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Immersive Technologies: The Building Blocks of the Metaverse in Brabant

Introduction

In an era of rapid technological advancement, immersive technologies are set to revolutionise how we interact, work, and consume content. Among these technologies, the metaverse, virtual and augmented reality (VR and AR) and digital twins offer key opportunities for businesses to advance innovation, foster collaboration, and elevate engagements to new levels.

According to GlobalData projections, the metaverse-based applications market is expected to reach an astounding value of $625.5bn by 2030, driven by remarkable progress in VR, AR, artificial intelligence (AI), and cloud computing. These cutting-edge technologies are set to continue reshaping our world.

Immersive technologies not only create new revenue streams by fostering creativity but also open up channels for enhanced collaboration among specialists from a range of industries regardless of their location around the world. These transformative technologies offer interactive and immersive experiences that drive innovation and engagement.

One area with considerable potential is education and training. The metaverse can revolutionise traditional learning methods by providing immersive and interactive experiences – such as medical students practising complex surgeries in a virtual operating room or automotive engineers designing vehicle prototypes in a virtual lab.

Moreover, immersive technologies have already begun to reshape the industrial sector. Companies are leveraging VR and AR applications for employee training, allowing workers to practice hazardous tasks safely and efficiently. VR is also being utilised for design simulations and prototyping, reducing production costs, and accelerating innovation cycles.

In manufacturing, the metaverse facilitates the monitoring of complex processes in real-time, leading to optimised workflows and predictive maintenance. As these technologies continue to evolve, the industrial sector is witnessing a transformative shift towards increased efficiency, safety, and competitiveness.

The impact of immersive tech isn't limited to just education and industry. Entertainment and media industries can also leverage the metaverse to captivate audiences in entirely new ways. Virtual concerts, immersive gaming experiences, and interactive storytelling are just a few examples of how these technologies enhance entertainment experiences.

In the Dutch province of Brabant, innovation has a rich legacy dating back centuries when the region's farmers collaborated to transform infertile delta sand and silt into arable land. Today, Brabant has evolved into a technological accelerator and a hub for immersive technologies and the metaverse.

At the heart of Brabant's success lies a vibrant community of tech-savvy professionals specialising in complex IT and hardware. They are driving the region's technological advances and revolutionising industries with state-of-the-art solutions. The province's culture of innovation continues to thrive, influenced significantly by the industrial legacy of Philips, a global powerhouse. This legacy has created a collaborative ecosystem that fosters cutting-edge technological advances that transcend borders.

In particular, immersive technologies find a perfect breeding ground for growth in Brabant. The province's astute tech start-ups and interdisciplinary collaborations push the envelope in VR, AR, and other immersive experiences. Brabant's commitment to transforming various sectors is evident through initiatives such as immersive training simulations for industries, including healthcare and manufacturing.

One of Brabant's core strengths is its focus on human-technology collaboration. Experts in the region understand the connection between human behaviour and technology, delivering seamless and intuitive experiences in VR, AR, and other immersive technologies.

"More than half of Dutch patents in this domain come from the Brabant region and it has been called the innovation hub of Europe for the Fourth Industrial Revolution," says Guido Leestemaker, project manager for foreign investments at the Brabant Development Agency (BOM). "So, if you want to be involved in innovation activities for the metaverse, IoT, or AI, then you have to be here."

"More than half of Dutch patents in this domain come from the Brabant region and it has been called the innovation hub of Europe for the Fourth Industrial Revolution."

"Brabant's historical commitment to innovation, its collaborative ecosystem, and its accomplishments have positioned it as a frontrunner in immersive technologies and the metaverse – despite this sector still taking shape."

In the following pages, we will cover the immersive technologies being developed in Brabant and the pivotal role of the province's high-tech ecosystem in shaping any future metaverse.

Why Brabant excels in immersive tech

One of the notable strengths of Brabant is its compact geographical area, which fosters a tightly knit and collaborative ecosystem. Government bodies, academic institutions, and industry players all work closely together under the triple helix model of innovation, sharing knowledge and resources to drive advances in immersive technologies. Notably, the Brainport region is a substantial driver of technological advances under this model.

