



D7.4: First policy brief

Looking at Europe Through a Virtual Reality Headset

How Can We Leverage the Immersive Technology Industry to Address Europe's Most Pressing Challenges

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Abstract	The European immersive technology sector faces substantial barriers hindering SMEs and startups from fully leveraging the digital single market. Ethnographic and quantitative research highlights persistent regulatory fragmentation, inadequate funding mechanisms, skills shortages, and infrastructure deficits. Addressing these challenges requires comprehensive regulatory simplification, enhanced funding tailored to SME needs, robust digital infrastructure investment, and targeted improvements in talent mobility. Strengthening competition policy and maximizing AI sandbox utility are crucial. Implementing these actions will create an innovation-friendly ecosystem, positioning the EU to achieve digital sovereignty and maintain global competitiveness in the rapidly evolving immersive technology and virtual worlds landscape.
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* R: Document, report (excluding the periodic and final reports)

DEM: Demonstrator, pilot, prototype, plan designs

DEC: Websites, patents filing, press & media actions, videos, etc.

DATA: Data sets, microdata, etc.

DMP: Data management plan

ETHICS: Deliverables related to ethics issues.

SECURITY: Deliverables related to security issues

OTHER: Software, technical diagram, algorithms, models, etc.

EXECUTIVE SUMMARY

The European Union's ambitious vision for Web 4.0 and virtual worlds faces significant hurdles, particularly for Small and Medium-sized Enterprises (SMEs) and startups, which are crucial drivers of innovation. While “looking at Europe through a virtual reality headset” makes us see the intricacies of today’s digital single market, the imperative must be focusing on how European SMEs and startups founders navigate and experience doing business in Europe.

Ethnographic research reveals a "business journey" fraught with persistent regulatory fragmentation, burdensome administrative requirements, and substantial market access challenges.

Concurrently, quantitative data on digital services maturity highlights a persistent gap between EU SMEs and larger enterprises, as well as a considerable distance from the EU's own 2030 digital transformation targets. Despite existing EU initiatives designed to foster digital growth and support SMEs, the pace of digital transformation and the efficacy of current support mechanisms require accelerated and refined implementation to unlock the full potential of the single market for virtual worlds innovators.

This study proposes targeted interventions focusing on comprehensive regulatory simplification, enhanced access to finance and critical digital infrastructure, fostering fair competition against dominant platforms, strengthening digital skills across the workforce, and maximizing the utility and accessibility of AI regulatory sandboxes.

These measures are crucial to create a truly innovation-friendly environment for virtual worlds SMEs, ensuring the EU's competitiveness and digital sovereignty in the rapidly evolving global digital landscape.

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ABBREVIATIONS

AI	Artificial Intelligence
AR	Augmented Reality
DMA	Digital Market Act
DSA	Digital Services Act
EU	European Union
GDPR	General Data Protection Regulation
MOSS	Mini One-Stop Shop
SME	Small to Medium Sized Enterprise
VAT	Value Added Tax
VR	Virtual Reality
XR	Extended Reality

1 INTRODUCTION: THE STRATEGIC IMPORTANCE OF VIRTUAL WORLDS FOR THE EU

Looking at Europe through a virtual reality headset makes us take a critical perspective on the continent's economic health and future competitiveness. Immersive technologies are not merely another set of digital tools; they represent complex, interconnected ecosystems, mirroring the intricate relationships between geography, infrastructure, industries, and people in our physical world.

Hardware, underlying digital infrastructure, specialised software, and diverse applications are inextricably linked within these virtual realms. This holistic view reveals that fragmentation or deficiencies in one area—such as inconsistent data regulations for 3D environments or inadequate high-speed connectivity impacting data-intensive content creation — have cascading impacts across the entire value chain of immersive experiences. This inherent interconnectedness is precisely what makes immersive tech special, positioning startups in this sector as the "ultimate crash test for the economy." If these most agile and innovative businesses struggle with systemic barriers, it signals fundamental flaws in the single market's ability to support any high-growth, innovative sector.

Just as efficient physical infrastructure boosts productivity in the real economy, a seamless virtual world ecosystem can drive significant productivity gains through applications like digital twins, advanced simulations, and remote collaboration across traditional European industries, directly addressing Europe's persistent productivity gap. Moreover, securing Europe's businesses and citizens to thrive in the Web 4.0 landscape is paramount. The EU's ambition for a truly unified digital single market must extend to these immersive environments; if digital borders persist in virtual worlds, it undermines the very essence of the single market, just as physical borders would impede trade. Ultimately, Europe's commitment to human-centric, ethical, and inclusive digital spaces can be framed as a unique competitive differentiator in the virtual world, requiring a holistic approach that embeds these values across all layers of the virtual ecosystem.

The European Union stands at a pivotal juncture in shaping the future of the digital economy. The European Commission's commitment to Web 4.0 and virtual worlds is articulated in its Communication, which outlines an ambitious goal to build sustainable, inclusive, and trustworthy virtual environments across Europe.ⁱ This strategy is not an isolated endeavor but forms a foundational component of the broader Digital Decade policy program, which sets concrete, human-centered targets for 2030, aiming for a prosperous and sustainable digital future for all European citizens and businesses.ⁱⁱ Further demonstrating this commitment, the Commission launched the 'Virtual Worlds Toolbox',ⁱⁱⁱ an online resource designed to empower citizens to safely and effectively navigate these new digital spaces, emphasizing the critical role of education, awareness, and digital skills in fostering widespread adoption and trust.^{iv}

SMEs are unequivocally the backbone of the European economy, constituting an overwhelming 99.8% of all businesses and contributing nearly two-thirds of total employment.^v Their inherent agility and capacity for innovation are particularly vital in nascent and rapidly evolving sectors such as virtual worlds. The EU's policy for virtual worlds and broader digital transformation is driven by a profound dual imperative: to foster innovation and competitiveness while simultaneously ensuring the development of an open, inclusive, ethical, and secure digital space that prioritises and protects citizens' rights.^{vi}

This policy brief aims to provide a comprehensive and rich understanding of the challenges and opportunities faced by virtual worlds SME and startup owners within the EU single market. It achieves this by synthesising qualitative ethnographic insights—the lived experiences and "pain points" of these entrepreneurs—with robust quantitative data on digital services maturity. The objective is to identify critical gaps in current policy frameworks, assess the practical efficacy of existing support mechanisms, and ultimately propose actionable, evidence-based recommendations designed to accelerate the growth, innovation, and international competitiveness of the single market.

2 THE STATE OF THE UNION: A QUANTITATIVE AND QUALITATIVE ASSESSMENT OF THE SINGLE MARKET

Paraphrasing Enrico Letta, the European Union is much more than a market but the state of the single market is the state of the European Union.^{vii}

The significant national disparities in digital maturity represent a direct and substantial threat to the cohesion and effectiveness of the EU's single market for virtual worlds.^{viii} These pronounced regional variations, when combined with the existing regulatory fragmentation, create uneven playing fields and impose additional, often prohibitive, barriers for cross-border operations.^{ix} This ultimately hinders the ability of virtual worlds SMEs to fully capitalise on the EU single market and undermines the EU's collective ambition for a unified, prosperous and competitive digital future.

