

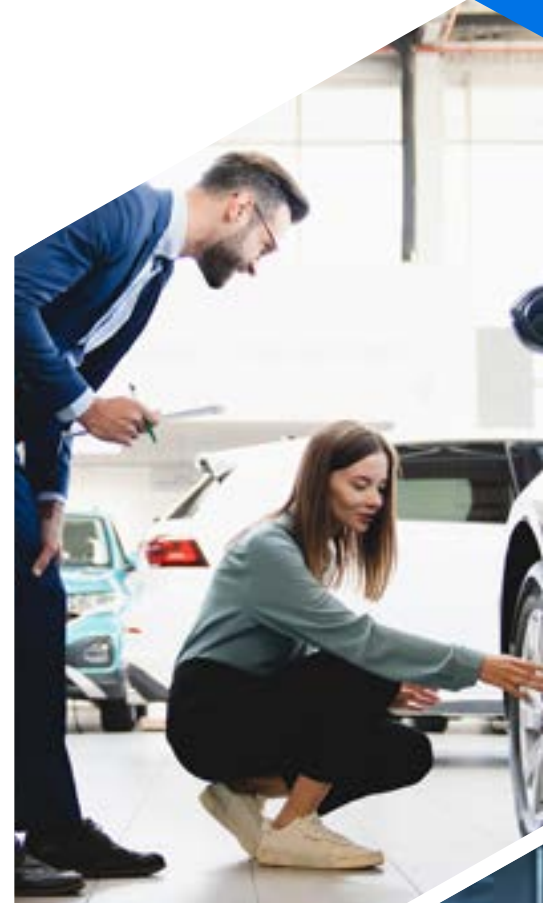


Automotive Ecosystem Vision Study

Next-Generation Transportation Mobility

The pace of digitalization accelerates to meet growing customer demands.

Changing customer expectations, the rise of electric vehicles (EVs), and unexpected global supply chain disruptions are pressuring the automotive industry to achieve new levels of service and efficiency.





About the Study

Zebra conducted the Automotive Ecosystem Vision Study among a global audience of over 1,300 respondents, including industry decision-makers, fleet managers and consumers. The study aimed to gauge views, priorities and expectations as the industry faces new challenges and opportunities because of rapid digital transformation. All data was collected and tabulated by third-party research firm Azure Knowledge Corporation.

Study Respondents

Industry Decision-Makers



Leaders within an automotive OEM (Original Equipment Manufacturer) or supplier responsible for selecting and managing enterprise solutions.

Customers*



Fleet Managers

Employees of organizations that manage vehicles for commercial use with direct influence over vehicle purchases.



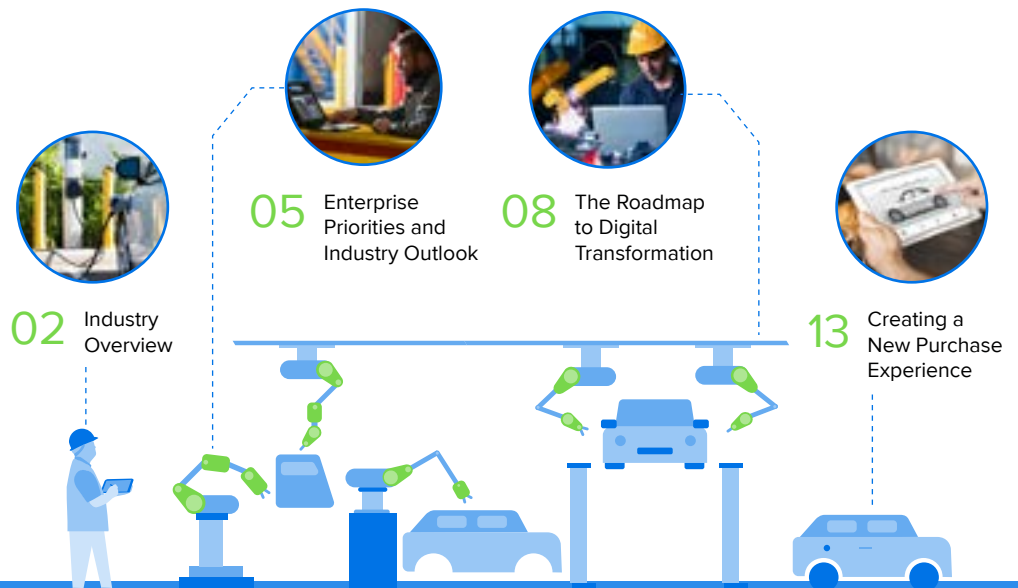
Consumers

Adult vehicle owners who drive at least once a month for personal use and indicate being likely to purchase/ lease a new vehicle within the next five years.

*References to "customer" include both B2B customers/fleet managers and B2C consumers combined.

