The metaverse at work

Automotive industry deep dive

June 2023

The metaverse at work

Contents

About this study

This report is based on qualitative interviews, independent research and 170 survey responses from the automotive industry. This research represents a subset of the overall research conducted by the EY organization and Nokia in creating the executive report "The Metaverse at Work." Numbers may vary slightly from those reported in the executive report, "The Metaverse at Work," due to the inclusion of automotive respondents from the operations function of their company in the sample. In the executive report this group is considered to be part of the industrial goods and manufacturing industry.

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1 The state of the industrial and enterprise metaverses today

Automotive companies are using the metaverse beyond the highly publicized customer-facing use cases like virtual showrooms, virtual product trials and metaverse-enhanced customer support.

Many automotive companies have already taken the leap into the industrial and enterprise metaverses. Today, 58% of automotive companies surveyed – from vehicle manufacturers, to suppliers, parts and accessories manufacturers and more – have piloted or deployed at least one industrial or enterprise metaverse use case [Figure 1]. As with digital transformation and the evolution of industry 4.0, OEMs are first-movers among the industry.

Of the 42% of respondents interested in the metaverse with no pilots or deployments to date, 90% intend to use the technology within the next two years [Figure 2].

There is an extensive list of both small-scale point solutions and large-scale transformative applications of the industrial metaverse at OEMs globally. Some of these applications of the industrial metaverse have been deployed for several years and are being scaled across sites and regions. Large OEMs from Ford to Volkswagen, Hyundai and BMW were catalysts in leveraging augmented and virtual reality for more collaborative vehicle design, training and factory planning – using this technology as early as 2018. Several OEMs have begun to explore and implement more expansive metaverse use cases with huge benefits. Renault is even expecting €320m in savings, 60% reduction in vehicle delivery time and 50% reduction in carbon footprint from its venture into the industrial metaverse. Their solution leans heavily into data interoperability in the metaverse, connecting billions of data points across factories globally for more connected production and supply chain processes. This application of the metaverse through digital twins of assets is also expected to improve control of the factory floor and allow employees to interact with complex systems and processes in a human-centric, visual manner. OEMs like BMW are deploying similar large-scale metaverse projects.

In some cases, other subsectors – particularly suppliers – may be adopting metaverse technologies in response to activity from their OEM partners, as many use cases can expand in scope to include external partners and their data. One research interviewee, the VP of IT at a large German supplier, noted that in their case, they are employing the metaverse in large part to enhance their existing partnerships with OEMs. They indicated that the use of metaverse and other emerging technologies augment their ability to collaborate with OEMs, especially across the supply chain.

Our survey polled business leaders with interest in using the metaverse. Within this population, 58% overall are experienced – having already deployed or piloted a metaverse use case today.

Figure 1: Hands-on metaverse experience today, by subsector in automotive

	Experienced companies 1+ use cases deployed, piloted	Inexperienced companies Planning to deploy
All automotive respondents	58%	42%
OEMs	62%	38%
Aftersales	58%	42%
Dealers	55%	45%
Suppliers	54%	46%
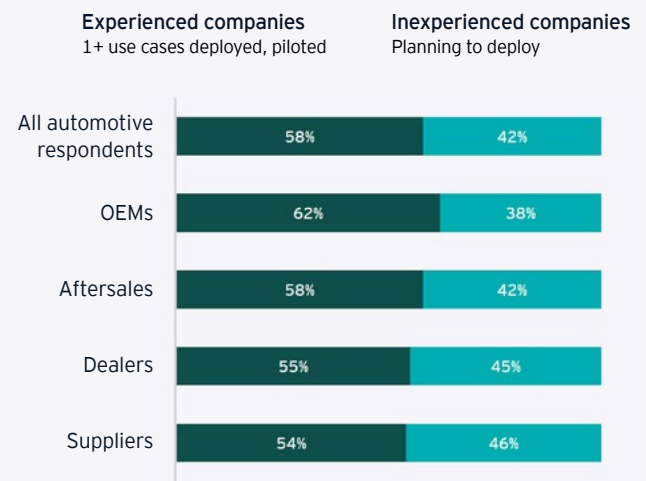
Figure 2: Estimated time to use the metaverse, among automotive respondents with no pilots or deployments to-date

