



D2.5 ECOSYSTEM ACTIVITIES AND BUSINESS SUPPORT SERVICES

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Table of Contents

List of abbreviations.....	7
LIST OF FIGURES	8
LIST OF TABLES.....	10
EXECUTIVE SUMMARY	11
1. INTRODUCTION	13
2. User-centred platform validation: workshops, surveys and feedback results.....	15
2.1 AWE EU 2024 – Workshop	15
2.2 OC1 Platform Feedback at Project Completion Phase– Survey	15
3. STAKEHOLDER ANALYSIS: OC2 ONBOARDING AND EMERGING STAKEHOLDERS – COMPARATIVE PERSPECTIVE WITH OC1	18
3.1 Stakeholders’ analysis – Onboarding and second iteration with OC2	19
3.2 OC2 Platform Feedback at Project Completion Phase – Survey	24
4. Ecosystem building strategy	28
4.1 Status of the Ecosystem	29
5. XR2Learn Forum – Structure, Engagement and Impact	34
5.1 Evolution of the XR2Learn Forum: Governance and Strategic Development.....	34
6. Business Models	40
6.1 Educational Platform Business Models	41
6.2 NFT-Based Business Models.....	43
6.3 XR-Based Applications Business Models	44
7. Conclusions	46
ANNEX A	47
OC1 Winner Workshop in AWE Vienna (October 29 – 30, 2024).....	47
Three-Phase Structured Methodology.....	49
ANNEX B	56
OC2 Stakeholder Analysis	56

LIST OF ABBREVIATIONS

CLI	Command-Line Interface
EdTech	Educational Technologies
FSTP	Financial Support to Third Parties
IPR	Intellectual property rights
KPI	Key performance indicator
NFT	Non-fungible token
OC	Open call
PDT	Platform Design Toolkit
SME	Small and medium-sized enterprises
WP	Work package
XR	Extended reality
Partners' names and acronyms	
CNIT	CONSORZIO NAZIONALE INTERUNIVERSITARIO PER LE TELECOMUNICAZIONI
F6S	F6S NETWORK IRELAND LIMITED
MAG	MAGGIOLI SPA
LS	LIGHT AND SHADOWS
SYN	SYNELIXIS SOLUTIONS SA
SUPSI	SCUOLA UNIVERSITARIA PROFESSIONALE DELLA SVIZZERA ITALIANA
UM	UNIVERSITEIT MAASTRICHT

HOU	HELLENIC OPEN UNIVERSITY
EADTU	EUROPEAN ASSOCIATION OF DISTANCE TEACHING UNIVERSITIES
EITM	EIT MANUFACTURING SOUTH SRL

LIST OF FIGURES

<i>Figure 1: DEVELOPER TESTIMONIALS “WHAT DEVELOPERS LOVED” AND USERS EXPERIENCES FROM OC1, PUBLISHED ON THE XR2LEARN COMMUNITY</i>	<i>17</i>
<i>Figure 2: TESTIMONIALS: “YOUR VOICE IN SHAPING THE FUTURE OF XR LEARNING” – OC1.....</i>	<i>17</i>
<i>Figure 3: OC2 ONBOARDING AND PRESENTATION OF SELECTED PROJECTS DURING THE XR2LEARN GENERAL ASSEMBLY.....</i>	<i>20</i>
<i>Figure 4: USER RESPONSES ON KEY FEATURES SUPPORTING CONTINUED PLATFORM USE</i>	<i>25</i>
<i>Figure 5: EXAMPLE OF USER RESPONSES ON SUSTAINABILITY AND CONTINUED USE OF THE PLATFORM</i>	<i>26</i>
<i>Figure 6: FEEDBACK ON THE XR2LEARN PROJECT AND ITS INFLUENCE ON THE LONG-TERM VISION FOR XR IN EDUCATION</i>	<i>27</i>
<i>Figure 7: ECOSYSTEM STATUS ACROSS XR2LEARN CHANNELS</i>	<i>29</i>
<i>Figure 8: PREVIEW OF BREAKING BARRIERS: HOW OPEN XR STANDARDS UNLOCK INTEROPERABILITY AND COMPLIANCE CAMPAIGN</i>	<i>31</i>
<i>Figure 9: EXAMPLES OF COMMUNITY SUPPORT AND CONTENT RESHARING ON THE FORUM.....</i>	<i>32</i>
<i>Figure 10: COLLABORATION ACTIVITIES BETWEEN XR2LEARN, MANTRA AND WOMEN TECHEU</i>	<i>33</i>
<i>Figure 11: DRAFT CONTENT creation PLAN AND PUBLICATION FRAMEWORK....</i>	<i>34</i>
<i>Figure 12: WELCOME KIT TO ONBOARD PARTICIPANTS IN THE FORUM AND COMMUNICATION CAMPAIGN TO SUPPORT FORUM ENGAGEMENT.....</i>	<i>36</i>
<i>Figure 13: WELCOME TO THE COMMUNITY.....</i>	<i>36</i>
<i>Figure 15: FORUM RESTRUCTURING PROCESS – BEFORE AND AFTER IMPLEMENTATION.....</i>	<i>38</i>