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Industry Overview

Next-Generation Mobility Advances Transformation in the Automotive Sector

Technology innovations are powering transformative changes in the automotive ecosystem. Automakers and businesses across the automotive value chain must out-innovate to gain a competitive edge amid transportation mobility changes and business model shifts. This transformation is driven by three major factors: technological advancements, increased connectivity and ever-shifting customer demand.



From hardware-driven to service-centric business

The industry's future looks much different than today: the near future will reflect a combination of electric, hybrid, and autonomous or self-driving vehicles. As a result, the industry is transitioning from a hardware business to a service-driven and software-based one. The digital automotive value chain will continue gaining importance and shaping customer service delivery expectations.



Better connectivity powers enhanced capabilities

Next-generation connectivity refers to types of connected systems within vehicles, including internal systems like GPS and entertainment, as well as sensors for measuring tire pressure, weather and road conditions. Other transportation mobility solutions, such as autonomous vehicles or rideshares, increased, driven partly by improved infrastructure, including wireless networks. Today's vehicles can have over 100 microprocessors, which will continue to grow as autonomous and self-driving vehicles become more prevalent in the market.



Customer pressure on manufacturers

Advancements in technology and connectivity are forcing organizations across the automotive supply chain to rethink the end-to-end customer experience, changing the design and production of vehicles and how they are marketed and sold to consumers or fleet managers. For example, automotive enterprises must meet new and rising consumer and fleet manager demands for higher levels of safety and personalization while also exploring new digital possibilities for the retail experience. Moreover, the environmental impact of fossil fuels and highly variable fuel costs combine to drive billions of dollars of investment into the increasing demand for electric vehicles (EVs) and hybrid vehicles.



Embracing digitalization

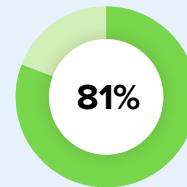
Forward-thinking leaders within the automotive manufacturing and distribution ecosystem are embracing digitalization, increasing supply chain resiliency and building industrial automation capabilities to differentiate their offerings and gain a competitive edge.



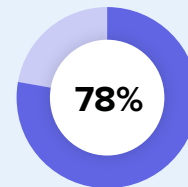
INVESTING IN INNOVATION

Most automotive industry decision-makers agree that investments in digital technology allow for the effective attainment of business objectives but recognize that remaining competitive requires a commitment to consistent innovation.

Decision-makers



say they could better meet business objectives if their organization made more investments in technology.



believe their organization needs to be more innovative to remain competitive in the automotive industry.

Market Watch

Top Trends Tell the Automotive Manufacturing Story



Top technology-led priorities over the next five years, according to automotive industry decision-makers.

1 AUTOMATE

through the integration of workforce and machinery / robotics

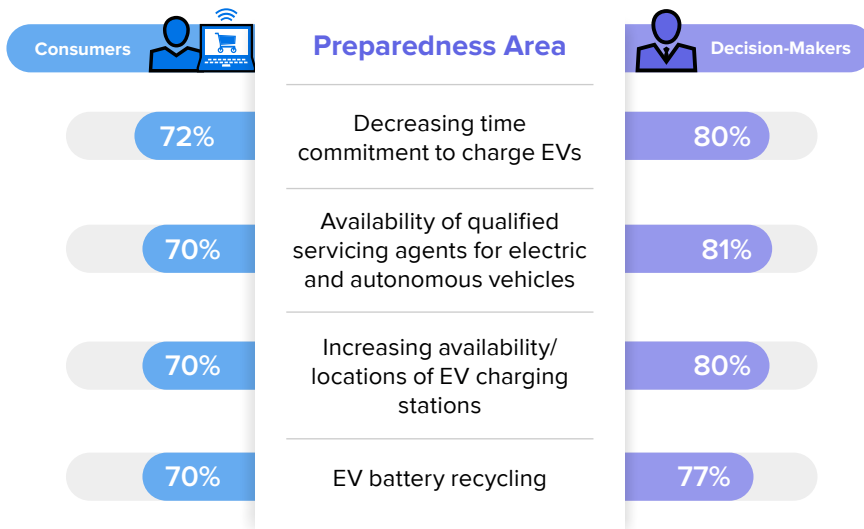
2 DEVELOP

in-house capabilities and technologies (own intellectual property)

3 BOOST

visibility across production and supply chain

Consumers cite a lower comfort level with industry preparedness than industry decision-makers.



Consumers and fleet managers are aligned on where they believe the industry should focus.