This collaborative approach enables efficient decision-making, streamlined processes, and effective utilisation of expertise, which has already seen the region become an international leader in terms of patents submitted on the metaverse and immersive technologies.

Brabant is home to several renowned institutions that play a key role in advancing vital technologies.

High Tech Campus Eindhoven (HTCE) in Brabant is making significant strides towards becoming a prominent player in the field of immersive technologies. Collaborating with world-renowned partner companies, their efforts aim to drive innovation, industrialisation, and practical applications of immersive technologies. With such proactive initiatives, Brabant showcases its commitment to being at the forefront of immersive tech, potentially positioning itself as a top location in the region for this domain. Yet the Campus emphasises the importance of R&D activities of companies and organisations that set up a base there.

“The slogan of HTCE is: ‘Turning technology into business’. Not just any company can locate to the Campus. They have to fit in our focus technology or application domains,” explains Philipp Werle, who is business developer for emerging tech at HTCE.

Werle plays a leading role in establishing the dedicated **3EALITY Hub** at the Campus, which will build on the success of the AI Innovation Center already set up in collaboration with ASML, NXP, Signify, and Philips – and strong partners such as AWS and Microsoft. “3EALITY will be a collaborative ecosystem where pioneering companies are united to research, develop, and implement emerging technologies for the next generation of the internet. We move into web3.0, with a blended connection of the physical world and virtual reality and the possibility to immerse yourself in 3D. 3EALITY stands for this development.”

3EALITY intents to create an interconnected and vibrant community that leverages the power of Virtual & Augmented Reality, spatial computing and Metaverse-enabling technologies & applications. The Hub is due to open towards the end of 2023. As with all activities in Brabant, there is very much an emphasis on collaboration and sharing expertise as well as facilities to create an infrastructure that enables the development of these new technologies and applications.

"Why not share the infrastructure? We have a 5G Hub here with very strong internet connectivity for communications.

Start-ups, who cannot afford it themselves, can take advantage of that,” adds Werle.

“Loads of business models are switching to software business models. That's also a development that we want to foster. At the moment, more than half the tenants are basically software companies. The whole region in general still has the image of a hardware-only region – and we don’t believe that’s the truth these days.

The Netherlands may not be the biggest country, but its high concentration of experts across a small area make it an ideal location to trial new technologies and business models. Once proven, these technologies and solutions can be introduced to larger markets with key indicators of success already established.

And amid fierce global competition for talent, Werle suggests that the growing numbers of graduates seeking careers in the gaming industry have an opportunity to apply their skills in Brabant by adapting the technologies for use in other industries.

“There's always talent looking for opportunities, and this might be a way into the industry, and using those skills in a different setting,” he says.

With more than 300 companies based at the High Tech Campus alone, the prolific levels of innovations extend throughout Brabant.

Elsewhere in the province, renowned research institutions such as the **Eindhoven University of Technology (TU/e)** foster an environment of innovation and cross-pollination of ideas. TU/e excels as a University of Technology through its strong ties with industry, both local and international. When it comes to research collaborations with industry, TU/e is among the top 1% of universities globally.

TU/e stands at the forefront of research and innovation, specialising in engineering science and immersive technologies. Such tech has captured the imagination of researchers and enthusiasts alike, and TU/e has been at the leading-edge of exploring their potential. The university hosts advanced facilities such as the **Virtual Reality Lab**, allowing people to experience fully immersive environments. One of the opportunities this opens up is to study human behaviour inside virtual worlds that are set to become a prominent feature of everyday life and industry.

The VR Lab team recognises the importance of gaining improved insights on the impact these technologies can have on the behaviour and experiences of people, which can be tracked with precision. Furthermore, VR can be used to create scenarios that would otherwise be extremely difficult to replicate – from simulated earthquakes to highly accurate virtual road networks.

TU/e's commitment to advancing immersive technologies is exemplified through the **EAISI Digital Twin Lab**. By supporting experiments in high-tech systems, health, and mobility – and leveraging VR and AR technologies – the university drives deeper interactions with virtual models.

