#TechVision

Technology Vision for SAP Solutions 2022

Gearing up for the enterprise metaverse

Start building the foundation of the enterprise metaverse with the SAP® ecosystem.

Foreword

Most business leaders will have heard a great deal about the metaverse and Web3 by now. But what are the practical implications and relevance for enterprises? At Accenture, we see these emerging concepts as a signpost to the future of enterprise technology, user experience and the way companies do business.

One day, the metaverse will offer a persistent shared set of experiences across a continuum spanning the real world, the virtual world and everything in between. And Web 3.0 technologies like blockchain and tokenization will change how we think about using data to interact with each other and with organizations.

For companies running SAP® solutions, it's important to understand how this technological evolution will impact business systems.

Because SAP technologies underpin so many core business processes, they're ideally positioned to form the foundation of the enterprise metaverse.

In this Accenture Technology Vision for SAP Solutions 2022, which builds on the ***Accenture Technology Vision 2022***, we explore the future business and technology implications of the metaverse for SAP customers—and set out some of the ways companies can get ready now.

It's an exciting future vision for businesses. The opportunities can be huge. And we look forward to helping your organization tap into them in the coming years.

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Introduction

Imagine the near future of business operations

It's a warm Monday morning, sometime in May 2030.

Jane, a construction supervisor living in California, is currently managing a road build in Santa Cruz and is about to start work on a new overpass 60 miles away in San Francisco. But, today, she's meeting a new client an hour's drive North in Sacramento. So while she waits for the meeting to begin, she puts on her VR headset and logs into her company's enterprise metaverse.

Instantly, Jane is teleported to a virtual representation of the worksite in Santa Cruz, where a complex construction robot is being used to lay down asphalt. One of the robot's 50 sensors has detected an anomaly and edge computing analytics have identified the root cause. The company's custom equipment dashboard created in SAP Business Technology Platform (BTP) has automatically raised a preventive maintenance order.

Having examined a real-time 3D digital twin of the robot with the lead engineer from head office, Jane confirms the maintenance order. She then reviews simulations of several automatically generated work plans for the day with her virtual AI assistant and after selecting the best one she approves the work orders seamlessly through the metaverse in her company's SAP system.

With her client meeting still half an hour away, Jane requests her colleagues join her in a 3D representation of the site of the new San Francisco overpass. As team members begin to join the meeting virtually, they start to review a real-time video feed from a drone on site overlaid with a digital twin of the construction site built on SAP technology, plus architectural drawings from the State of California Contractor Cloud.

With all the key data in front of them, the team quickly establishes that the right equipment (displayed as assets from SAP Intelligent Asset Management) and materials are present for work to begin and agree the relevant work orders for the following day. They then review the scheduling agreements with vendors in the SAP system through the enterprise metaverse environment and confirm deliveries for the rest of the week.

Having completed the review within 30 minutes, Jane then removes her headset and goes into the meeting with her new client.

INTRODUCTION

SAP systems embedded in the enterprise metaverse

The metaverse is likely one of the most disruptive technology topics of recent years. It's not hard to see why. The concept evokes a long-term vision of persistent and shared virtual spaces that people can enter, explore, and exit as easily as they move about the real world.

As the example above shows, these virtual spaces won't just be for consumers or gamers. They'll enable anyone and everyone—shop floor workers, field operatives, onsite engineers, supervisors, managers, leaders, suppliers, partners, public officials, and many more besides—to meet, connect and work in new ways.

In fact, the metaverse and Web3 have the potential to revolutionize the way whole organizations, whole industries, even whole economies operate. And underpinning it all will be the core platforms and data that are critical to the smooth running of the modern enterprise. This enterprise metaverse will be a new and more efficient way of doing business. And SAP solutions are well positioned to play a pivotal role—just as they do for so many enterprise operations today—as they become seamlessly embedded in the metaverse.

INTRODUCTION

The emerging metaverse continuum

It's an exciting future for enterprise technology. But much about the journey and the destination is still uncertain. Right now, many different metaverses are being built, each with its own initial areas of focus, its own core platforms, partners, and technologies, and its own ideas for how to get the metaverse experience right.

Eventually, this spectrum of ideas will coalesce into a more unified shared experience. In the meantime, it makes sense to view the metaverse as an evolving and expanding continuum of technologies and experiences.

