

The metaverse at work

Industrial goods and
manufacturing industry
deep dive

June 2023

The EY logo, consisting of the letters 'EY' in a bold, white, sans-serif font, preceded by a yellow chevron pointing upwards and to the right.

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The metaverse at work



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About this study

This report is based on qualitative interviews, independent research and 356 survey responses from the industrial goods and manufacturing 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.”

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1 The state of the industrial and enterprise metaverses today

The industrial goods and manufacturing industry has been and will continue to be increasingly technology-driven - from the growth of automation and robotics to the infusion of IoT technologies and big data and analytics. The factory floor has become a hub for emerging and advanced technology, and the metaverse is now staking its claim.

Companies in the industry are taking the leap into the metaverse, often considered a continuation of industry 4.0, offering a fusion of digital and physical worlds and immersive experiences. Our research surveyed 356 industrial goods and manufacturing leaders interested in using metaverse technology. Today, 60% of respondents have already piloted or deployed a use case in their company [Figure 1]. For the 40% of respondents with no activity to date, the future is promising, with 98% reporting plans to use the metaverse in the next two years [Figure 2].

Certain subsectors appear to be leading in experience with the metaverse, particularly process manufacturers (65%), where food and beverage manufacturers particularly stand out, with 78% reporting experience with the metaverse today. These manufacturers have an incentive to use the metaverse across the value chain - from design to production and delivery - to improve internal processes and drive customer experience. Virtual supply chain networks, for example, can connect stakeholders across production and delivery, with the ability to trace, detect and remove contaminated products. Kraft-Heinz partnered with Microsoft to build a metaverse ecosystem across their supply chain to predict bottlenecks and simulate scenarios. Others are connecting the industrial metaverse to the consumer. One leading beverage manufacturer interviewed is exploring marrying the metaverse and blockchain technologies to allow consumers to scan a QR code and track their product's journey to the shelf, complete with a tamper-free certification. The company aims to use the metaverse not only for internal supply chain visibility but also to drive trust among consumers.

Transportation manufacturing appears to be slightly behind in metaverse experience today, with 49% of respondents having hands-on experience. Within the sub-sector, some have demonstrated greater use of the metaverse, like aerospace and automotive manufacturing. Others, however, like railway and marine manufacturing, appear to be less advanced yet ripe for innovative technologies like the metaverse to support highly complex processes. Maritime manufacturing is a prime example, with a greater scale than traditional parts and product manufacturing. Emerging technologies will need to integrate into a sizeable set of processes and data systems. These systems in their current state may not be adept in accommodating the real-time data collection and processing needed to execute in the metaverse. Additionally, cybersecurity is paramount in shipbuilding, especially in the case of naval vessel manufacturing, where hacking and malware can compromise operations safety and the supply chain. Here, companies interested in the metaverse may require additional time and consideration before embedding innovation.

Our survey polled business leaders with interest in using the metaverse. Within this population, 60% overall are experienced - having already deployed or piloted a metaverse use case today.

Figure 1: Hands-on metaverse experience today, by subsector in industrial goods and manufacturing

