

XR Sweden

From extended reality to extended human

Strategic recommendation report



Annika Rickne, Eric Holmstedt, Per Johannesson, Mario Romero, Asreen Rostami, Fredrik Trella, Fredrik Viksten, Peter Westerdahl and Anders Ynnerman



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Background

This report 'XR Sweden: From extended reality to extended human - Strategic recommendation report' is a result of a feasibility study to design and assess a Swedish innovation platform for national resilience and sustainability within the transformative technology Extended Reality (XR) (Vinnova DNR 2024-02859).

The study was led by process manager Peter Westerdahl and Professor Annika Rickne at Visual Sweden. Based on extensive data collection, needs assessment, discussions, and interactions, the analysis was conducted by a collaborative team including Linköping University, RISE, SAAB, Meta, Ericsson, Volvo Cars, Siemens, Flowtropolis, the Swedish Police Authority, the Swedish Post and Telecom Authority (PTS), Invajo, Sweden Game Arena, Visual Sweden, WISDOM, Umeå University, Örebro University, KTH, Lund University, Malmö Museum, Universeum, Tekniska Museet, Norrköping Visualisering AB, WASP WARA Media and Language, InfraVis, AI Impact Lab, and other contributors from academia, industry, public organisations and civil society.

A detailed description of the analysis and results of the strategic forecasting - including a definition of the field, description of the sectors, trends, scenarios and strategic recommendations - can be found in the report 'XR Sweden: From extended reality to extended human - Trends & scenarios' (LiU DNR: ITN-2024-00481).

We invite you to read, reflect, reach out and engage in the process to enhance Swedish capabilities, actors base, innovations and international position within XR.

Peter Westerdahl

Visual Sweden

Authors and contributors

Authors: Annika Rickne, Linköping University, Eric Holmstedt, NOSP, Per Johannesson, Linköping University, Mario Romero, Linköping University, Asreen Rostami, RISE, Fredrik Trella, RISE, Fredrik Viksten, Linköping University, Peter Westerdahl Linköping University and Anders Ynnerman, Linköping University.

Contributors:

Magnus Ahlström, Vice President Global Innovation, SAAB
Patrik Andersson, Senior Visualisation Artist & XR specialist, Volvo Cars
Tomas Bendz, Chief Commercial Officer, Invajo
Jan Bergdahl, Senior Adviser, Swedish Post and Telecom Authority
Johanna Björklund, Associate Professor, WARA ML Processing, Umeå University
Ulf Björkman, Head of System Management, Training and Simulation, SAAB
Madelen Bodin, Director, Associate Professor, Curiosum, Wisdome Umeå, Umeå University
Janne Elvelid, Head of Policy Meta Sweden and Finland, Meta
Eric Ericsson, Strategy manager, Ericsson
Mats Fastrup, Development Lead, Malmö Museum
Carina Halvord, CEO, Universeum, Wisdome Göteborg
Ylva Hansdotter, Co-Founder, Flowtropolis
Emma Billington, Team Leader, Concept and Marketing Simulators, SAAB
Eric Holmstedt, Project Manager, Visual Sweden
Lena Klasén, Research Director, Swedish Police Authority
Mikael Klintberg, Project Manager, Örebro University
Jonas Kronander, Research Leader, Ericsson
Lisa Lindgren, CEO, Norrköping Visualisering AB, Wisdome Norrköping
Amy Loutfi, Director, Professor, Örebro University
Kajsa M. Paulsson, Researcher, InfraVis, Lund University
Andrii Matviienko, Assistant Professor, KTH
Peter Skogh, Director, The National Museum of Science and Technology
Sofia Sproge, Software Developer, SAAB
Erik Sundén, Technical Director, Linköping University, Wisdome Norrköping
Per Södergren, Head of Customer Technical Support, Siemens Energy
Per Söderberg, Head of Digital PLM, Siemens Energy
Marcus Toftedahl, Project Manager, Sweden Game Arena
Jesper Wallerborg, Tech Lead, The National Museum of Science and Technology
Maria Wirén, Head of Development and Learning, Universeum, Wisdome Göteborg
Jonas Boström, Pedagog, Universeum, Wisdome Göteborg
Anna Öst, Producer, Visualization Center C

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1. Introduction

Sweden's potential in XR and the importance of including humans

Sweden has a great opportunity to reap the benefits from and lead the development within technologies and applications related to extended reality (hence XR). Already today, the Swedish research base is well advanced, and there are several companies developing applications in areas such as gaming, healthcare and industry. Importantly, in their quest to advance new solutions, companies as well as public organisations take the role as lead users and early adopters, thereby spurring the development and deployment.