Meanwhile, the **Game/Play Lab** is dedicated to understanding player experiences in digital gaming environments. Additionally, the UseLab conducts usability research on consumer products, enhancing the overall user experience. The **Human-Technology Interaction (HTI) group** plays a pivotal role in examining the ways humans interact with technology to create solutions that positively impact individuals and society as a whole.

Collaborations with industry players are essential to driving progress in the immersive tech domain and accelerating the adoption of innovative solutions. A joint initiative between TU/e and NXP Semiconductors aims to develop advanced wireless communication technology operating at frequencies above 300GHz, with the potential to revolutionise communication and data transfer.

Notably, **Breda University of Applied Sciences (BUas)** offers one of the best worldwide HBO courses in gaming, equipping students with the essential skills and knowledge to thrive in the immersive technology industry. Through tailored education and valuable industry connections, the university contributes to the vast talent pool in the region and fuels the growth of immersive technology. Moreover, BUas goes beyond its exceptional courses in games by placing a strong emphasis on the integration of immersive technologies across various other domains. Recognising the transformative potential of these technologies, BUas fosters innovation and progress by incorporating immersive tech into diverse fields that include education, healthcare, architecture, and entertainment. Through active promotion and adoption of immersive technologies, BUas aims to drive positive change and revolutionise how we interact with the world.

Boasting the highest number of IT graduates in the Netherlands, **Fontys University of Applied Sciences** is another vital institution in the region, playing a significant role in shaping the future of immersive technology. With a strong focus on cutting-edge technologies such as AI, blockchain, and robotics, Fontys empowers students to explore new possibilities. The university also emphasises the transformative potential of VR, particularly for SMEs, unlocking untapped opportunities for businesses to drive growth and innovation in the region's immersive tech landscape. The university's commitment to fostering innovation is exemplified through its state-of-the-art VR Lab. This lab serves as a hub for immersive tech research and development, creating a conducive environment for students and researchers to push the boundaries of VR applications. By actively collaborating with the business sector, the lab enables SMEs to harness the potential of VR and unlock new dimensions of growth and competitiveness in their respective industries.

Tilburg University's expertise in social sciences, human behaviour, ethics, legal aspects, economics, and business administration makes it highly relevant for immersive technology. The university can provide valuable insights into the impact of immersive tech on individuals, their well-being, and society. Its focus on legal and ethical considerations addresses privacy and ethical concerns. Additionally, its research in economics benefits those businesses exploring opportunities in the immersive tech domain.

Also based on the Tilburg University campus is the **DAF Technology Lab**, which enhances these strengths by providing a dynamic platform for experiential learning and innovative research. With cutting-edge VR systems and advanced sensing technology, the lab fosters immersive education, interdisciplinary research, and corporate partnerships. This partnership between Tilburg University's expertise and the DAF Technology Lab's innovation establishes a solid basis for responsible development, enhancing capabilities for immersive technologies to advance education, research, and collaborative initiatives.

Further examples of important companies in the immersive tech ecosystem in Brabant include **Enversed Studios**, which leads the way in VR and immersive media, offering 3D visualisations, interactive training apps, and multiplayer VR games. **Manus** excels in finger-tracking gloves for motion capture and VR. **PWXR** is an award-winning VR/AR studio with a focus on esports.

Expivi revolutionises shopping experiences by merging a 3D configurator and AR, empowering customers to virtually personalise products and aiding businesses in offering diverse choices without excess inventory.

Dimenco specialises in 3D screen technologies, servicing hardware and collaborating with brands such as Acer and ASUS. Notably, the company has presented glasses-free 3D laptops to highlight its commitment to accessible immersive innovation. In a sign of how highly regarded Dimenco is, the company was acquired by Leia Inc in August 2023.

Fectar is driving the fastest-growing Metaverse Creators Platform, which empowers businesses and individuals to create interactive AR and VR experiences without any programming. Fectar is the Dutch leader in spatial computing with more than six million downloads.

These are just a couple of examples of the diverse and impactful companies contributing to the growth and advancement of immersive technology in Brabant.

The global players

There are several large companies based in Brabant that have successfully harnessed immersive tech to drive innovation and solve real-world challenges. One such example is **ASML**.

