Digital Skills & Jobs Platform

Stepping into immersive environments: how 3 independent skill clusters turn immersive technology into immersive experience

Part of the 2026 Digital Briefs – a series of deep-dives on digital skills and key technologies, produced by some of Europe's leading experts in the field

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Executive summary

Five years on, from the moment the word "metaverse" entered mainstream conversation, immersive technologies have become essential infrastructure across surgical theatres, factory floors, classrooms, museums and ordinary phones. The vocabulary has matured, from "metaverse" to virtual worlds, Web 4.0, spatial computing, immersive environments, and the underlying skills question is sharper than ever.

Building immersive environments well takes three interdependent skill pillars: XR development, 3D modelling, and the user-side skills, that turn immersive technology into immersive experience. Each makes the others work. XR creates the conditions for presence; 3D gives presence something to hold onto; user experience invites people to step inside. Built together at the joints, the three combine into immersive environments that feel whole, and audiences who genuinely want to step into them.

Europe is well placed for this moment. With the Virtual Worlds Strategy, DigComp 3.0, the AI Act and the European Accessibility Act (EAA) already shaping the landscape, and deep cultural-creative and technical-engineering traditions to draw on, the building blocks are in place. As generative AI lowers the technical barrier to producing immersive content, the deciding factor will increasingly be how thoughtfully these environments are designed for the people who use them. That is the work ahead, and one Europe is well shaped to take on.

Keywords

#Immersive Technologies, #XR, #VR, #AR, #3D modelling, #XR modelling, #skill clusters

Author's biography

Susheel Nath is a Brussels-based Senior Technologist – Digital & Immersive Systems at FARI – AI for the Common Good Institute, where he leads the architecture and integration of immersive and digital technologies in support of ethical AI research and real-world societal impact. His work focuses on Extended Reality (XR), Local Digital Twins (LDTs), hardware simulation environments, and AI-enabled decision-support systems for public-sector and urban contexts. He holds a Master's in Computer Science – Augmented and Virtual Reality from Trinity College Dublin (2019), and is currently pursuing a PhD on Visual Quality Assessment in CAVE systems, focusing on the Quality of Experience (QoE) of users in large immersive hardware environments such as 360-degree immersive rooms.

A strong advocate and technical evangelist for ethical, inclusive technology adoption, Susheel explores how immersive systems can reshape collaboration, decision-making, and the future of cities. His practice bridges research, design and engineering across XR development, 3D content creation and user-centred design, with a focus on bringing immersive environments out of the laboratory and into everyday civic and professional contexts.

From metaverse hype to immersive reality

The word "metaverse" broke into mainstream conversation almost overnight when Facebook rebranded to Meta in October 2021 (Zuckerberg, 2021). Five years on, the technologies it pointed to have not faded. Rather they have matured, multiplied, and threaded themselves through hospitals, factory floors, museums, classrooms and the design pipelines of much of the cultural sector. Surgeons rehearse complex procedures in virtual reality before stepping into the operating theatre; engineers walk through digital twins of factories that do not yet exist; students explore the inside of a cell or the architecture of ancient Rome from a school desk. Even on ordinary phones, augmented-reality filters, indoor navigation and shopping previews are now familiar enough to count as everyday tools. What has shifted, alongside this spread, is also the vocabulary we use to describe it.

Immersive environments: why progress on EU skills indicators matters

In July 2023, the European Commission stepped away from the word "metaverse" and adopted the framing of *"virtual worlds"* in its Communication on Web 4.0 and virtual worlds, setting out an EU-level strategy to coordinate industrial uptake (European Commission, 2023). In early 2024, Apple released its Vision Pro under the banner of *"spatial computing,"* another shift away from the metaverse label. Today, policy and industry vocabulary increasingly converges on **immersive environments**: persistent, three-dimensional, real-time experiences that blend physical and digital worlds.

