



The metaverse at work

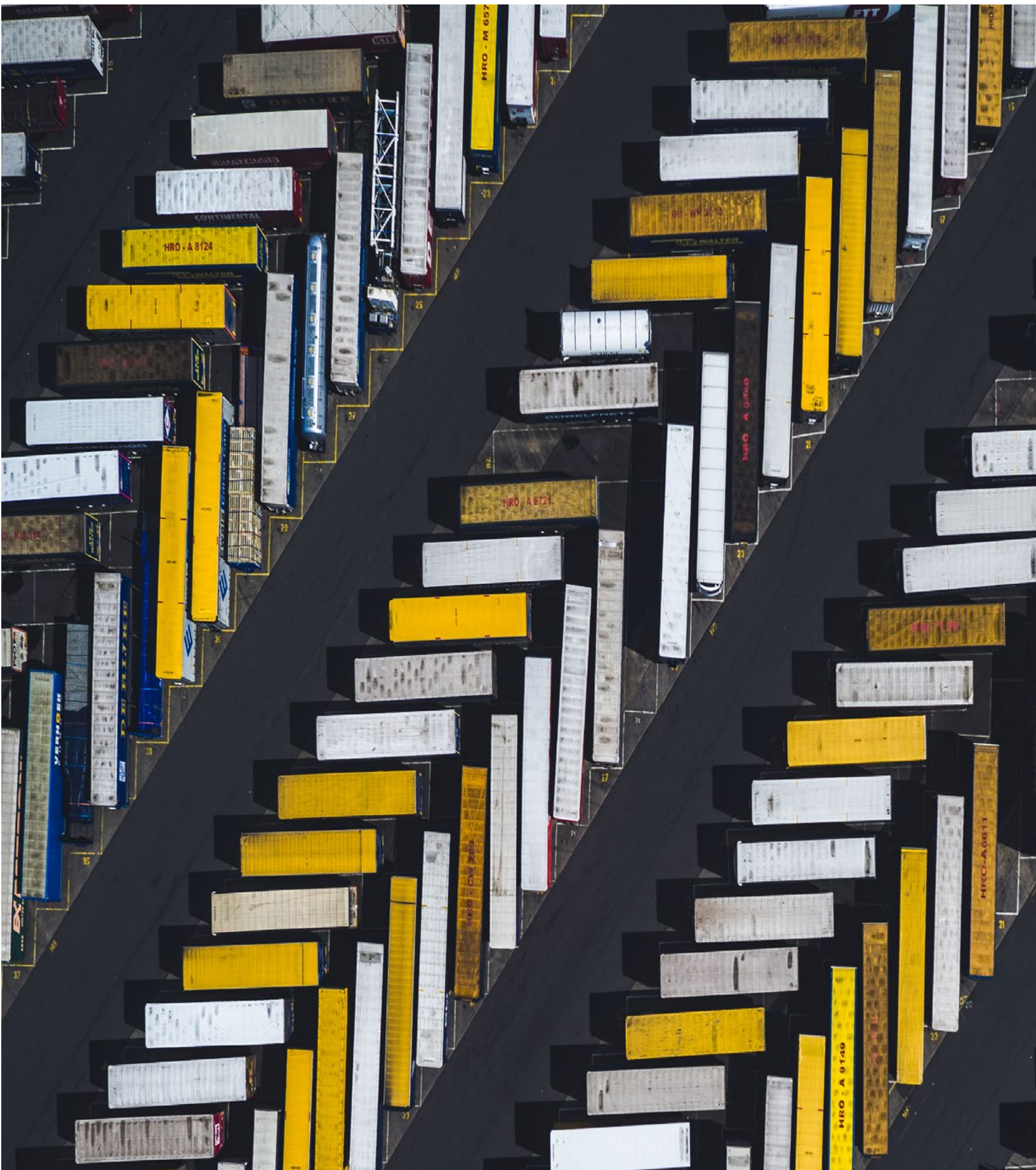
Transportation, supply chain and
logistics industry deep dive

June 2023



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working world

NOKIA



The metaverse at work



Contents

| | |
|--|----------|
| The state of the industrial and enterprise metaverses today | 2 |
| Top industrial use cases | 3 |
| Key enablers and partners to deploying the metaverse | 5 |
| Challenges in the industrial and enterprise metaverses | 7 |
| Appendix: other use cases..... | 9 |
| Endnotes..... | 10 |

About this study

This report is based on qualitative interviews, independent research and 130 survey responses from the transportation, supply chain and logistics 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

As the market begins to explore the industrial and enterprise metaverses, beyond the customer-facing realm, transportation, supply chain and logistics companies are paying attention. These metaverses have the potential to enable expedited onboarding of external partners and change the way fleets are optimized, bottlenecks are flagged, and warehousing and distribution processes are configured by fully integrating data across sites and controlling assets and spaces in a collaborative, virtual environment. Companies that embrace this technology have the potential to streamline and improve their operations, reduce costs and provide greater visibility across the network.