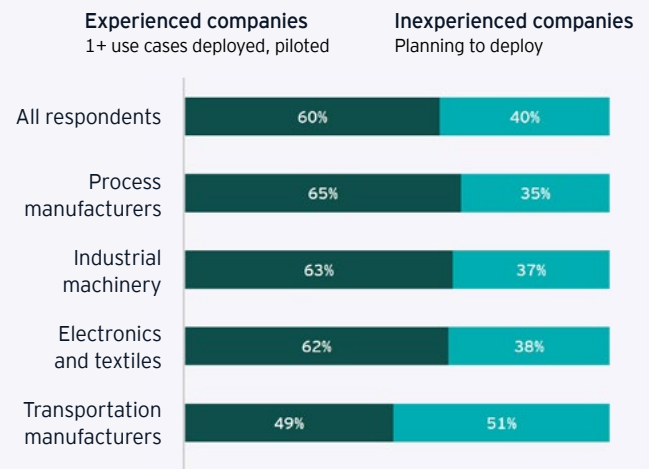
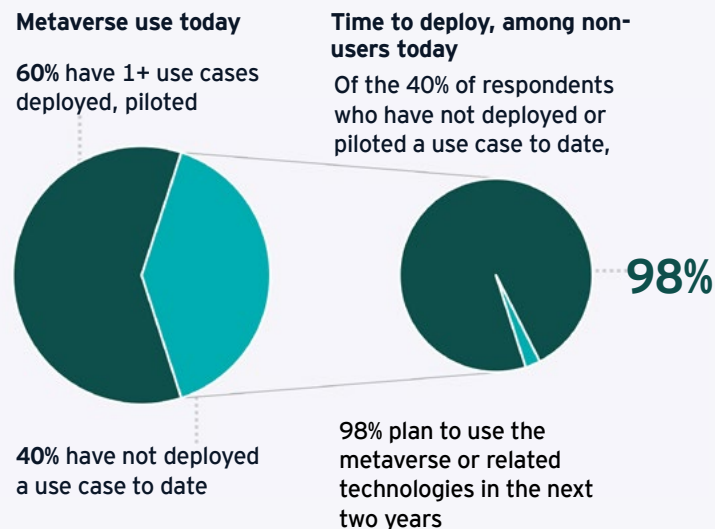


Figure 2: Estimated time to use the metaverse, among industrial goods and manufacturing respondents with no pilots or deployments to-date



2 Top industrial use cases

based on the expected impact reported by respondents in the industrial goods and manufacturing industry

Visualized predictive maintenance

By using virtual representations of real-world assets like digital twins as visual reporting tools for predictive maintenance models, companies can increase their understanding of asset health across their facilities and better inform decision-makers. Of all the use cases tested, industrial goods and manufacturing respondents were most excited by the potential of visualized predictive maintenance. The use case was seen as driving process

efficiency, sustainability, and time to market by extending the useful life of machinery and avoiding unexpected outages. The potential magnitude of the impact was notably high across all functions.



Figure 3: Key benefits of predictive maintenance

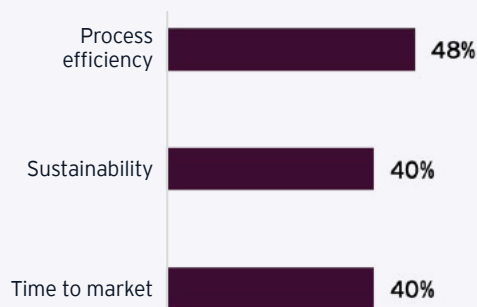
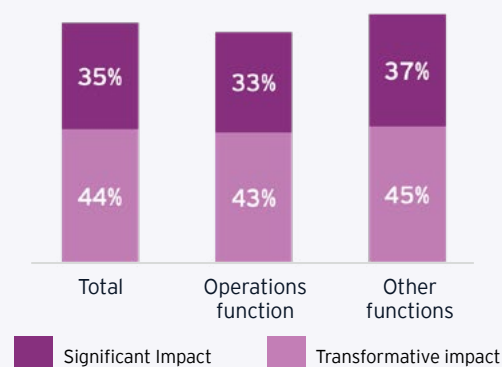


Figure 4: Impact of predictive maintenance



Autonomous and remote-controlled operations robotics

Another use case with potential transformative impact on the industrial goods and manufacturing industry is operations robotics. The use case allows for greater automation in processes like surveillance, facility reconfiguration and production, as well as the ability for people to work remotely through an on-site robot for inspections, audits, etc., all while providing greater

capacity for human oversight and intervention through the metaverse. Companies see the use case as creating process efficiencies, improving safety by moving strenuous or dangerous tasks out of the hands of human workers, and improving sustainability by reducing errors in production and subsequent waste.

