter with more integrated control systems to capture this information. But, how are construction companies receiving and interacting with this data? What are the downfalls? And what's the best way to use it moving forward?

Technology Apprehension

It's a common mission amongst construction fleet managers to find ways to make their business more productive. Whether that means getting work done faster, reducing equipment downtime, promoting job site safety or eliminating tedious or repetitive tasks, the concerns of wasting time or money are real.

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Today, a lot of these challenges can be solved by various technological advancements. However, according to the McKinsey Global Institute's (MGI) Digitization Index, construction is among the least digitized sectors in the world. And according to a 2017 report by the MGI, infusing new technology into construction workflows and equipment is one of the key factors that can reverse poor productivity trends.

Unfortunately, some fleet managers still don't see the potential of the connected job site. For example, some estimates have shown that only 20-30 percent of equipment fleet companies leverage telematics on their fleet. Whether it's fear, cost or unfamiliarity, contractors and businesses throughout the industry have shown signs of hesitancy when it comes to digitally connected technologies and tools.

But technology isn't stopping, and these tools are only continuing to grow in popularity. So, while some managers will remain stagnant, a large number have recognized that tools such as telematics or access control systems are a wise investment to enhance safety on the job site and ensure their machines are being operated properly.



Moving toward the future, that willingness to connect digitally will progress the construction industry in new and exciting ways.

Making Progress

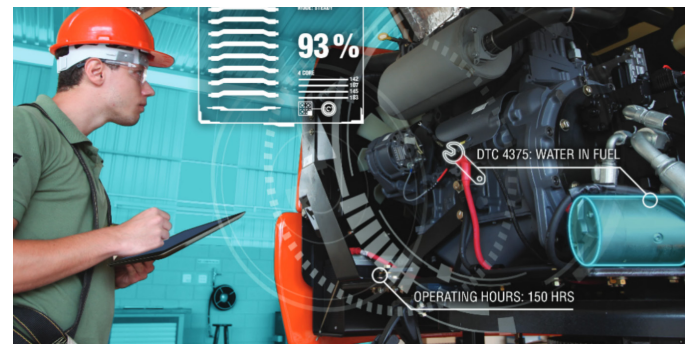
As we mentioned, access and heavy construction equipment have become increasingly more intelligent through integrated control systems and technologies that enable advanced analytics, active safety and autonomous or assistive operation.



What do these systems have in common? Well, many consider the job site of the future to be about two-way, interactive communication. Two-way communication links equipment to operators, remote third parties and other machines on the construction site to automate certain functionalities, speed [up] documentation, deliver information for crews to make faster, more accurate decisions and enable technicians to access information that increases machine uptime.

However, the volume of data that can be transmitted through some equipment's control systems is limited by communications bandwidth and the capabilities of today's telematics hardware. But as they evolve and improve, they'll enable more enhancements.

For example, equipment users will begin to see more real-time data on machine performance and diagnostics during operation. Based on the data, suggestions will be made for improving performance or conducting maintenance. In general, machines will become increasingly effective to operate and maintain.



The Progression of the Digitally Powered Customer

As connectivity increases, the faster we anticipate the rate of adoption of digital in the construction industry. For example, where customers may have resisted new technologies in the past due to concerns around added cost and complexity, we anticipate seeing fewer of those barriers moving forward. Digitally powered users are more willing than ever before to embrace technologies that eliminate pain points and drive efficiencies that provide tangible benefits to their business.



As the industry continues to take steps toward connected job sites and data-driven businesses, new opportunities to interact and connect will offer exciting insights into the world of construction.

At A Glance: Digitally Powered Customers

- Embrace technologies that eliminate pain points and drive efficiencies
- Expect technology to provide tangible benefits to their business
- Will continue to grow and evolve as connectivity increases

Megatrend #5: New Ways of Working

Consequences of the pandemic have forced dramatic changes throughout the construction industry in the last few years, including job sites across the world shutting down and then reopening with new safety protocols in place, a workforce shortage and demand outpacing supply.



