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Accelerate Future Manufacturing Transformation With The Industrial Metaverse

A FORRESTER CONSULTING THOUGHT LEADERSHIP PAPER COMMISSIONED BY MICROSOFT, AUGUST 2023

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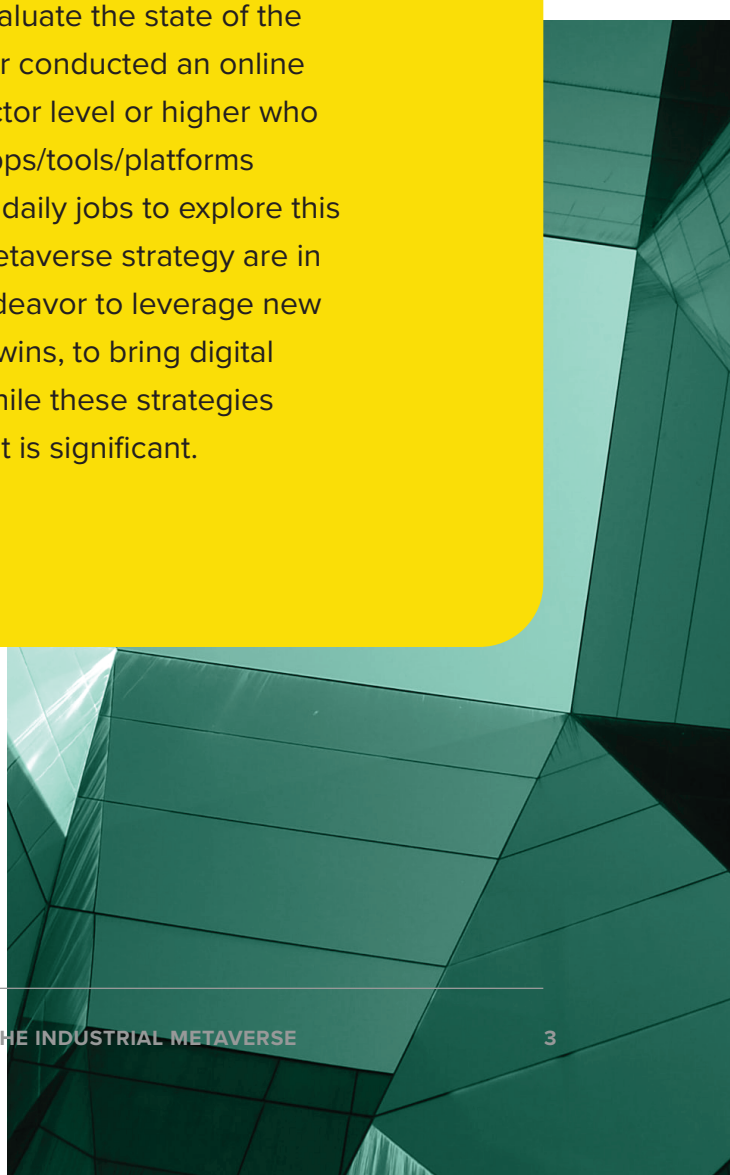
Executive Summary

In volatile market conditions, manufacturers must become quicker, smarter, and greener to survive.[1] The transformation of traditional — often conservative — manufacturing firms must involve more than just making existing physical processes more efficient.[2] Business and technology leaders must work together to build future fit organizations that are adaptive, creative, and resilient, unlocking more sustainable and profitable customer relationships as a result.

In this transformation journey, the growing importance of the industrial metaverse cannot be overlooked. In fact, the industrial metaverse may be closer than previously thought, as many manufacturing firms have already completed the essential first steps and are starting to lay the groundwork of their strategy. But many manufacturers are still questioning what the industrial metaverse journey looks like and how they can take next steps.

