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Digital twins and the Metaverse in the construction industry

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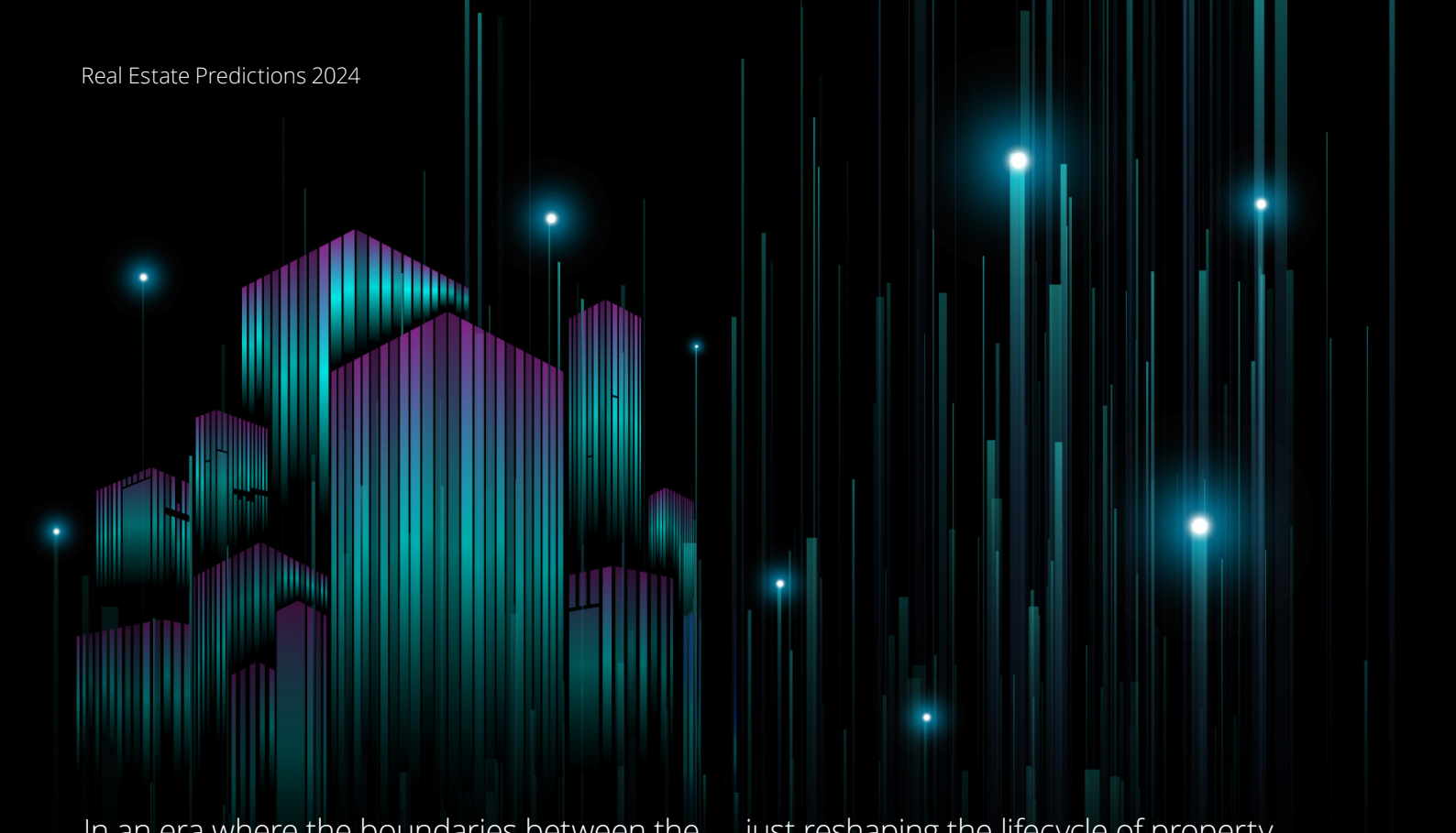
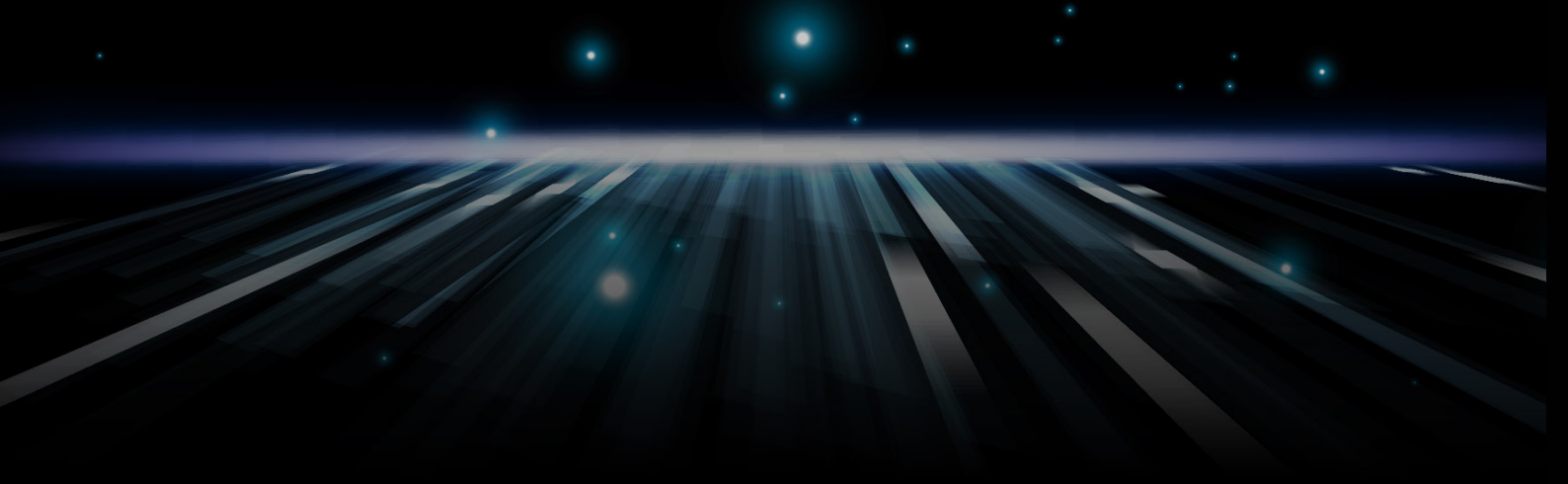