Today, the transportation, supply chain and logistics sector marginally outpaces others surveyed in the adoption of the industrial and enterprise metaverses, among companies interested in deploying use cases. 61% of companies surveyed have had hands-on experience with these metaverses today, through a pilot or one or more use case deployments [Figure 1]. Of the 39% of respondents with no pilots or deployments to date, 98% intend to use the technology within the next two years [Figure 2].

The US and UK respondents notably report greater experience with the metaverse, with over 70% of respondents in either region having piloted or deployed a use case.

The US transportation, supply chain and logistics sector is substantial, driven by expansive geographic space, sufficient infrastructure and large consumer goods demand. The US market is highly fragmented, with a vast array of players competing for market share, making technologies like the metaverse attractive and viable options to gain a competitive advantage.

The UK also has an important presence in the industry, with a highly advanced contract logistics market - assisting companies with key parts of the supply chain, predominantly delivery management - with increased demand from ecommerce post-COVID-19. The impact of Brexit on the UK also provides important context, as many UK companies have been pressed to rethink their supply chains as trade with the EU has become more complex. Additionally, related to transportation, the UK government is constructing digital twins of the entire highway system in the country, with real-time data feeds accessible to partners and companies to support business planning and other activities. Transportation, supply chain and logistics companies may be incentivized to use these publicly sponsored assets to improve and streamline operations.

While Japan, South Korea and Germany lag the US and UK in metaverse use in transportation, supply chain and logistics today, 100% of respondents in these three countries have identified plans to use the metaverse in the next two years.

Our survey polled business leaders with interest in using the metaverse. Within this population, 61% overall are experienced - having already deployed or piloted a metaverse use case today.

Figure 1: Hands-on metaverse experience today, by subsector in transportation, supply chain and logistics

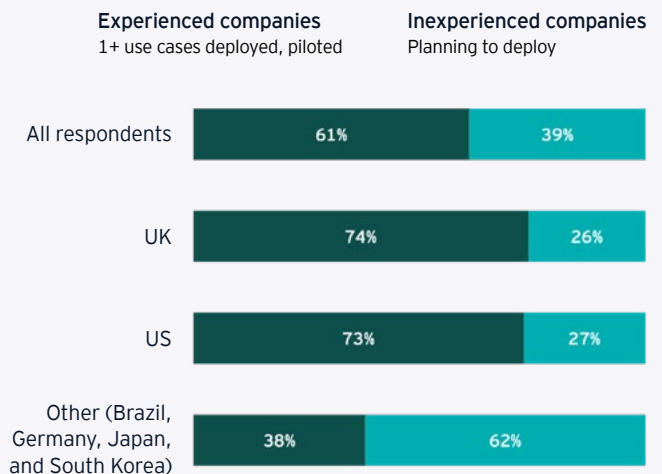
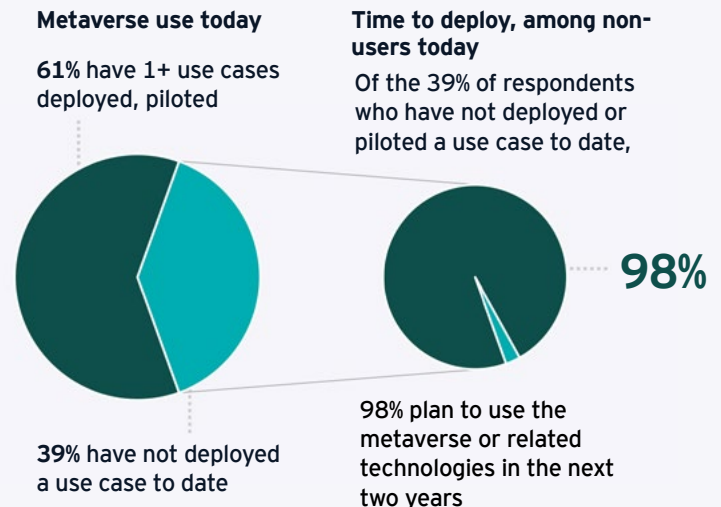