1 INCREASING safety

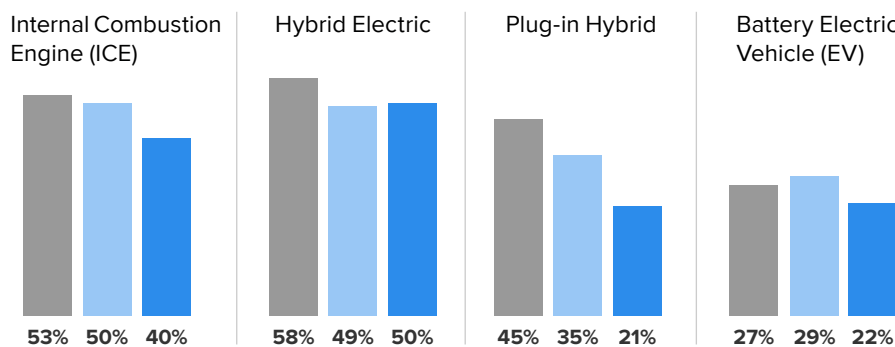
2 EXPANDING the convenience of vehicle service

3 IMPROVING end-to-end supply chain infrastructure

4 OFFERING more personalization options

Future interest in electric or hybrid vehicles varies by consumer generational cohort.

Preference for a vehicle type in 5 years



Curves Ahead

Automotive Manufacturing Challenges

The automotive industry faces many of the same challenges as all manufacturers: finding and retaining a qualified workforce, navigating supply chain disruptions, and delivering on heightened expectations around speed and accuracy.

Automotive industry decision-makers are under intense pressure to compete, and almost **eight in ten (78%)** agree their organizations are struggling to keep up with the speed of technological innovations. Manufacturers need to keep pace with the industry's dramatic transformation or risk getting left behind.

Embracing digitalization to overcome operational challenges

Most automotive enterprises are working to improve foundational capabilities and achieve greater levels of operational agility. The majority of industry decision-makers rate their top operational challenge as digitalization of operations and the supply chain, which can ultimately increase manufacturing speed and accuracy. This agility becomes more critical as the industry prepares to meet shifting consumer demand and overcome potential future disruption.



Industry Decision-Makers

TOP OPERATIONAL CHALLENGES

1 **DIGITALIZATION**
of operations and supply chain



2 **ADHERENCE**
to policies and regulations about regulating fuel efficiencies



3 **RISING DEMAND**
for higher levels of personalization in vehicle features



4 **REMAINING COMPETITIVE**
amid industry transformation



FEELING THE PRESSURE

Gauging industry pressure points, decision-makers were asked to rate the urgency with which they are approaching future business initiatives.

75%

Building strategic partnerships with technology companies to cut costs and mitigate risk with next-generation transportation mobility production.

74%

Gaining greater visibility across the supply chain.

71%

Providing automotive dealers and consumers with real-time visibility into their order status.

Enterprise Priorities and Industry Outlook

Automotive manufacturers are re-evaluating manufacturing systems and processes to identify opportunities to drive company growth and improve financial performance.

Automotive enterprises keep an eye on the future and prepare for long-term realities

Today's automakers, OEMs and suppliers are working to maintain a tricky balance. Most must still operate a traditional business model, maintaining development and production lines for conventional ICE vehicles. At the same time, they must also plan for a smooth transition to the future of EVs, which have very different requirements from raw materials to final assembly and delivery to customers.

Technology-led priorities are focused on increasing automation, building in-house capabilities/technologies and expanding visibility across production and the supply chain.



Industry Decision-Makers

COMPARE CURRENT AND PROJECTED PRIORITIES

Today

2027

% Change



RESKILL

labor to enhance data and technology usage skills

26%

47%

+81%



MAINTAIN

current operations for ICE vehicle production while building capacity for EVs

28%

49%

+75%



INCREASE

quality assurance measures

27%

46%

+70%



INCREASE

visibility across production and throughout the supply chain

29%

49%

+69%



IMPLEMENT

AI to improve workflows

28%

47%

+68%



BUILD

manufacturing flexibility and resiliency with modulation of assembly and production lines

29%

48%

+66%



EXPAND

sustainability and environmental production initiatives

28%

48%

+48%



Industry Views, Concerns and Expectations

How do the perspectives of consumers, fleet managers and industry decision-makers compare when assessing the current state of the automotive industry?

Significant challenges impacting the industry

Consumers and decision-makers view manufacturing sustainability as the top automotive industry challenge, inclusive of energy management and the recycling and reuse of resources. In contrast, fleet managers find sustainability and waste mitigation issues less pressing. Instead, they point to digitization initiatives to better meet demand and incorporate innovation as the automotive industry's most significant hurdle to overcome.