Whatever we call them, the underlying skills question is the same. Delivering on this vision depends on two things at once, a skilled workforce able to build immersive environments, and digitally confident citizens able to use them. The Digital Competence Framework (DigComp), the EU's reference framework for citizen-level digital competence, added emerging immersive technologies such as virtual reality among the literacies every European was expected to develop in its 2022 update, DigComp 2.2 (Vuorikari, Kluzer and Punie, 2022). Its current version, DigComp 3.0, released in December 2025, takes a technology-neutral approach, setting general competences that apply to emerging technologies alike, bringing in much necessary upskilling to technology neutrality and AI competence.

On the workforce side, the Digital Decade 2030 targets call for at least 80% of adults to hold basic digital skills and 20 million Information and Communication Technology (ICT) specialists employed across the Union. Both indicators are currently off-track: according to the 2026 State of the Digital Decade Report, Europe will reach the target of 80% by 2037 instead of 2030; and is currently just over halfway of its target on ICT specialists in employment (10.5 million). Immersive environments, in other words, are arriving into a labour market and a citizenry that have not yet caught up with the basics.

The gist of it all: three complementary skill clusters

This brief argues that building, using and governing immersive environments well depends on three interdependent skill clusters: **XR development, 3D modelling, and the user-side skills that turn technology into experience.** None of them works in isolation, and treating them as parallel tracks, as much current skills provision does, produces practitioners who cannot ship working immersive experiences. The pillars that follow examine each cluster in turn, and then the joints where they meet.

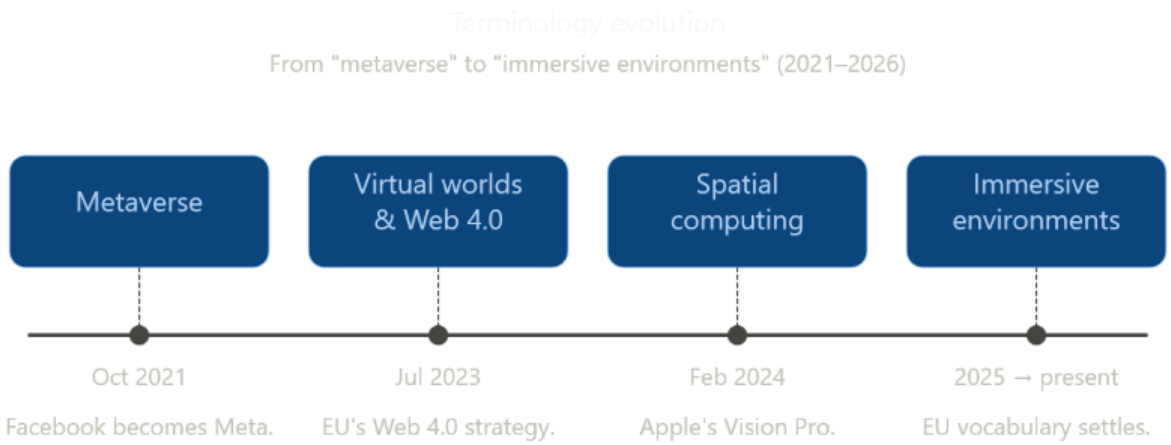

Figure 1. Terminology Evolution Timeline (2021 - 2026)

Building immersion: the XR skills layer

Extended reality (XR) is the umbrella term covering virtual reality (fully digital environments), augmented reality (digital overlays on the physical world) and mixed reality (where the two merge). It is the layer that creates the immersed sense of being inside an environment that is not physically there, what research calls "**presence**": the psychological state in which a user responds to a digital environment *as if it were real*. The European Commission's framing of XR captures the breadth of what is at stake: applications now span manufacturing, construction, cultural heritage, tourism, training, education and healthcare, alongside more familiar entertainment uses (European Commission, 2025a). Producing convincing presence across that range is a technical discipline in its own right.