Microsoft commissioned Forrester Consulting to evaluate the state of the industrial metaverse within manufacturing. Forrester conducted an online survey with 758 global decision-makers at the director level or higher who are responsible for making decisions around the apps/tools/platforms employees use within their organization to do their daily jobs to explore this topic. We found that the makings of an industrial metaverse strategy are in the works for many manufacturing firms as they endeavor to leverage new technologies, such as AI, mixed reality, and digital twins, to bring digital worlds and physical worlds closer together. And, while these strategies aren't without their challenges, the expected payout is significant.



Key Findings

Manufacturing is evolving, underpinned by the further integration of physical and digital technologies. Economic disruption has most manufacturing decision-makers looking to better understand, optimize, and automate their physical world. Two-thirds of respondents consider the industrial metaverse important to achieving their organizational goals, but only around one-third have a strategy in place. The industrial metaverse is seen as a tool that enables support for the workforce and provides broader reach for organizations.

Manufacturers have much to learn but should prepare themselves to reap industrial metaverse benefits. Available industrial metaverse technologies provide connectivity, automation, and immersive modeling/visualization experiences. However, as an emerging category, its nascent capabilities, low organizational maturity, implementation costs, and a lack of internal skills inhibit organizations from maximizing their investments in this space.

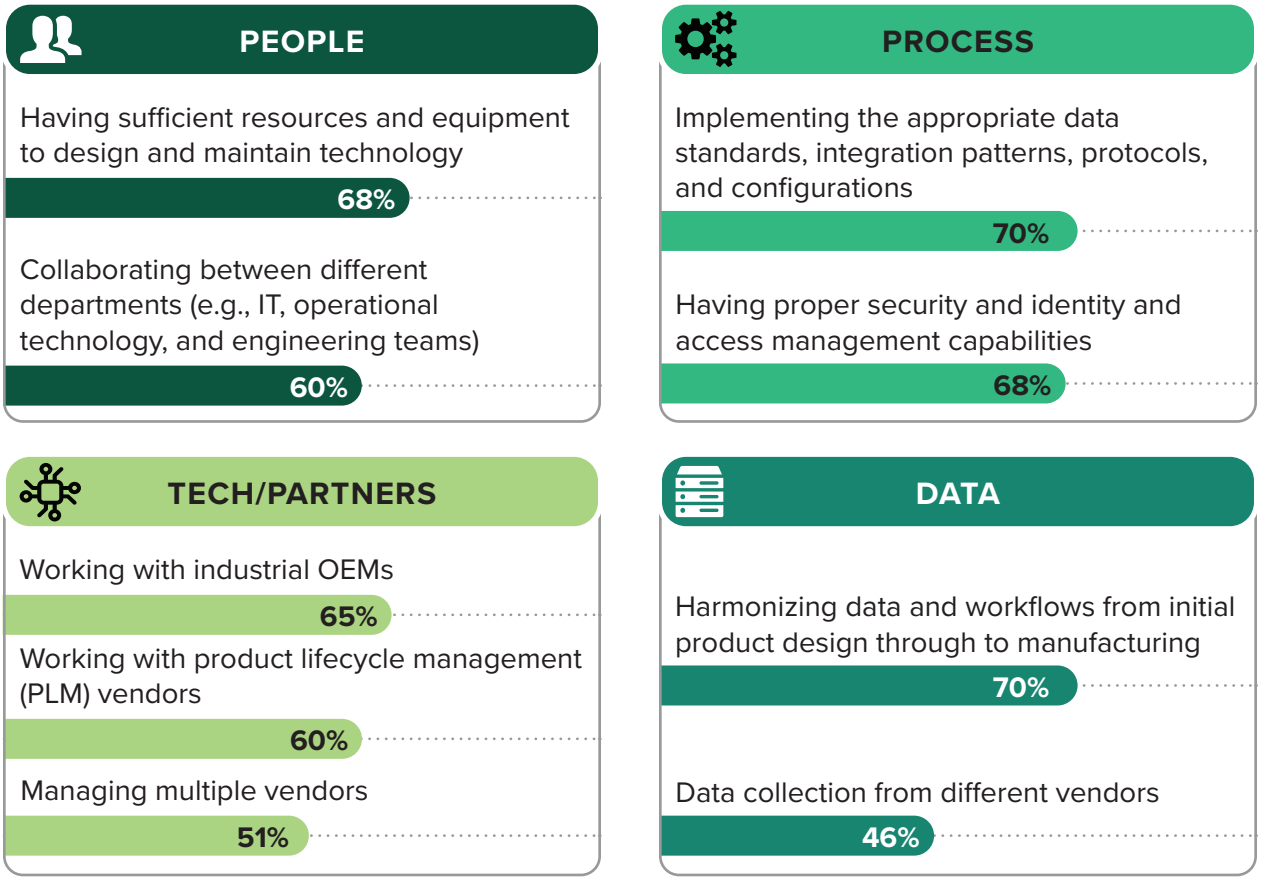
Manufacturers can advance their industrial metaverse strategies to realize value with help from strong partners. Less than half of surveyed manufacturing leaders feel prepared to deliver on industrial metaverse goals, but believe these investments are needed. Unsurprisingly, these investments must impact an organization's productivity and bottom line to be deemed successful, which early adopters are experiencing. Most organizations seek partners with strong technical expertise and integration strategies to ensure implementation success, given the complexity and potential value from converging technologies.