Industry Challenges

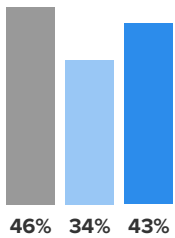
Consumers

Fleet Managers

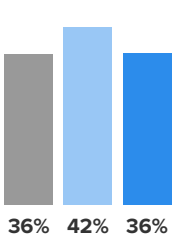
Decision-Makers



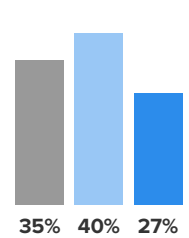
Accommodating sustainability in manufacturing



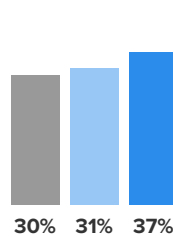
Digitalization of operations and supply chain



Increasing demand for higher safety in vehicles



Rising demand for personalization in vehicles



Growing emphasis on sustainability

Eco-friendliness is a deciding factor for over **eight in ten** consumers. Unsurprisingly, digital-native Millennials drive much of the change in demand among future vehicle buyers and are projected to comprise the highest demand for hybrids and EVs. Most industry decision-makers (**79%**) are aware of this growing environmental imperative.



Consumer likeliness to prioritize sustainability and eco-friendliness when purchasing or leasing a vehicle

All Consumers

81%

Millennials (1981-1996)

87%

Gen X (1965-1980)

78%

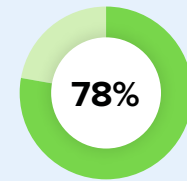
Boomers (1946-1964)

76%



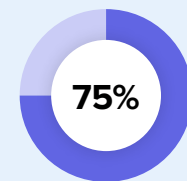
MAKING IT PERSONAL

Personalization factors into the purchase decision for



of consumers

Industry decision-makers understand the importance of this factor.



of decision-makers

say their organization is struggling to keep up with demands around vehicle customization.

Building Customer Trust

Consumers and fleet managers are seeking more visibility into the automotive ecosystem.

Consumers and fleet managers broadly align on what it takes for automotive enterprises to earn their trust, with transparency and data usage ranking highly important to both. When considering a vehicle for purchase or lease, most buyers (**81%** of consumers and **86%** of fleet managers) indicate they want to understand the origin and source of materials and parts on their vehicle, as well as have end-to-end visibility during the manufacturing process (**79%** of consumers and **81%** of fleet managers).

Younger consumers demand transparency

Millennials are most likely to want more visibility into the automotive ecosystem, looking to understand their vehicle's entire journey through the manufacturing process.

The importance of vehicle production visibility among generations	Millennials (1981-1996)	Gen X (1965-1980)	Boomers (1946-1964)
Having access to manufacturer information on the origin of materials and parts	85%	78%	77%
Knowing if the source materials and parts are sustainable	84%	78%	77%
Understanding how the vehicle is manufactured from start to finish	86%	76%	72%

Data is the new oil

Automotive enterprises recognize the power of consumer data. In fact, technology investments that enable more consumer data capture are the most important consumer service element to **45%** of industry decision-makers, outranking the connection of a front-line workforce (**43%**) and offering contactless sales and services (**41%**). However, as the vehicle itself shifts from machine-powered to computer-driven, most customers are concerned about their privacy and the automotive industry's use of data.

Consumers are less likely to feel the industry is prepared to handle cybersecurity risks compared to fleet manager and industry decision-makers.



68%

of consumers

78%

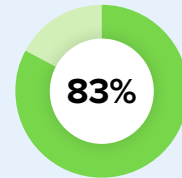
of fleet managers

76%

of decision-makers

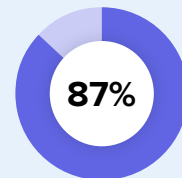


TRANSPARENCY AND DATA SECURITY



of consumers and fleet managers

expect data ownership and control post-purchase.



of consumers and fleet managers

believe understanding data usage throughout the automotive ecosystem is a right.

The Roadmap to Digital Transformation

Decision-makers recognize the importance of enterprise and manufacturing technologies to gain and retain a competitive edge.

Seventy-three percent of industry decision-makers believe their business will be at a competitive disadvantage if they do not embrace more digital technologies. Nevertheless, it remains a challenge for most enterprises (**76%**) to achieve the secure integration of devices, sensors and technologies throughout their organization and supply chain. Three-quarters of decision-makers say their employees are frustrated with the slow pace of enterprise technology deployment.

Barriers to digital transformation

The automotive industry is on a journey to digital transformation, but hurdles remain for OEMs and suppliers. OEM decision-makers are struggling to keep up with management expectations for the implementation speed of new digital tools. Among suppliers, re-skilling and up-skilling their workforce is the leading challenge.