That includes, on the one hand, technologies like extended reality, blockchain, artificial intelligence, digital twins, smart objects, and edge computing. It also includes, on the other hand, the spectrum of "virt-real" user experiences, applications, environments and business models these technologies enable—such as smart cities, connected factories, automated logistics networks, intelligent homes and office buildings, and more.

Soon, every enterprise will be expected to navigate these technologies and environments as a day-to-day part of running a business. It's why companies running SAP solutions should look to understand how the technology environment is evolving, identify opportunities to innovate with SAP and emerging technologies today... and start planning for a future in the metaverse continuum.

97%

of executives say emerging technologies are enabling their organization to have a broader and more ambitious vision.[1]

WebMe

Putting the business “Me” in metaverse with SAP solutions

Technology Vision for SAP Solutions 2022

What's the big picture?

WHAT'S THE BIG PICTURE?

The internet is evolving in two important ways.

First, digital experiences are moving into new shared virtual spaces—the early incarnations of the metaverse. At the same time, a constellation of Web3 technologies is building a new distributed layer into the internet. These technologies, which include cryptocurrencies, distributed ledgers and non-fungible tokens (NFTs) are reinventing how data is stored and shared.

Much of the debate so far has been centered around the impact on consumer experiences, and especially gaming. But this evolution is as relevant to businesses as it is to individuals. For example, the global cloud hyperscalers are starting to create metaverse technology stacks that will let enterprises build apps on top of digital twins, enabling them to bring the physical and digital worlds together. With more and more SAP customers looking to increase their business agility and speed of innovation by running or consuming enterprise resource planning (ERP) applications in the cloud, the potential to integrate SAP solutions with metaverse-ready infrastructure will be increasingly important.

BMW is one manufacturing giant that is already taking steps into early metaverse-like environments. The company is using Nvidia's Omniverse platform to build digital twins of 31 of its factories.[2] In doing so, it's creating a photo-realistic 3D real-time environment that can be used for everything from training robots, to experimenting with new line layouts, to running simulations for individual tasks.[3] Employees can also use the environment to push software updates, monitor individual cells for disruptions, assign new "missions" to the robots on the floor, and even take over and teleoperate machines for individual tasks.

90%

of executives say their organization sees growth opportunities in participating in the metaverse.[4]

42%

believe the metaverse will be breakthrough or transformational.[5]

Ultimately, it's the convergence of virtual spaces with Web3 technologies that's likely to deliver truly breakthrough value. Consider Decentraland, an Ethereum-based virtual world where users can play, explore, and interact with activities.[6] Almost everything in Decentraland is an NFT, meaning ownership of assets—from real estate to avatar skins—can be tracked securely as users move throughout the space, even across areas developed by different companies.[7] Since the start of 2021, Decentraland's average number of daily users has grown tenfold to 18,000.[8]

The intersection of virtual environments, Web3, and real-world business operations will be the center of the enterprise metaverse. So it's no surprise that SAP, too, sees promising potential in the metaverse and Web3. For example, the company has indicated to Accenture that it aims to help customers bring digital finance transactions (including cryptocurrencies and NFTs) into financial reporting, adapt workforce planning for a hybrid mix of digital and real-world workers and provide an augmented employee engagement experience in shared virtual spaces.

This is important because, in the enterprise metaverse, transactions may take place using NFTs and "smart contracts" which exist as executable code written in blockchain technology. These contracts are then secure, immutable and self-executing, ensuring ongoing validity, certainty and mutual trust between contracting parties.

Similarly, by adapting workforce planning to the metaverse, SAP solutions will help companies better manage a hybrid mix of digital and physical working, as well as enabling HR professionals to engage with employees in shared virtual spaces. This will become increasingly relevant for enterprises as employees spend more of their time interacting and collaborating with each other's metaverse avatars (digital representations of themselves) and with data in SAP systems.

88%

of executives agree distributed ledger technologies will be critical for persistence and seamless integration in unified digital spaces.[9]

81

of the top 100 public companies are already using blockchain—65 of which are actively developing blockchain solutions.[10]

What should SAP customers look out for?

As metaverse experiences and Web3 technologies continue to evolve, companies running SAP solutions should be on the lookout for the following trends.

SAP solutions can power the business metaverse

The technologies and data that will power the business metaverse are yet to be defined—and SAP solutions are ideally positioned to take up the mantle.