Metaverse use today

58% have 1+ use cases deployed, piloted

42% have not deployed a use case to date

Time to deploy, among non-users today

Of the 42% of respondents who have not deployed or piloted a use case to date,

90%

90% plan to use the metaverse or related technologies in the next two years
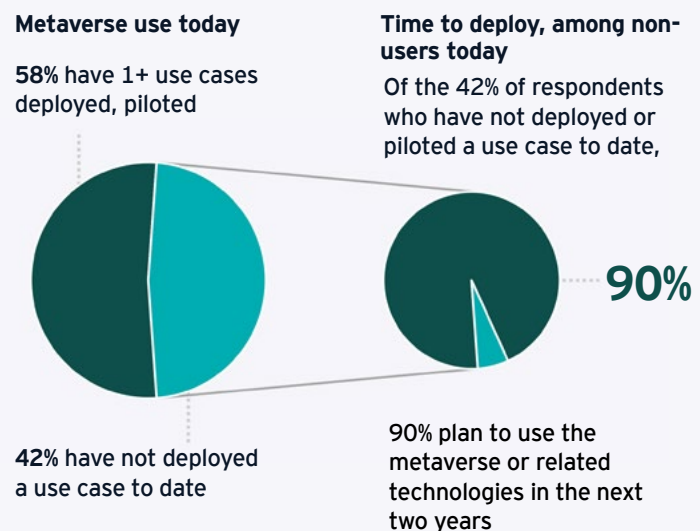
2 Top industrial use cases

based on the expected impact reported by respondents in the automotive industry

Virtual R&D, prototyping and testing

Of all the use cases tested, automotive respondents were most excited by the potential of bringing design and testing into the metaverse (48% expect transformative impact to current business processes). By creating initial designs of cars and components virtually, with added ability for cross-functional collaboration and co-design, and then testing these virtual concepts for safety, assembly readiness and more, automotive companies can improve safety, customer service and experience and process efficiency through better digital tools for collaboration.

Though OEMs and other subsectors agree that the use case is highly likely to bring positive change to their company and industry, the other subsectors may be even more optimistic on potential transformative impact based on the fact that they have not used AR/VR as much, and the net gain may be greater for them than OEMs who have used earlier, less advanced versions of virtual R&D already.

9%
Deployed

31%
Planned use this year

Figure 3: Key benefits of virtual R&D

Process efficiency	46%
Enhanced service & CX	43%
Safety improvement	39%

Figure 4: Impact of virtual R&D

	Total automotive	OEMs	Other subsectors
Significant Impact	35%	41%	32%
Transformative impact	48%	41%	51%

■ Significant Impact   ■ Transformative impact
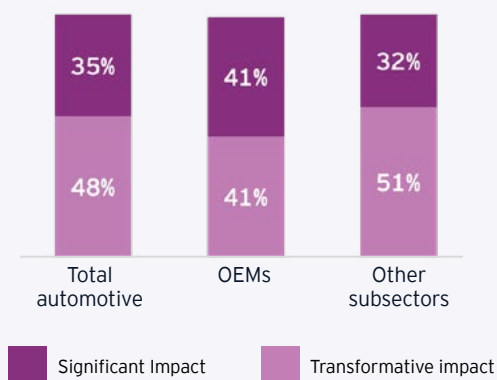
Virtual facility optimization

Among the most deployed use cases in the automotive industry, respondents from both operations and other functions saw the potential for virtual facilities to impact on the way their business operates today. By planning, simulating and tracking facilities in a virtual environment, companies can better lay out machinery and equipment to optimize processes like production and assembly. Expectations are slightly less optimistic in operations functions (31% expect transformative impact vs. 44% in other

functions), potentially a result of the promise seen by tech and innovation respondents exceeding the experience operational roles are seeing in early implementations. The use case is seen primarily as driving safety improvement and staff retention and upskilling by allowing for better layout of facilities to best suit the individuals working inside them but also can benefit time to market with added efficiency leading to more consistent delivery.