Figure 2: Estimated time to use the metaverse, among transportation, supply chain and logistics respondents with no pilots or deployments



2 Top industrial use cases

based on the expected impact reported by respondents in the transportation, supply chain and logistics industry

XR-enhanced UX research

Companies in transportation, supply chain and logistics see the most potential impact in the use of XR technology to better understand the everyday experiences of customers, employees and intermediaries. Companies in the industry are excited by this use case due to the ability to conduct fully virtual user testing or using AR to overlay digital elements on the physical world. Eye

tracking and measurement of other physical indicators using XR allows for new testing innovation. Respondents in non-operational functions like technology, strategy, and enterprise and digital transformation believe even more so in the potential for transformative impact.



Figure 3: Key benefits of XR-enhanced UX research

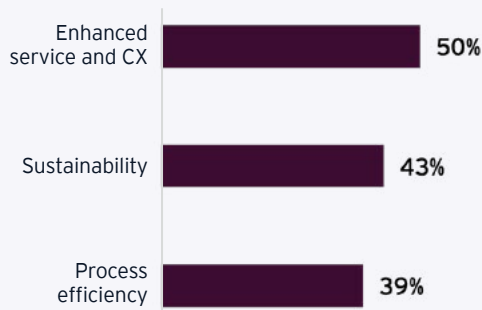
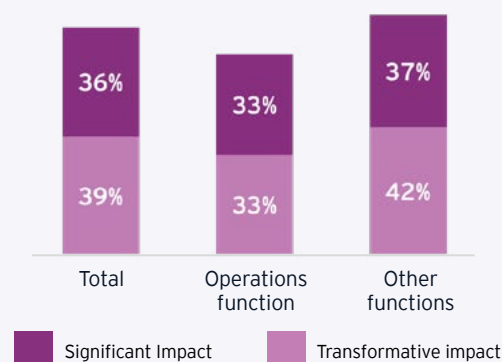


Figure 4: Impact of XR-enhanced UX research



Autonomous and remote-controlled delivery robotics

Another use case expected to bring major change to the transportation, supply chain and logistics industry is the use of autonomous and remote-controlled robots in delivery. Many companies are already using metaverse environments and VR to deploy, control and monitor these robots, which are used to deliver goods to end consumers, deliver parts to technicians working on machinery and

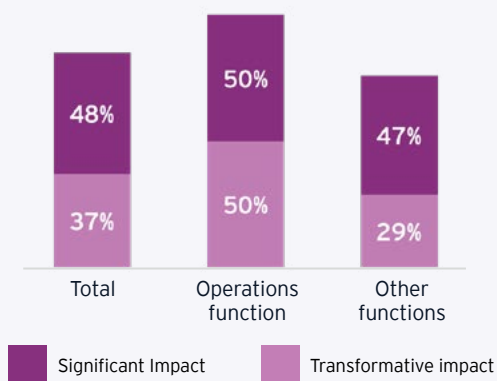
equipment like airplanes and trains, and in several other ways. Although the potential impact is apparent based on respondents in other functions within their company, respondents in operational roles had stronger views on the potential magnitude of impact of this use case, with all operational respondents believing the use case would have a significant or transformative impact on current processes.



Figure 5: Key benefits of delivery robotics



Figure 6: Impact of delivery robotics



Virtual supply chain optimization

Companies in the transportation, supply chain and logistics industry are also excited by the potential to streamline their entire supply chain virtually. By planning, simulating and tracking the supply chain on a virtual representation, companies can now better understand the entire system with advanced modeling and greater context for decision-makers, participants across the company and partner and

supplier organizations. Respondents in the US were most convinced of the transformative value this use case could bring to the industry, with more than half expecting it to bring a transformative impact to their current business processes vs. just 27% in the five other countries tested.