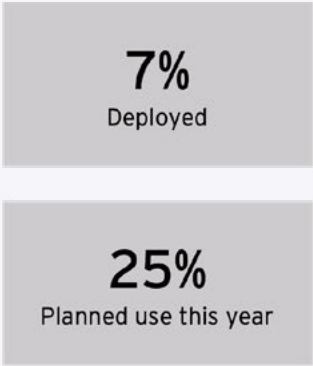


Figure 5: Key benefits of operations robotics

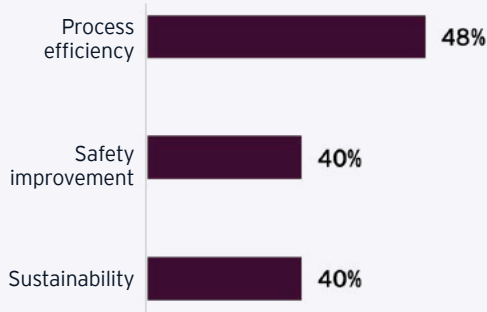
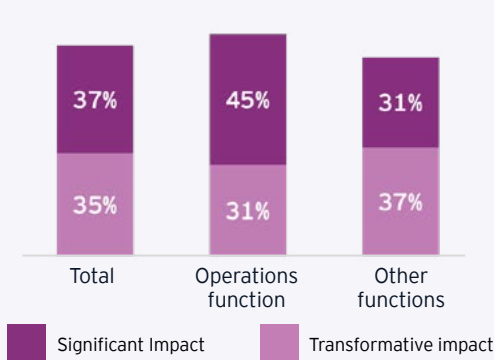


Figure 6: Impact of operations robotics



Virtual R&D, prototyping and testing

Industrial goods and manufacturing respondents were also excited by the potential to bring design, engineering and testing into the metaverse (33% expect transformative impact). By conducting initial R&D and design virtually or in a digitally augmented physical environment, with added ability for cross-functional collaboration and co-design, and then testing concepts for safety, production readiness and more, companies can improve time to market, process

efficiency and sustainability with reduced setbacks and waste when brought to the real world. The potential impact is noted in all subsectors, although process manufacturing respondents (e.g., chemicals or food and beverage) are less optimistic. One interview participant noted their company was using the technology to allow for development throughout different time zones around the clock.

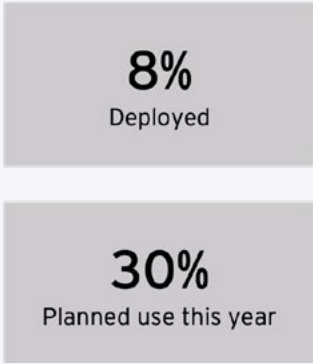


Figure 7: Key benefits of virtual R&D

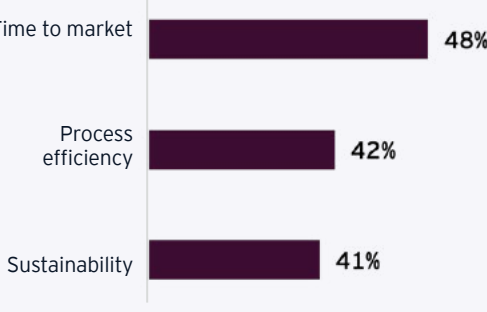
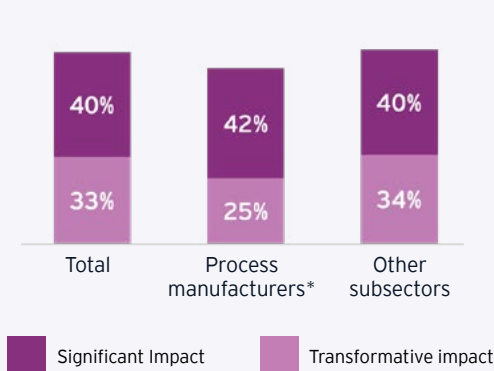


Figure 8: Impact of virtual R&D



*Process manufacturers refer to the food and beverage manufacturing and chemical manufacturing subsectors