<i>Figure 16: XR2LEARN PARTICIPATION AT AWE EU 2024 (BANNER)</i>	47
<i>Figure 17: OC1 BENEFICIARIES PARTICIPATING IN THE XR2LEARN WORKSHOP AT AWE 2024</i>	48
<i>Figure 18: EXAMPLE OF BENEFICIARIES INTERVIEWS ON XR2LEARN LINKEDIN PAGE</i>	49
<i>Figure 19: XR2LEARN PLATFORM VISUAL BOARD FOR THE REFLECTIVE EXERCISE</i>	50
<i>Figure 20: XR2LEARN EMOTIONAL REFLECTION BOARD (PHASE 1)</i>	51
<i>Figure 21: XRTWINSCAPE ECOSYSTEM CANVAS</i>	57
<i>Figure 22: XRTWINSCAPE ECOSYSTEM ENTITY-ROLE PORTRAIT</i>	58
<i>Figure 23: XRTWINSCAPE TRANSACTION BOARD</i>	59
<i>Figure 24: XRIVE ECOSYSTEM CANVAS</i>	60
<i>Figure 25: XRIVE Entity Role Portrait</i>	61
<i>Figure 26: XRIVE Transactions Board</i>	62
<i>Figure 27: EcoDrive XR Ecosystem Canvas</i>	63
<i>Figure 28: EcoDrive XR Entity Role Portrait</i>	64
<i>Figure 29: EcoDrive XR Transactions Board</i>	65
<i>Figure 30: X-DE-MAN Ecosystem Canvas</i>	66
<i>Figure 31: X-DE-MAN Entity-Role Portrait (Manufacturers)</i>	66
<i>Figure 32: X-DE-MAN Transactions Board (Partners)</i>	67
<i>Figure 33: X-DE-MAN transaction board (producers)</i>	68
<i>Figure 34: X-DE-MAN Transactions Board (Consumers)</i>	68
<i>Figure 35: X-DE-MAN Transactions Board (External Stakeholders)</i>	69
<i>Figure 36: XPOTLESS Ecosystem Canvas</i>	70
<i>Figure 37: XPOTLESS Entity-Role Portrait</i>	71
<i>Figure 38: XPOTLESS Transactions Board</i>	72
<i>Figure 39: XCC Ecosystem Canvas</i>	73
<i>Figure 40: XCC Ecosystem Entity-Role Portrait</i>	74

<i>Figure 41: XCC Entity-Role Portrait.....</i>	75
<i>Figure 42: RTXRoom Ecosystem Canvas</i>	76
<i>Figure 43: RTXRoom Entity-Role Portrait</i>	77
<i>Figure 44: RTXRoom Transactions Board</i>	78
<i>Figure 45: Portal-XR Ecosystem Canvas.....</i>	79
<i>Figure 46: Portal-XR Entity-Role Portrait.....</i>	80

LIST OF TABLES

<i>Table 1 Registered Users and Participants Across XR2Learn Dissemination Channels.....</i>	29
<i>Table 2: different optional archetypes for educational platforms.....</i>	42
<i>Table 3: OVERVIEW OF KEY PRE-ENGAGEMENT INSIGHTS IDENTIFIED ACROSS THE FOUR REFLECTION DIMENSIONS</i>	52
<i>Table 4: USE AND PERCEIVED VALUE OF XR2LEARN SERVICES BASED ON FEEDBACK FROM OC1 BENEFICIARIES.....</i>	54

EXECUTIVE SUMMARY

Within the XR2Learn project, a set of activities have been dedicated to developing the methods, tools, and actions required to establish and support the XR2Learn ecosystem. This includes:

- (i) analysing the value chain of XR applications for education and training;
- (ii) identifying and understanding the needs of the actors involved in and influencing this value chain;
- (iii) setting up the XR2Learn ecosystem to attract and engage representatives from all relevant actor categories who can benefit from the XR2Learn platform, its services, and its Financial Support to Third Parties (FSTP) activities;
- (iv) defining innovative business models to enhance the adoption and penetration of Extended Reality (XR) applications;
- (v) creating the XR2Learn marketplace, the blockchain-based Intellectual Property Rights (IPR) management tools, and the on-demand application creation component of the platform;
- (vi) developing and integrating the XR2Learn platform; and
- (vii) collecting and processing stakeholder feedback to support result assessment and validation.

This document reports on the final phase of activities related to the **Ecosystem, needs analysis, set up and growth** addressing objectives (i)–(iii) and (vii), and the **Novel business models and business model support**, addressing objective (iv). It builds upon the baseline results presented in earlier versions of this deliverable (D2.1 and D2.3), further refining and expanding them. The outcomes presented here represent the consolidated results achieved by the end of the project (Month 42).