2.1 CURRENT STATE OF CONNECTIVITY

Broadband internet access is nearly ubiquitous for SMEs, with 94% having access in 2022. In 2024, 95.36% of EU enterprises with at least 10 employees used a fixed broadband connection. However, this widespread basic connectivity masks a significant underlying challenge: only 15.09% of all EU enterprises used the fastest connections (≥ 1 Gb/s) in 2024. This figure is significantly lower for small enterprises (13.27%) compared to large enterprises (36.40%). The average downstream bandwidth in Europe was 645 Mbps in Q4 2024. The cost of business broadband services increased by 11% in Q4 2024, reaching an average of \$146 PPP. Significant regional disparities exist, with western European businesses paying an average of \$156 PPP for 716 Mbps, compared to Eastern European businesses paying \$94 PPP for 636 Mbps. Remote access to enterprise ICT systems is common for email (81% of enterprises), but access to more critical business applications and software is lower (over 65%).^x

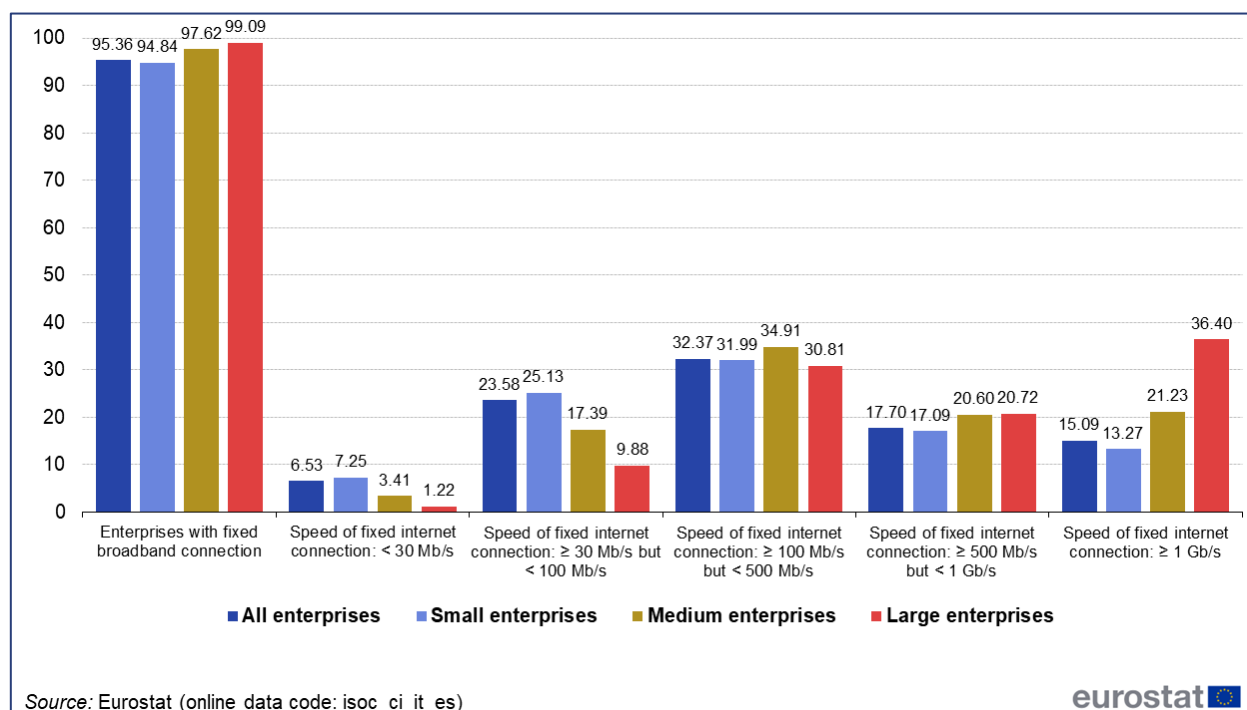


Figure 1: Enterprises with fixed broadband connection, by speed of fixed internet connection and size class, EU 2024 (% of enterprises)

This data indicates that the challenge is not merely about achieving basic connectivity, but about providing the high-capacity, low-latency infrastructure essential for data-intensive virtual worlds and advanced digital applications. The EU's Digital Decade policy program articulates ambitious targets for 2030, including secure and sustainable digital infrastructures, with plans for advanced compute infrastructure like edge nodes and quantum computers. However, the latest reports including the State of the Digital Decade show clearly that Europe is lagging behind in the digital transition.^{xi}

2.2 CURRENT STATE OF DIGITAL PUBLIC SERVICES FOR BUSINESSES

The availability and quality of digital public services are crucial for streamlining administrative processes and facilitating cross-border business operations. The eGovernment Benchmark provides insights into the digital maturity of public services.^{xii}

In 2023, the EU average score on digital public services for businesses was 85.4%. While this indicates a solid level of digitalisation, significant room for improvement remains, especially concerning cross-border services. For 'Cross-border services', the EU average score in 2023 was around 57.1%.^{xiii} This lower score highlights persistent challenges for businesses attempting to operate across member states borders.

Additionally, once looking at the electronic information sharing in the Digital Europe Society Index (DESI) the EU average drops to an underwhelming 43.3% indicating that European businesses, small, medium or large, lag behind on one of the most fundamental uses of ICT.^{xiv}