The potential for products and services is wide spanning, and a range of consumer needs and societal challenges could be addressed. Indeed, the concept of XR has rapidly matured and expanded, from the XR technology itself to an XR ecosystem enhanced by e.g. AI technologies and multisensory, multimodal interaction. The path is moving from extended reality to what we may call 'extended human'. Development of technologies and applications are, however, in early phases, and the market is far from mature. Therefore, for Sweden to take an international position, urgent action is needed to pave the way and create XR readiness at all levels. It is essential to integrate human in the loop of XR applications to ensure ethical, user-centred innovation and effective support structures.

In this situation, it is important that Swedish policy has recognised the pervasiveness of the XR field and pushes for joint initiatives and investments. In particular, an innovation platform is seen as a main vehicle to move the area ahead, and shape Sweden's response in leadership, research, technologies, applications, market development.

Our approach

This mission for this feasibility study was to define prerequisites for national readiness, sustainability and resilience for Sweden in the area of XR. The need for a national platform is underlined by the rapidly maturing technology and potential applications in a wide range of sectors. The current situation creates new opportunities for development, commercialization and market penetration of XR. This study thus aimed to lay the foundation for if a Swedish innovation platform for XR is called for, and what such a platform should contain and how it should be organised. We have called this platform 'XR Sweden'.

Our team brings perspectives from various technologies, products, sectors and regions, and builds on a close collaboration between experienced and well-established organisations: Visual Sweden, Linköping University, WISDOM, WASP WARA Media and Language, InfraVis, AI Impact Lab and RISE, SAAB, Meta, Ericsson, Volvo Cars, Siemens, Flowtropolis, The Swedish Police, PTS, Invajo and Sweden Game Arena. Within XR and AI, this constellation possesses world-class research and applied expertise, competence and long-term experience of leading innovation processes and platforms. The constellation also extends to a network of relevant actors, in a comprehensive range of sectors, partnering with research units, companies, public organisations and authorities across Sweden. An active Development Team ensured that all types of actors and perspectives are heard and considered. In addition, a wide range of Contributing Partners were involved in various tasks. The organisational inclusivity helps us to truly capture the Swedish position and needs, and gives a solid foundation for technology, product and market foresight, and high competence in, and experience of, analysis and strategic design of XR Sweden.

The study takes a research based and foresight-oriented approach and developed actionable recommendations for if and how XR Sweden could be developed and

implemented. Guided by strategic foresight, we focused on trend analysis, scenario building, agenda setting, stakeholder engagement, verification and organisational development. This structured approach ensured an inclusive and coordinated effort.

As a starting point for the work, we identified key enablers for the advancement of the XR concept in terms of technology trends, AI-driven solutions, multimodality, and distribution of resources. We also addressed issues related to privacy, security and ethics from a policy perspective. Based on the enablers and accelerators, and our collective competence, we systematically analysed trends and potential scenarios for a range of contexts, assessed the potential benefits of an innovation platform, detailed its content, structure and organisation, and assessed risk and contingencies. This resulted in a related report *XR Sweden From extended reality to extended human Trends and Scenarios*, and in enactable recommendations that create a foundation for a novel XR innovation platform, positioned in the fast-moving global context.

2. Needs, Trends & Scenarios

What do we mean with XR and how it relates to AI?

Extended Reality together with AI technology redefines how information is experienced by enabling embodied interaction through gaze, gesture, spatial audio, sensing, smells, and shared digital environments. This mode of engagement restores subtle, non-verbal cues and allows participants to perceive each other at life-size, hear voices positioned in space, and interact with shared digital artefacts. The result is a heightened sense of co-presence and a more intuitive interface for engaging with both people and AI systems. When algorithms are represented as spatial collaborators, users interact with data through natural modalities (gesture, voice, and visualization) making the exchange more fluid and perceptive. The expressive bandwidth of XR surpasses traditional formats: a picture may convey more than words, a video more than pictures, and an interactive application more than video. XR environments extend this progression further, offering experiences that are too complex to capture in text alone.

Technologically, XR systems are composed of multiple interdependent layers. They begin with sensing and interpreting the real world through devices such as cameras, depth sensors, IoT nodes, haptic wearables, displays, and actuators. These components serve as the system's sensory and output channels, capturing geometry, motion, voice, and biometrics, and delivering forces, sound, and light back to the user. At the core are XR engines that transform raw signals into structured, computable knowledge. Functions such as viewpoint matching, object detection, segmentation, tracking, SLAM, and 3D reconstruction convert sensor data into geometry, textures, physics, and sound. Rendering, real-time simulation, and spatial audio generate immersive environments. These modules also capture user interaction (gaze, hand poses, controller states) and feed it back into actuators or AI services, maintaining responsiveness and presence.