A global leader in chipmaking equipment, ASML has embraced the transformative power of immersive tech. It all began when Thomas Weinlandt, a mechanical engineer, introduced VR headsets for design work within the company. This early initiative laid the groundwork for their swift response during the Covid-19 pandemic. As the pandemic hindered travel, ASML explored immersive tech further, using gaming-inspired AR to remotely assist customers. With AR, subject matter experts virtually entered customer factories, completing service actions with precision through smartphones and Microsoft HoloLens headsets. This successful application showcases the immense potential of immersive tech in driving innovation and tackling real-world challenges. As Brabant continues to foster a vibrant immersive tech ecosystem, more businesses are likely to harness its benefits.

In parallel, ASML recognises the importance of knowledge and continuous learning. To safeguard and disseminate knowledge, the company has established the **ASML Academy at the Brainport Industries Campus (BIC)**. The academy serves as a hub for fostering employee growth and development, with a strong emphasis on visualisation, simulation, and hands-on practice using VR and real machines. This 7,000m2 international academy not only underscores ASML's commitment to nurturing its workforce but also highlights its role as an integral part of the regional high-tech ecosystem.

As the immersive tech ecosystem continues to flourish in Brabant, more businesses are expected to recognise the myriad benefits it offers. ASML's unwavering commitment to immersive technology and continuous learning positions them as a pioneer and a role model for others, propelling the entire Brainport region towards a brighter and more innovative future.

At the heart of tech in Brabant is **Philips**, a globally recognised brand in the fields of healthcare, consumer electronics, and lighting. The company has a significant presence in Eindhoven. In fact, many of Brabant's leading tech companies have roots in Philips, including ASML. Philips has been actively exploring the applications of immersive technology in various sectors, for example, using VR and AR within healthcare. The company has leveraged immersive technologies to enhance patient care, medical training, and surgical procedures. Philips has developed VR simulations for surgical planning and training, allowing surgeons to practice complex procedures in realistic and risk-free environments.

Philips has also been exploring the potential of immersive technology in improving patient well-being and mental health. The company has developed immersive experiences, such as VR relaxation programs, to help reduce stress and anxiety, creating a positive impact on patient outcomes.

How Brabant technology is shaping the metaverse

One of the primary ways Brabant is shaping the evolution of immersive technologies is through its thriving start-up ecosystem. The region has become a hive of activity for start-ups focused on immersive technologies, attracting entrepreneurs and investors from around the world. This concentration of talent and innovative ideas fosters a dynamic environment that fuels the development of new applications, platforms, and content for immersive experiences.

This is supported by the fact that Eindhoven was ranked as the seventh most promising global science hub in a recent research report that assessed more than 200 separate locations. The report by Dealroom.co identified high-quality science, the university-educated talent pool, and the number of registered patents as key strengths of Eindhoven.

One remarkable illustration of this active collaboration is the **Fontys ICT Innovation Lab**, a leading initiative within the Brainport region's immersive tech space. By bringing together education, research, and industry partners, the lab serves as a knowledge hub for exploring immersive technologies. After an initial year of in-class and academic learning, students have the unique opportunity to work exclusively with partner companies on real-world immersive tech projects.

MINDLABS

Another exemplary case is **Mindlabs**, a collaborative effort involving four knowledge institutions, including Tilburg University, along with governments, business partners, social institutions, and startups. Their shared focus is on developing technologies that interact with human behaviour, also known as human-centred AI. Additionally, Mindlabs places a strong emphasis on immersive technologies such as VR/AR, harnessing their potential to address societal challenges and create positive impacts on society.

Fieldlab VIA APPIA

Another notable initiative is **Fieldlab Via Appia**, aiming to industrialise AI and VR/AR applications for maintenance and service contexts by leveraging the collective expertise of project participants. The goal is to analyse opportunities and develop valuable industrial applications. Challenges include deploying these technologies in physical industrial environments, ensuring application robustness for operational decision-making, and managing knowledge transfer despite ageing workforces and remote work. The approach involves developing applications through communities of practice, validating them within Living Labs (pilot environments), and sharing lessons learned through desk-based activities.