Expivi (a graduate of the SAP.iO accelerator program) shows how the SAP ecosystem is already adapting to support metaverse-like services. Expivi looks to help companies increase sales, reduce costs and improve customer experience through interactive 3D and augmented reality (AR) for ecommerce. And they'd be able to quickly and easily simulate and test "what if?" scenarios to find ways to improve performance without incurring any upfront costs.

Similarly, in a co-innovation project with BitPay, SAP is exploring how to simplify and accelerate the adoption of cryptocurrencies in the enterprise space. The goal is to provide "simple and non-disruptive ways for companies to implement crypto payment services together with partners".[11] The team has identified three major use cases for crypto payments in SAP Commerce Cloud, SAP® Ariba® and SAP® SuccessFactors® Employee Central Payroll. They all leverage the SAP Digital Payments Add-On as a central hub for payment orchestration and can be implemented by customers.

WHAT TO DO NOW

Modernize SAP systems in the cloud

Prepare for the evolution of the metaverse by ensuring the core SAP S/4HANA® system is as clean, flexible and easily upgradable as possible in the cloud. Then look to integrate and extend the core with solutions like SAP BTP. Done right, this combination enables a continuous innovation capacity that helps the organization iterate, experiment and scale fast.

Shore up innovation governance

A business' ability to innovate, adapt and scale will be critical in capitalizing on emerging metaverse and Web3 opportunities. But channeling innovation into growth takes discipline. It's therefore vital to consider how innovation is managed and governed, how ideas are put into practice systematically and how a culture of experimentation is nurtured across the organization. The good news? Accenture's research[12] has found that companies that govern innovation extensively over time sustain stronger revenue growth.

Accelerate metaverse readiness

Kick-start the journey to the enterprise metaverse by starting small with capabilities that can be implemented and deliver value today—whether that's intelligent and actionable dashboards for IoT devices, agile data crunching at the edge, augmented-reality maintenance or insight-driven decision making.

Organizations will start to manage their businesses and systems virtually

Today, digital twins are already providing an advanced means of visualizing and understanding complex systems. But adding virtual or augmented reality into the mix can take this to another level—both in terms of the insights generated and the user's experience.

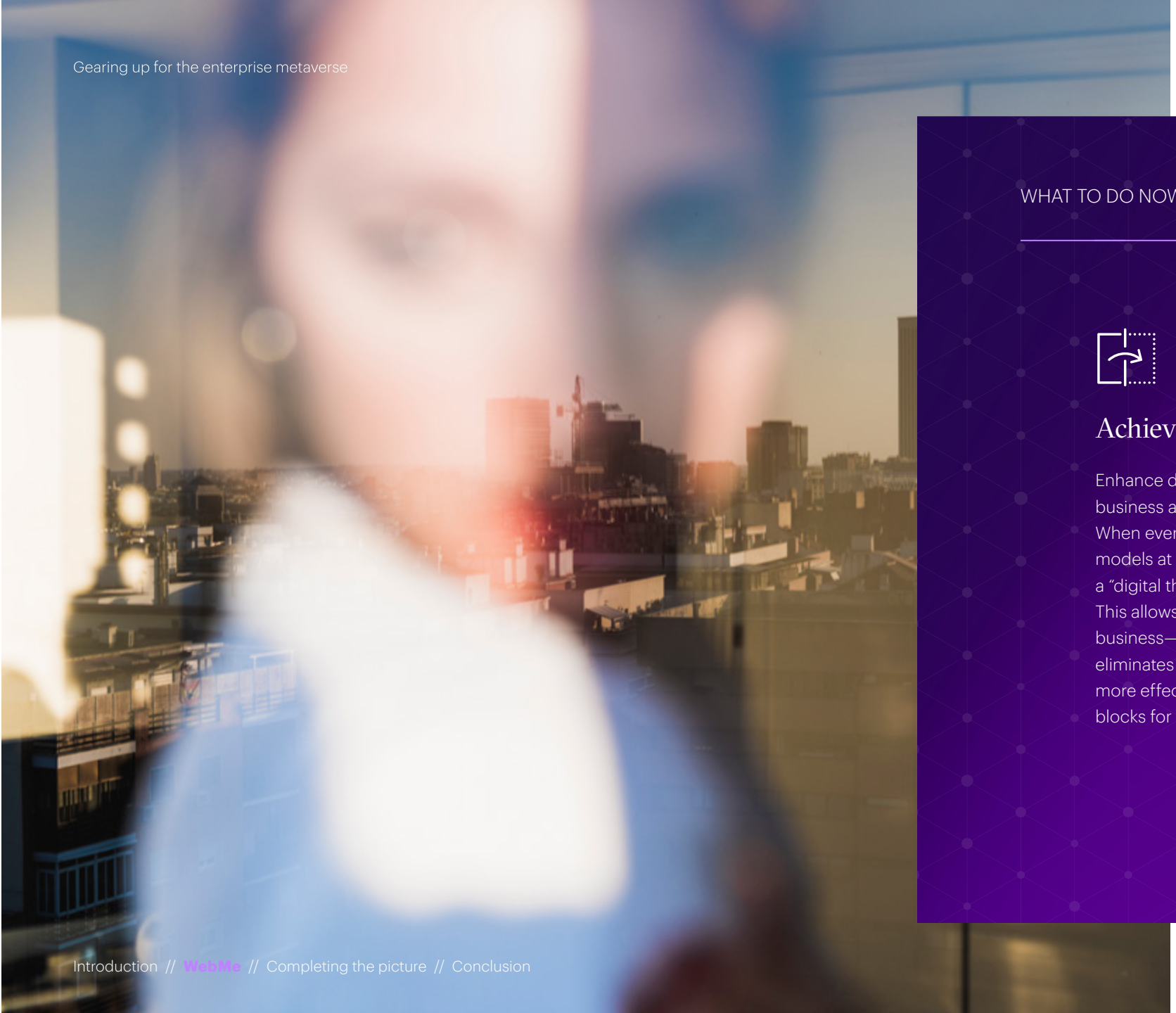
Imagine, for example, being able to explore all your organization's locations, wherever they are in the real world, in the same "street" in the metaverse—with the ability to scale instantly from a global view right down into individual sites, stores, assets or pieces of equipment. Then imagine being able to view a real-time video stream of each site or asset and even converse directly with shop-floor employees. And what if that experience were overlaid—at every level—with key operational, ERP, customer experience (CX) and human resources data in user-friendly "pop-ups" selected and powered by artificial intelligence?