TOP BARRIERS hindering digital transformation



OEMs



Suppliers

MEETING

management expectations for the implementation of digital tools

1

RE-SKILLING

/ up-skilling workforce

LACK OF RESOURCES

to support technological advances

2

SCALABILITY

from pilot program to organization-wide implementation

COMPLEXITIES

of integration with legacy systems

3

CYBERSECURITY

concerns

CUSTOMER-CENTRICITY

/ lack of customer focus

4

MEETING

management expectations for the implementation of digital tools

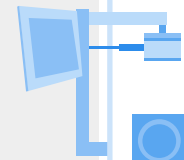
RE-SKILLING

/ up-skilling workforce

5

COST

of integration with legacy systems





TOP BENEFITS

of digital transformation



OEMs



Suppliers

WORKPLACE SAFETY

1

PROVIDE

innovative vehicle design and performance

SUPPLY CHAIN

resiliency

2

LOWER

operating costs

IMPROVES

competitiveness in the marketplace

3

WORKPLACE SAFETY

LOWER

operating costs

4

QUALITY ASSURANCE

PRODUCTION FLEXIBILITY

5

PRODUCTION FLEXIBILITY



Seeking competitive advantage

TOP INVESTMENTS

for decision-makers

1

PRODUCING

batteries in-house

2

DEVELOPING

software expertise

3

BUILDING

flexible capabilities to support personalization

4

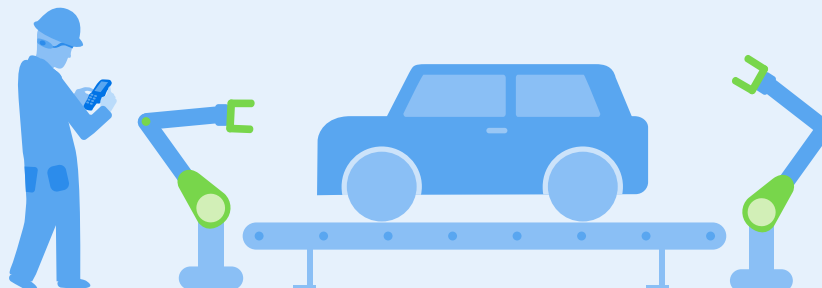
SEPARATING

ICE operations from EV operations

5

VERTICALLY INTEGRATING

to gain more control over the production and distribution processes



Five-Year Digital Deployment Plans

Digital transformation in the automotive industry will have massive implications for everyone along the value chain, from OEMs to consumers and everyone in between.

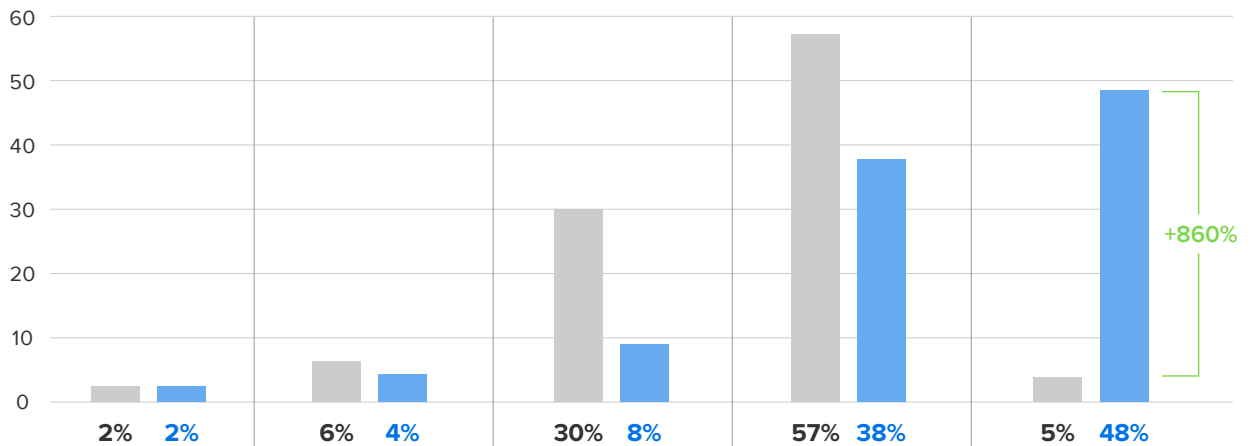
Development of OEMs' digital capabilities outpace those of suppliers

Among OEMs, almost **nine in 10** plan to advance their digital capabilities over the next five years, with about **one-half** expecting to operate fully connected based on real-time information. Comparatively, supplier operations are not yet as advanced as OEMs today, though more than **six in 10** industry decision-makers plan to deploy more digital capabilities over the next five years.