XR Fusion refers to the integration of XR with AI-driven agents and generators. This convergence enables immersive environments enriched with real-time analysis, data fusion, and generative content. The fusion layer is supported by trained AI models that provide reasoning, representation, and generation capabilities, enhancing the XR experience with semantic interaction and adaptive support.

From a technical perspective, AI bolsters XR via computer vision algorithms for real-time object detection, tracking, and 3D reconstruction using for example simultaneous localization and mapping (SLAM), enabling precise digital overlays on physical environments. Generative models like GANs and diffusion techniques create adaptive content such as avatars and simulations, personalized through reinforcement learning. Explainable AI (XAI) integrates with XR for transparent multimodal interactions, like NLP-powered gesture and voice recognition, reducing biases in applications such as industrial and therapeutic systems.

Surrounding the core XR technologies are enabling systems that extend functionality and scalability. These include edge and cloud rendering for performance distribution, high-speed connectivity (5G/6G), generative AI for content and graphics enhancement, blockchain and NFT-based commerce rails, security and privacy frameworks, and data platforms for digital twins. These components ensure that XR sessions can be distributed across devices, personalized, synchronized, and verified. The overall system operates through a continuous flow of sensing, simulation, knowledge generation, fusion, augmentation, actuation, perception, and human interaction. Each component contributes to a loop where real-world events are captured, interpreted, enhanced, and responded to, either through digital

feedback or physical action. This structure enables XR to function as a responsive and intelligent interface between the physical world, digital systems, and human users.

Transitional potential

Sweden is poised to lead a renaissance through the transformative potential of Extended Reality (XR), which spans virtual, augmented, and mixed reality. Rather than driven solely by technological advancement, XR's momentum in Sweden is propelled by societal and user demand. The country's strong international research position in human-centred XR, visualization, and image analysis, combined with dynamic experimentation across both large and small companies, positions it as a global leader. As hardware and development costs decline, especially with generative AI, XR is expected to revolutionize key sectors including information and communication technology (ICT), education, healthcare, industrial manufacturing, games and culture, and public services.

ICT and XR forms and will form a symbiotic engine for digital transformation. ICT provides the infrastructure, software, and connectivity essential for distributed XR systems, while XR reshapes ICT by introducing spatial computing, multimodal interfaces, and real-time collaboration. This convergence accelerates adjacent technologies such as edge computing, 5G/6G, and digital twins, transforming ICT into a dynamic infrastructure for extended human experience. In **education**, XR enables immersive classrooms, vocational simulations, and lifelong learning platforms. It supports adaptive learning, identity exploration, and collaborative research, with initiatives like WISDOME, Expert Learning Lab (ELL), and Wadströms Exploratorium Laboratory showcasing its impact on STEM outreach and national competence development.

In **industrial manufacturing**, XR enhances efficiency and innovation through virtual prototyping, AR-guided assembly, and VR-based training. Companies like Volvo, Epiroc, AstraZeneca and Siemens Energy use XR for remote diagnostics, predictive maintenance, and human-robot collaboration. XR also enables mass customization, allowing customers to co-design products in immersive environments. As XR becomes embedded across the industrial value chain, it supports safer training, distributed design collaboration, and AI-guided maintenance. Swedish firms, startups, and universities co-develop XR platforms aligned with Industry 5.0, advancing sustainability, competence development, and global competitiveness. Public organisations and policymakers play a key role in scaling adoption through shared infrastructure, funding, and regulatory alignment, ensuring inclusive access and long-term impact.

In **healthcare**, organisations such as the centre for medical image science and visualization (CMIV) and Karolinska Institutet integrate XR across clinical, educational, and research domains. XR supports surgical planning, AR-assisted navigation, and VR-based training, while also advancing mental health therapies and rehabilitation. It improves accessibility through remote consultations and interfaces for individuals with cognitive or sensory impairments, aligning with Sweden's commitment to equitable healthcare.

The **cultural sector** embraces XR as a new expressive medium, transforming games, film, music, and art into immersive experiences. Sweden's renowned gaming industry and vibrant artistic community drive innovation in interaction models and content formats. XR enables embodied gameplay, emergent storytelling, and AI-driven narratives. Platforms like Wisdome promote accessibility, heritage preservation, and inclusive design. Artistic experimentation in XR influences other domains, enhancing industrial training, education, and healthcare through gamified environments and collaborative design spaces.