In an era where the boundaries between the physical and digital worlds are increasingly blurred, the concept of the metaverse has captured the global imagination. This digital expanse promises to revolutionize the way we interact with each other and with virtual environments, yet its full potential is just beginning to be understood. Meanwhile, digital twins—exact virtual models of physical objects or systems—are transforming the property and construction industries with their precision and utility. These two technological frontiers are converging, heralding a new age of innovation and efficiency.

This article delves into the heart of this convergence, exploring how the integration of digital twins within the metaverse is not just reshaping the lifecycle of property development but also redefining stakeholder engagement and customer experience. We will examine the implications of this synergy for various industry practices, from design and construction to operations and maintenance, and how it opens the door to a future where virtual and physical realities coexist in unprecedented harmony.

Join us as we navigate through the digital landscapes of the metaverse and its burgeoning relationship with digital twins, uncovering the transformative effects on architecture, urban planning, and beyond. We will also look at current trends, the state of the technology, and the exciting possibilities it holds for businesses, consumers, and investors alike.



Metaverse

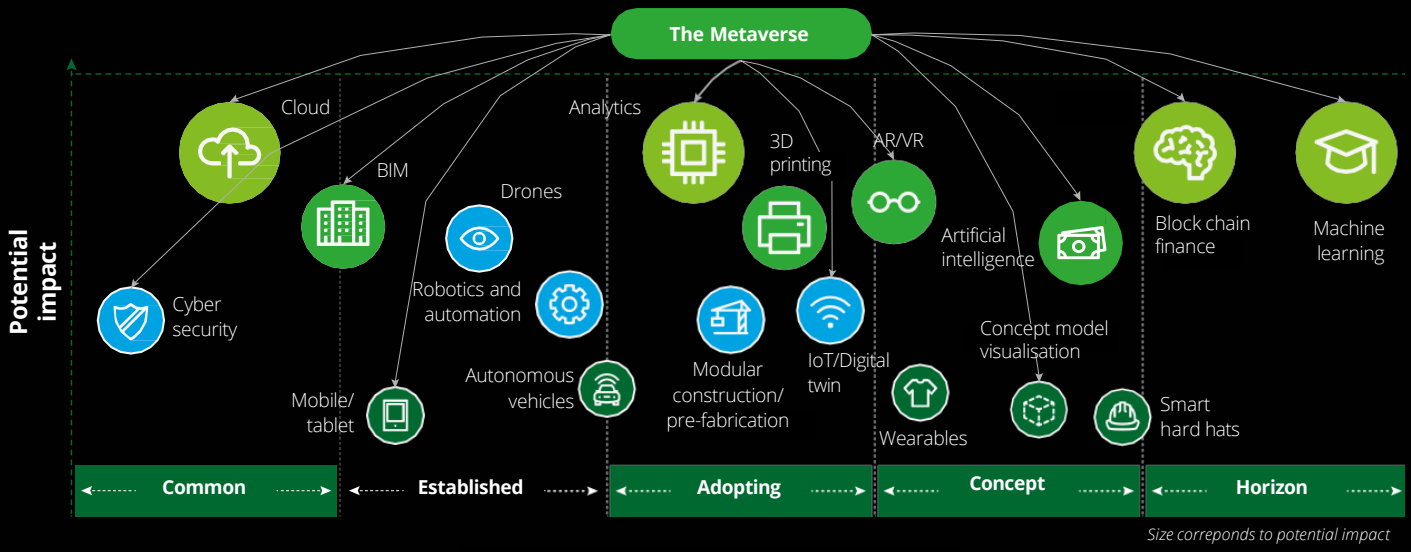


Figure 1. Technology maturity spectrum
The metaverse simultaneously draws on many of the below technologies, with almost infinite potential for expansion. As adoption of the metaverse and digital twins increases, integration across technologies will also increase.

Despite the global attention it has received recently, the metaverse can be best understood as a universal term for the diverse creative uses of virtual worlds. It's a digital domain where users can engage with each other and with virtual objects and environs in a manner that mirrors the physical world, a concept that holds immense potential.

Digital twin, however, is an exact digital duplication of a physical object or system, such as a building or a large-scale infrastructure project. With digital twin technology, developers, architects, and contractors can perfect the design, minimize mistakes, and enhance the performance of a building. While digital twins are typically created for the construction phase to enhance interdisciplinary coordination and as a tool for visualizing for stakeholders, they are widely utilized during building operations to supervise performance, execute simulated scenarios, and optimize maintenance.

Neither of these concepts is novel, but their relevance to property and construction industries is increasing, with the integration of digital twins into a metaverse setting taking center stage. The integration can lead to substantial efficiencies throughout the property development cycle by prolonging the usefulness of digital twins, from concept design for marketing and sales purposes, to operations for maintenance, integration with connected devices, and even to decommissioning.

This fusion not only ushers in vast opportunities for incorporating emerging technologies, as depicted in Figure 1, but it also demonstrates how the metaverse can be a nexus for a multitude of technologies with vast potential for growth. As the adoption of both the metaverse and digital twins progresses, so too will the interplay between various technological spheres.