3 Key enablers and partners to deploying the metaverse

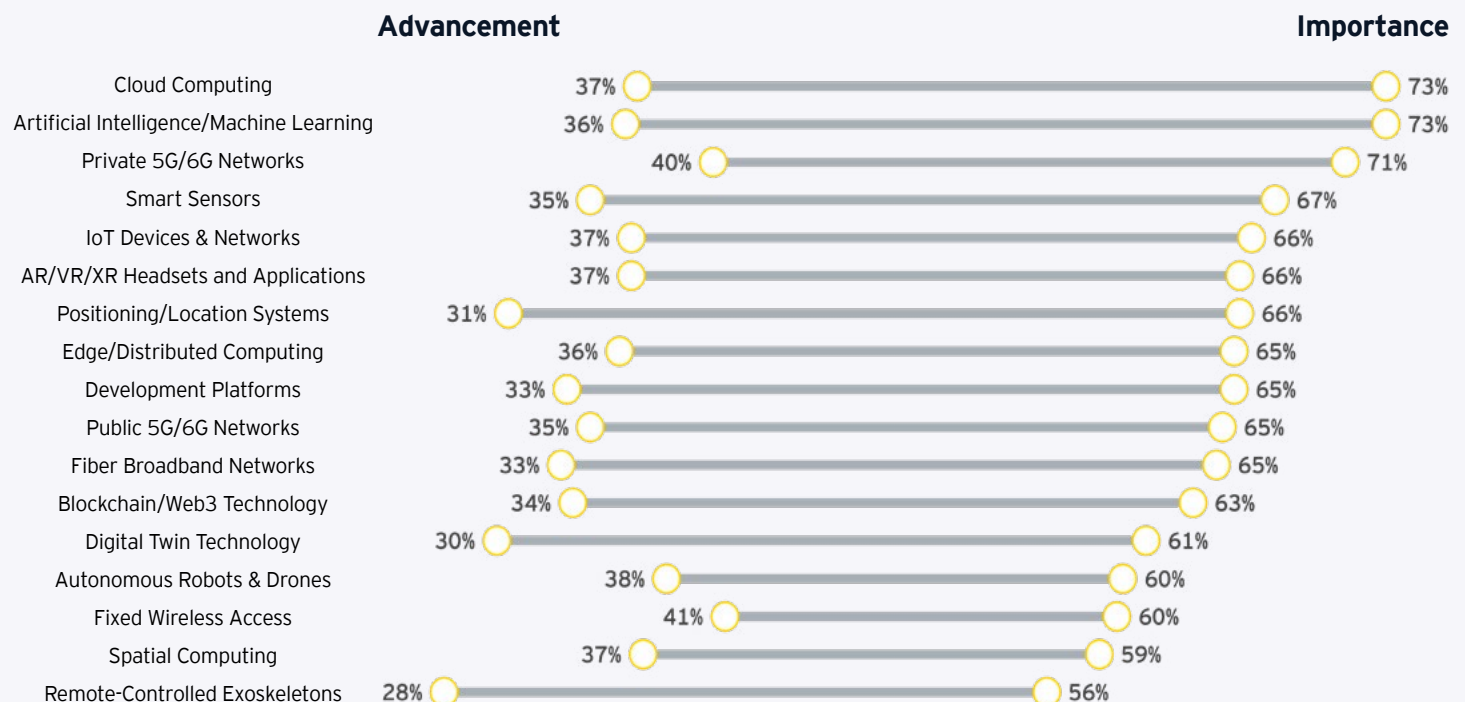
Across all industries, respondents value a foundational set of enablers for underpinning industrial and enterprise metaverse use cases, from cloud computing to AI, machine learning and network connectivity, specifically private 5G/6G. All capabilities are essential building blocks to creating metaverse solutions that maximize the enhanced accuracy and fidelity these use cases offer. One research interviewee, a C-level executive at an apparel and textiles manufacturer, noted that the network should not be overlooked. While their digital center of excellence is focused on advanced computing and AI, they have realized the criticality of network connectivity as they look to turn proof of concepts and pilots into deployments at scale.

In addition to these top enablers, the industry is also highly focused on the hardware needed to bring metaverse use cases to life. For use cases like visualized predictive maintenance and operations robotics,

enabling technologies like smart sensors, IoT devices and networks, and positioning and location systems will be a priority, allowing for a better understanding of asset tracking and asset health across the value chain. One research interviewee, a VP at a global food and beverage manufacturer, noted that upgrading their smart sensors and IoT data capture capabilities were one of the key considerations before deploying metaverse use cases at scale.

Additionally, XR headsets were seen as a key enabling technology, both for use cases like training, user research, and augmentation of workers and in their ability to augment other use cases like virtual R&D and visualized predictive maintenance. Although not vital to these use cases, they can benefit greatly from immersive 3D renderings of objects made possible by XR.