This blend of the real and virtual worlds would allow a business to bring advanced data analysis together with insights that only the expert human eye can truly capture. The potential for next-level business analytics—in industries like retail, manufacturing, construction and many more is obvious. Expert analysts would be able to walk into and explore these digital twins in an immersive way, visualizing performance and employee behavior as if they were really there, with the added benefit of real-time data at their virtual fingertips.

And they'd be able to quickly and easily simulate and test "what if?" scenarios to find ways to improve performance without incurring any upfront costs.

Accenture built a ***supply change showcase*** to demonstrate how organizations can visualize and monitor the shop-floor environment using a digital twin. It's a powerful example of how consolidating data from SAP and other systems in a realistic digital view can be used to optimize operations, adapt and respond to disruptions, and embed sustainability across the value chain.

Accenture also developed FabLab, an immersive experience for solving product engineering problems using a 3D CAD model built with real-time data from SAP systems. It lets engineers work together to manipulate a digital twin of a product based on real-time data on parts, bills of materials, and inventory levels pulled directly from an SAP S/4HANA digital core.



WHAT TO DO NOW

Achieve digital continuity

Enhance data-driven collaboration across the business and with partners through digital continuity. When everyone has access to the same data and models at every stage of the product lifecycle, a "digital thread" is formed throughout the organization. This allows data to flow consistently across the business—and even across the supply chain. It eliminates data siloes, joins up operational systems more effectively and provides the critical building blocks for creating digital twins of business systems.

User experiences will evolve into shared digital spaces

Today, business users interact with SAP systems and data via SAP Fiori®, portals and mobile apps. Increasingly, these will evolve into more immersive, collaborative and augmented experiences, supplemented with artificial intelligence and integrated with core business workspaces.

We've already seen ***how SAP systems can be integrated with platforms like Microsoft Teams*** to provide enhanced efficiency and productivity. But that's just the start. In the metaverse, SAP Conversational AI, the conversational AI layer of SAP BTP, will likely become the first point of contact for many ERP-related business activities. It's also possible that SAP Mobile Start, a native mobile app which serves as an entry point for users to access various applications and contents, could in the future evolve into something like "SAP VR Start" to deliver immersiveness by design.