Societal applications include where public organisations and research units adopt XR to simulate complex systems, visualize data, and foster interdisciplinary collaboration. XR supports participatory research and public outreach in climate science, medicine, and urban development. In public services, XR enhances healthcare, police training, transport planning, and education. Museums and cultural venues use XR for virtual exhibitions and inclusive experiences. XR fosters social inclusion, empathy, and identity exploration, while supporting digital transformation and citizen engagement across municipalities. In urban planning, XR enables interactive design assessment and virtual exploration of proposed changes, aligning with smart city initiatives in Kista, Hammarby Sjöstad, Norrköping, and Gothenburg.

In the **civil-military interface**, XR strengthens preparedness through immersive simulations for defence, emergency response, and inter-agency coordination. It supports disaster training, first aid education, and strategic planning. XR also contributes to sustainability and the green transition by visualizing climate data, modelling environmental change, and educating citizens on biodiversity. These immersive tools facilitate ecological storytelling, behavioural change, and public engagement in climate governance. Through XR, Sweden can align societal goals with ecological action, driving innovation and shaping a future where imagination meets reality.

Global Trends: Social, Technological, Economic, Ecological, Political

XR is rapidly evolving into a foundational layer of our digital society, shaped by five interdependent trend domains: social, technological, economic, ecological, and political. These forces collectively define the opportunities, risks, and strategic choices that will determine Sweden's position in the global XR ecosystem.

Social trends reveal a cultural shift toward digital-first lifestyles, virtual communities, and human-centred design. We seem to increasingly prefer virtual interaction for work, learning, and entertainment, driving demand for immersive platforms that support collaboration, identity expression, and community-building. Digital identities and virtual communities are central to how individuals connect and express themselves, influencing XR adoption. Expectations for intuitive, portable, and accessible XR devices are rising, while concerns around privacy, mental health, and digital addiction call for ethical design and responsible use. Businesses are adapting to hybrid work models and seeking XR solutions that enhance remote collaboration, reduce travel costs, and support scalable training. XR's potential to support mental health care and inclusive digital spaces positions it as a tool for wellbeing and social cohesion.

Technological trends accelerate XR's capabilities through convergence with AI, advanced computing, and real-time data. Breakthroughs in 5G and 6G, spatial computing, and generative AI enable more adaptive, personalized, and scalable XR experiences. Sweden's leadership in connectivity and open data infrastructure provides a strong foundation for innovation. Real-time data from public and industrial sources supports XR innovation when combined with edge analytics and generative AI. Spatial computing and 3D mapping are maturing, enabling precise interaction with physical environments. Portable hardware and head-mounted displays have evolved significantly, offering onboard computing and high-fidelity experiences. Neural interfaces and brain-computer integration are emerging, supporting adaptive training and entertainment. Generative AI transforms XR content creation, enabling rapid prototyping and democratizing development. However, the rise of proprietary platforms and closed ecosystems threatens openness, competition, and developer autonomy. Open standards and cross-platform interoperability are essential to sustaining innovation and developer freedom.

Economic trends show that XR hardware has become easier to use and more cost-effective, boosting uptake and deployment. XR is increasingly used in virtual communities and industrial productivity, with training, simulation, and digital twins driving adoption in manufacturing, logistics, and public services. Healthcare and gaming remain high-impact sectors, with XR supporting diagnostics, therapy, and immersive storytelling. Blockchain-based monetization models offer creators new revenue streams, embedding scarcity and royalty logic into virtual goods. These models enable creators to sell, rent, or license immersive assets across platforms, though they raise regulatory and ethical questions. Security threats in immersive environments escalate, with features of superrealism, such as realistic avatars and spatial audio enabling persuasive fraud and social engineering. Digitalization drives winner-takes-all dynamics, with dominant platforms capturing market share through scale and data feedback loops. XR inherits this structure with even greater switching costs due to volumetric assets and biometric data. Regional hubs and public-private collaborations are key to ensuring inclusive growth and exportable solutions. Continued support for academic research, early-stage ventures, and open standards is essential to sustaining XR's economic potential.

Ecological trends highlight the need to embed sustainability into XR's design and deployment. Energy consumption, e-waste, and hardware obsolescence are pressing concerns, especially in Metaverse-scale environments. Frameworks like C3Meta aim to create energy efficient XR systems. XR supports industrial green transition through workforce reskilling and energy optimization, particularly when integrated with digital twins. XR enhances environmental awareness and education through immersive experiences that communicate climate impacts and promote sustainable behaviours. It supports urban planning and architectural education by visualizing sustainable design choices. Remote work enabled by XR reduces travel and infrastructure needs, contributing to national climate targets and low-carbon workflows. Sweden's climate commitments and industrial transformation goals align well with XR's ecological applications, provided sustainability is prioritized from the outset.