Showcase: Enversed Studios

Enversed Studios is a pioneering Dutch company specialising in immersive technologies and the metaverse. With a strong focus on VR and AR, Enversed Studios creates immersive experiences that demonstrate what can be achieved with technology.

The company's work ranges from developing engaging VR games and simulations to crafting interactive AR applications. Enversed Studios is at the forefront of exploring the potential of the metaverse, creating virtual worlds that allow users to connect, interact, and collaborate in shared digital spaces.

The company leverages immersive technologies to develop virtual training simulations and visualisations for industries such as manufacturing, healthcare, and engineering. By employing VR and AR, Enversed Studios enables companies to provide realistic and interactive training environments, facilitating skills development, safety protocols, and complex procedures.

Showcase: Dimenco

With roots dating back to Royal Philips Electronics, Dimenco is a leader in crafting immersive 3D experiences without requiring wearables. The Veldhoven-based company's pioneering spatial visualisation technology seamlessly merges hardware, software, and innovation to redefine interactions with displays. Its advanced Simulated Reality (SR) technology eliminates the need for special glasses to engage with immersive 3D content. From realms spanning business to entertainment, Dimenco's innovation is reshaping industries, delivering visually pleasing displays with depth and resolution.

In a strategic move, Dimenco was recently acquired by Menlo Park-based Leia Inc, a prominent provider of 3D display hardware and content services. This partnership aims to further accelerate the mainstream adoption of immersive 3D experiences across various platforms and devices. The combination of Dimenco's expertise and Leia's capabilities removes technological boundaries, presenting users with a unified, cross-platform solution rooted in a shared industry standard.

Dimenco's acquisition by Leia Inc is a testament to their joint mission to bridge the gap between virtual and reality, revolutionising content interaction in ways previously only imaginable.

Showcase: Prespective

Prespective is an innovative technology company dedicated to immersive spatial computing solutions and digital twins. The Dutch company enables cutting-edge AR and VR experiences that seamlessly blend the digital and physical worlds.

The company develops advanced software and hardware solutions that enable users to interact with virtual objects in real-world environments. Prespective serves a wide range of industries that include architecture, engineering, construction, and retail – offering intuitive and all-encompassing experiences for design visualisation, remote collaboration, and product demonstrations.