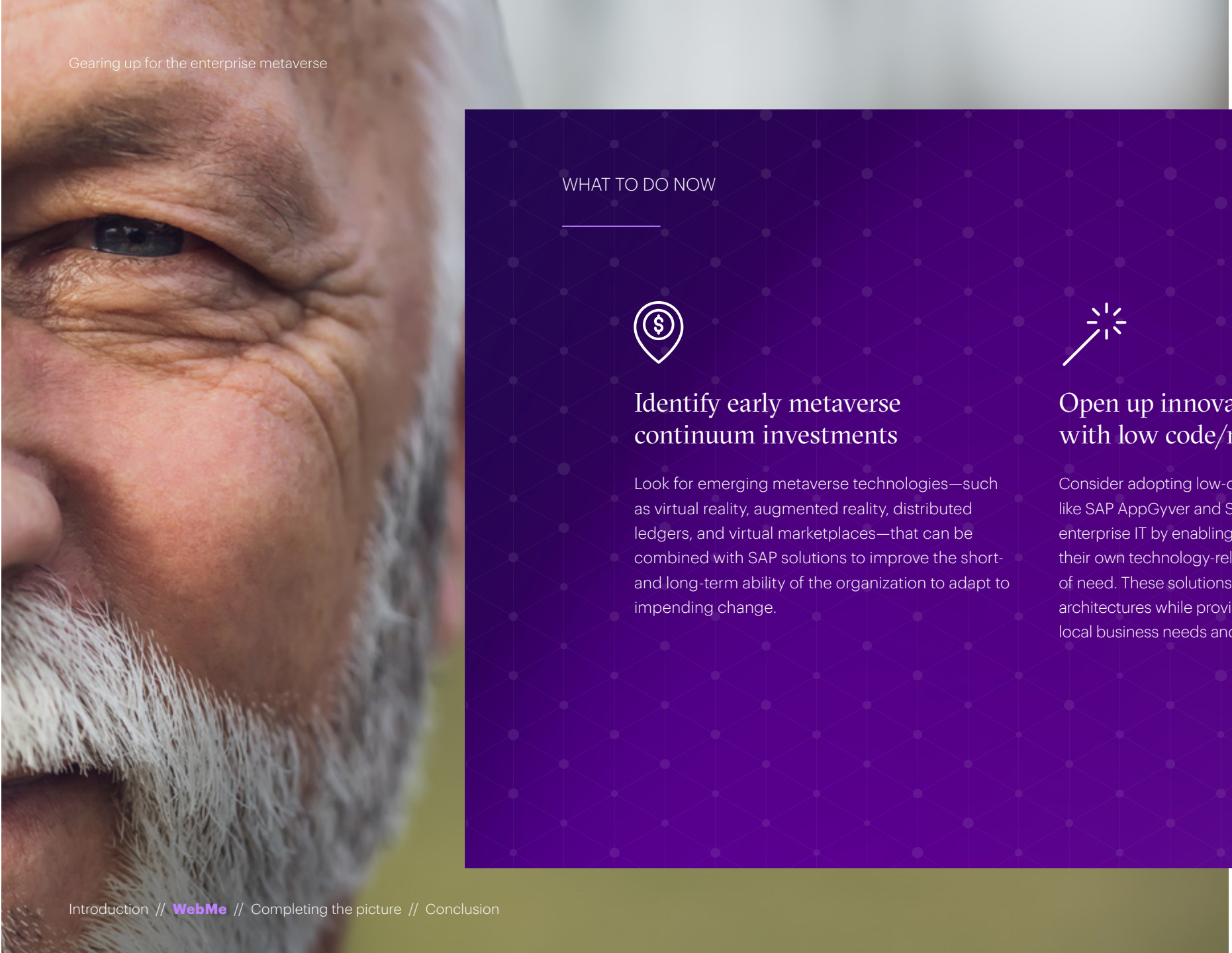
Consider how this might change activities such as human capital management. SAP SuccessFactors, SAP's human experience management suite that also covers recruiting, will likely evolve to enable richer interview experiences in shared virtual spaces. Then there's the potential for employee learning. The metaverse is the ideal environment to train workers in key activities—think of a 3D "flight simulator" of the work environment—whether that's operating a piece of equipment or engaging with customers on the shop floor.

41%

of executives say augmenting employee experience is a key ambition in the metaverse.[13]

Accenture Labs has developed a way to accelerate the creation of digital twins by using 3D scan, AI and VR technologies to quickly build digital representations of physical assets. The resulting digital assets can then be used to train operators in 3D immersive environments.