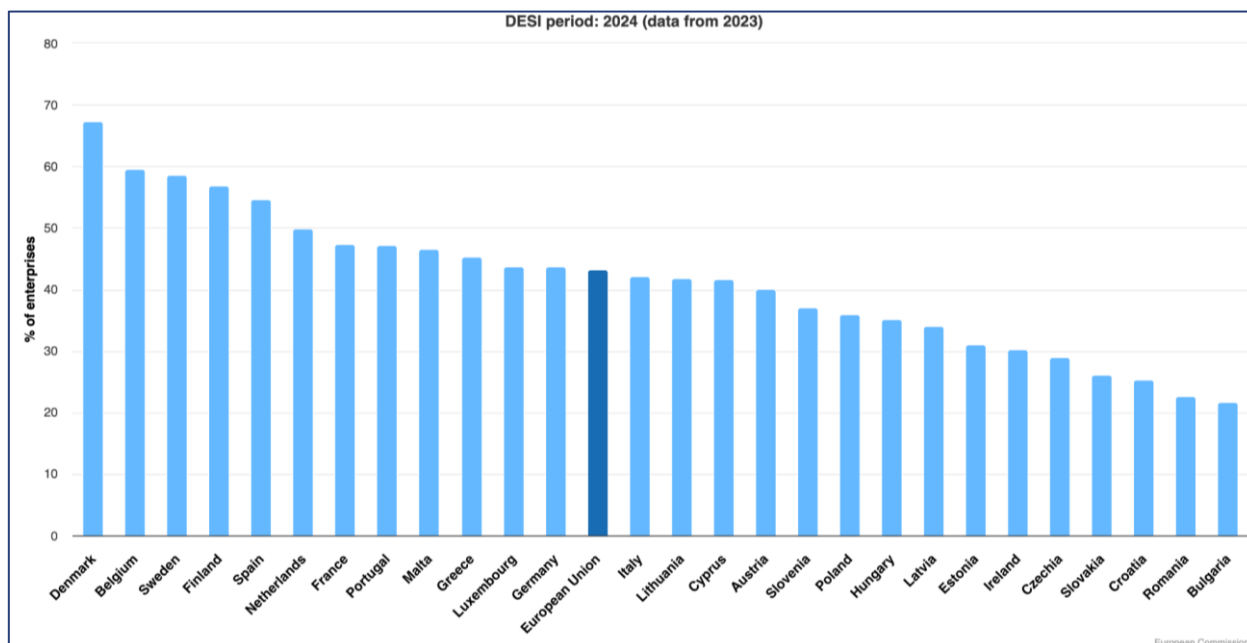


Figure 2: Electronic information sharing, All enterprises (10 persons employed or more)

These figures underscore the need for continued efforts to simplify and digitise government-to-business (G2B) interactions, particularly for cross-border activities, to reduce administrative friction for virtual worlds SMEs.

2.3 CURRENT STATE OF SKILLS

A significant barrier is the human capital deficit, with only 56% of the EU population possessing basic or above basic digital skills in 2023.^{xv}

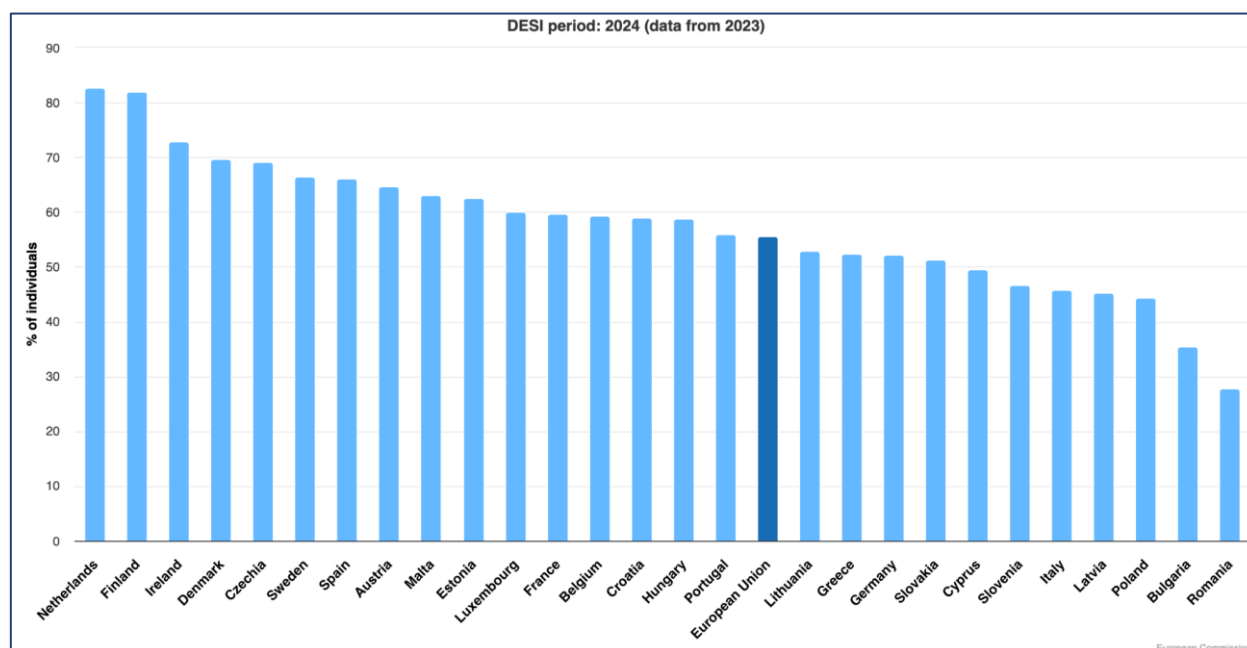


Figure 3: At least basic digital skills, All Individuals (aged 16-74)

This means almost half of the EU population lacked basic IT skills. While 22% of EU businesses provided ICT training in 2024, this figure dramatically rose to 73% for large businesses compared to a mere 21% for SMEs.^{xvi} The lack of employees with necessary IT skills and a shortage of external IT experts are explicitly cited as key obstacles for SMEs. In Germany, for instance, only about one-fifth of all SMEs employ specialists with advanced ICT knowledge, compared to 47% of medium-sized enterprises and 15% of small enterprises.^{xvii} The EU's 2030 target aims for at least 80% of the population to have basic digital skills and for 20 million ICT specialists, with gender convergence.^{xviii} In 2022, over 9 million people in the EU were employed as ICT specialists, accounting for almost 5% of the bloc's workforce, a figure that has been growing over time.^{xix} However, the share of employed ICT specialists varies significantly across member states, from 9% in Sweden to 3% in Greece and Romania.^{xx}