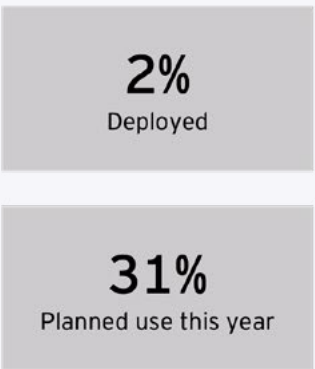


Figure 7: Key benefits of virtual supply chains

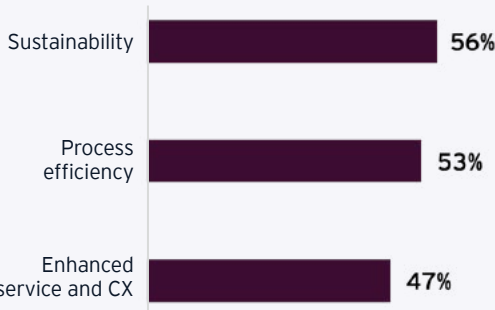
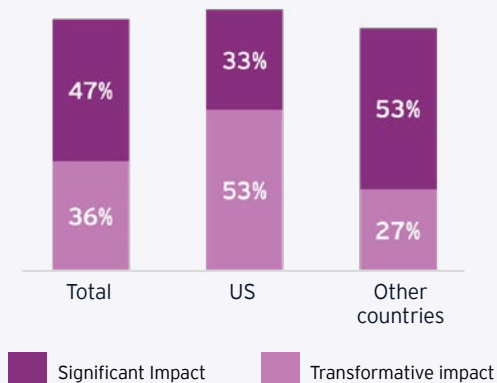


Figure 8: Impact of virtual supply chains



3 Key enablers and partners to deploying the metaverse

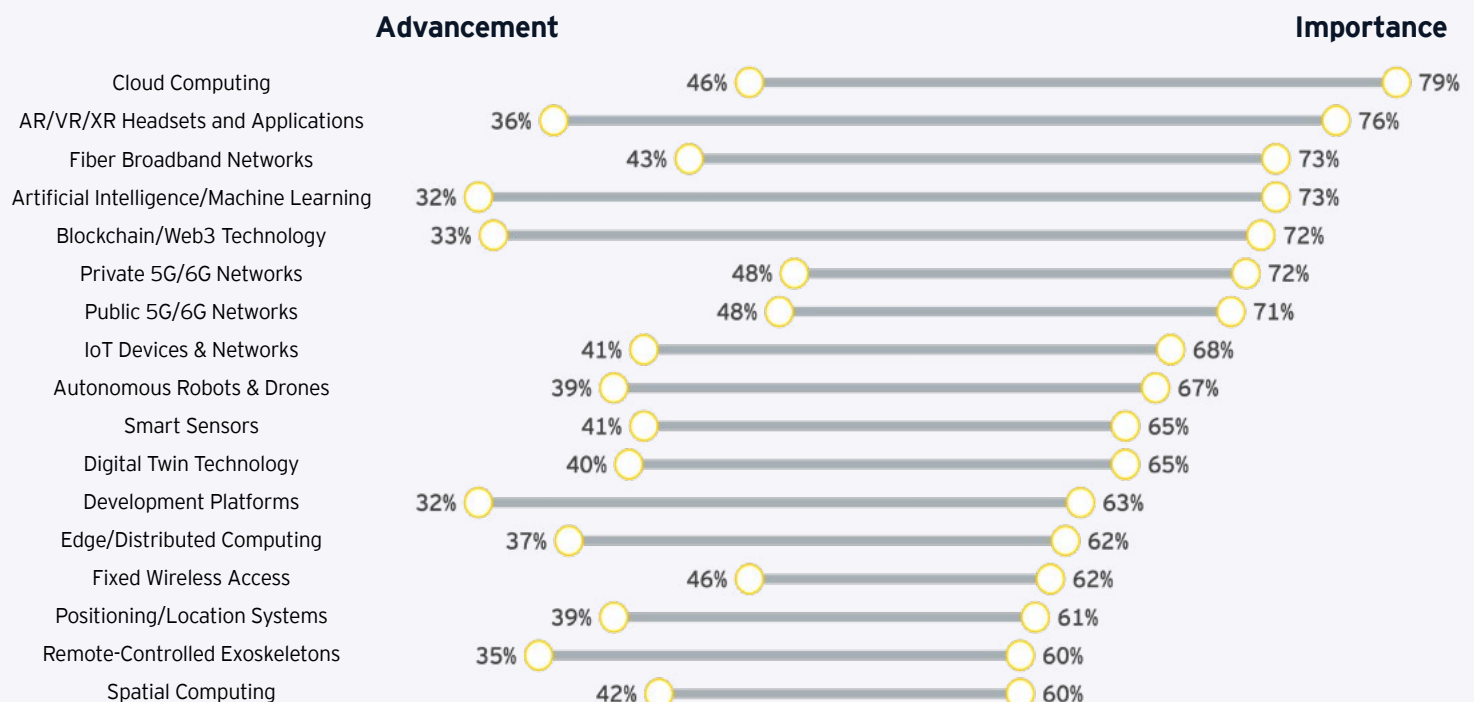
Across all industries, there are a clear set of enablers that stand out as highly critical for underpinning the success of metaverse use cases. Cloud computing, connectivity (fiber, public and private networks), AI and machine learning, and IoT capabilities are essential building blocks to creating low-latency experiences and simulations with effective data capture, processing and storage capabilities as the backbone.