SAP has indicated that one of its priorities for the metaverse is to explore how to maximize employees' productivity and well-being with contextualized and tailored data. By assessing learning needs, health and engagement levels, customers can create new ways to inspire more active engagement with their jobs and improve corporate training.



WHAT TO DO NOW

Identify early metaverse continuum investments

Look for emerging metaverse technologies—such as virtual reality, augmented reality, distributed ledgers, and virtual marketplaces—that can be combined with SAP solutions to improve the short- and long-term ability of the organization to adapt to impending change.

Open up innovation with low code/no code

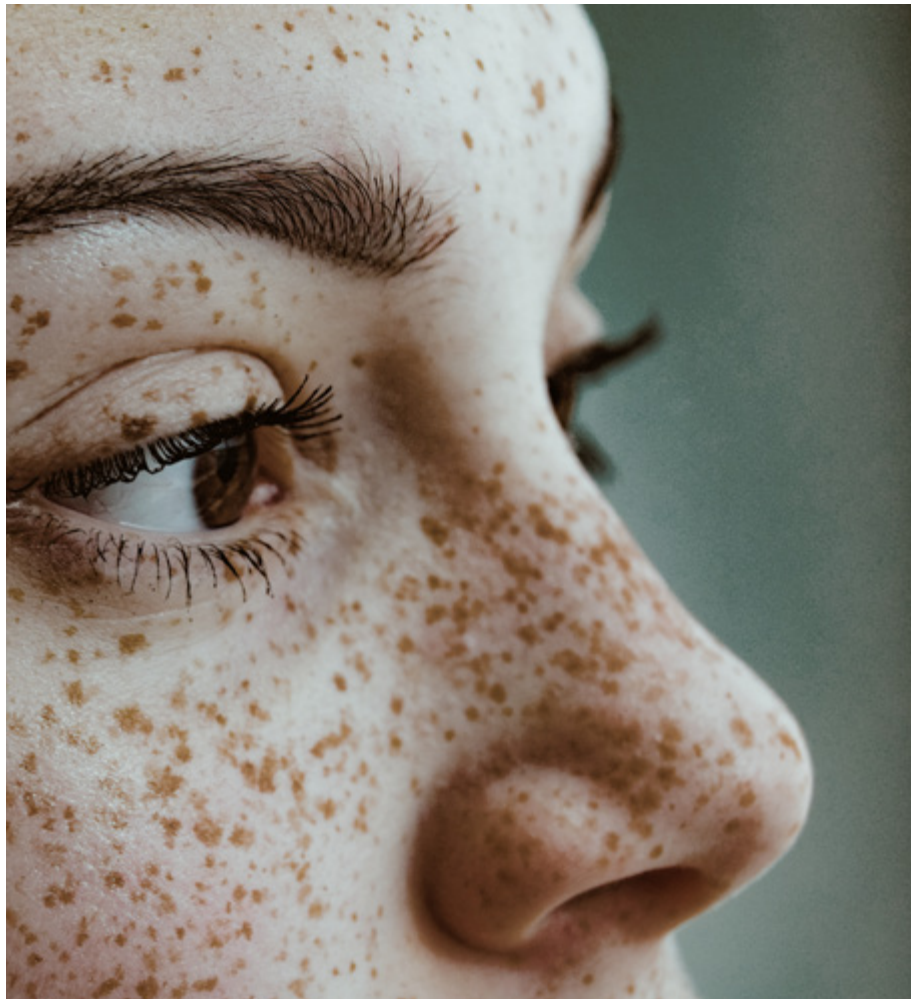
Consider adopting low-code and no-code platforms like SAP AppGyver and SAP Ruum to "democratize" enterprise IT by enabling business users to solve their own technology-related challenges at the point of need. These solutions can also help rationalize IT architectures while providing flexibility to adapt to local business needs and circumstances.

Virtual experiences will create new security and analytics requirements

As people start to spend more time in shared virtual spaces, organizations will need to rethink how they maintain user trust and safety. Ensuring frictionless data and system security as people enter and exit persistent digital environments will be essential.
And organizations may also need to reconsider how they provide responsible, sustainable, traceable products and services across the continuum of metaverse experiences.

Similarly, organizations will need to reimagine the way they track and analyze customer and employee experiences. The catch? That's very hard to do well in virtual spaces today. Existing tools are still relatively immature, especially compared with the level of insight companies can get from sources like social media. However, solutions like Qualtrics® are well positioned to evolve into this kind of experience analysis in virtual worlds.