As a result, businesses have had to reinvent themselves to be prepared for the future. That reinvention has led to a new influx of remote and hybrid work, with many workers desiring to remain remote post-pandemic. In fact, according to professional services firm PwC's recent remote work survey, almost 55 percent of respondents said they'd like to work remotely at least three days a week.

The biggest question moving forward is whether the continuation of remote work is sustainable for the construction industry, or if its evolution will accelerate the adoption of autonomous machinery.

Non-Traditional Ways of Working

The last few years have seen both employers and employees finding new and creative ways to work outside of the traditional office and job site environments.

"Construction workers are no different from those in adjacent industries in their desire for long-term work flexibility," says [Nerenhausen in a recent review of the State of the Rental Industry](#). "With so many work-from-home jobs now available, companies are quickly adjusting to retain and attract key talent."

With the ever-present labor shortage and skills gap affecting the industry, the rise in working remotely has caused an increase in the pool of qualified candidates, as well as shrunk it considerably as workers want more flexibility to look outside the industry. Based on historical Census Bureau Job-to-Job flow data, an estimated 1.2 million construction workers left their jobs to work in other industries in 2022.



This has inspired many businesses to invest in technologies that inspire close connection and virtual meetings, as collaboration has proved to be key in remote work. Employees, regardless of age, need digital capabilities to help them thrive.

But in an industry that needs to attract nearly hundreds of thousands of additional workers to meet the demand for labor, says a report by the Associated Builders and Contractors, construction companies have had to look at continuing to craft hybrid work policies.

Out With the Old

While remote work has changed the face of the work environment as we know it, it has also opened the door for innovative new tools and technologies.

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"To stabilize the workforce and facilitate this type of work, look for an increase in autonomous and semi-autonomous robotic features that allow machines to be operated or monitored by a skilled tradesperson at a distance from the work area; perhaps even off-site," adds Nerenhausen. "Remote project managers and service technicians may also become more commonplace as new digital technologies and applications facilitate the sharing of real-time job site data and machine diagnostics."

The quest to develop more digital tools for customers has become an absolute necessity as well. With the onset of the pandemic, the construction industry had to accelerate nearly five years overnight as it relates to the adoption of virtual.

That's why JLG created the ["Access Your World" virtual experience](#), a dynamic, evolving environment that allows users, regardless of time zone, the ability to experience JLG where and when they want. It is designed to provide equipment owners and users with important product information, education and training.



What's Coming Next?

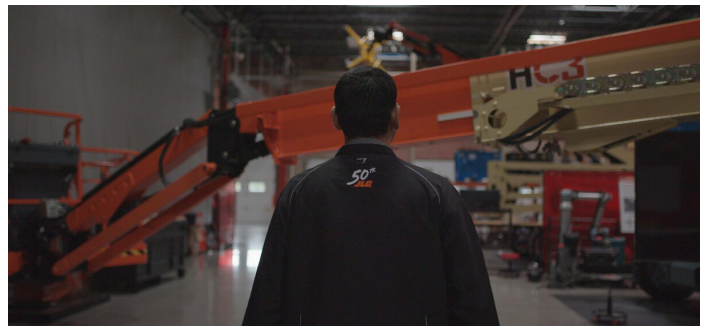
Moving forward, flexibility and innovation will be the new norms for companies looking to succeed. Cultivating new skills around the tools and technologies aiding business growth, employee retention and hiring will be the next challenge for the industry. But, an open mind around remote work and everything it has to offer will go a long way.

At A Glance: New Ways of Working

- **New skills around the tools and technologies aid business growth, employee retention and hiring**
- **Employees, regardless of age, need digital capabilities to help them thrive**
- **Look for an increase in autonomous and semi-autonomous technologies and features**

Megatrends Are Transforming the Industry

As these new megatrends continue to pave the way for the job site of the future, at JLG we are at the forefront of this transformation. As a leader in the access industry, we believe it's up to us to continue to push the boundaries of possibility, and we take that responsibility seriously — our pioneering spirit drives us to redefine what is possible.



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