10%
Deployed

41%
Planned use this year

Figure 5: Key benefits of virtual facility optimization

Safety improvement	38%
Staff retention and upskilling	38%
Time to market	34%
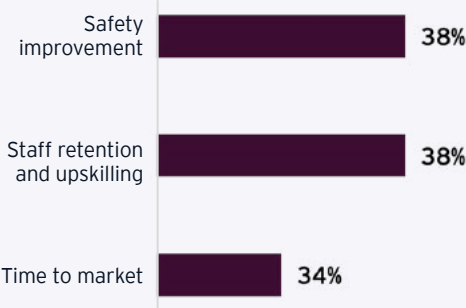
Figure 6: Impact of virtual facility optimization

	Total automotive	Operations function	Other functions
Significant Impact	38%	38%	38%
Transformative impact	41%	31%	44%

Significant Impact ▪ Transformative impact
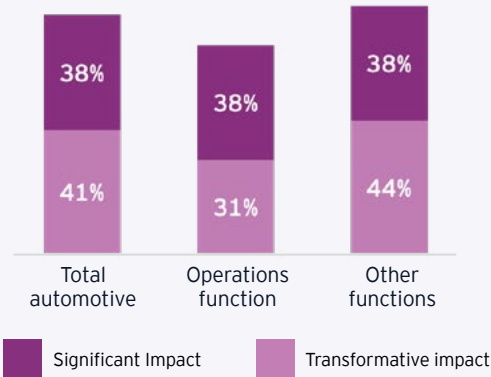
XR hands-on training

Automotive respondents were also excited by the potential of XR hands-on training (36% expect transformative impact overall). The use case allows for more in-depth training for the hands-on tasks performed by industrial roles while eliminating the need for travel to training sites and machine hours dedicated to training. As a result, companies believe the use case can benefit their sustainability initiatives, employee's skills, and drive enhanced safety with both safety procedure trainings and less need for untrained employees to practice on actual machines.

Respondents in non-operational functions, often those owning decision-making and implementation, are more confident in the potential impact from the use case. Respondents in operations functions see slightly less transformative potential. This can result in a disconnect between key decision-makers and the actual users of the training programs and create challenges in getting employees to adopt the new technologies, as was noted in an interview with the director of partnerships from a US-based OEM.

9%
Deployed

29%
Planned use this year
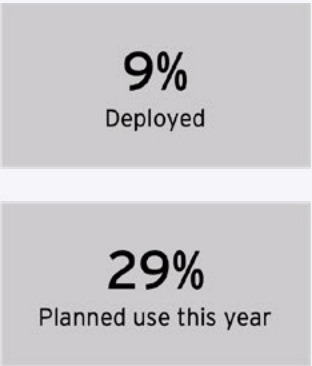
Figure 7: Key benefits of XR hands-on training

Sustainability	45%
Safety improvement	42%
Staff retention and upskilling	36%

Figure 8: Impact of XR hands-on training

	Total automotive	Operations function	Other functions
Significant Impact	45%	58%	42%
Transformative impact	36%	8%	44%

Significant Impact ▪ Transformative impact
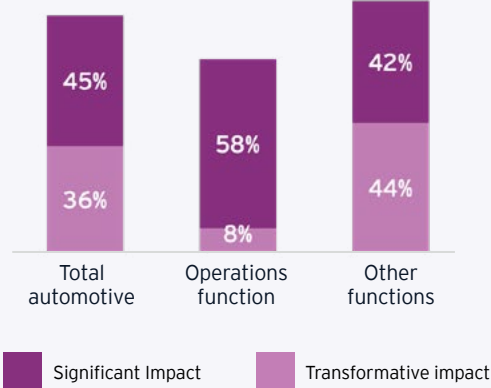
3 Key enablers and partners to deploying the metaverse