Political trends shape XR through regulation, governance, and strategic investment. Data privacy, ethical AI, and platform accountability are central to emerging policy frameworks. Regional disparities in regulation complicate global collaboration, while standardization efforts like OpenXR and glTF offer pathways to interoperability. Public investment is shifting toward capital assets that deliver long-term savings, positioning XR as a fiscally responsible tool for municipalities and agencies. Sweden's proactive stance on digital sovereignty and innovation policy will be critical in navigating geopolitical tensions and platform dependencies. Ethical AI and the threat of deepfakes are gaining political urgency, prompting calls for transparency, accountability, and ethical standards. Standardization and interoperability are advancing rapidly and support innovation. Public investment in XR is shifting toward strategic capital allocation, with immersive systems delivering labour savings and faster service.

Thus, XR is no longer a niche technology but is becoming a foundational layer of digital society. Human-centred design and ethical safeguards are essential, with trust, wellbeing, and inclusion built into XR systems from the start. Open standards and interoperability are strategic imperatives to prevent fragmentation and monopolization. Sustainability must be embedded early, with energy use, hardware lifecycle, and ecological impact actively managed. Public-private collaboration is key to national leadership, with Sweden's innovation system supporting experimentation, regional hubs, and exportable solutions. Regulatory foresight and digital sovereignty will shape Sweden's global position, requiring active engagement in international standards and governance frameworks to protect national interests and democratic values.

Global scenarios across six core sectors

Clearly, XR is positioned to become a foundational technology across Sweden's digital and societal landscape. The six scenarios developed for Sweden's core sectors illustrate how immersive technologies can support inclusive governance, sustainable development, and national competence, while identifying opportunities and risks. These scenarios are not predictions but possible or plausible futures we jointly can form, and that can guide innovation, policy, and collaboration.

In **ICT & digital infrastructure**, XR is integrated into platforms used by municipalities and national agencies to manage transport, energy, and emergency services through spatial data and immersive dashboards. These applications rely on high-speed connectivity, edge computing, and cloud systems. System integrators and platform providers enable deployment but face challenges with legacy systems and procurement. Hardware developers focus on durable, energy-efficient devices, while software developers build spatial interfaces and AI-driven tools. Data scientists and AI engineers apply predictive analytics, managing ethical risks tied to biometric data. Public organisations coordinate infrastructure investment and promote open standards. Policymakers and financiers support digital inclusion while navigating regulatory complexity. Professional users gain tools for oversight and collaboration, and citizens benefit from improved services, though digital literacy and access remain key concerns.

In **education and training**, XR is embedded across schools, universities, and vocational centres to support immersive learning, skills development, and lifelong education. It enables simulation-based training, adaptive tutoring, and remote access to complex subjects. Universities lead research and curriculum development, while vocational institutes use XR to prepare learners for roles in healthcare, manufacturing, and public services. Startups and content developers create modular learning tools and AI-driven tutors, often in partnership with educators. Hardware developers design classroom-ready devices, and software developers build platforms for personalized instruction. Public organisations invest in inclusive education and regional upskilling. Policymakers and financiers support infrastructure and pedagogical innovation, while navigating procurement and equity challenges. Teachers and trainers adopt new roles as immersive facilitators, and learners benefit from more engaging and accessible education, though disparities in access and digital competence remain.

In **industrial manufacturing**, XR supports workforce training, product design, and remote collaboration across large firms, SMEs, and startups. It enables virtual prototyping, immersive diagnostics, and AI-enhanced planning. Universities and research institutes co-develop training modules and ergonomic simulations with industry partners. Startups offer low-code XR tools and conversational interfaces for operators, while SMEs adopt XR to improve onboarding and safety. Hardware developers produce rugged, high-performance devices for industrial environments, and software developers build simulation platforms and collaborative design tools. Public organisations promote lifelong learning and industrial innovation. Policymakers and financiers fund pilot programs and support standardization. Engineers, technicians, and planners use XR to optimize workflows and reduce risk, while firms benefit from increased efficiency and reduced travel. Challenges include integration with legacy systems, skill gaps, and uneven access to infrastructure.