Zooming in on XR skills and tools

At its core sits work in *real-time engines*. **Unity and Unreal Engine**, historically associated with video games, are now the dominant tools for almost any XR experience, from a VR surgical trainer to an AR (Augmented Reality) maintenance overlay on a wind turbine as examples. Around the engines, several adjacent skill areas are non-negotiable. **Spatial design** asks practitioners to compose for 360-degree space, with attention to *sightlines*, *reach zones*, *motion comfort and cognitive load*. **Performance optimisation** is unforgiving: XR applications typically must render at 90 frames per second or higher to prevent cybersickness. **Spatial audio and haptics** matter as much as visuals to complete the immersion of the experience, wherein sound and touch carry an enormous share of the presence. **Hardware fluency**, likewise, is increasingly demanding across a varied landscape of headsets, controllers, hand-tracking and eye-tracking devices. Working knowledge of **open standards** rounds out the picture: OpenXR, maintained by the Khronos Group, allows XR applications to run across various headsets with utmost interoperability, and WebXR brings immersive experiences into easily accessible web browsers, lowering the hardware-need barrier for both developers and end users.

At the crossroads: GenAI and XR

The skill set is also being reshaped by generative AI. *Procedural generation* of text or images for **user interface design**, *neural-network-driven* **character animation**, and *conversational large-language-model* agents are now standard parts of an XR developer's toolkit, accelerating prototyping of credible content. The labour-market signal points

firmly in one direction. Cedefop's skills forecast 2035 projects continued growth in high-tech and Science, Technology, Engineering and Mathematics (STEM)-related employment, with computer programming and engineering activities among the sectors driving most demand (Cedefop, 2025). **The European Commission notes that demand for XR-skilled staff is rising exponentially, and that this is not only a story of software engineers. Creative practitioners working in 3D, design, sound, image and video are an equal part of the picture** (European Commission, 2025a).

This cross-disciplinary skill point is exactly the bridge to the next pillar. *Immersion needs something to be immersed in*, and that is where 3D modelling comes in.

Building believable worlds: the 3D modelling skills layer

3D modelling is where imagination takes shape. A model gives an immersive environment its substance: the surfaces, volumes and behaviours that a user will see, walk through and reach toward. If the XR layer creates the foundations for presence, the 3D layer determines whether presence is sustained or collapses. For example, a surgical trainee will only learn from a VR simulator if the anatomy is accurate and the tissue responds plausibly; an engineer will only act on what they see in a digital twin if the geometry matches the physical asset they will operate. Believable worlds, whether photorealistic or coherently stylised, are a precondition for immersive environments that work.

An in-depth look into 3D modelling skills

The skills behind this craft span a long pipeline.

Modelling (commonly in *Blender*, *3DS Max*, *Maya or ZBrush*) builds geometry from primitives, sculpting or scanned input.

Texturing and materials determine how surfaces look, from colour, pattern, the smallest bumps and grooves, to the way each material catches the light, which is an enormous driver of realism.

Rigging, animation and **lighting** give the world motion and atmosphere; real-time engines now support physically-based rendering and ray tracing at quality levels that were cinema-only a decade ago, that too with brilliant performance.

Photogrammetry, the capture of real-world objects from photographs or **LIDAR** scans, is increasingly used across cultural heritage, location-based entertainment and digital-twin construction.

Procedural generation, where algorithms create variation at scale, lets a single artist populate a forest, a city or a factory floor at ease.

What makes 3D modelling distinctive is the *range of disciplines it pulls into its development pipeline*. Bridging computer-aided design (CAD) and building information modelling (BIM) with real-time engines has become a defining skill of the digital-twin workforce; cultural-heritage institutions now employ photogrammetrists alongside curators; surgical-training studios employ medical illustrators alongside game developers. The European Commission underlines this when it points out that XR-skilled staff include not only software engineers but creative practitioners working in 3D, design, sound, image and video (European Commission, 2025a).

Shaping a new era: at the intersection of 3D modelling and AI

Generative AI is reshaping 3D modelling extensively nowadays. *Text-to-3D* models can produce usable geometry from a written prompt in seconds. *Neural radiance fields (NeRFs)* and *Gaussian splatting* turn ordinary photographs into navigable 3D scenes, collapsing what was a week or two of photogrammetric work into an afternoon. This does not eliminate the 3D modeller, but shifts the craft from manual sculpting toward direction, curation, optimization, cleanup and integration. The senior modeller of the next decade is less a digital sculptor and more a creative director with a strong technical eye, able to brief an AI system, judge what it produces, and fold the result into a working pipeline, a merger of technical practices that has been historically robust, to the up-and-coming.