Across all industries, respondents value a foundational set of enablers for underpinning industrial and enterprise metaverse use cases. Cloud computing, connectivity (fiber, public and private networks), AI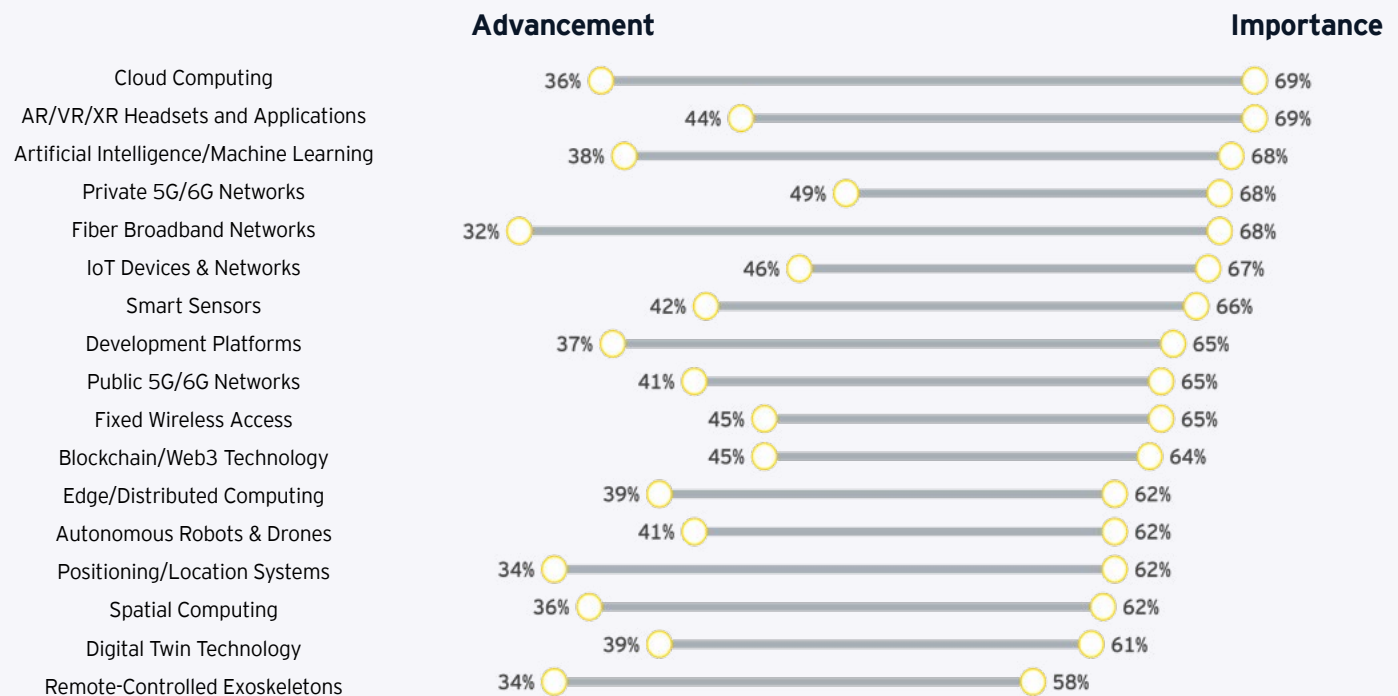 and IoT capabilities are essential building blocks to creating low-latency experiences and simulations with effective data capture, processing and storage capabilities as the backbone. While many automotive companies report higher advancement in leveraging network, particularly private 5G/6G [Figure 9], some companies are recognizing that the network requirements to scale metaverse use cases across sites and regions may be greater than anticipated. One research interviewee, the head of IT at a German automotive supplier, noted that while they've had successful metaverse pilots to date, they are now facing connectivity challenges across various sites that may be a barrier to scaling use cases.

In the automotive industry, AR/VR/XR headsets and applications are also highly ranked in terms of importance, compared to other industries surveyed. This technology is

an important component to many use cases in automotive, but particularly to those deemed most impactful to survey respondents.

Leveraging headsets for virtual R&D, prototyping and testing allows realistic, immersive collaboration for everyone involved, especially critical in component or vehicle design. BMW is using the NVIDIA "Omniverse" to allow engineers to collaborate virtually and run real-time tests on vehicle ergonomics and efficiently make design changes. For virtual facility optimization, automotive companies are using digital twins and other related technologies, along with metaverse, to plan and simulate factory design and processes in a virtual environment. Here, headsets add increased value, allowing employees assess factory plans and make decisions to manipulate layouts in a realistic environment. Since 2020, Fiat has been using VR for collaborative factory design, citing benefits like improved process efficiency and cost reduction, as well as communication and increased quality and safety from the use of metaverse and VR headsets.