Moreover, technological advancements and increased investment are paving the way for potential partnerships between firms at various stages of the capital project lifecycle. This results in enhanced collaboration, higher market and customer engagement, and continuous operational and end-user benefits that can validate the investment in these technologies..

Attracting the attention of customers and stakeholders

Architects, design firms, and creative agencies typically produce concept renditions, visuals, and animations of new projects for marketing and sales, which are expensive and offer little flexibility for reuse. A project-wide digital twin developed in the early design stage is a viable solution to this. Combined with advancements in photorealistic visualization technology, there are limitless possibilities for customer and stakeholder engagement, including marketing content creation, virtual, VR, and AR tours, and immersive design experiences.

Furthermore, as the design develops, the granularity of detail within the digital twin can be enhanced. This allows stakeholders and customers to gain an increasingly accurate and tangible feel for the final product, fostering a stronger connection and higher engagement with the project.

Just as in social media, the focus and engagement of potential customers and stakeholders in the metaverse can be tracked and evaluated, unlocking new possibilities for user experience design. Digital twins can be used during the detailed design and construction to facilitate collaboration, allowing for real-time communication and coordination, reducing delays and design clashes, and increasing efficiency.

Digital twins in the metaverse can be used to enhance design based on end-user experiences, such as virtual reality walkthroughs of the building, allowing stakeholders to experience the building before it's built. This can be used to showcase the building to potential clients and investors, as well as to train workers on how to navigate the construction site or building safely.

Upon completion and handover, the same digital twin serves for continuous monitoring and analysis of the building’s performance. Digital twins can be used to simulate different scenarios to optimize the operations and maintenance of the building, and reduce operating costs.

For residential and hospitality assets, the use cases for digital twins and the metaverse include device connectivity, security and privacy, and other smart home applications. Assets with these features can command a price premium, and as these technologies become more common, consumers will begin to expect these features as standard, which will further drive investment in and adoption of these technologies.