There are some enablers that transportation, supply chain and logistics respondents have ranked slightly higher than others - like Web3/blockchain and AR/VR/XR headsets and applications. Companies in this industry are driving forward use cases like virtual supply chain optimization, in which the essential metaverse enabling technologies around data, connectivity, sensors and AI are key but also may benefit from the use of additional technologies like

blockchain. In this case, blockchain can aid the tracking of components or vehicles in transit or delivery and to serve as a settlement layer for a company to automate payments to suppliers.

AR/VR/XR headsets and applications may also be important in allowing for remote presence in decentralized sites across vast supply chain networks, serving use cases like XR-enhanced UX research, where XR technology enables employees to collaborate remotely, design and test experiences while sitting in physically separate locations. One research interviewee noted that their company, a global overseas carrier, uses VR to monitor temperatures onboard their overseas vessels and adjust controls from afar, an example of using XR to allow a human to interact or make decisions in an environment where they are not able to be physically present.

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



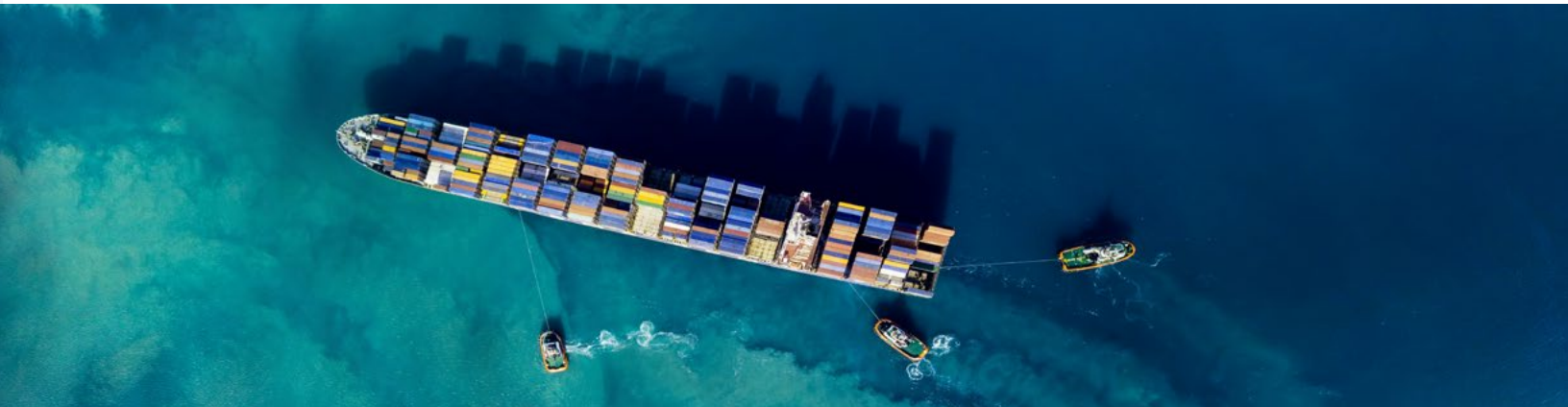
Partners are integral to almost all companies using the metaverse. Today, most partners offer specialized services or technologies, and companies must curate multiple partnerships to activate a metaverse use case.

Figure 10: Key partners for most impactful transportation, supply chain and logistics use cases

| | Ranked most important: Partners to deploy use case | Ranked 2nd: Partners to deploy use case | Ranked 3rd: Partners to deploy use case |
|-----------------------------------|---|--|--|
| XR-enhanced UX research | Big tech | AI/ML providers | Professional services firms |
| Autonomous/RC delivery robotics | Industrial equipment/tech providers | Blockchain protocol providers | Tie: AI/ML providers and Big tech |
| Virtual supply chain optimization | Web3 application providers | Big tech | XR/metaverse platform providers |

When asked which partners are critical for deploying key use cases, respondents in transportation, supply chain and logistics, like other industries, see the importance of big tech partners. They also note the importance of AI/ML providers, where support building predictive models may be valuable in executing realistic scenarios for use cases like XR-enhanced UX research and automating tasks in delivery robotics. Blockchain and Web3 partnerships are also of interest for respondents with interest in delivery robotics and virtual supply chain optimization. These use cases can benefit from the immutable ledger to track and trace goods at every step in the supply chain and

use smart contracts to automate payment and delivery, especially in last-mile delivery, to improve efficiency. With more macro-scale use cases, extending beyond the four walls of a factory, warehouse or other facility, partnering to scale may be even more critical, as enabling technologies need to be matured and harmonized across sites, sometimes in remote locations. One research interviewee in overseas shipping noted that network and data connections are poor in most of their ocean carriers today, requiring budget and help from partners to improve connectivity for metaverse use cases to work as intended.