In **healthcare**, XR is integrated into clinical education, patient care, and public health outreach. It supports training for medical staff, intraoperative guidance, rehabilitation, and mental health interventions. Universities, regions, municipalities and hospitals collaborate on simulation-based learning and therapeutic applications. In this scenario, there are solutions for sharing and co-developing XR-based solutions in the public sector, both in terms of policy

and law, business models and sharing of resources between actors from different municipalities of regions. Startups develop AI-powered XR agents and immersive treatment environments, while SMEs adopt XR for onboarding and specialist training. Hardware developers focus on ergonomic, clinical-grade devices, and software developers build adaptive platforms for care delivery and patient engagement. Public organisations deploy XR for inclusive care and competence development. Policymakers and financiers support pilots and ethical frameworks, while navigating GDPR and procurement complexity. Healthcare professionals use XR to improve precision and empathy, and patients benefit from reduced anxiety and improved access. Key risks include data sensitivity, validation requirements, and uneven adoption across regions.

In **games and culture**, XR evolves into a medium for artistic expression, storytelling, and community engagement. Indie studios, cultural organisations, and cross-disciplinary teams create immersive experiences that blend performance, interaction, and generative content. Universities explore new dramaturgical formats and digital identity, while museums and venues use XR for outreach and education. Startups build creative automation tools and multiplayer platforms, and SMEs develop regionally relevant content such as heritage tours and interactive theatre. Hardware developers integrate multisensory tech into public spaces, and software developers support cross-platform creation and user participation. Public organisations commission XR works and promote cultural access. Policymakers and financiers invest in open infrastructure and ethical standards for biometric data. Artists and performers adopt hybrid roles in immersive production, and audiences engage through participatory formats. Challenges include market fragmentation, content moderation, and sustainable funding.

In **societal applications**, XR enables inclusive urban planning, participatory governance, and civil preparedness. Municipalities and agencies use XR to model traffic, simulate crises, and audit accessibility in collaboration with citizens. Universities develop tools for urban analytics and emergency training, while startups create modular applications for public consultation and environmental impact visualization. Defence and civil protection bodies use XR for multi-agency coordination and scenario planning. Hardware developers support location-based access and mobile deployment, and software developers build simulation platforms and inclusive interfaces. Public organisations coordinate cross-sector pilots and promote regional equity. Policymakers and financiers support strategic investment and ethical data use, while navigating regulatory complexity. Planners, responders, and citizens engage in co-creation and decision-making, though digital divides and infrastructure gaps remain barriers to full participation.

What does Sweden need to enhance the possibilities and growth within XR?

Our detailed study has revealed that to enhance the possibilities and growth of XR in Sweden, there are three main components that the actor in the ecosystem need: **a governance framework & arena, enhanced resources**, and **innovation support**.

A strong **governance framework** is needed to unite actors across academia, industry, public organisations, policy units, and support structures. This includes creating *neutral arenas* and events that foster *dialogue*, *collaboration*, and *shared learning*. A joint understanding must be developed around the opportunities and challenges facing developers, users, and civil society. Comprehensive *mapping and analysis* of XR in Sweden, covering research, technologies, infrastructure, actors, innovation processes, and system dynamics, should provide the foundation for *informed decision-making*. Policymakers and organisations must be made aware of the sector's needs and potential, and encouraged to act and invest accordingly. It is equally important to demonstrate how XR can address

societal challenges, and to ensure *regulatory stability* through mechanisms such as sandbox environments. Key regulatory concerns include privacy and data protection, intellectual property rights for virtual assets and digital twins, and ethical considerations around synthetic data, propaganda and deepfakes. It is also important to distinguish between propaganda and deepfakes, in the sense that the former is an intent along the lines of malign foreign interference: where someone does attempts to affect the political views or cause disturbances in our democratic system, where the XR content *could be* a deepfake. Deep fakes on the other hand can be used for other purposes like for example advanced identity theft, scamming and phishing. *Visibility and promotion* of XR must be strengthened, within the ecosystem itself, across Swedish society and policymaking circles, and internationally. A *national agenda* and shared strategic direction are needed, supported by a leading organisation or platform that works in close partnership with the ecosystem. A national innovation platform for XR can, for example, mediate the risks of becoming dependent on foreign suppliers.

The actors express that they need enhancement of **resources**. Sweden requires a *centralised knowledge depository* for XR domain expertise, encompassing research actors, applications, sectors, markets, trends, financing, and international collaborations. The *legitimation* of XR as a strategic field is vital. Access to state-of-the-art *infrastructure* such as research labs, physical infrastructure, open-source platforms, and tools must be expanded, with facilities open to companies, organisations, and the public. These spaces can serve as incubators for experimentation, learning, and testing, bridging the gap between research, education, and industry. Scaling up experimentation in technology and product development, commercialisation, and use is essential, along with ensuring the longevity of initiatives and investments. A *critical mass* of developers, particularly innovative firms, must be cultivated. Policy support and long-term *financing* are key, as is guidance on funding opportunities. This includes help identifying relevant national and European grants, coordinating and process support to strengthen innovation proposals. Strong *networks and collaboration* with *international* financiers and ecosystems will help Sweden remain globally connected and competitive. *Human resources* are equally important: Sweden needs access to talent, training programmes, and workshops that build XR and AI competence across sectors, from foundational knowledge to advanced development.