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



Companies in the industrial goods and manufacturing industry are primarily turning to trusted providers like industrial equipment and tech providers, as well as software and application providers to bring their metaverse solutions to life.

Figure 10: Key partners for most impactful industrial goods and manufacturing use cases

	Ranked most important: Partners to deploy use case	Ranked 2nd: Partners to deploy use case	Ranked 3rd: Partners to deploy use case
Visualized predictive maintenance	Industrial equipment/tech providers	Industrial software/app providers	Network/networking equipment providers
Autonomous/RC operations robotics	AI/ML providers	Industrial equipment/tech providers	Industrial software/app providers
Virtual R&D, prototyping and testing	Web3 application providers	Network/networking equipment providers	XR/metaverse platform providers

These companies can provide the hardware, like robotics and smart sensors, and the software, like digital twins, to help companies pilot and deploy top use cases, like visualized predictive maintenance and operations robotics. However, there is a need for other providers to help support the connectivity and data requirements to drive further advancement of these solutions.

AI and machine learning providers are seen as key partners in deploying operations robotics for their ability to enhance

the capabilities of robots with capabilities like computer vision. Network providers are also seen as key partners to multiple top use cases, as these use cases ultimately are only as strong as the underlying networks and connectivity that support them. For example, virtual R&D, prototyping and testing requires low latency and high bandwidth connectivity to ensure collaborative design, engineering or other experiences are as realistic as possible in the virtual environments compared to physical environments.



4 Challenges in the industrial and enterprise metaverses

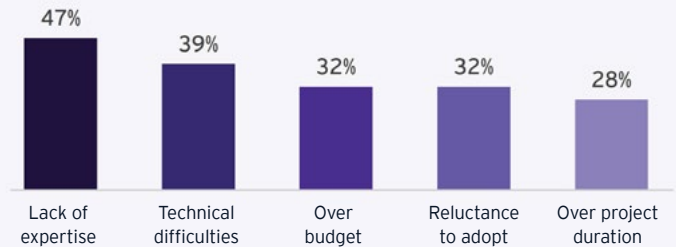
Industrial goods and manufacturing companies face similar headwinds in employing the metaverse as other industries, like struggling to find the right internal expertise, to execute and track value, as well as with convincing employees to adopt the solutions.

Like other industries, the primary challenge companies in the industrial goods and manufacturing industry are facing is lack of internal expertise (47%). This can create challenges not only in initiating conversations around the industrial and enterprise metaverse but also in partner selection. With the large number of providers and start-ups offering metaverse solutions, companies lacking internal knowledge on the subject may struggle to understand their own capabilities and the abilities of any partner they may select.

Aside from internal expertise, some companies with more traditional processes and a less tech-savvy workforce may struggle to overcome pre-existing notions about the metaverse, often driven by the consumer and gaming spaces. One research interviewee noted their factory employees and technicians repudiate the idea of the metaverse and may even conflate it with Web3 technologies like cryptocurrency and blockchain. Because of this, there's fear that the metaverse may degrade trust among critical employees unless implemented in an approachable, tactical manner with a focus on the benefits, like making processes easier and more efficient. Limited digital skills among employees was an additional cause of concern, especially in leveraging XR headsets to access metaverse solutions.

Industrial goods and manufacturing respondents with experience in the metaverse also cited experiencing technical difficulties (39%). Multiple research interviewees noted that data and integrating legacy systems were the drivers of their technical challenges when adopting the metaverse, especially in large-scale factories.


Figure 11: Top challenges for industrial goods and manufacturing companies already piloting or deploying 1+ use case



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We were lacking expertise in metaverse technology, and not just for hardware and software. What's the appropriate way to build out at scale? How do we secure the environment? How do we ensure that our IP won't be taken? It took us some time to find the right partners and use cases.