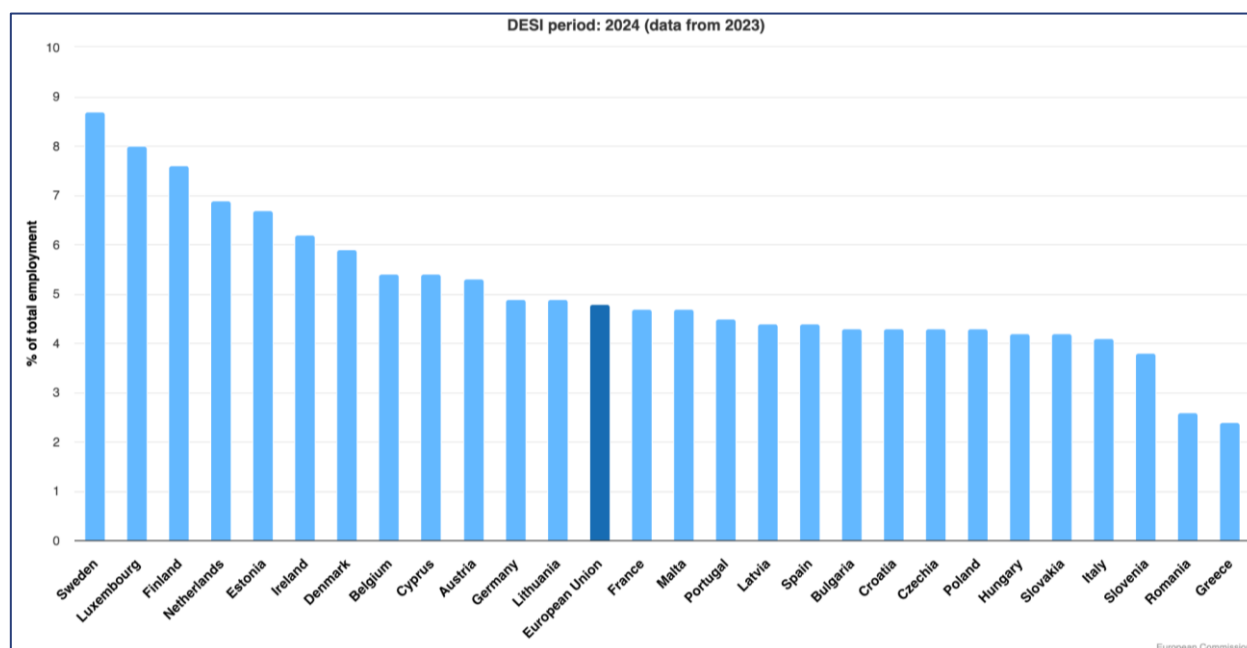


Figure 4: ICT specialists, Total

2.4 THE STATE OF THE SINGLE MARKET

The European Union recognises that its future competitiveness and prosperity hinge on its ability to innovate and adapt in the digital age. This understanding is deeply embedded in its strategic policy framework, which has been significantly informed by recent high-level analyses of Europe's economic standing.

The Draghi Report, commissioned by President von der Leyen, provides a stark diagnosis of Europe's economic predicament, warning that the continent can no longer rely on past growth factors.^{xxi} It highlights Europe's persistent productivity growth gap of over two decades, its static industrial structure dominated by traditional sectors, and a critical failure to translate innovative ideas into marketable technologies and integrate them into its industrial base. The report underscores that innovation must be at the heart of European renewal to avoid a "*slow agony*" of economic decline.^{xxii} Complementing this, the Letta Report emphasises the urgent need for Europe to leverage its single market much more effectively, warning that failure to do so risks losing relevance in a world characterised by intense global competition. It asserts that the single market is "much more than a market" – it is a powerful catalyst for growth, prosperity, and solidarity, crucial for increasing productivity, protecting the European social model.^{xxiii}

Not everything is lost, though. In fact, quite the opposite. Over the last five years the number of unicorns in Europe almost tripled, from less than 100 to more than 250.^{xxiv}

The question then becomes, how are innovators in Europe navigating the single market and what could be done to make their experience better.

3 THE ENTREPRENEURIAL JOURNEY: CHALLENGES AND OPPORTUNITIES FOR VIRTUAL WORLDS SMES

The path for virtual worlds SMEs and startups within the European single market is characterised by a unique set of challenges and opportunities, as revealed through ethnographic research and broader industry analysis.

To truly understand the pulse of Europe's virtual worlds sector, we must look beyond statistics and delve into the lived experiences of the entrepreneurs shaping its future. These "deep-dives" offer a human-centric perspective on the challenges and triumphs within the European single market, illustrating the real-world impact of policy and infrastructure.

DEEP-DIVES: STORIES FROM THE EUROPEAN VIRTUAL WORLDS FRONTIER

ONEBONSAI: THE BELGIAN PIONEER NAVIGATING A FRAGMENTED MARKET

Based in Belgium, OneBonsai embarked on a mission to revolutionise corporate training through immersive virtual reality. Their vision is clear: to offer cutting-edge VR solutions that transcend traditional learning methods. Yet, their journey quickly reveals a European landscape that, despite its grand single market ambitions, often feels like a patchwork of distinct territories.

A primary hurdle for OneBonsai was **securing adequate funding** to scale their ambitious projects. While Europe boasts significant capital, the founder observed a palpable *"risk aversion among European investors compared to the U.S.,"* especially for investments exceeding €1,000,000. This often leaves innovators with a stark choice: *"either remain small or seek funding outside Europe."*

Beyond capital, the **regulatory environment** proved to be a labyrinth. OneBonsai found themselves grappling with regulations seemingly *"designed for large corporations,"* yet small companies are expected to adhere to the same stringent requirements. The inconsistent implementation of EU laws, like the general data protection regulation (GDPR) and the impending artificial intelligence (AI) act, across different member states created a heavy administrative burden, particularly for their cross-jurisdictional operations.

For OneBonsai, operating in Europe has been not a unified market but a collection of fragmented national markets, each with its own rules, languages, and administrative quirks. Scaling often means establishing costly subsidiaries and navigating complex logistical and financial burdens, especially for hardware-dependent VR solutions. Despite these systemic challenges, OneBonsai adapted their team by recruiting from diverse backgrounds, including game developers, whose skills could be honed for their niche immersive tech needs.

OneBonsai's story underscores the urgent need for a truly seamless single market that supports the cross-border growth of deep tech SMEs as they hold the potential of making upskilling and reskilling more accessible and effective throughout the European Union.

READY PLAYER ME: THE ESTONIAN AVATAR ARCHITECT SCALING GLOBALLY

From the digital heart of Estonia, Ready Player Me sets out to build a universal avatar platform, enabling users to create and use their digital identities across various virtual worlds. Their ambition was global, and in many ways, the EU's single market facilitated their rapid ascent.

Initially, Ready Player Me encountered an **underdeveloped funding ecosystem** in Europe a decade ago, relying heavily on local investors from Estonia, Finland, and Germany. While the landscape has since improved with the entry of larger funds, they still find the process of applying for European public grants to be *"time-consuming and complex"* due to bureaucratic hurdles and extensive reporting requirements. Their strategy evolved to combine both private and public funding sources, diversifying their financial base.

In terms of **regulation**, Ready Player Me found GDPR to be rather manageable, but compliance with the digital services act (DSA), particularly its content moderation requirements for user-generated content, adds significant operational costs. Despite these specific challenges, their experience highlights how an overall consistency of European regulations is a positive factor for cross-border operations, simplifying compliance when expanding into new markets compared to navigating disparate global legal frameworks.

Ready Player Me's ability in navigating the EU single market allowed them to scale efficiently, leveraging remote working solutions and platforms to maintain operational flexibility. However, they still face challenges in **talent acquisition**, initially limited by Estonia's local talent pool for niche gaming roles. This pushes them to recruit across Europe, encountering varying labor laws, such as Germany's three-month notice period, which required them to adapt their hiring strategies.

Ready Player Me's story highlights the dual nature of the EU: a unifying force for market access, yet still presenting specific regulatory and talent mobility frictions that require agile navigation.

STRATUM1: BRIDGING REALITIES FROM AUSTRIA

Born from a legacy of cinematic VR content production dating back to 2016, Austria's Stratum1 has evolved into a pioneering web-based, interoperable immersive platform. Their vision is to seamlessly connect 2D and 3D content, allowing creators to *"claim a space"* and share their digital creations globally with ease.