Innovation support is another cornerstone of XR growth. The innovation process encompasses the full iterative cycle of research, development, business modelling, market engagement and large-scale adoption. Strengthening these processes across the XR ecosystem will be key to unlocking Sweden's potential in immersive technologies. Sharing examples and *best practices*, ranging from research findings to industrial applications and business models, can inspire new directions and validate emerging approaches. Regular conferences, seminars, and *networking events* will foster collaboration and idea exchange. Businesses must be given *access* to cutting-edge academic *research*, while researchers need insight into *industry* and *societal needs*. *Joint research initiatives* between industry and leading academic organisations can accelerate development across the ecosystem. Facilitated workshops and seminars can help generate new ideas and identify promising XR applications. *Project matching* services and platforms can connect developers, researchers, users, and public sector actors based on shared interests and complementary expertise. This could include a searchable *database* of competencies and needs. Access to *prototyping environments* and *testbeds* is crucial for validating new solutions before scaling. Regional strengths and specialised expertise should be leveraged to build a diverse and resilient national landscape. Establishing arenas where businesses and the public can explore and experiment with technologies, products and services could support adoption and help translate scientific advances into practical use. Finally, targeted support is needed to address *market acceptance* and *adoption* challenges.

3. The proposed Innovation Platform

Does Sweden need an Innovation Platform within XR?

Clearly, Sweden has strong possibilities within the area of extended reality. We envision Sweden as a global leader in the development, application and use of XR and related AI-based visualization and interaction technologies. The focus for Sweden will be to move the area from extended reality to extended human. The country has world-class research, globally competitive companies in many of the leading sectors, a vibrant start-up scene, public organisations that act as early adopters and lead users, a competent and interested civil society, and financiers, support structures and policy organisations that see the importance of the field. Already today, XR-based solutions are applied across sectors such as ICT, education, healthcare, manufacturing, culture, and public services. These applications are not only technologically advanced but also marketwise and socially relevant, contributing to inclusion, sustainability, and national competence. However, the presence of potential does not guarantee progress. The question is not whether Sweden can lead in XR, but whether the ecosystem is equipped to fully realise its opportunities and address its challenges.

The answer from the ecosystem itself, and in particular from all the partners contributing to this study, is clear: Developers, researchers, public organisations, and policymakers consistently express the need for structured support. The XR landscape in Sweden is rich but fragmented. Even though there are some important co-development already in place, actors sometimes operate in silos, infrastructure is unevenly distributed, and strategic alignment is lacking. Without coordination, efforts risk duplication, momentum is lost, and opportunities are missed. What is needed is a collaborative structure that can bring together representatives from the public, private, and research sectors – from all sectors – from users and civil society - to identify needs, align priorities, facilitate innovative solutions, foster business opportunities, and jointly move Sweden forward. To strengthen national, regional and local initiatives is crucial to build national fortitude.

An innovation platform should act as a neutral arena to map, coordinate and market stakeholders; increase public understanding and acceptance; share best practice, use cases and success stories; discuss and alleviate hindrances; form a national agenda for XR; access and share resources and infrastructure; enhance knowledge transfer and link knowledge, technology, strategy, and market opportunities; facilitate experimentation; accelerate technological and commercial development; contribute to regulatory frameworks; augment market adoption; illustrate benefits and effects of XR adoption and use; and strengthen international collaboration. The effects could be innovation, new business models, company growth, value for society, national resilience in XR, enhanced national Sweden's competence and competitiveness.

In conclusion, Sweden does not only have the potential to lead in XR—it has the responsibility to organise that potential into a coherent, inclusive, and resilient national effort. An innovation platform is the structure that can make this possible. It is not just a support mechanism, but the strategic vehicle needed to help the ecosystem grow, collaborate, and deliver lasting value to users, civil society, and the country. This goes hand-in-hand with important and high-profile investments such as Wallenberg's 'Spherical AI', the governments focus on 'Advanced Digitalization'. And without such an innovation platform, Sweden risks to lose out on opportunities and perhaps see stagnation of some parts of the industrial landscape, not gain access to international financing, or perhaps become too dependent on foreign suppliers.