Figure 9: Top-ranked enablers by importance, compared to the level of advancement in using them

	Advancement	Importance
Cloud Computing	36%	69%
AR/VR/XR Headsets and Applications	44%	69%
Artificial Intelligence/Machine Learning	38%	68%
Private 5G/6G Networks	49%	68%
Fiber Broadband Networks	32%	68%
IoT Devices & Networks	46%	67%
Smart Sensors	42%	66%
Development Platforms	37%	65%
Public 5G/6G Networks	41%	65%
Fixed Wireless Access	45%	65%
Blockchain/Web3 Technology	45%	64%
Edge/Distributed Computing	39%	62%
Autonomous Robots & Drones	41%	62%
Positioning/Location Systems	34%	62%
Spatial Computing	36%	62%
Digital Twin Technology	39%	61%
Remote-Controlled Exoskeletons	34%	58%

Partnerships bring together the expertise and resources needed to build and execute a robust metaverse use case; automotive companies are leveraging an array of partners for use cases deemed most impactful.

Figure 10: Key partners for most impactful automotive use cases, based on survey responses

	Ranked most important: Partners to deploy use case	Ranked 2nd: Partners to deploy use case	Ranked 3rd: Partners to deploy use case
Virtual R&D, prototyping and testing	Network/networking equipment providers	Industrial equipment/tech providers	Professional services firms
Virtual facility optimization	Industrial software/app providers	Blockchain protocol providers	AI/ML providers
Extended reality (XR) hands-on training	Industrial equipment/tech providers	Gaming companies and engines	Big tech

For virtual R&D, prototyping and testing, network providers are top of mind. In the case of testing specifically, real-time bandwidth is of utmost importance to conduct and monitor crash testing activities, with latency resulting in unrealistic experiences. In this case, network partners can ensure that users experience low latency and minimal or no lag during the design and test process using the metaverse, while also providing automotive companies with solutions to increase security in transmission of the billions of data assets that will be created from metaverse use cases.

Automotive companies are turning to industrial software and application providers often to construct digital twins. For use cases like virtual facility optimization, these providers may be integral to helping companies digitally replicate physical assets in a virtualized environment, where metaverse technologies can then be applied for virtualized collaboration

and the fusion of digital and physical data for scenario planning and design. For example, Renault partnered with Dassault Systemes to create digital twins of the company's factories, an important lever in driving collaboration, efficiency and sustainability. While digital twins for facility planning is only one of many use cases, Renault expects that the use of Dassault's platform overall within the organization will reduce vehicle development time by one year and reduce overall cost.

Today, the partner landscape is fragmented, and companies are often tasked with curating a team of partners, each providing a specialized service or technology. Automotive respondents are relying on professional services firms and big tech companies not only to help define the strategic imperative and business case for a metaverse project, but also to help with vendor selection to execute.

# 4 Challenges in the industrial and enterprise metaverses

While automotive companies have been using VR and digital twins for years, they still face many of the same headwinds in using the metaverse as other industries, like struggling to find the right internal expertise, to execute and to track the value of use cases.

Figure 11: Top challenges for automotive companies that have already piloted or deployed a use case

54%	39%	35%	32%	31%
Lack of expertise	Technical difficulties	Reluctance to adopt	Over budget	Over project duration

Fifty-four percent of respondents with experience using the metaverse in the automotive industry cite lack of expertise as a challenge in executing on metaverse use cases, the highest among all industries surveyed. For respondents within the operations and production functions in their company, like supply chain and manufacturing, lack of expertise is an even greater challenge, with 71% citing it as a difficulty they've experienced. While these functions have potentially used technologies like digital twins or VR for years, there may be new challenges as they look to other use cases or to expanding the scope of existing activities. There may also be knowledge siloes around metaverse – as the technology has been used often as point solutions to date, like in design. For some companies, siloed metaverse knowledge may also exist in digital centers of excellence, for example, which may be situated in parts of the company outside of the operational space.