4 Challenges in the industrial and enterprise metaverses

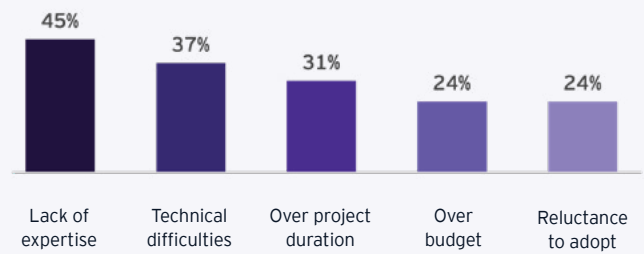
Transportation, supply chain and logistics companies face similar headwinds in employing the metaverse as other industries, such as struggling to find the right internal expertise to make the case for, as well as to execute and articulate the value.

Respondents in transportation, supply chain and logistics with experience using the metaverse reported slightly lower rates of challenges with project duration, budget and reluctance to adopt, compared to other industries. Twenty-four percent of respondents with experience in the metaverse faced a reluctance to adopt the technology, compared to 30% on average among other industries surveyed. Research interviewees called out that the potential benefits of metaverse use cases to their company are clear or have been realized in the early stages. Companies in transportation, supply chain and logistics are most concerned with lack of expertise and technical difficulties, the two most cited challenges faced by experienced companies, potentially around data and the complexity of expanding use cases across sites.

The volume and complexity of data, which is often siloed across sites and suppliers, can act as a barrier to deploying metaverse use cases or a technical obstacle during deployment if the data is not organized or accessible and understood among the employee base. The metaverse requires a level of data management and centralization that some companies still need to build.

Some organizations working on their digitalization and data journey may delay metaverse activities until they've recovered from technical debt due to aging systems. One

Figure 11: Top challenges for transportation, supply chain and logistics companies already piloting or deploying 1+ use case