VP technology, mid-sized industrial equipment and machinery manufacturer



The path forward

For industrial goods and manufacturing companies interested in entering the metaverse, the first hurdle will likely be building internal support. Between the lack of internal expertise, unclear ROI and employee adoption challenges many experienced companies are facing, building internal support before, during and after the implementation of metaverse solutions will be key to ongoing success. For this reason, companies should stress education across stakeholder groups on the technology and anticipated benefits, with examples of metaverse applications at other industry-leading companies. Because the range of benefits from the metaverse is wide, from sustainability to cost reduction, to name a few, companies can lean into certain benefits that may excite different groups of stakeholders.

Companies should also pay attention to nomenclature surrounding their new industrial and enterprise metaverse solutions to avoid reputational risk in cases where employees and customers have strong pre-existing notions around the metaverse and related technologies. Although this may not be the case in all companies or sectors if the term “metaverse” is expected to erode trust in a solution, it may be beneficial to avoid the term altogether, opting to refer to the metaverse as an “immersive experience” or “enhanced digital twin,” where applicable. Similarly, some metaverse use cases are not new to the industry at all - having existed for years without the term “metaverse” as a label. In this case, it’s important for companies to call out their pre-existing use of and success with the metaverse.

Finally, companies should invest early in the enabling technologies needed to help them pilot and scale metaverse solutions. Although these enablers may not be vital in the pilot phase, an early start can be beneficial to further deployment. This is especially important for companies in industrial goods and manufacturing, as self-reported maturity with enabling technologies is low compared to other industries, and it may take time to get data capture technology (e.g., smart sensors, positioning and location systems, etc.) and connectivity to the level needed to scale use cases.

Appendix: other use cases

While industrial goods and manufacturing respondents have found visualized predictive maintenance, operations robotics, and virtual R&D, prototyping and testing 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)