Like other industries, automotive companies may struggle with the business case process preceding use case deployment, ensuring the distinct value and ROI from the metaverse is proven to garner buy-in and investment. In this case, interviewees note that resources need to understand the technology, the enablers and the benefits to accurately predict and communicate value from the metaverse.

Automotive companies may also face challenges in ensuring leadership and employee buy-in, especially in a factory setting, around the metaverse. One research interviewee at a global automotive manufacturer noted that they faced challenges in affirming the true purpose of using metaverse
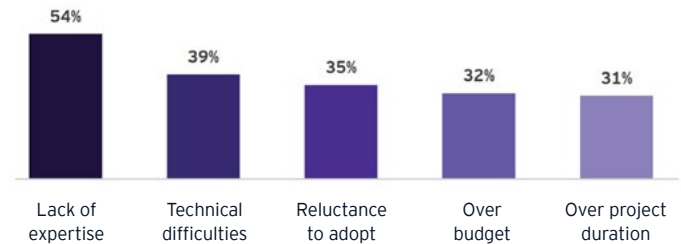
in factories, tasked with proving that the metaverse is a tool to make employees' work easier and safer, rather than an oversight mechanism.

Automotive companies also face technical difficulties and reluctance of employees to adopt the new technologies and processes. For some, the technical difficulties are directly driving the low adoption. One research interviewee from a global automotive manufacturer noted that, when piloting XR technology to allow remote experts to support service technicians virtually through the maintenance process, there were occasional technical difficulties and significant ramp-up required to get employees to adopt the new technology. In this case, the maturity of the technology and the level of comfort and advancement in leveraging an enabler like XR headsets and the speed of the network to allow for real-time experiences were key barriers to success. Another research interviewee, a global automotive supplier, noted that they found success overall in their metaverse pilots to date, but that fidelity – the degree to which an augmented or virtual environment accurately represents or integrates with the real-world environment – has been a concern among others in the industry.

> " Our employees lose trust easily when technology doesn't work as intended.
>
> Director of Partnerships, US-based OEM

The path forward

Not dissimilar to any other new technology, implementing the metaverse in enterprise and industrial processes will pose challenges, some unique to the automotive industry. And while there is no playbook for beginning or scaling in the metaverse today, companies should look to established leaders in their industry as they implement to better anticipate barriers and understand the people, process and technical enablers to getting metaverse use cases off the ground.

While challenges around expertise, technology and adoption will remain, automotive companies can consider ways to navigate while still driving forward metaverse initiatives as first movers and early adopters rather than waiting for market maturity. In the automotive industry, especially in production, leaning into certain benefits like improved employee safety as key upsides of using metaverse can potentially improve buy-in from organizational and union leaders, where applicable. Similarly, when tackling issues with technology and employee adoption, some may consider allowing the option for service technicians or other employees to access metaverse environments from a more familiar device, like a desktop or tablet, as they continue to train and establish comfort with AR/VR/XR or in cases of headset fatigue.

Finally, tackling issues with core capabilities like upgrading legacy systems, improving data interoperability and expanding network connectivity early can improve the experience with the metaverse in the long-term and solidify more user-friendly experiences with the technology before scaling.

Appendix: other use cases

While automotive respondents have found virtual R&D, prototyping and testing, virtual facility optimization, and XR hands-on training to be the most impactful use cases overall, there are a range of other use cases companies are considering.