The journey has been one of navigating both the promise and the pitfalls of innovation. While a national deep tech grant provided crucial early **funding**, although grant application processes are often cumbersome, akin to a *"master thesis."* Additionally they often come with a significant caveat: the obligation to hire talent that is based in Austria. This geographical constraint proved challenging in a global field like XR. Additionally, there are instances where **hiring** processes are hampered by the need for relocation embedded in taxation laws around Europe, underscoring the difficulty of truly *"hire the best talent wherever you are."*

The most striking challenge for Stratum1 lies in the **regulatory environment**. There is a "big gap" between 2D and 3D regulations. *"Everything that works in 2D now in terms of regulations and social platforms is not necessarily working for 3D,"* is explained. The main complexities revolve around data, privacy, and intellectual property in immersive, social spaces. Virtual worlds imply a mindset shift, regardless of how immersive the experience is. On the web we are subject to *"digital borders,"* which bear the need to *"know if we are entering another set of rules"* when transitioning between virtual platforms based in different regions.

Despite these hurdles, Stratum1 thrives on its **global market access** and open approach. Being *"fully web-based and interoperable,"* their platform offers a *"low barrier and low access, an easy entry point into the immersive world."* This has enabled them to cultivate a vibrant global community.

Stratum1 experience highlights the need for legislative and jurisdictional clarity as well as a regulatory environment 3D-centred. Their story is a testament to the power of open innovation as well as the ubiquity of virtual worlds and need for a global perspective.

REVERA: THE ITALIAN CULTURAL HERITAGE INNOVATOR BATTLING LOCAL FRICTION

For five years, Revera, an Italian company, has specialized in crafting immersive virtual reality environments, primarily for cultural heritage sites. Their work breathes new life into monuments and archaeological wonders, offering enhanced experiences that captivate audiences. Now, they are venturing into the competitive gaming market, seeking their first intellectual property.

Revera's experience paints a vivid picture of the **funding challenges** in member states. The novelty of this field makes it challenging to stay abreast of technological developments. This often leads to funds being misallocated and resulting in *"very bad content production... not enough to satisfy the minimum requirements from the global market in terms of quality."*

Compounded by *"heavy taxation and no guarantees,"* securing capital is a constant uphill battle, especially for service-oriented companies like Revera, as venture capitalists typically companies that produce products, not services.

The **regulatory environment** suffers from the absence of guidelines in order to determine the quality of a product in VR/AR, which allows low-quality content to receive public funds, damaging the industry's reputation. This lack of clear standards, combined with the high cost of hiring due to *"huge taxation on what you pay to a professional and what they perceive from you,"* makes **talent acquisition** a significant hurdle. Additionally *"there isn't a proper course or university course or any kind of infrastructure that can provide people with the competencies needed in this kind of industry, at least in Italy,"* making it easier for companies to hire junior staff and train them internally.

Perhaps most strikingly, Revera's experience with **digital infrastructure** reveals a stark reality. Despite operating in a high-tech field, their office south of Rome lacks high speed connectivity this can lead to *"days of delays"* when sharing material with international partners, sometimes even necessitating *"a physical meeting... to share a physical hard disc"* to avoid project slowdowns.

Despite these formidable national challenges, Revera has found success by carving out a niche in cultural heritage and leveraging international opportunities, including a significant project with Saudi Arabia that built their portfolio and led to collaboration with UNESCO.

Revera is perhaps the clearest example of how entrepreneurial acumen enables European startups founders to grow and innovate in a market that throws curveballs at businesses. While entrepreneurship is commendable this proves unequivocally that the very same people that could focus on developing and delivering high-quality products and services are often caught up with coming up with creative ideas on how to make the best out of the regulatory landscape and infrastructure they have, rather than innovating.

The ethnographic research reveals that while the overarching challenges (funding, regulation, talent, market access, infrastructure) are common across all virtual worlds SMEs and startups in Europe, the precise nature of their needs is often distinct. It is not merely that they experience the same needs differently; in many cases, the *type* of solution required to meet that need is fundamentally different, reflecting their divergent paths.

3.1 FUNDING CHALLENGES

- **Common Pain Point:** Fragmented and often risk-averse European funding landscape, bureaucratic public grants.
- **Global Platform or Product Innovator (e.g., Ready Player Me, Stratum1):**
 - **Experience:** These companies, typically product-focused and aiming for rapid, global scale, find that traditional European VCs are often too risk-averse or lack the deep pockets of their US counterparts. Public grants, while a source, are cumbersome and can impose restrictive clauses (e.g., mandatory local hiring) that hinder their ability to attract global talent. They need substantial, agile capital to compete on a global stage.
 - **Specific Need:** Access to **large-scale, internationally competitive private capital** that understands high-growth, deep-tech ventures, and **streamlined, fast-tracked public funding mechanisms** that do not impose restrictive nationalistic conditions. Their need is for *scale-up capital* that enables rapid global expansion.
- **Niche Service Provider (e.g., OneBonsai, Revera):**
 - **Experience:** These companies, often B2B service providers, struggle significantly to attract venture capital because VCs typically prioritise product-based businesses with clear, scalable ideas. They are heavily impacted by national public funding bureaucracy, which can misallocate funds due to a lack of technological understanding by authorities. High national taxation also directly impacts their ability to hire and grow.
 - **Specific Need:** Access to **targeted public funding** that is tailored to and understands service-based models, **national tax incentives** for hiring and investment, and **local/national networks** that can connect them with appropriate funding opportunities. Their need is for *foundational capital* and *operational support* within their specific national/regional context.
- **Nuance in Needs:** While both need funding, the *type* of funding and the *mechanisms* to access it are different. Global innovators need capital for aggressive scaling and global competition, while niche providers need support for sustainable growth within their often nationally-bound service models, requiring more localized and sector-specific financial instruments.

3.2 REGULATORY ENVIRONMENT

- **Common Pain Point:** Complex, fragmented, and often outdated regulatory environment, disproportionate compliance burdens for SMEs.