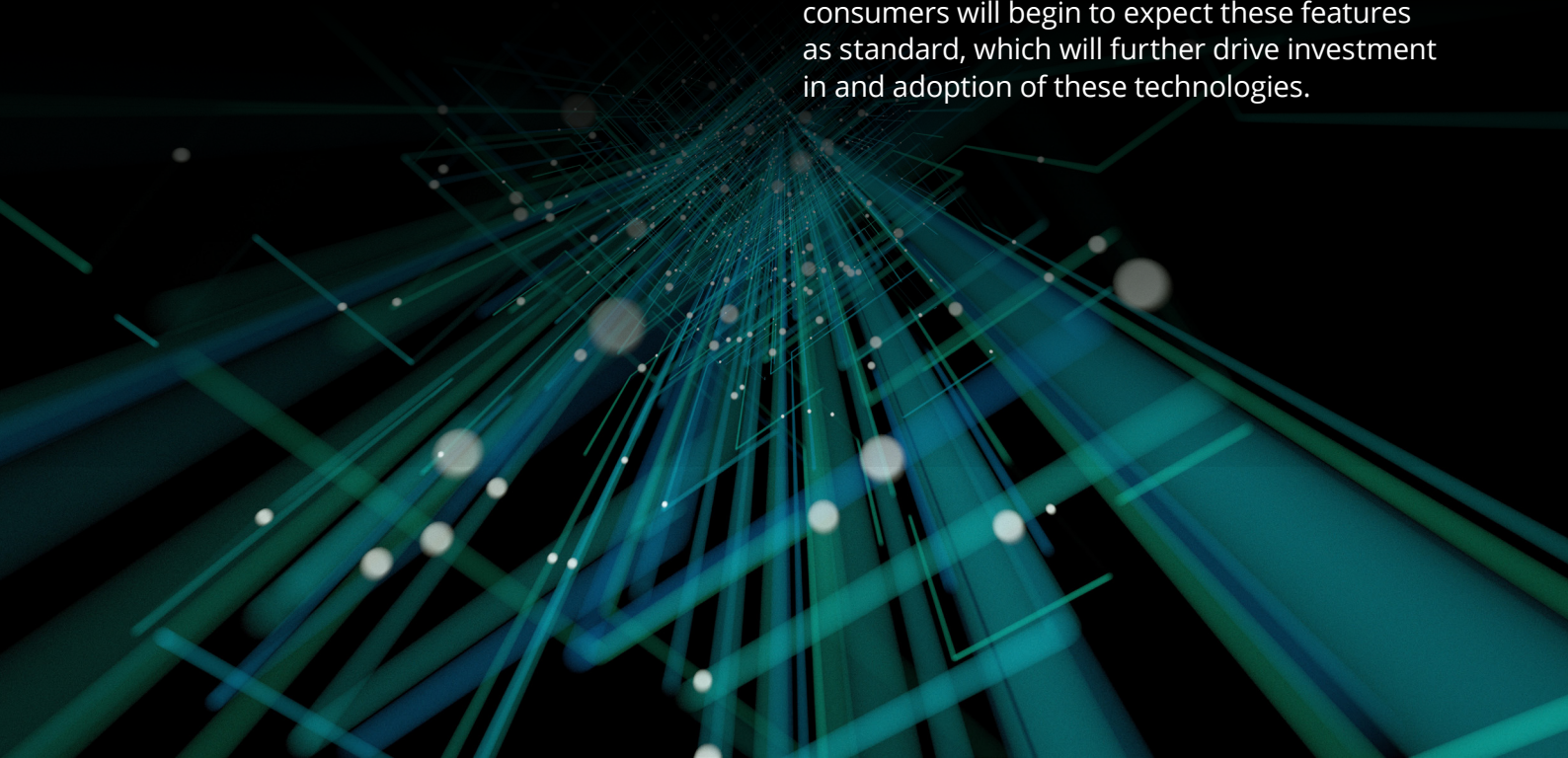