Industry decision-makers estimate their organization's current and future digital capabilities

OEMs:
Digital
Transformation
Deployment



Today

2027

No connected machines, devices or digital sensors

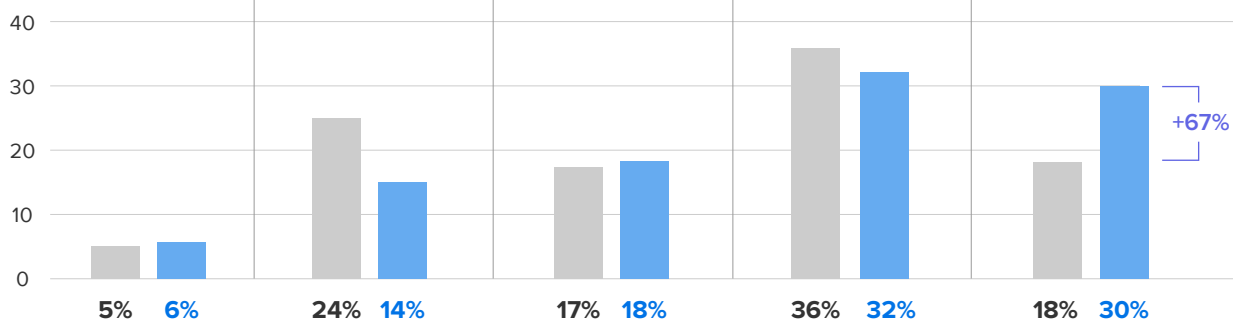
Some data being captured but with no connection to business systems or staff

Data is being captured from multiple sources but is kept in silos

Production data is captured from multiple sources and centrally analyzed in real time

Data is fully connected to production systems, supply chain partner systems and front-line technologies used by workers

Suppliers:
Digital
Transformation
Deployment



Technology Drivers and Growth Strategies

Increases in intelligence, power and capabilities are required in automotive components. Industry decision-makers acknowledge that better connectivity and enterprise technologies across the board are essential to growing and transforming businesses. While machine vision solutions rise to the top overall, supply chain planning solutions and additive manufacturing, or 3D printing, expect the most significant growth over the next five years.

Technologies expected to make the largest leap in usage

Today

2027



OEM technology plans

Industrial machine vision

+83%



24% 44%

Sensing and monitoring systems

+79%



24% 43%

Computer vision

+73%



30% 52%

Machine learning

+70%



27% 46%



Supplier technology plans

Additive manufacturing / 3D printing

+88%



24% 45%

Supply chain planning solutions

+84%



25% 46%

Augmented / virtual reality

+76%



25% 44%

Advanced data analytics

+70%



27% 46%

A Reimagined Supply Chain

Building supply chain resiliency in the digital automotive value chain is critical to driving next-generation transportation mobility success. By capturing and analyzing real-time data, manufacturers can gain actionable insights to control quality better, streamline processes and optimize production. Whether at a manufacturer, parts supplier or dealership, greater inventory accuracy translates to more enterprise agility and helps ensure higher levels of customer service.