Most importantly however, a believable digital world is only inhabitable if the people inside it can navigate it in a natural condition, and ultimately only worth building if it has been designed around them. That brings us to the third and most under-discussed pillar.

Building for people: the user skills layer

The third pillar is the human side of the equation: the literacies citizens need, and the user-centred design skills producers need to match them. Where the early metaverse pitch put hardware and graphics first, the next generation of immersive environments will be defined by how much they put people at the centre. The user-skills pillar has two sub-clusters that belong together: the competences citizens need to engage with immersive environments well, and the user-centred design and research skills producers need to make immersive environments worth engaging with.

Skills for everyday users

On the citizen side, the everyday person who picks up a headset, walks through for example, a VR training of a surgery, or using their handheld, an AR-overlaid museum: these needs competences that did not previously exist. They begin with basic operational fluency, such as moving, selecting and communicating in three-dimensional digital space, but extend much further. **Critical skills** matter now more than ever. Deepfakes, persuasive design tuned by biometric signals, and persistent virtual identities raise questions flat-screen literacy did not have to answer. Privacy and safety call for new awareness too, given that movement, gaze and physiological signals can be continuously recorded as a person interacts. And the body itself becomes part of the literacy: knowing how to recognise cybersickness, take breaks, and stay oriented in immersive space. DigComp 2.2 now includes virtual worlds and immersive technologies among the literacies every European is expected to develop (Vuorikari, Kluzer and Punie, 2022), but most citizens are encountering these technologies before any formal learning catches up.

User-centred design skills for professionals

On the producer side, **user-centred design skills** take on more dimensions in immersive environments than in traditional software. **Spatial UX and UI** require designers to think in volumes rather than rectangles, to design for gesture and gaze rather than pointer-and-click, and to compose experiences a user moves through rather than scrolls down. **Accessibility** is a particularly important and under-addressed area: ensuring immersive environments are usable by people with mobility, visual, auditory or cognitive differences is a live research frontier, and the European Accessibility Act, applicable from 28 June 2025, makes accessibility a legal obligation for many digital products and services across the EU (European Union, 2019). **Quality of Experience (QoE)** measurement gives designers principled tools to evaluate comfort, presence and usability, while **inclusive design and ethnographic literacy turn an immersive environment from a demo into a fully deployed experience.**

What ties these two sub-clusters together is a longstanding theme in research on how people adopt technology. The Technology Acceptance Model (TAM) (Davis, 1989) frames adoption around two factors that have proved

durable across many later refinements: whether users find a technology useful, and whether they find it easy to use. Subsequent work has layered social, emotional and contextual factors on top of these two, but the core pairing has travelled well across desktop software, mobile apps and AI tools, and it travels into immersive environments too. Both factors are harder to satisfy in immersive contexts. Usefulness can be elusive when the value of putting on a headset is unfamiliar until a user tries it. Ease of use is demanding because spatial interaction, such as gesture, gaze, voice and locomotion, replaces decades of pointer-and-click habit. That makes citizen-side literacies and producer-side design skills a single integrated agenda: citizens need enough exposure to discover what immersive environments are useful for, while designers need enough user-grounded research to make those environments easy to use. Each side carries the other across the adoption threshold.

Encouragingly, on a governance-level, there has been groundwork already laid out. The European Citizens' Panel on Virtual Worlds, convened in 2023, produced 23 recommendations to make virtual worlds fair and human-centric, feeding directly into the EU's Web 4.0 and virtual worlds strategy (European Commission, 2023b). The AI Act, in force since August 2024, has direct implications for XR: its prohibitions on emotion-recognition systems in workplaces and education, and on biometric categorisation based on sensitive attributes, apply squarely to immersive environments where eye-tracking, gaze, gesture and physiological signals can be continuously read (European Union, 2024). **Governance literacy** is now a necessity of every immersive practitioner's skill set, not an optional add-on.