Manufacturers Must Continue To Transform In Order To Thrive

Manufacturers are familiar with disruption. Supply chain issues, materials shortages, fluctuating commodities costs, the conflict on the eastern edge of Europe, and surging energy prices continue to impact operations and processes.[3] However, manufacturing leaders are now also grappling with large organizational challenges — namely insufficient access to skilled workers, modern equipment, and dependable partners — all while needing to better leverage operational data that could help assess workflow, optimize production, and reduce costs (see Figure 1).

FIGURE 1

Top Challenges Cited By Manufacturing Leaders



Base: 758 global decision-makers at the director level or higher who are responsible for making decisions around the apps/tools/platforms employees use within their organization to do their daily jobs
Source: A commissioned study conducted by Forrester Consulting on behalf of Microsoft, June 2023

In response, manufacturers are resetting organization priorities with an eye toward the future and initiatives focused on integrating digital technologies with physical products to develop a balance between automation (inclusive of hardware and software) and their workforce. We found that:

- 57% of surveyed manufacturers have set these new priorities to help overcome supply chain issues.
- 56% indicate it is to address the workforce challenges through technology and automation.
- 42% are hoping the shift will create a more connected ecosystem through data and technology.

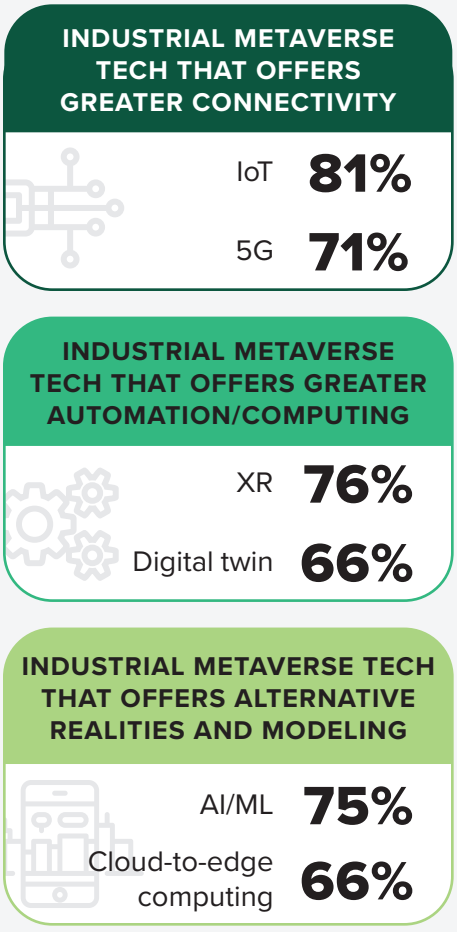
MANUFACTURING LEADERS CONSIDER THE INDUSTRIAL METAVERSE TO BE AN IMPORTANT COMPONENT OF THEIR ORGANIZATIONS' CONTINUED EVOLUTION