DECISION-MAKERS PLAN TO INCREASE INVESTMENTS IN 2023

74%

Technology Spend

72%

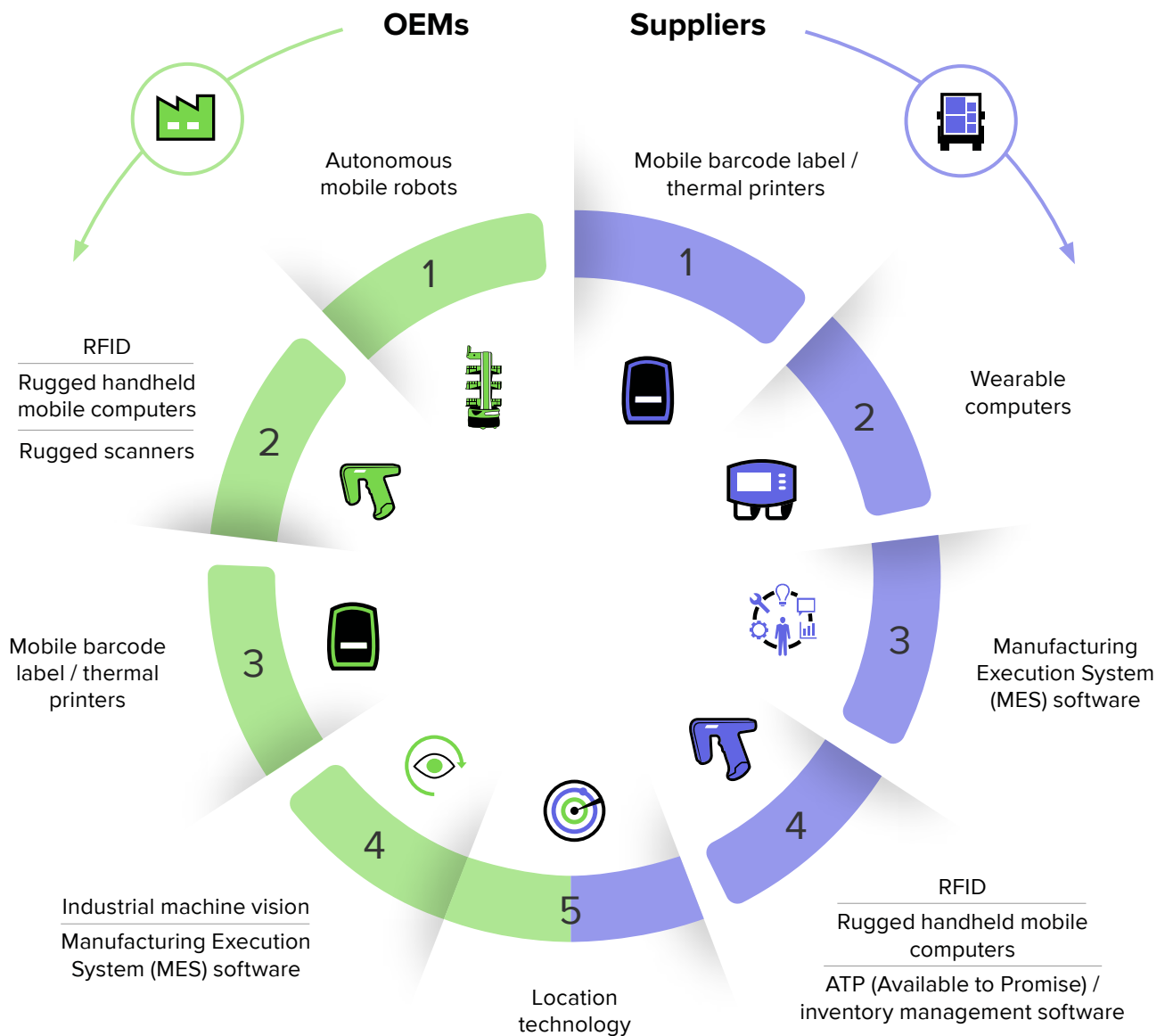
Staff Spend

67%

Manufacturing Spend

Key Devices and Technologies

believed to improve supply chain management



Creating a New Purchase Experience

Consumers and fleet managers are bringing new expectations to the category, pressuring automakers to innovate around products and the shopping experience.

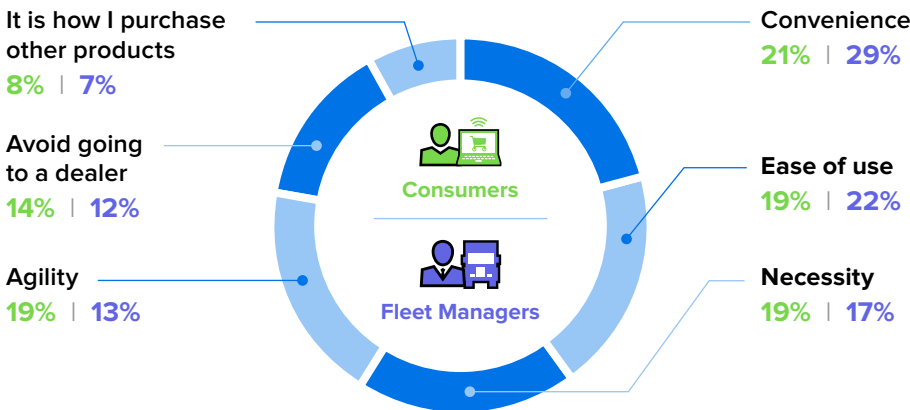
Changing the sales channel

The automotive industry has been slower than most to embrace e-commerce. Now expectations for a quick, convenient and digital-first shopping experience are extending to automotive. Consumers and fleet managers are shifting to a preference for purchasing a vehicle directly from the manufacturer rather than the traditional dealership model. **Eight in 10** consumers and fleet managers, and nearly **nine in 10** industry decision-makers, agree the dealership-based sales model should be replaced with an agency model, in which vehicles are sold directly to end users.

Convenience is key to driving the move to digital

However, the promise of a virtual process is still nascent, with **64%** of consumers and **49%** of fleet managers saying their last vehicle buying experience was completed in person. Only **4%** of consumers and **8%** of fleet managers experienced a completely virtual purchase process.