- **Global Platform or Product Innovator (e.g., Ready Player Me, Stratum1):**
 - **Experience:** They are acutely sensitive to the "2D vs. 3D regulatory gap," where existing rules for traditional digital platforms don't adequately address the unique challenges of immersive, social 3D environments (e.g., data, privacy, IP, content moderation). The Digital Services Act (DSA) content moderation requirements, for instance, impose significant operational costs. They also express a need for "digital borders" or "provenance labels" to inform users about the regulatory jurisdiction of virtual spaces. They need fast-tracked regulatory sandboxes to remain competitive.
 - **Specific Need: Agile, forward-looking, and harmonized EU-wide regulation** specifically designed for the unique challenges of immersive 3D environments; clear, enforceable standards for "digital provenance" and content quality; and **truly accessible and fast-tracked regulatory sandboxes** that de-risk innovation without slowing down their global pace.
- **Niche Service Provider (e.g., OneBonsai, Revera):**
 - **Experience:** They perceive regulations as primarily designed for large corporations, imposing disproportionate compliance burdens. They face inconsistent interpretation and implementation of EU laws like GDPR at the national level. Revera specifically highlighted the absence of clear quality guidelines and standards for VR/AR content in Italy, leading to misallocation of public funds to low-quality productions. Their B2B model sometimes allows them to rely on clients for regulatory guidance, offering some agility.
 - **Specific Need: Simplified, proportional compliance pathways** for SMEs within *existing* regulatory frameworks; **clear, technology-informed quality and safety standards** for immersive content (especially crucial for public procurement); and **harmonized interpretation and enforcement** of existing EU laws at the national level.
- **Nuance in Needs:** Both need regulatory clarity and simplification. However, global innovators need *proactive, future-proof regulation* for emerging immersive challenges and rapid testing environments, while niche providers need *better implementation and simplification of existing rules* at the national level, coupled with quality standards for their specific content.

3.3 TALENT ACQUISITION

- **Common Pain Point:** Challenges in finding and retaining specialised talent, skills gaps, and complexities of cross-border hiring.
- **Global Platform or Product Innovator (e.g., Ready Player Me, Stratum1):**
 - **Experience:** While they can leverage remote work, they are still impacted by limited local talent pools and administrative hurdles for cross-border hiring. Relocation barriers due to national tax laws (e.g., Austria) prevent them from hiring the "best talent wherever you are." They navigate complex national labor laws (e.g., Germany's notice periods).
 - **Specific Need: Harmonized EU labor laws and tax incentives** to facilitate

seamless cross-border hiring and remote work; **streamlined visa processes** for attracting global talent; and **pan-European talent networks** that support remote and global hiring. Their need is for *unrestricted talent mobility across the EU and globally*.

- **Niche Service Provider (e.g., OneBonsai, Revera):**
 - **Experience:** They face a significant lack of specialised local education and infrastructure (e.g., Italy) for immersive tech skills, forcing them to hire junior staff and train them internally. High national taxation directly impacts their ability to hire new employees.
 - **Specific Need:** **Targeted national education and training programs** for immersive tech; **national tax incentives** for hiring; and **local/national talent networks** to connect with available skills. Their need is for *stronger national talent pipelines and local hiring support*.
- **Nuance in Needs:** The underlying need for skilled talent is universal. However, global innovators prioritise *EU-wide harmonisation and global access* to talent, while niche providers emphasize *strengthening national educational infrastructure and local hiring incentives*.

3.4 MARKET ACCESS AND COMPETITION

- **Common Pain Point:** Dominance of large tech platforms (gatekeepers), slow enforcement of competition laws.
- **Global Platform or Product Innovator (e.g., Ready Player Me, Stratum1):**
 - **Experience:** They are impacted by (the lack of) digital borders created by dominant platforms or countries and the lack of open interoperability standards. Speed of innovation and market entry is paramount for them to compete with U.S. and Asian companies.
 - **Specific Need:** **Robust and swift enforcement of competition laws; active promotion of open standards and interoperability protocols** to counter proprietary ecosystems; and **reduced regulatory burdens** that hinder rapid market entry and innovation. Their need is for *a truly open and level digital playing field*.
- **Niche Service Provider (e.g., OneBonsai, Revera):**
 - **Experience:** They view Europe as a fragmented market, often requiring costly localised presence.
 - **Specific Need:** A **truly unified digital single market** with significantly reduced administrative and logistical barriers for both physical and service-based cross-border operations; **support for niche market players** and diverse business models; and **incentives for EU-based publishing and distribution channels**. Their need is for *reduced friction in physical and administrative cross-border expansion*.
- **Nuance in Needs:** Both need fair competition and frictionless market access. However, global innovators focus on *digital ecosystem openness and anti-monopoly action*, while

niche providers emphasise *reducing physical and administrative fragmentation* within the single market.

3.5 DIGITAL INFRASTRUCTURE

- **Common Pain Point:** Inconsistent high-speed connectivity and its impact on operational efficiency.
- **Global Platform Innovator (e.g., Stratum1):**
 - **Experience:** While their web-based, hardware-independent solutions mitigate some dependency on local high-speed broadband, they still benefit significantly from ubiquitous Gigabit connectivity (5G/6G) and advanced headset technology for optimal user experience and future innovation.
 - **Specific Need: Ubiquitous, affordable, and cutting-edge digital infrastructure** (including 5G/6G and distributed edge computing) across all member states to support advanced immersive experiences; and policies that encourage and support web-based, hardware-independent solutions. Their need is for *next-generation, pervasive infrastructure*.
- **Niche Service Provider (e.g., Revera):**
 - **Experience:** They are directly and severely impacted by poor high-speed connectivity in specific national/regional locations, leading to significant operational delays for large file transfers and cross-border collaboration (e.g., "days of delays" in Italy). They also note the high costs of advanced infrastructure in some countries.
 - **Specific Need: Consistent and affordable high-speed digital infrastructure** across all regions, particularly addressing "blind spots" in less developed areas; and targeted investment to ensure foundational connectivity for data-heavy operations. Their need is for *reliable, basic high-speed infrastructure to overcome fundamental bottlenecks*.
- **Nuance in Needs:** Both need robust digital infrastructure. However, global innovators need *cutting-edge, ubiquitous infrastructure* for advanced experiences, while niche providers need *reliable, foundational high-speed connectivity* to overcome basic operational bottlenecks in specific regions.

3.6 ETHNOGRAPHIC INSIGHTS: LIVED EXPERIENCES OF SME AND STARTUP OWNERS

The experiences of immersive tech and virtual worlds business owners highlight a "business journey" often complicated by systemic hurdles.

Regulatory and Administrative Burdens: EU SMEs in immersive tech and virtual worlds consistently report significant administrative burdens, market fragmentation, and regulatory inconsistencies as major impediments. These challenges become particularly acute when businesses attempt to engage in cross-border activities within the EU's ostensibly unified digital single market. Specific difficulties include navigating disparate national laws, especially

concerning critical areas such as data protection and privacy (e.g., GDPR compliance), intellectual property rights, and digital services regulations. The slow pace of regulatory convergence mechanisms across member states means that companies frequently incur substantial additional compliance costs, often necessitating expensive localised legal expertise. More broadly, regulatory burdens are identified by over 60% of all EU companies as a significant obstacle to investment, with a striking 55% of SMEs specifically flagging administrative burdens as their greatest challenge.^{xxv} BusinessEurope further highlights an increase in these burdens due to recent legislative changes and strongly advocates for a comprehensive reduction that extends beyond mere reporting requirements to encompass overall regulatory compliance costs and the removal of cross-border barriers.^{xxvi} The ethnographic business journey methodology offers a powerful qualitative lens for diagnosing the practical failures of existing policies. It vividly illustrates that regulatory fragmentation and administrative burdens are not just abstract compliance issues but direct, tangible impediments to operational efficiency, cross-border scaling, and innovation for virtual worlds SMEs. By understanding these specific pain points, policymakers can design more targeted, human-centric solutions that genuinely alleviate the real-world pressures on entrepreneurs.