Manufacturing leaders are looking to the industrial metaverse to bridge the physical and digital worlds to address current challenges. While Forrester's research states that metaverse maturity is still years from realization, companies can still benefit from implementing metaverse precursors (e.g., augmented/virtual worlds and development tools, etc.) to prepare for future opportunities.[4] In this study, we found that 66% of manufacturing leaders consider the industrial metaverse (and its preceding technologies) important to achieving their organizational goals, but over 50% still acknowledge the fact that the timeline to start executing their industrial metaverse strategy is at least three years away or more (see Figure 2).

FIGURE 2

"How important are the following technologies to your organization's industrial metaverse strategy?"

(Showing "Somewhat important" and "Very important")



Base: 758 global decision-makers at the director level or higher who are responsible for making decisions around the apps/ tools/platforms employees use within their organization to do their daily jobs
Source: A commissioned study conducted by Forrester Consulting on behalf of Microsoft, June 2023

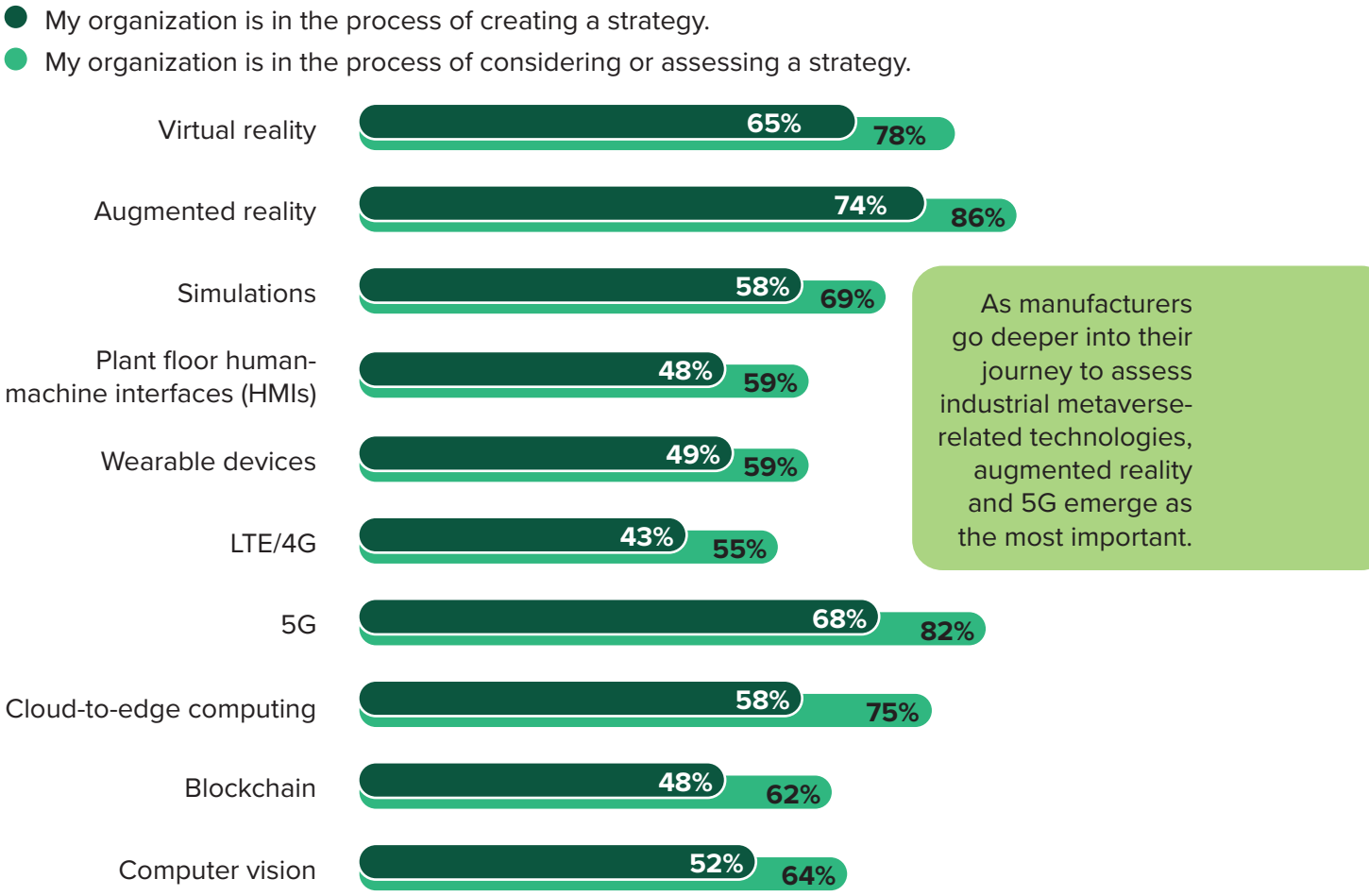
There are three specific categories where manufacturers expect the industrial metaverse to drive improvements:

- **Technology that offers greater connectivity.** In industrial environments with hundreds of moving parts, connectivity is paramount. New capabilities connected by the internet of things (IoT) and 5G networks are important enablers of this connectivity and are essential for most companies' ability to implement a successful metaverse strategy. Our survey found that IoT capabilities are already deployed at 53% of respondents' work sites on average, making it an easy starting point. 5G was the second-most technology currently being used, reported at 42% of respondents' worksites on average.
- **Technology that offers greater simulation, modeling, and environment engagement.** Manufacturing leaders see great value in leveraging extended reality (XR) (e.g., augmented reality, mixed reality, and VR) as a way to train and empower employees. This may include creating digital twins for certain machines or environments. For example, 42% of surveyed manufacturers intend to use these technologies to simulate expensive or dangerous operations before carrying them out in real life. Fifty-eight percent want to use these tools for employee training and 43% see use cases for providing product and service demonstrations to customers.
- **Technology that offers greater automation and computing power.** Repeatable manufacturing processes can benefit from automation (commonly powered by artificial intelligence and machine learning [AI/ML]). Seventy-five percent of respondents note their companies consider AI/ML an important component of their metaverse strategy. Over 40% see operational benefits with these technologies, such enhancing work processes and instructions with AI to guide employees through complex workflows. Meanwhile, roughly two-thirds consider cloud-to-edge computing to be important. This technology enables manufacturers to control bigger machines more carefully at a local level, while machine learning models optimize machine performance in the cloud.

Interestingly, those assessing an industrial metaverse strategy are more likely to consider several supporting technologies to be important to their strategy compared to those in the process of creating one (see Figure 3). This finding indicates that manufacturing leaders are often bullish towards these technologies at the onset of this technology journey, but their perceptions change as they learn more, understand more, and experience what's possible for their own organizations. It's during this phase when manufacturing leaders need the most help deciphering the value these technologies deliver.

FIGURE 3

Industrial Metaverse Technology Importance By Strategy Maturity: Those Assessing A Strategy Vs. Those Creating One



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Successful Industrial Metaverse Investments Require A Thoughtful Strategy

The alluring promise of the industrial metaverse has most manufacturers questioning where to start. Most manufacturers are still formulating what their strategy looks like as just over one-third note they have one in place, and 57% don't feel prepared to deliver on industrial metaverse goals.

63%

of leaders cite costs as an issue and **48%** cite lack of skills to maximize the value of the investment.