> Tauny.ai, a graduate of the SAP.iO accelerator program, helps companies understand people's reactions in real time with emotion analysis. Its solutions include tools to analyze users' facial expressions, eye tracking, and attention on the screen.



The relationships between people, organizations and assets will change

Eventually, virtual representations of physical business assets could become NFTs and/or augmented with scripting logic, enabling them to be exchanged and to interact with other similar assets and SAP systems in real time.

Whether they represent individual pieces of equipment, raw materials or even whole systems, these "smart assets" could then take on a life of their own in metaverse-like environments.

Imagine, for example, being able to download a ready-made smart virtual representation of a physical asset before purchasing it. Engineers could then collaboratively explore, test and validate the asset—with suppliers and partners if necessary—in an accurate virtual setting before committing to buy. Not only would it give buyers a better way to assess integration with existing systems and the potential return on investment, but it would also enable sellers to ensure a better product-customer fit.

And what if suppliers and partners could enter and explore a company's virtual digital twin environment independently? It would allow them to proactively monitor equipment performance or material inventories in real time—and automatically schedule maintenance, restock supplies or arrange payments as soon as the need arose. The boost to efficiency and productivity could be transformational. And when combined with multiparty systems like blockchain, stringent data confidentiality and protection can be maintained, even as access to these spaces is opened up to partners.

> SAP's Extended Reality Cloud is a SaaS service on SAP BTP that lets users create, use and share smart assets within mobile devices running Unity applications. It's well positioned to evolve into a marketplace for exchanging B2B NFTs and smart assets in the metaverse.

WHAT TO DO NOW

Plan for a multi-technology systems architecture

Create a roadmap for bringing a range of emerging technologies together in a disruptive combination of new ideas, either within SAP solutions or in conjunction with them. That might include, for example, using machine learning software from SAP combined with SAP Intelligent Asset Management to predict when equipment may fail. It might mean using solution-embedded distributed ledger technology with Green Token by SAP to achieve end-to-end traceability and proof of sustainable material sourcing throughout the supply chain. Or it could even mean combining quantum computing with SAP S/4HANA to optimize transportation and distribution routes.

Completing the picture

The three remaining building blocks of the metaverse continuum

Without perhaps even realizing it, some businesses have already started adopting the future-focused capabilities that will underpin the enterprise metaverse.

In their drive to tackle disruption from COVID-19 and geo-political upheaval, they used digital innovation to make decisive and rapid pivots to the future. And while the challenges of these disruptions continue to weigh heavily on many businesses today, the technology innovations and digital transformations that resulted from this acceleration are providing the core building blocks from which the future enterprise metaverse will be constructed.

WebMe

Accenture has outlined four of these core building blocks in the Accenture Technology Vision 2022. The first, ***WebMe***, which we discuss above, is the reimagination of the internet as a persistent space for virtual living via the metaverse and Web3 technologies. As we explain in the preceding section, SAP solutions and technologies are ideally positioned to power enhanced business experiences, collaboration, and outcomes in this virtual future.

Programmable World

However, the value of new virtual worlds cannot be truly realized unless anchored in the physical world. That's why the second building block, ***Programmable World***, is about how technology is being threaded through physical environments in increasingly sophisticated ways. Technologies like augmented reality, edge computing and 5G cellular connectivity are fusing digital lives into physical environments, enabling people to shape, control and automate the world around them to an unprecedented degree.

> An example? Consider Accenture's augmented reality transportation management application. Running on industrial tablets connected to SAP S/4HANA and SAP's Transportation Management system, the application offers warehouse employees an augmented reality visual aid to help them optimize the loading of cargo. Using real imagery from truck compartments, it shows how to place cargo in an optimized sequence provided the SAP system according to truck size and cargo characteristics such as box size, weight and unloading sequence.

Companies running SAP solutions can look to use technologies like 5G to connect physical assets with SAP systems in real time—building digital twins of the whole organization that can be explored, analyzed, tested and simulated in new ways, as well as acting as an interface to control and manipulate equipment and systems in the real world.

> A good example is Logidot, a graduate startup from the SAP. iO Resilient Supply Chain cohort. Logidot's solution helps optimize industrial logistics and production in real time by using low-cost, plug and play trackers on high-value assets. This can help create digital twins that can simulate and provide scenario planning capabilities.