Figure 12: Impact and deployment of other industrial metaverse use cases (ranked 4-9)
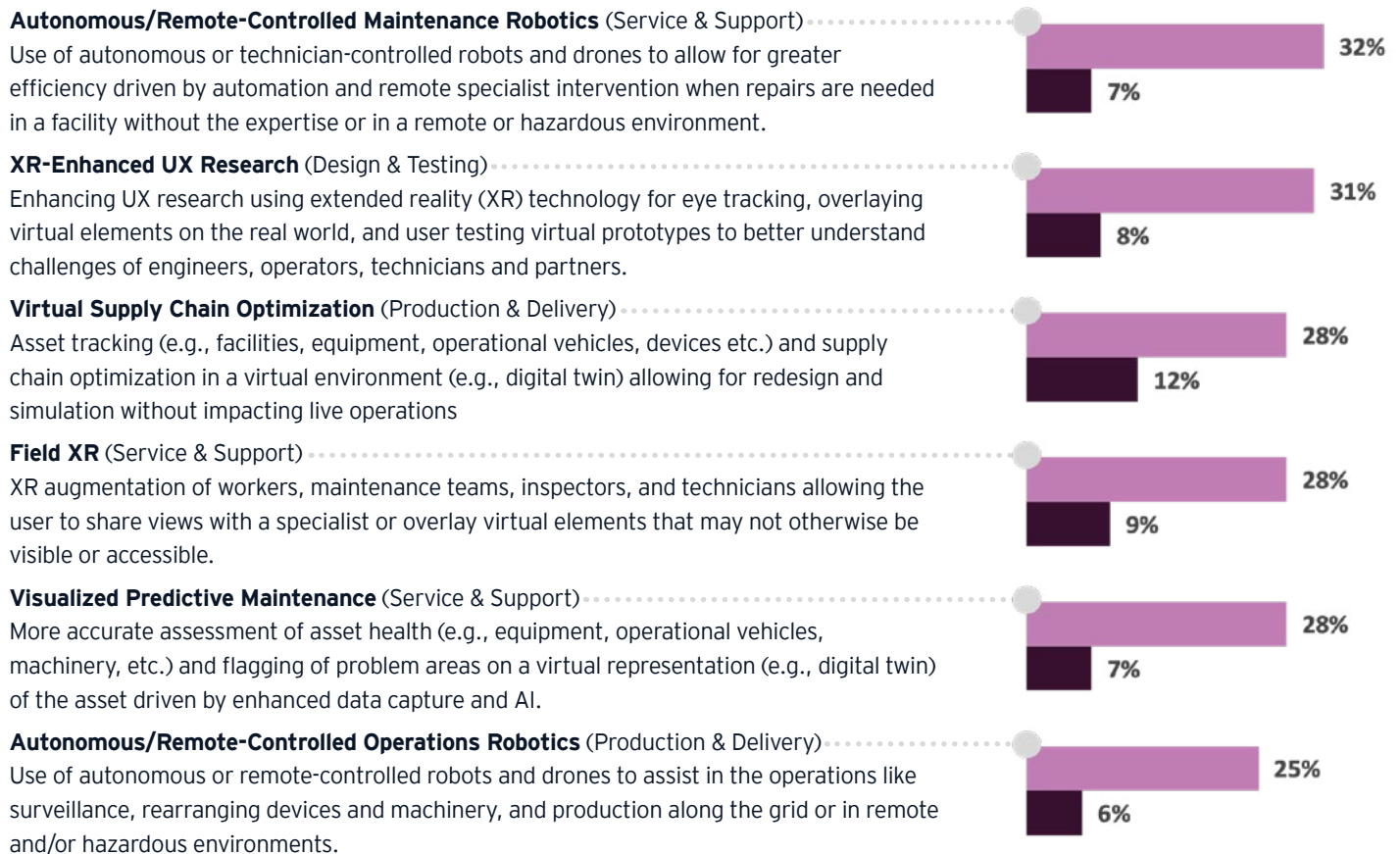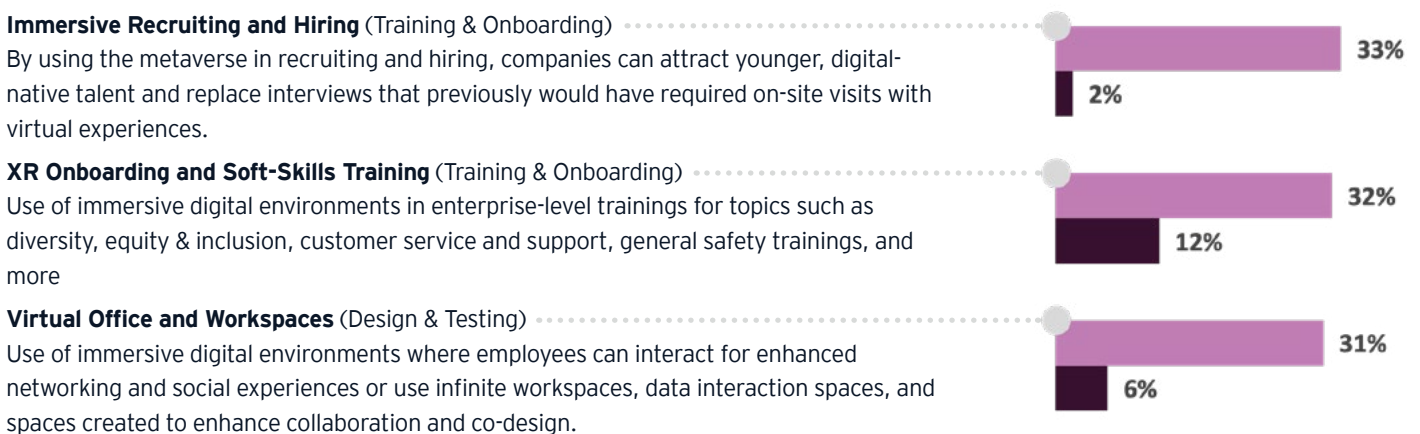
Autonomous/Remote-Controlled Maintenance Robotics (Service & Support)
Use of autonomous or technician-controlled robots and drones to allow for greater efficiency driven by automation and remote specialist intervention when repairs are needed in a facility without the expertise or in a remote or hazardous environment.