Like other nascent technologies, several adoption barriers stand in the way of organizations maximizing value from their industrial metaverse investments. Sixty-three percent of surveyed leaders cite costs as an issue, while 48% cite lack of necessary skills as a problem. Organizations particularly struggle to optimize or adopt industrial metaverse technologies when lacking a clear and relevant business strategy. Over one-third of unprepared organizations experience difficulty training employees, lower operating margins, and ineffective collaboration — leading to reduced productivity — when exploring industrial metaverse technologies.

Strategy or not, most manufacturing organizations are already using many industrial metaverse foundational technologies to support employee education, operations planning, innovation, and connectivity. What's lacking for many respondents is a focused vision on how this technology will drive positive returns; however, we see that positive outcomes are obtainable from early adopters that have a clear strategy.

Prepare Your Organization To Achieve Its Industrial Metaverse Goals

Given their challenges, manufacturers acknowledge the need to make organizational changes to continue or realize true business transformation with the industrial metaverse. Leaders are focusing on three key areas in particular:

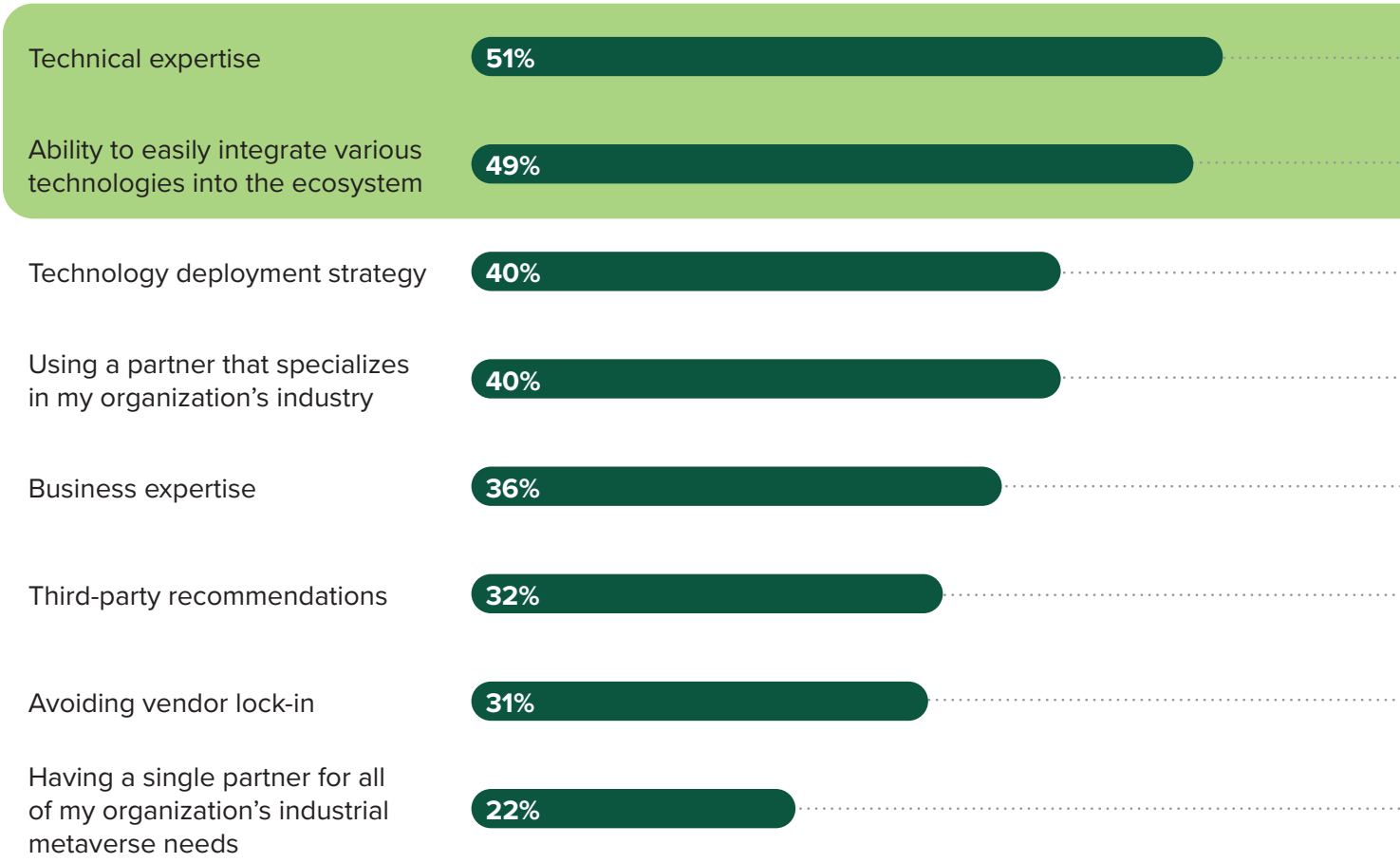
- **Increasing technology investments.** Nearly 60% of manufacturing leaders state that greater investment in technology is a key change they need to make to achieve their industrial metaverse objectives. Forrester predicts that in 2023, investment in industrial metaverse initiatives will double.[5]
- **Increasing employee training/upskilling.** Manufacturing leaders see employee training and remote assistance as a keyway in which industrial metaverse technologies will be leveraged in the future. Nearly 50% of manufacturing leaders surveyed consider employee training to be a top-three metaverse technology use case.
- **Increasing data integration.** Forrester anticipates that manufacturing will lead the way in moving beyond today's metaverse precursors toward more integrated environments, ranging from collaboration solutions (with or without VR) to rich digital twin capabilities.[6] As well, data gathered from metaverse tools and experiences will provide organizations with valuable information for improving existing processes and driving innovation, which is a top outcome for 38% of manufacturing leaders surveyed.