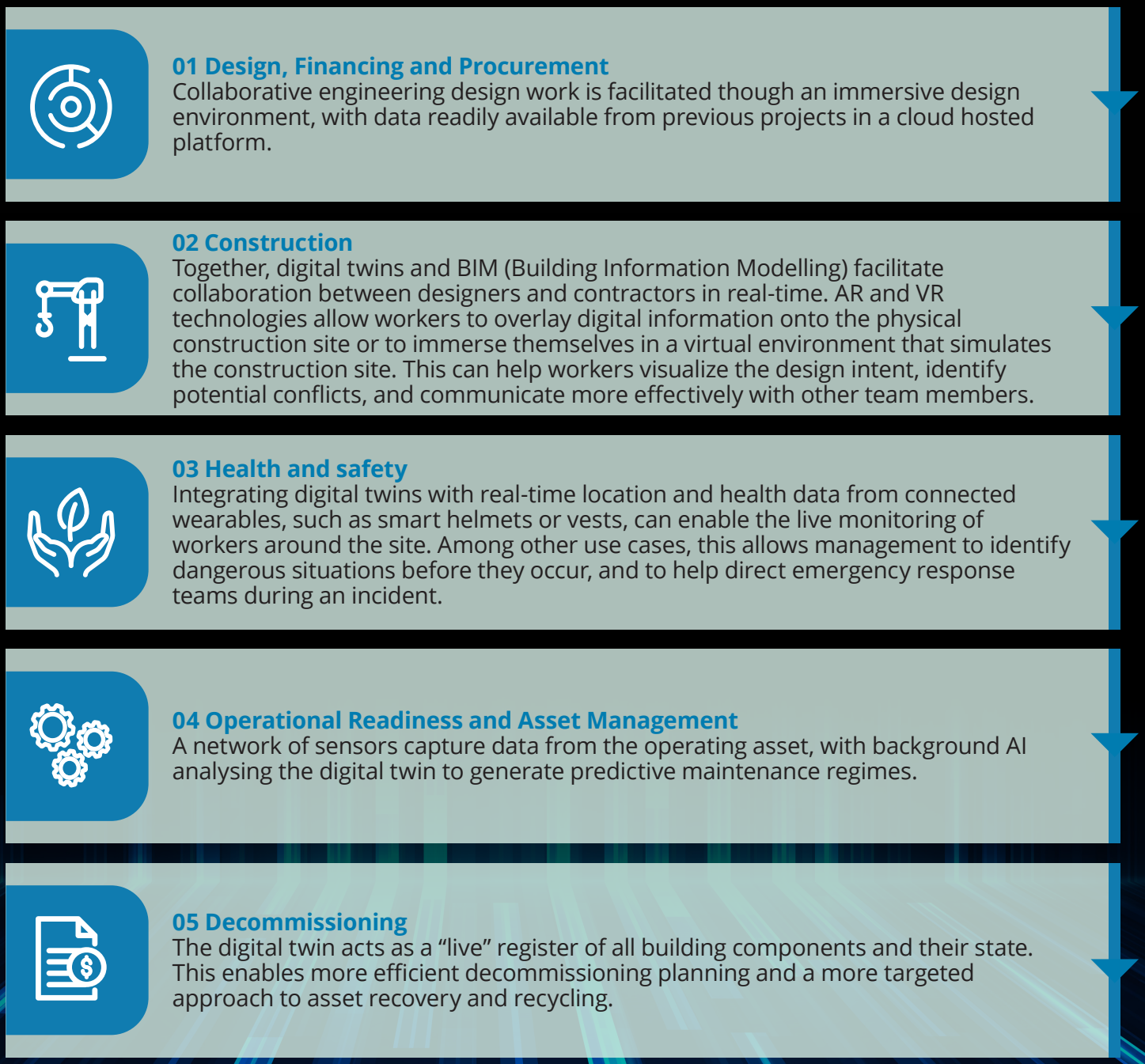