32%
7%

XR-Enhanced UX Research (Design & Testing)
Enhancing UX research using extended reality (XR) technology for eye tracking, overlaying virtual elements on the real world, and user testing virtual prototypes to better understand challenges of engineers, operators, technicians and partners.

31%
8%

Virtual Supply Chain Optimization (Production & Delivery)
Asset tracking (e.g., facilities, equipment, operational vehicles, devices etc.) and supply chain optimization in a virtual environment (e.g., digital twin) allowing for redesign and simulation without impacting live operations

28%
12%

Field XR (Service & Support)
XR augmentation of workers, maintenance teams, inspectors, and technicians allowing the user to share views with a specialist or overlay virtual elements that may not otherwise be visible or accessible.

28%
9%

Visualized Predictive Maintenance (Service & Support)
More accurate assessment of asset health (e.g., equipment, operational vehicles, machinery, etc.) and flagging of problem areas on a virtual representation (e.g., digital twin) of the asset driven by enhanced data capture and AI.

28%
7%

Autonomous/Remote-Controlled Operations Robotics (Production & Delivery)
Use of autonomous or remote-controlled robots and drones to assist in the operations like surveillance, rearranging devices and machinery, and production along the grid or in remote and/or hazardous environments.

25%
6%

Figure 13: Impact and deployment of enterprise metaverse use cases

Immersive Recruiting and Hiring (Training & Onboarding)
By using the metaverse in recruiting and hiring, companies can attract younger, digital-native talent and replace interviews that previously would have required on-site visits with virtual experiences.

33%
2%

XR Onboarding and Soft-Skills Training (Training & Onboarding)
Use of immersive digital environments in enterprise-level trainings for topics such as diversity, equity & inclusion, customer service and support, general safety trainings, and more

32%
12%

Virtual Office and Workspaces (Design & Testing)
Use of immersive digital environments where employees can interact for enhanced networking and social experiences or use infinite workspaces, data interaction spaces, and spaces created to enhance collaboration and co-design.

31%
6%

Expect transformative impact   Deployed

Appendix: consumer use cases

Among the tested consumer use cases, automotive respondents were most interested in immersive virtual product trials, followed by metaverse-augmented customer support and immersive virtual showrooms.

Use case	Definition
1. Immersive virtual product trials	Immersive digital spaces where customers can test products and services using technology like XR headsets, haptic feedback, and more to create a life-like experiences (e.g., virtual test drives).
2. Metaverse-augmented customer support	Augmenting traditional customer support services with immersive digital spaces to create more realistic interactions and offer engagement & education to customers while waiting for help.
3. Immersive virtual showrooms	Immersive digital spaces where customers can view and customize different products, interact with virtual company representatives, view company facilities and processes and more.

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