PARTNERS CAN MAKE METAVERSE INVESTMENTS MORE EFFECTIVE

Rather than trying to address every challenge on their own, manufacturers recognize the important role that partners can play in helping them address industrial metaverse use cases. Most notably, respondents in our survey claim technical expertise and integration capabilities as most valuable criteria when selecting an industrial metaverse partner (see Figure 4). Manufacturers need partners who understand the technology and can provide guidance on how to best integrate it within their complex manufacturing ecosystems.

FIGURE 4

"What's the most important criteria to consider when your organization selects industrial metaverse partner(s)?"



Base: 758 global decision-makers at the director level or higher who are responsible for making decisions around the apps/tools/platforms employees use within their organization to do their daily jobs
Source: A commissioned study conducted by Forrester Consulting on behalf of Microsoft, June 2023

Key Factors Of Industrial Metaverse Success

Business leaders expect any business investment to deliver positive outcomes or returns. Investments in the industrial metaverse is no different, even though its maturity is several years off. When asked which outcomes were driving their industrial metaverse investments and strategies, the top responses from manufacturers were:

- **Increased profitability.** Thirty-nine percent of respondents say that increased profitability is a top desired outcome for their industrial metaverse strategy. Of those in our survey who are currently executing on an industrial metaverse strategy, most are seeing success with their strategies, yielding benefits from employees and customer alike. In fact, 55% report industrial metaverse technologies enabling frontline workers, and 55% also state that the technology architecture provides a great user experience for customers as well.
- **Improved operating margins.** Through automation and better integration and communication, leaders expect that new technology investments will drive down operating costs — 40% use operational costs as a primary ROI measure for industrial metaverse technology investments.
- **Increased productivity.** Many of the intended use cases for industrial metaverse technologies focus on enabling and supporting frontline and service-line workers. With the proper training and enablement, 40% of manufacturing leaders surveyed expect to see positive returns by way of a more efficient workforce.

While adoption continues, early returns indicate that these investments are paying off. Expectations from those in the process of developing their own strategies are also high. Manufacturers on the front edge of the industrial metaverse path today are in prime position to reap the benefits now and tomorrow.

Key Recommendations

The industrial metaverse will change the way manufacturers operate. Cutting-edge firms with industrial metaverse strategies in place are seeing early returns on their investments, with those in the drafting process anticipating tangible benefits. Before manufacturing organizations can unlock the value of the industrial metaverse, however, they must prepare their organization.