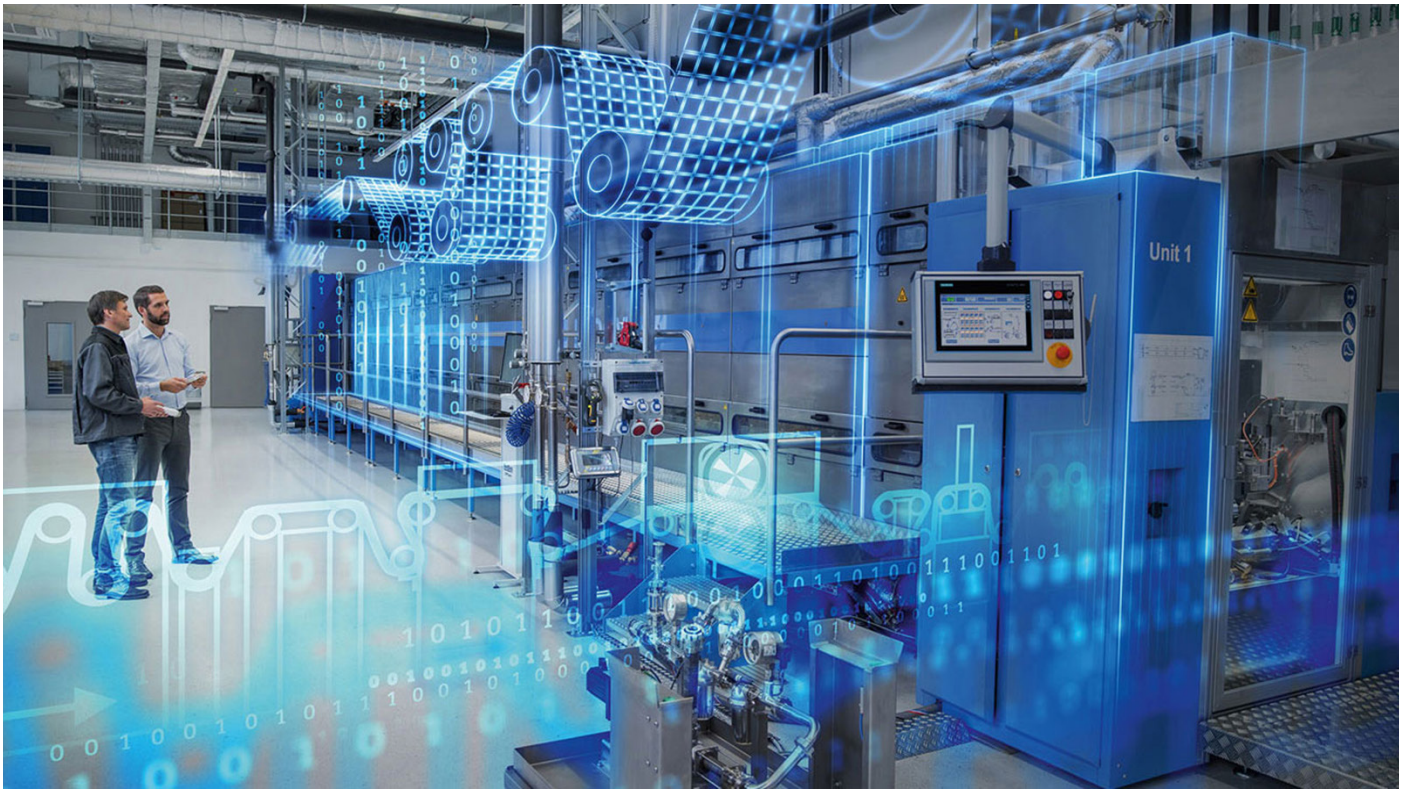
Prespective's expertise lies in creating highly realistic and interactive AR and VR applications that empower businesses to enhance communication, streamline workflows, and harness untapped possibilities.

Showcase: Fontys ICT Innovation Lab

The Fontys ICT Innovation Lab is a dynamic research and development centre located at Fontys University of Applied Sciences in the Netherlands. With a focus on technology and innovation, the lab serves as a hub for collaboration between students, researchers, and industry professionals. The lab offers a creative and experimental environment where cutting-edge technologies such as AI, VR, and IoT, are explored and developed.

Through collaborative projects and partnerships, students are actively paired with companies to work on real-world projects to gain hands-on experience. Through these collaborations, students have the opportunity to apply their knowledge, contribute to industry projects, and develop practical skills while benefiting from the mentorship and expertise of professionals in their respective fields.

“It's an interesting way of teaching students hands-on and real-world skills, but also offers a powerful way of bringing industry and companies into the education space,” explains Leestemaker.



Collaborating to create value in Brabant

Businesses and technical specialists in Brabant are permanently on the lookout for other organisations that will strengthen the ecosystem, from the biggest global players to highly innovative start-ups fresh out of university departments.

Brabant Development Agency (BOM) supports companies seeking to add value to the province and collaborating to further progress immersive technologies to form the building blocks of the metaverse.

The depth and breadth of technical experts from across the value chain in Brabant mean that there will almost always be a specialist within the area who can help take a project to the next level. For companies looking to establish a presence in Brabant, BOM can make the necessary introductions and start the collaboration process and allow innovations to flourish. While the use of shared facilities saves innovators' expenses such as rent and reduces the risks associated with the development of new technologies.

"When a company relocates to this area, we can provide assistance in various ways. This includes helping them find suitable office space or a research base. Additionally, we facilitate their integration into the ecosystem by connecting them with specialists in specific fields," explains Leestemaker. "Our goal is to ensure that companies have access not only to fundamental support services like accounting and legal guidance, but also to a network of innovative partners, dynamic field labs, and esteemed research universities.

"We are delighted to extend an invitation to immersive technology companies, inviting them to explore the Brabant ecosystem through our Bright Innovation Tour."

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