Overall Strategy for the XR Sweden Innovation Platform

The innovation platform is designed to support Sweden's ambition to become a global leader in the development, application, and responsible use of extended reality. The strategy is built on a clear understanding of the ecosystem's needs, the transformative trends shaping potential scenarios, and the platform's mission to empower the ecosystem, support innovation, and catalyse industrial and societal transformation. The platform which we call *XR Sweden*, will help Sweden take the lead in a field that moves from extended reality to extended human. The overall strategy of XR Sweden should therefore be structured around three pillars, and these should be coherently developed during the coming 10-year period.

The first pillar is to reinforce ***national engagement***, strategic ***coordination*** and ***leadership***. XR Sweden will act as a neutral and trusted platform, bringing together academia, industry, public sector, and civil society, ensuring representation and legitimacy.

The platform should:

- gather the ecosystem; provide a joint arena for dialogue and knowledge exchange across sectors, promote visibility;
- disseminate Swedish XR expertise through international events and networks; represent Sweden in global contexts;
- engage in policy dialogue; support public organisations with assessments and impact studies;
- coordinate a shared national agenda and roadmap that promotes sustainability, equality and is human centred; align efforts to reach this national strategy;
- engage in regulatory discussions, standardisation efforts and ethical frameworks.

The second pillar is to ***expand competence, infrastructure*** and ***resources*** throughout the entire country. Based on the strengths of existing XR-infrastructure partners such as the Wisdome sites, RISE, university labs and industrial facilities, the entire ecosystem can learn and grow. It is a matter of mapping the nodes and infrastructural resources, finding models for resource sharing, creating meeting places for innovation, and enabling regional and national collaboration.

The platform should:

- map and link to specific resource needs of all sectors;
- map and engage both national and regional hubs for infrastructure and competence
- facilitate knowledge and resource sharing; promote access to labs, software, development tools, etc.;
- support interdisciplinary education and training;
- connect actors to funding opportunities and innovation support structures.

The third pillar is to ***accelerate innovation, application, commercialization*** and ***use***. This is the engine of XR Sweden and ensures that XR technologies address pressing societal and industrial challenges, and the opportunity for Sweden to take international lead. XR Sweden should not develop or innovate but assist the ecosystem in these processes. It involves supporting the transition from research to real-world solutions by shortening the distance between concept and implementation, and by creating conditions for rapid development, testing, and deployment of XR solutions. Innovation and development will surely be strengthened by the other two pillars: For example, national leadership and international visibility is crucial to connect to development partners within EU and beyond.

The platform should:

- foster new ideas; promoting best practices and success stories to inspire new applications; enable project matching and enhance access to financing; identify shared interests and complementary expertise; connecting actors across sectors to form consortia and initiate joint projects;
- promote experimentation; facilitate collaborative innovation through workshops and co-creation labs; facilitating collaborative innovation through workshops, hackathons, and co-creation arenas;
- bridge the gap between cutting-edge research and industrial applications; prove access to testbeds and prototyping facilities for experimentation;
- support proof-of-concept development; enable rapid prototyping, use cases, user testing in controlled environments, business modelling and market tests.

Approach of the XR Sweden Innovation Platform

The innovation platform should be built on a long-term, inclusive, and strategically grounded approach that reflects the needs of the ecosystem, responds to global trends and scenarios, and supports Sweden's ambition to lead in XR. The strategy and activities of XR Sweden are grounded in theory and international best practice. The platform draws on state-of-the-art knowledge to guide its development, ensuring that Sweden's efforts are informed, credible, and globally competitive.

The design of XR Sweden is created by central actors from industry, academia, public organisations, etc. All types of actors in this ecosystem, users, policy and civil society must be continuously involved to ensure that we capture the dynamics of various sectors, the diversity of perspectives and needs, and maintain trust and legitimacy. The structure should be a neutral, transparent and trusted arena that enables collaboration across sectors and regions, while adapting to a rapidly evolving technological and societal landscape. The platform operates across a wide range of sectors, with focused efforts in ICT, education and training, societal applications, industrial manufacturing, healthcare, and games and culture. This breadth reflects the transformative potential of XR and the need for cross-sectoral collaboration.

The platform is designed to take national leadership, not through top-down orchestration, but through bottom-up coordination. It supports distributed initiatives and processes, recognising that each organisation, region, and sector has its own strategies, culture, and motivations. The platform facilitates collaboration rather than directing it, enabling actors to align around shared goals while maintaining autonomy.

At the core of the approach is a long-term vision, where XR Sweden should function as a learning organisation, where goals and activities are continuously refined in response to new insights, changing conditions, and emerging opportunities. Such an adaptive mindset ensures that the platform remains relevant and resilient over time.