Forrester's in-depth survey of 758 global decision-makers at the director level or higher, who are responsible for making business decisions around the applications, devices, and technology employees use throughout their workday, yielded several important recommendations:

Integrated technologies create a combinatorial impact.

Industrial metaverse foundational technologies (e.g., IoT, mixed reality, digital twins, AI, etc.) deliver unique benefits on their own, but together unlock greater business applications and value – especially for frontline workers – than if implemented or used in isolation. Information technology (IT) and operational technology (OT) partners are critical to bringing disparate industrial metaverse technologies together in a meaningful way.

Let maturity guide where and how to start.

Industrial metaverse journeys are more successful when implementing technologies that have been tested within a manufacturing ecosystem or extend current technical capabilities. When applied to frontline worker training, skilling, and maintenance scenarios, mixed reality offers a good starting point. It allows organizations to deploy industrial metaverse technologies against a major organizational challenge without disrupting current production or processes.

Understand the key technology investment areas.

Realizing the combinatorial effect of industrial metaverse technologies will require data, infrastructure, and workforce investments. Your ability to leverage them to their potential at scale will necessitate a strong industrial data foundation. From this, your organization can synchronize its IT, OT, and ET data, enabling greater analysis of assets and processes using IoT. This contextualization allows for real-time simulation and visualization of these same processes using digital twins and mixed reality with AI facilitating facility operations. Keep your business goals in mind to ensure your industrial metaverse investments are linked to specific business scenarios and outcomes.

Appendix A: Methodology

In this study, Forrester conducted an online survey of 758 C-level, VP-level, and director-level respondents responsible for making decisions around the apps/tools/platforms employees use within their organization to do their daily jobs in the United States, Canada, Australia, the United Kingdom, China, France, Germany, and New Zealand to better understand the current industrial metaverse journey that manufacturing organizations are experiencing, and how it may evolve in the future. Respondents were offered a small incentive as a thank-you for time spent on the survey. The study began in May 2023 and was completed in June 2023.

Appendix B: Demographics

COUNTRIES	
United States	**18%**
Canada	**15%**
Australia	**13%**
United Kingdom	**13%**
China	**11%**
France	**10%**
Germany	**10%**
New Zealand	**10%**

MANUFACTURING VERTICAL	
Automotive	**21%**
Consumer product goods	**18%**
Food and/or beverage	**15%**
Energy	**14%**
Pharmaceuticals	**14%**
Semiconductor	**12%**
Aerospace	**6%**

Note: Percentages may not total 100 due to rounding.

NUMBER OF EMPLOYEES	
500 to 999 employees	**16%**
1,000 to 4,999 employees	**41%**
5,000 to 19,999 employees	**30%**
20,000 or more employees	**13%**

TYPE OF MANUFACTURING	
Discrete manufacturing	**59%**
Process manufacturing	**59%**

RESPONDENT LEVEL	
C-level	**11%**
Vice president	**36%**
Director	**53%**

RESPONDENT DEPARTMENT	
IT	**37%**
Operations	**27%**
Marketing/advertising	**14%**
Digital	**11%**
HR/training/EX	**10%**

Appendix C: Endnotes

[1] Source: "The Future Of Manufacturing," Forrester Research, Inc., September 9, 2022.

[2] For this study, we defined manufacturing firms as organizations within discrete and/or process manufacturing. Specifically, manufacturers in auto, food and beverage, semiconductor, aerospace, consumer packaged goods, energy, and pharmaceuticals.

[3] Source: "Predictions 2023: Smart Manufacturing," Forrester Research, Inc., November 2, 2022.

[4] Source: "The State Of The Metaverse," Forrester Research, Inc., March 29, 2022.

[5] Source: "Predictions 2023: Smart Manufacturing," Forrester Research, Inc., November 2, 2022.

[6] Ibid.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