Figure 2. Real-time Collaboration and Feedback



Current state of play

A combination of technological limitations and a lack of tangible ROI has previously kept digital twins out of the metaverse. However, giga-projects like in the Middle-East with enormous budgets and a passion for driving technological innovation have helped bridge this gap. The UAE government, for instance, has recently announced its plans for a “Ministry in the Metaverse”, and Dubai’s new "Metaverse Strategy" has listed digital twins as one of its key pillars.

By integrating Digital Twins into the metaverse, the useful life of assets can be considerably extended and integration with a multitude of other technologies can be unlocked, further augmenting the value of the digital twin and even the asset itself. It is therefore vital for leadership to stay abreast with the latest developments in this technology and dedicate resources to explore potential opportunities and risks.

Conclusion

The exploration of the metaverse and digital twins heralds a new era where virtual and physical realities merge, promising incredible advances in how we live, work, and interact. This powerful synergy provides a transformative platform for the property and construction industries, offering innovative ways to design, build, and manage assets with unprecedented precision and efficiency.

As we have seen, the potential of these technologies extends far beyond current applications, influencing everything from stakeholder engagement to the optimization of operations and even redefining user experiences. With trailblazing initiatives already underway, particularly in the Middle East, the future of digital integration in asset management and development is not only promising—it's practically upon us.

In closing, the marriage of the metaverse and digital twins is not merely an incremental change; it's a quantum leap into a future where the boundaries between the digital and the tangible are seamlessly blended. For industry leaders and decision-makers, now is the moment to embrace this shift, to invest in these technologies, and to pave the way for a brave new world of opportunities. The future is here, and it's ours to shape. Let's rise to the challenge and unlock the full potential of this digital revolution.

Contacts

Mark A. Smith, Ph.D.
Partner, Infrastructure & Capital Projects
msmith5@deloitte.com
Deloitte Middle East

Matthew Minogue
Manager, Infrastructure & Capital Projects
mminogue@deloitte.com
Deloitte Middle East

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