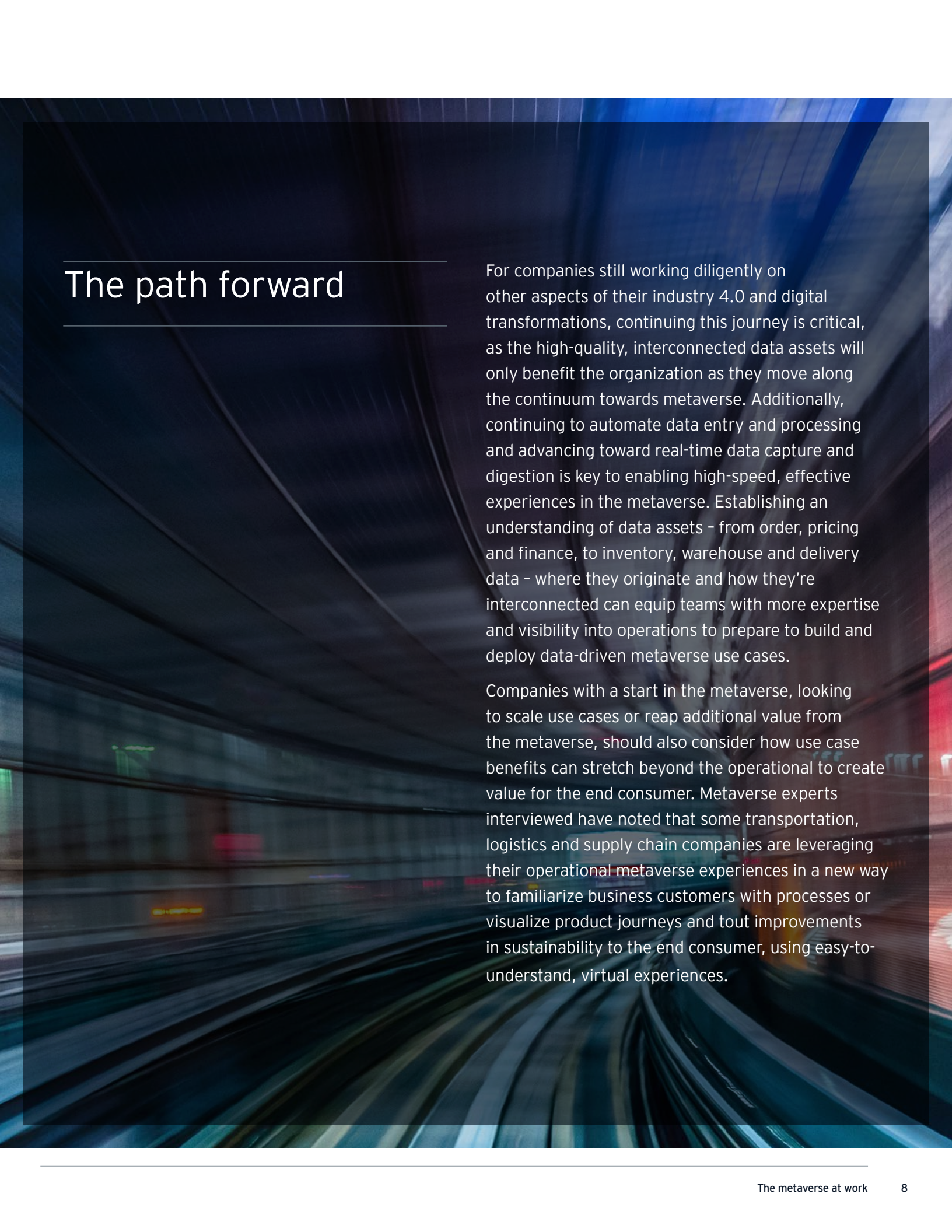


research interviewee, a transportation director for a global automotive manufacturer, noted that their organization has already dedicated significant time and resources to their digitalization journey, including a large-scale internal technology migration from a legacy to cloud solutions, leaving little budget or resource focus for metaverse today, let alone scaling. Similarly, they remarked that their organization's data entry processes were still manual and could not meet the real-time data capture requirements that the metaverse demands.

“

Because we are operating in countries with poor infrastructure, we need a reliable network to power our metaverse and industry 4.0 solutions. We have some countries where technical capacity and bandwidth is not there to support the metaverse.

C-Level, Global Supply Chain and Logistics Provider



The path forward

For companies still working diligently on other aspects of their industry 4.0 and digital transformations, continuing this journey is critical, as the high-quality, interconnected data assets will only benefit the organization as they move along the continuum towards metaverse. Additionally, continuing to automate data entry and processing and advancing toward real-time data capture and digestion is key to enabling high-speed, effective experiences in the metaverse. Establishing an understanding of data assets - from order, pricing and finance, to inventory, warehouse and delivery data - where they originate and how they're interconnected can equip teams with more expertise and visibility into operations to prepare to build and deploy data-driven metaverse use cases.

Companies with a start in the metaverse, looking to scale use cases or reap additional value from the metaverse, should also consider how use case benefits can stretch beyond the operational to create value for the end consumer. Metaverse experts interviewed have noted that some transportation, logistics and supply chain companies are leveraging their operational metaverse experiences in a new way to familiarize business customers with processes or visualize product journeys and tout improvements in sustainability to the end consumer, using easy-to-understand, virtual experiences.

Appendix: other use cases

Figure 12: Impact and deployment of other industrial metaverse use cases (ranked 4-9)