The most rewarding immersive work emerges at the cohesion of the three pillars. When XR engineers, 3D modellers and UX designers share enough vocabulary to design across those joints together, the result is an immersive environment that feels whole rather than assembled. The joints are where this brief turns next.

The joints: where the three pillars meet

Integration between the three pillars is its own competence. Knowing how to model a 3D asset does not automatically tell you how it will behave in a real-time engine at 90 frames per second; knowing how to optimise that engine does not automatically tell you how the result will land with a user with low vision. Designing across the joints is what turns a demo into a deployed experience, and it is one of the most rewarding parts of working in immersive technology.

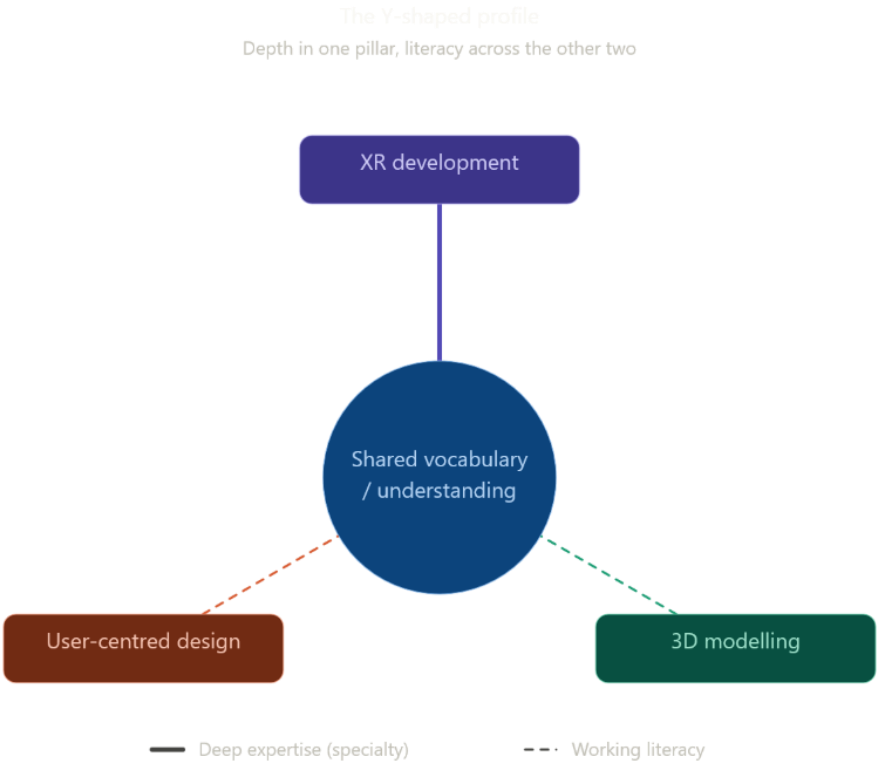

Figure 2. The Y-shaped profile: three skill pillars converging on shared vocabulary and understanding

The most useful frame here is the **Y-shaped profile** (Figure 2), wherein a deep expertise in one pillar and working literacy across the other two goes longways. For example, a senior XR engineer who can understand a 3D modeller's pipeline and brief a UX researcher, will get more done than three siloed specialists writing past one another. No single person needs to master all three pillars; teams do. What teams need is enough shared comprehension, about presence, performance, accessibility, pipelines, QoE, to make decisions across the joints without friction at every step. Practitioners working in immersive teams report that the joints become easier with experience: they are a learnable skill, not a fixed barrier.

Europe's skills provision is well placed to support this shift. XR development is taught in computer-science faculties; 3D modelling lives in art schools and design programmes; user-centred design sits in human-computer interaction or industrial design departments. Each tradition is strong on its own terms, and Europe's cultural-creative depth combined with its technical-engineering base gives it a distinctive position internationally. What is needed is not to invent new "metaverse degrees" that try to teach everything, but to weave cross-pillar modules, joint studio project initiatives, and shared assessments into existing programmes, so engineers, modellers and designers learn the joints alongside their own depth from the start.