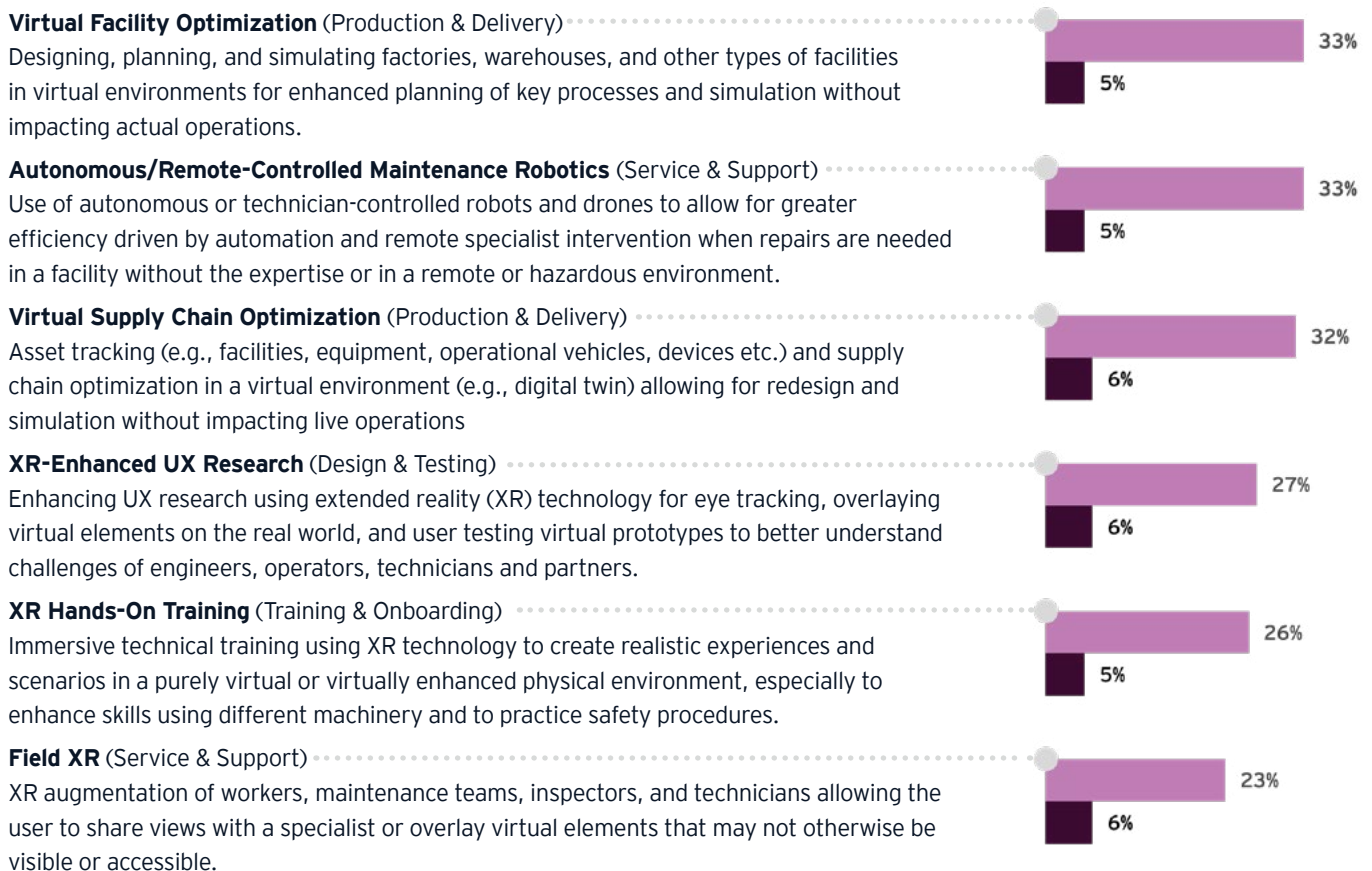
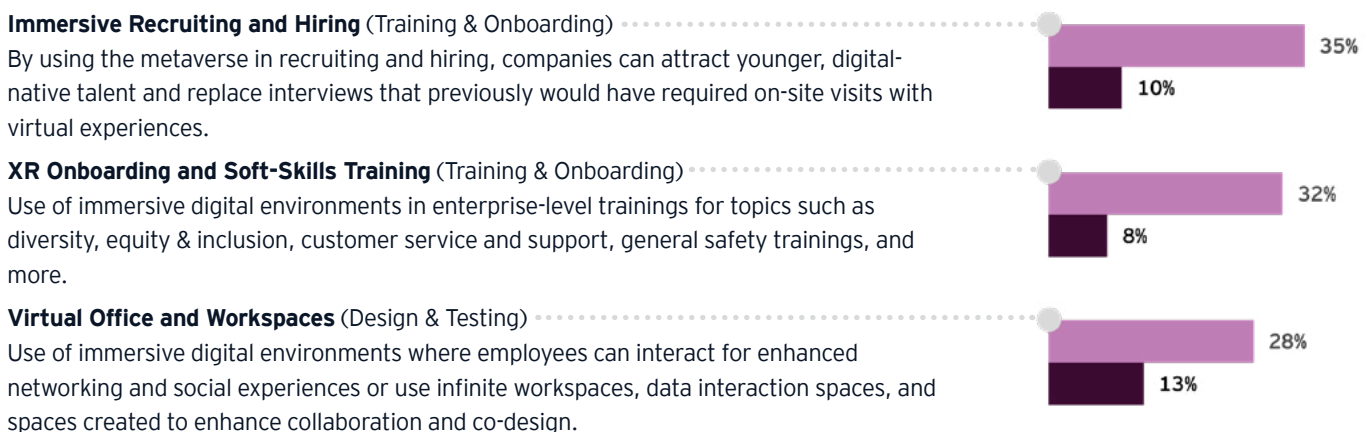


Figure 13: Impact and deployment of enterprise metaverse use cases



Expect transformative impact Deployed

Endnotes

1. Reynolds, Conor, "How drinks brands are using smart packaging," JustDrinks, 21 February 2023, <https://www.just-drinks.com/features/how-drinks-brands-are-using-smart-packaging/>.
2. Mann, Jyoti, "US giant Kraft Heinz will use the metaverse to quash logistical woes. Here's how it plans to avoid products getting trapped in its supply chain," Business Insider, 7 May 2022, <https://www.businessinsider.com/kraft-heinz-microsoft-metaverse-logistics-investment-2022-5>.
3. Naval Technology, "Maritime 4.0 shapes the digital shipyard of the future," 5 May 2022, <https://www.naval-technology.com/comment/maritime-4-0-shapes-the-digital-shipyard-of-the-future/>.

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