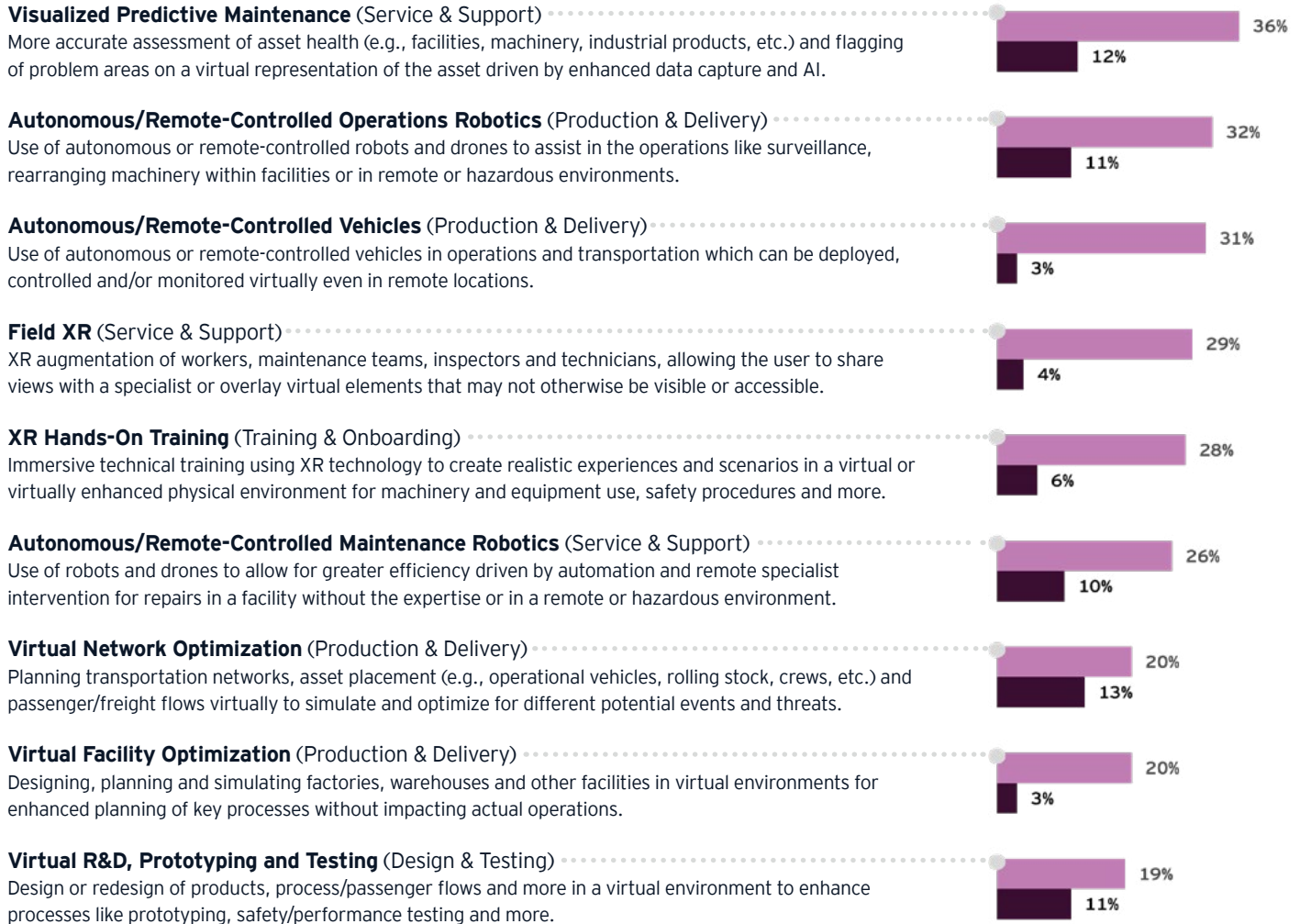
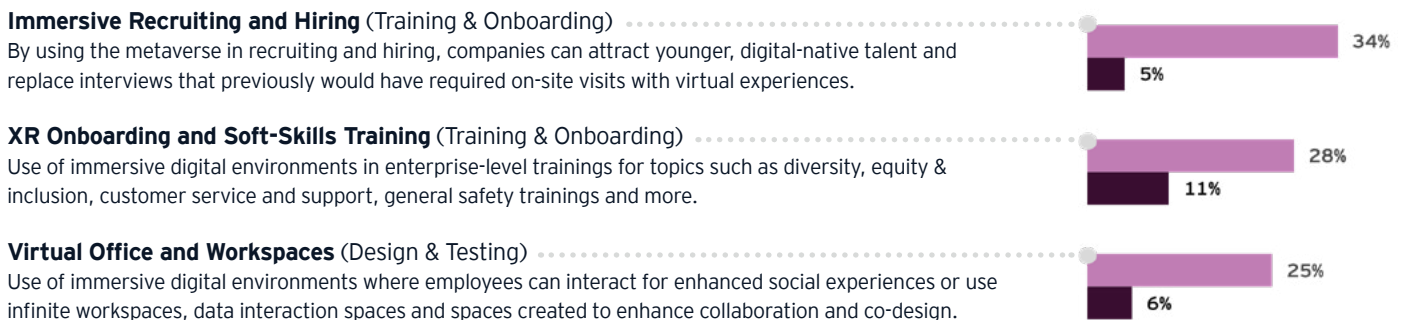


Figure 13: Impact and deployment of enterprise metaverse use cases



Expect transformative impact Deployed

Endnotes

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