The Unreal

Humans will be the primary residents of new virtual spaces. But they'll increasingly be joined by machines that look, sound and act like humans too. ***The Unreal***, the third building block, refers to this trend towards hyper-realistic synthetic content and media. This is particularly relevant when it comes to enterprise applications of AI and the development of hybrid workforces, in which employees increasingly interact with intelligent systems that support, augment or even carry out certain business activities.

> Take synthetic data, which is already being used to enhance SAP systems today. At one Agribusiness client, for example, Accenture used historical data converted to the right data model to train machine learning algorithms for use in SAP's Intercompany Reconciliation solution. This allowed efficient reconciliation at the day of the go live rather than after several months of use.

> Accenture's self-healing SAP application is another example. Using AI algorithms, our solution allows an SAP S/4HANA system to automatically identify errors (whether user mistakes or configuration issues), recommend fixes, and then take action to either amend the business process or fix the configuration by itself.

At Accenture, we also use artificial intelligence to augment our ***financial pre-close processes***. Our solution uses SAP HANA® as a datamart, Python algorithms and a custom commentary platform to automatically generate commentaries explaining variances, patterns and events in Accenture's P&L and balance sheet. As much as 80 percent of these commentaries are approved without any need for further human intervention. This has boosted productivity, saving financial controllers around 57,000 hours in the first 12 months of operation.

Companies should explore how contextual AI systems can interface with SAP solutions to help automate and enhance business processes in a way that maintains the trust of users—by explaining actions in intelligible ways, adapting to new circumstances, providing options for user control and having enough contextual data to "see" like a human does.

SAP customers can augment solutions such as SAP BTP's IoT service with AI, for example, to not only automatically detect equipment failure but also see it in the context of other issues to understand the bigger picture, get to the root cause and take action to prevent it from happening again or causing ripple effects.

Computing the Impossible

At the same time, the limits of what is computationally possible are being expanded by a new class of quantum, biologically inspired, high-performance computers. The fourth building block, ***Computing the Impossible***, refers to the way this is enabling companies to solve big computational challenges that have historically appeared unsolvable.

> SAP customers can explore the combination of next-generation computing with SAP technologies and data. Qlogistics for example, developed by Accenture on SAP BTP, is a maritime freight logistics optimizer that uses quantum computing to perform calculations on huge amounts of data at a pace and scale that would be impossible with traditional computing. As such, it can optimize the complex process of maritime freight logistics routing and offer a unique competitive edge.

Conclusion

Change can happen suddenly when a pivot point is reached

CONCLUSION

The metaverse and Web3 are creating the next version of the internet. As these momentous shifts in technology take shape, the friction that exists today between different digital platforms and virtual spaces will be eliminated. And the way data moves between systems and is used across digital experiences will be reinvented. This will drive new lines of business, new ways of working and new means of interaction between organizations and people. For most, this is the first and best chance they have ever had to architect a new kind of digital world.

The race to define, build and populate that world is on. In December 2021, the Oculus virtual reality app became the most downloaded app in the United States and a top-five app in 14 countries.[14]

A study in late 2020 found that daily time spent consuming digital content in Europe and the U.S. had doubled since the start of the pandemic.[15] And in the third quarter of 2021, NFT sales surged to $10.7 billion, over eight times higher than the previous quarter.[16] These are some of the early signals that the metaverse and Web3 will be the next significant technology shift.

The danger of a "wait and see" approach is that it can quickly become "look it already happened" when the technology reaches its tipping point. Organizations should therefore start planning for the Web3 and metaverse skills, capabilities and partners they'll need in the future—in areas like 3D virtual world design, digital twins, blockchain, NFTs, cryptocurrency and more.

As the enterprise metaverse emerges, companies will be able to use SAP systems seamlessly across a continuum of virtual spaces and experiences to create new ways of working and new ways to interact and transact with partners, suppliers and clients. As they do so, they'll be architecting a new kind of digital business world—one with virtually limitless possibility for collaboration, innovation and user experience.

It's time to gear up for the enterprise metaverse.

This thought leadership document would not be possible without the valuable contribution of: Deepika Bhaskar, Daniel Franulovic, Roberto Frossard, Andrea Hebel, Dries Kuipers, Vibhash Kumar, Fancesca Mazzoleni, Catherine Nguyen and Adriano Regis

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