The signs of this are already visible. Erasmus+ partnerships and Horizon Europe projects pertaining to XR, increasingly bring cultural-heritage institutions together with engineering schools; immersive media labs are appearing inside universities at a progressive pace; sectoral skills alliances are creating contexts in which industries can co-design training with technology providers. The infrastructure for cross-pillar learning is forming. The next step is to use it deliberately.

What this means for immersive skills development in Europe

The three pillars and their joints translate into concrete choices for the people and institutions shaping Europe's immersive workforce. For educators and training providers, the work is to design across departmental lines, wherein building cross-pillar modules, joint projects and shared assessments into existing curricula, drawing on the Digital Education Action Plan as a framing instrument. For employers and HR leaders, the lesson is to hire for ecosystems rather than roles: building immersive teams that combine deep specialists with strong joint vocabulary, and engaging sectoral Pact for Skills partnerships to co-design upskilling routes in healthcare, tourism and the cultural and creative industries. For policymakers, the priority is to keep aligning the Virtual Worlds Strategy, the AI Act and the European Accessibility Act with the Digital Decade funding instruments, namely Erasmus+, Horizon Europe and the DIGITAL Europe Programme, so the three pillars are supported in steps rather than one at a time. **Table 1** lays out concrete starting points for each group.

Table 1. Implications by reader group: concrete starting points derived from the three-pillar thesis

Educators & training providers	Employers & HR/L&D leaders	Policymakers & EU stakeholders
Integrate XR, 3D and user-design content into existing computer science, design and art programmes, rather than creating new "metaverse degrees."	Hire for teams, not roles. Look for Y-shaped profiles, deep in one area, conversant in the other two.	Connect the frameworks. Align the Virtual Worlds Strategy, AI Act, Accessibility Act and Digital Decade so they work together. Where viable, set non-negotiables.
Run joint projects. Bring technical, artistic and design students together to build one immersive piece, so integration is learned by doing.	Help engineers learn user research; help artists learn real-time engines; help designers learn spatial interaction.	Steer Erasmus+, Horizon Europe and DIGITAL Europe toward projects that bring the three pillars together.
Make immersive literacy part of every student's curriculum, not just specialists, using DigComp 2.2 as a reference.	Join the Pact for Skills partnership in your sector, for example in cultural, health, tourism, to shape upskilling with peers and providers.	Update DigComp 2.2 and ESCO as new immersive roles and pipelines emerge.
Treat accessibility and inclusive design as a core requirement, not an elective.	Plan for compliance early. Incorporate AI Act and accessibility requirements into projects from day one, not as an afterthought.	Invest in citizens. Support immersive literacy through schools, libraries and adult-learning programmes.

This process is also visualised in the infographic below.


XR Development
3D Modelling
User-Side Skills
BUILDING SKILLS FOR IMMERSIVE ENVIRONMENTS
Empowering Education, Industry, and Policy through XR and 3D Innovation
EDUCATORS & TRAINING PROVIDERS
Embed XR, 3D & user design into existing programmes
Promote interdisciplinary immersive projects
Make immersive literacy universal
Prioritise accessibility by design
EMPLOYERS & HR/L&D LEADERS
Hire for teams, not roles
Build Y-shaped talent profiles
Promote cross-disciplinary upskilling
Join sector skills partnerships
Embed compliance from day one
POLICYMAKERS & EU STAKEHOLDERS
Align EU frameworks and strategies
Support projects across all three skill pillars
Update DigComp 2.2 and ESCO
Invest in immersive literacy for all citizens
This brief argues that building, using and governing immersive environments well depends on three interdependent skill clusters: XR development, 3D modelling, and the user-side skills that turn technology into experience.
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Figure 3. Building skills for immersive environments - infographic

The outlook is encouraging. Generative AI is already accelerating both XR development and 3D modelling, lowering the technical barrier to producing convincing immersive environments. That makes the third pillar, the user side, more important, not less. As immersive technologies become easier to build, the deciding factor will increasingly be how thoughtfully they are designed for the people who use them. Europe has the citizens, the creative depth, the policy frameworks and the regulatory imagination to lead on exactly that. Stepping into the metaverse, on European terms, is well within reach.

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