Market Access Barriers and Competition Dynamics: Despite the theoretical promise of a level playing field within the single market, the reality for SMEs is that competition is heavily skewed in favour of larger, entrenched corporations. Dominant tech platforms, particularly those with established VR and AR ecosystems, effectively act as gatekeepers. They dictate the rules of engagement for smaller firms, making it exceedingly difficult for virtual worlds SMEs to gain market traction or scale without incurring prohibitive commissions or facing restrictions on innovative features. While the Digital Markets Act (DMA) was specifically designed to address these market imbalances and curb the power of such gatekeepers, its enforcement is perceived as slow. This delay leaves many SMEs without fair and timely access to markets, undermining the DMA's intended protective effect.^{xxvii} Recent designations of major tech companies as gatekeepers under the DMA indicate ongoing, albeit slow, efforts to address their market dominance.^{xxviii} Regulatory complexity and administrative burden are not isolated issues but actively exacerbate market access challenges for virtual worlds SMEs. The disproportionate compliance costs faced by smaller firms hinder their ability to compete effectively against dominant platforms, even with the digital market act in place.^{xxix} This creates a feedback loop where regulatory friction reinforces existing market power imbalances, thereby undermining the single market's promise of a level playing field and stifling innovation.

Access to Capital and Compute Resources: A critical challenge, particularly for AI startups (which are intrinsically linked to virtual worlds development), is the pervasive difficulty in accessing sufficient capital. Fragmented investment channels across Europe significantly limit their ability to scale operations.^{xxx} A compelling statistic highlights this issue: while €10 trillion in household savings exists within the EU, this vast capital rarely fuels tech ventures,

underscoring the urgent need for a more integrated "savings and investment union."^{xxx} Furthermore, a significant limitation identified is the lack of accessible compute and data resources, which are essential for researchers and startups to train and develop advanced models.^{xxxii} The EU's Digital Decade targets aim to mitigate this by planning for 10,000 climate-neutral, highly secure edge nodes and the development of the first quantum computers by 2030. Despite the EU's explicit ambition for digital leadership and the substantial domestic capital available within its borders, there is a critical systemic failure in channeling this capital effectively into high-growth tech ventures, particularly for virtual worlds SMEs. This points to a deeper structural issue in the EU's investment ecosystem, characterised by fragmented investment channels and potentially disincentivizing tax regimes. This systemic gap undermines the ability of innovative SMEs to secure adequate funding, scale operations, and compete on a global stage.

Opportunities: Innovation Potential and Growth Drivers

Despite the formidable challenges, the immersive tech and virtual worlds sectors present significant opportunities for EU SMEs to contribute unique value. They can help shape a distinctive European approach to virtual worlds, designed to be open, transparent, inclusive, ethically and environmentally responsible. The EU's Virtual Worlds Strategy is explicitly geared towards fostering sustainable, inclusive, and trustworthy virtual environments. These efforts are crucial for shaping industry standards, promoting interoperability, and influencing future funding priorities. The policy action on AI, while introducing new compliance obligations, is also designed to support SMEs through access to computing resources and AI models. The European Competitiveness Compass is set to guide action to shape a competitive landscape in Europe and, together with the European Union Startup and Scaleup Strategy and the Single Market Strategy, foster innovation and economic prosperity.

4 CONCLUSIONS AND ACTIONABLE POLICY RECOMMENDATIONS

The analysis of the European single market, focusing on the experiences of virtual worlds SME and startup owners, reveals a complex interplay of challenges and opportunities. The ethnographic accounts derived from virtual worlds SME owners provide vivid, human-centric illustrations of the tangible impact of regulatory fragmentation, pervasive administrative burdens, and the stifling market conditions. These qualitative observations are not isolated anecdotes but are powerfully reinforced and given scale by the quantitative data.

This evidence reveals:

- a significant and persistent gap in access to high-speed connectivity,
- wide disparities in digital maturity across individual member states, which creates an inherently uneven playing field within the ostensibly unified single market
- persistent, foundational challenges in access to critical finance and essential digital skills

While the EU has commendably established a comprehensive policy framework, including the Web 4.0 Strategy, Digital Decade, AI Act, and Digital Simplification Package, alongside various support initiatives such as AI regulatory sandboxes, and EUSAIr, their full effectiveness for virtual worlds SMEs is demonstrably hampered.^{xxxiii}^{xxxiv}

This is primarily due to issues of coordination, accessibility, and the practical, cumulative burden of compliance that continues to weigh heavily on smaller enterprises. The comprehensive analysis reveals that for virtual worlds SMEs, the European Digital single market remains largely aspirational rather than a fully functional and unified reality. Persistent regulatory inconsistencies, significant administrative burdens, and pronounced national disparities in digital maturity¹⁴ collectively create a fragmented and challenging operational environment. Therefore, policy recommendations must fundamentally aim not just at providing individual support measures but at genuinely *harmonising* the digital landscape to unlock true cross-border scaling potential and ensure equitable opportunities across all member states.

Given the inherently rapid and unpredictable evolution of virtual worlds and AI technologies, EU policy must fundamentally embrace a paradigm of proactive regulatory learning and agile adaptation. While the establishment of AI regulatory sandboxes is a commendable step towards *regulatory learning*, it must be robustly complemented by continuous, rigorous ex-post evaluations, sustained stakeholder dialogue, and a clear commitment to agile policy adjustments. This ensures that regulation remains fit-for-purpose, effectively fosters innovation, and avoids inadvertently stifling growth in this dynamic technological landscape.

The effectiveness of policy interventions designed to support virtual worlds SMEs is profoundly interdependent. Addressing regulatory burdens in isolation, without concurrently tackling critical market access issues or enhancing access to finance, will result in limited and fragmented outcomes.

A truly holistic, integrated policy approach that simultaneously strengthens digital skills, improves infrastructure, fosters fair competition, and comprehensively simplifies regulation is the only way forward towards a truly European market.

4.1 POLICY RECOMMENDATIONS

To foster a vibrant and competitive ecosystem for virtual worlds SMEs and startups within the European single market, the following actionable policy recommendations are put forth:

REDESIGN FUNDING MECHANISMS FOR DIFFERENT BUSINESS MODELS

Pain Points Addressed: Fragmented venture capital, bureaucratic public grants, national funding restrictions (e.g., local hiring), high national taxation impacting hiring, and VC preference for product-based companies over service providers. The "double valley of death" for startups (lab to market, and scaling).