Reasons for interest in conducting vehicle purchase virtually



The automotive industry's route toward EVs rapidly continues

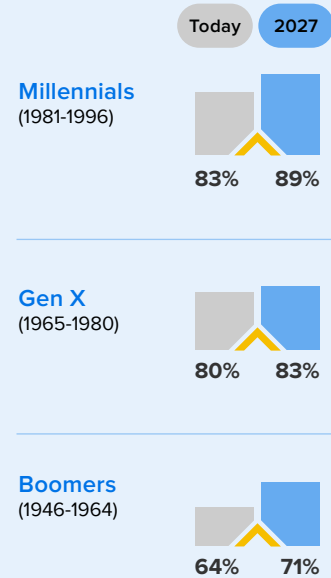
Both consumers' and fleet managers' affinity for electric or hybrid vehicles is growing. Among respondents considering an EV purchase in the future, both segments are influenced heavily by the promise of lower fuel costs (**47%** of consumers and **54%** of fleet managers), and consumers are equally motivated by the promise of eco-friendliness and reduction of emissions. Increasing government regulation calling for carbon-neutral vehicles is on the rise and is expected to impact the overall auto industry.



THE GENERATIONAL ECOMMERCE DIVIDE

Millennials are most likely to consider purchasing a vehicle online, both today and in the next five years. On the other hand, Boomers show the highest percentage change with **11%** growth over five years.

Consumer interest in virtual vehicle purchase



Regional Findings

North America

Eighty-three percent of industry decision-makers in North America agree that the pace of technological innovations is accelerating at a rate their organization is struggling to keep up with—the highest of any region.

They feel they are under pressure to build strategic partnerships with technology companies in order to cut costs and mitigate risk with next-generation mobility production (**83%**) as well as greater visibility across the supply chain (**83%**).

Europe

Industry decision-makers in Europe are increasingly focused on expanding sustainability, waste reduction and environmental protection initiatives.

Twenty-seven percent say these initiatives are drivers of financial performance and growth, and **49%** expect them to be within the next five years.



Latin America

Consumers in the Latin America region are the most concerned about the use of data collected from their vehicle, at **80%** compared to the global average of **74%**.

Nearly half (**47%**) of fleet managers in the region would like to see the industry focus on ensuring automotive data is kept safe, secure and private, compared to **32%** globally.

Asia Pacific

In the Asia Pacific region, industry decision-makers foresee an increased focus on balancing current operations for ICE vehicle production (**19%**) while at the same time building capacity over the next five years to support the production of next-generation electric vehicles (**39%**).

With an increase of over **100%** by 2027, this strategy to drive growth and improve financial performance is the highest of any region.



The Fast Track to Digitalization

Recent years have posed unprecedented challenges to the automotive industry’s already complex network of supply chains and services. Global market disruptions, the industry-wide evolution from ICE vehicles to transportation mobility alternatives such as EVs, and shifts in consumer expectations will continue to create complications in the near- and long-term future.



KEY TAKEAWAYS

GLOBAL SUPPLY CHAIN CHALLENGES



Today’s global supply chain challenges may be unique, but they won’t be the last. The auto industry’s complex network of suppliers, manufacturers and retailers will have to work together to increase operational efficiency and meet customer demand despite future disruptions.

TECHNOLOGY INVESTMENTS



Investing in manufacturing and warehouse technology will be key to achieving future operational success. Not only does it provide crucial visibility into supply chains and production lines, but it can empower the workforce and help meet rising customer expectations around transparency and traceability.

SUSTAINABILITY FOCUS



Sustainability is a growing focus across the global automotive industry, and environmental concerns are a major factor in the shift toward next-generation mobility. Automakers and other businesses across the automotive value chain will need to balance the needs of the present and future consumer at the same time.

CUSTOMER EXPERIENCE CHANGES



The automotive customer experience is changing just as profoundly as the manufacturing of vehicles themselves. Forward-thinking organizations are leveraging technology to help redesign the process and meet consumer expectations shaped by the age of e-commerce.

About Zebra

Zebra (NASDAQ: ZBRA) empowers organizations to thrive in the on-demand economy by making every front-line worker and asset at the edge visible, connected and fully optimized. With an ecosystem of more than 10,000 partners across more than 100 countries, Zebra serves customers of all sizes— including 84% of the Fortune 500— with an award-winning portfolio of hardware, software, services and solutions that digitize and automate workflows. Supply chains are more dynamic, customers and patients are better served, and workers are more engaged when they utilize Zebra innovations that help them sense, analyze and act in real-time. In 2021, Zebra expanded its industrial automation portfolio with its Fetch Robotics acquisition and increased its machine vision and AI software capabilities with the acquisitions of Adaptive Vision, antuit.ai and Matrox Imaging.

Build a Dynamic and Resilient Automotive Supply Chain

Learn more about how Zebra can help you digitalize your automotive supply chain for improved visibility, agility and business resilience at zebra.com/automotive



NA and Corporate Headquarters
+1 800 423 0442
inquiry4@zebra.com

Asia-Pacific Headquarters
+800 1302 028
contact.apac@zebra.com

EMEA Headquarters
zebra.com/locations
contact.emea@zebra.com

Latin America Headquarters
+1 866 230 9494
la.contactme@zebra.com