- **1.1. The European Commission and Member States Create Service-First and Deep Tech-Adapted Public Funding Streams with Time-to-Grant Caps:**
 - **Recommendation:** Establish dedicated, simplified, and **semi-automated public funding schemes** within existing EU or national grant programs specifically designed for **service-oriented immersive tech SMEs** and **deep tech ventures**. These schemes should prioritise project-based funding with clear, technology-informed criteria, reduce administrative burden by imposing a **three-month "time to grant" cap**, taking inspiration from the European Patent Office Programme for the ACcelerated prosecution of European patent applications (PACE).¹ Link this initiative to recommendation 2.1.
 - **Impact:** Directly addresses misallocations of funds due to lack of technological clarity by decision-makers and the difficulty for service providers to attract VC. It ensures public money supports a broader spectrum of innovation, particularly for capital-intensive virtual worlds deep tech, and accelerates access to crucial early-stage funding.
 - **Timeline:** Urgent. Take immediate action and implement it within the next multi-annual financial planning.
- **1.3. The European Innovation Council and the European Central Bank Design Public-Private Investment Funds for Scale-ups**
 - **Recommendation:** Launch a **pan-European co-investment fund** backed by the European Innovation Council and national banks to support top-tier to provide loans to First-of-a-Kind (FOAK) stage scale-ups. Access to this scheme should be based on demonstrable customer interest, even in the absence of stable revenue or profitability, drawing inspiration from models like France's Bpifrance.
 - **Impact:** Catalyses investments across the European Union, addressing the reluctance among angel investors and the lack of scale-ups funding.
 - **Timeline:** Urgent. Take immediate action to properly align the public-private partnership funding.

¹ <https://information.patentepi.org/4-16/fast-and-sure-options-to-quicker-processing-before-the-epo/>

IMPLEMENT INSTRUMENTS FOR PROACTIVE REGULATORY LEARNING

Pain Points Addressed: The 2D-3D regulatory gap, lack of clear quality standards for immersive content, slow enforcement of digital acts, disproportionate compliance burdens for SMEs, and the concept of digital borders. Regulatory fragmentation and "gold-plating" by member states.

- **2.1. The European Commission and the Public-Private Partnership Design "3D-Native" Regulatory Guidelines, Quality Passport and IP Support:**
 - **Recommendation:** Task the European Commission, in collaboration with industry (including the public-private partnership) and technical standards bodies, to rapidly develop and publish clear, non-binding "3D-native" regulatory guidelines for virtual worlds. This includes specific guidance on data, privacy, IP, and content moderation in immersive environments, alongside a voluntary "European Quality Passport" or "Provenance Label" for virtual spaces and content.
 - **Impact:** Directly addresses "2D vs 3D regulation gap" and the need for provenance labels. It also responds to the need for guidelines in order to determine the quality of a product to combat low-quality content and strengthens IP protection for innovators.
 - **Timeline:** Important. Leverage the public-private partnership to kickstart the work and aim for completion of the drafts by the end of the European Commission's mandate.
- **2.2. The European Commission and Member States Design and Implement a Fast-Tracked and SME-Centric 28th regime:**
 - **Recommendation:** Establish a "New European Company Regime" (the 28th Regime) as an optional, modern legal framework allowing businesses to operate seamlessly across the single market, based on the once-only principle and identical administrative processes across member states. This regime should include a unified startup register and single startup ID, aiming for company establishment within 48 hours. Draw from the EU Inc. initiative.
 - **Impact:** Directly addresses the need for fast procedures and harmonisation. It provides a de-risked environment for SMEs to test AI-powered immersive solutions, reducing compliance costs and market entry barriers, and can also facilitate SME access to public contracts.
 - **Timeline:** Urgent. It must be drafted by the first quarter of 2026.
- **2.3. The European Union Strengthens the "Competitiveness Check":**
 - **Recommendation:** Build on the mandatory "Competitiveness Check" for all new EU legislation impacting digital services and technologies, specifically assessing the cumulative impact on cross-border operations, interoperability, and market fragmentation for SMEs. Take example from the latest digital readiness policy making

statements and implement a Competitiveness Check hub within the European Commission. Devise a clear mechanism for immediate adjustment if negative impacts are identified.

- **Impact:** It ensures new regulations genuinely foster, rather than hinder, a unified digital market for virtual worlds SMEs, and simplifies cross-border operations.
- **Timeline:** Urgent. Since it builds on existing regulations it must be implemented by the end of 2025.

ENHANCING TALENT MOBILITY AND SKILLS DEVELOPMENT

Pain Points Addressed: Lack of specialised education, high national hiring costs, administrative/legal barriers to cross-border talent mobility.

- **3.1. The European Commission and Member States Strengthen and Facilitate the Access to the Blue Card :**
 - **Recommendation:** Develop a standardised EU-wide framework for automatic renewal where eligibility is verified digitally based on continuous employment and compliance with conditions, reducing administrative overhead for workers and authorities. Implement a fast-track notification system allowing blue card holders to move and work in other member states without submitting a full new application, relying instead on a digital pre-approval mechanism. This could be linked to an EU skills registry to facilitate verification. Harmonise key social security rights and benefits under the blue card scheme, supported by EU legislation ensuring pension, healthcare, and other social benefit portability, especially for workers in multi-country assignments or remote work. The European Social Security Coordination regulations (Regulation (EC) No 883/2004) could be enhanced to cover blue card holders explicitly.^{xxxv} Simplify and harmonise family reunification procedures, possibly enabling simultaneous applications for family members with blue card holders and ensuring their automatic right to work and access to public services. Explicitly extend blue card eligibility to remote workers who provide highly skilled services across borders, adapting criteria to capture non-traditional employment models. This would require new EU-level guidance or directives. Introduce a flexible, role-based language proficiency framework, recognising that many technical roles require minimal or no local language skills, thereby lowering barriers for specialists.
 - **Impact:** Directly responds to the need for a talent pool and addresses the "fragmented labour market" and "problems of labour mobility."¹ It enables SMEs to attract and retain global talent more easily.
 - **Timeline:** Important. Aim for completion of the draft by the end of the European Commission's mandate.

FOSTERING OPEN MARKETS AND ROBUST DIGITAL FOUNDATIONS

Pain Points Addressed: Connectivity.

- **4.1. The European Commission Pairs the Initiatives on Access to AI with a "Gigabit-for-SMEs" Infrastructure Investment:**
 - **Recommendation:** Launch a dedicated EU investment program to ensure ubiquitous, affordable, and high-speed (Gigabit and beyond) digital infrastructure specifically for SMEs across all member states, with a focus on addressing blind spots in less developed regions. This includes incentives for edge computing deployment to support data-intensive virtual worlds.
 - **Impact:** Directly addresses poor high-speed connectivity in Europe. It provides the foundational digital backbone necessary for all virtual worlds SMEs to operate efficiently and scale.
 - **Timeline:** Urgent. Take immediate action and implement it within the next multi-annual financial planning.

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