A core part of this document reports a comparative perspective of the stakeholder analysis activities conducted with the first Open Call (OC1) winners and the second Open Call (OC2) winners. The stakeholder analysis methodology applied is the Platform Design Toolkit (PDT), originally used with consortium partners and participants of the OC1 winners, and subsequently extended to those of the second Open Call. This ensured methodological coherence and allowed for a structured comparison between the two cohorts, highlighting similarities and differences across stakeholder groups. The results enabled the identification and comparison of stakeholders, the mapping and expansion of sectors following the inclusion of OC2 participants, and the analysis of key challenges alongside the potential benefits offered by XR2Learn solutions. This contributed to a more sector-oriented and forward-looking perspective for their adoption, while also identifying the most relevant stakeholders to engage based on both sectoral and role-based dimensions.

The document also outlines the validation activities conducted with the OC1 and OC2 beneficiaries within the XR2Learn project, to assess the usability, effectiveness, and relevance of the platform, its ecosystem, and associated services. Validation was carried out through a combination of in-person workshops, online surveys, and continuous feedback collection, engaging Open Call beneficiaries from both cohorts to capture qualitative and quantitative insights on their experience. In parallel, activities to strengthen the XR2Learn ecosystem progressed, focusing on leveraging stakeholder engagement, supporting community development, and enhancing collaboration across initiatives. Particular attention was given to ensuring continuity between sister project's activities and collaboration, promoting alignment and cohesion. This approach

contributes to consolidating an active and connected ecosystem, capable of sustaining ongoing collaboration and supporting the progressive evolution of XR2Learn outcomes.

Furthermore, the document provides an updated analysis of business models relevant to educational platforms, Non-Fungible Token (NFT)-based applications, and XR-based solutions. These insights directly inform the design and development of the XR2Learn platform. Overall, the analyses presented in this deliverable underpin the ongoing development of the XR2Learn platform, contribute to the definition of its business model, and support the elaboration of exploitation strategies.

1. INTRODUCTION

This document reports on the work carried out in **Task 2.1 Ecosystem, needs analysis, set up and growth** and **Task 2.2 Novel business models and business model support** of Work Package (WP) 2, during the final phase of the project. The first version of this deliverable (D2.1) was released at Month 6 (M6), followed by an updated version (D2.3) delivered at Month 16 (M16). These earlier versions presented the overall approach and initial results of Tasks 2.1 and 2.2. The present document represents the final update (D2.5), due at Month 42 (M42). It consolidates previously reported results while focusing on the most recent outcomes achieved during the final phase of the project.

Specifically, this deliverable presents the following results:

- **Survey of OC1 and OC2 Beneficiaries:**

Analysis of surveys conducted with Open Call 1 (OC1) and Open Call 2 (OC2) beneficiaries, aimed at collecting structured feedback on XR2Learn platform functionalities.

- **Stakeholder Analysis of OC2 and Comparative Assessment:**

Updated stakeholder analysis focusing on OC2 beneficiaries, including a comparative assessment of stakeholder profiles, roles, and needs emerging from OC1 and OC2.

- **Community-Building and Sustainability Activities:**

Overview of ongoing and planned activities designed to strengthen, expand, and sustain the XR2Learn community beyond the project's lifetime.

- **Horizon Results Booster Support:**

Targeted support activities provided under the European Commission's Horizon Results Booster service.

Service 3.1 – Networking: Support was provided for the organisation of our Women in XR event.

Service 3.5 – Audiovisual: A project video was produced with the support of the Horizon Results Booster.

During the first phase of project implementation (from Month 1 to Month 16), Tasks 2.1 and 2.2 focused on analysing the value chain of XR applications for education and supporting the initial setup of the XR2Learn platform with project partners, leveraging their expertise and networks to build the ecosystem. This was followed by stakeholder engagement and community-building activities, including the onboarding of OC1 and their networks. In parallel, initial efforts were devoted to defining business modelling approaches to support the uptake of XR2Learn platform and XR-based solutions developed by OC1 beneficiaries.

During the second phase of the XR2Learn project (from Month 16 to Month 42), these activities were further extended and consolidated in the context of OC2 beneficiaries and ecosystem. The work emphasised onboarding new stakeholders, strengthening and retaining the existing community, and fostering active participation through demonstration and showcase events. Continued efforts were also dedicated to refining the value chain analysis, systematically collecting and processing stakeholder feedback, improving the platform accordingly, and advancing business modelling and sustainability-oriented actions to support the long-term evolution of the XR2Learn ecosystem.

The remainder of this document is structured as follows:

- Section 2 describes the validation and continuous improvement activities of the XR2Learn platform based on user-centred feedback.

- Section 3 presents the stakeholder analysis, including onboarding activities for OC2 and a comparative assessment with OC1.
- Sections 4 reports on ecosystem-building strategies and community engagement.
- Section 5 describes the evolution of the XR2Learn Forum: the implemented restructuring, the content strategy and the engagement strategy
- Section 6 focuses on the Educational Platform, NFT and XR-Based Business Models.
- Section 7 concludes the deliverable by summarising key outcomes and future perspectives.

2. USER-CENTRED PLATFORM VALIDATION: WORKSHOPS, SURVEYS AND FEEDBACK RESULTS

This section presents the user-centred validation activities carried out within the XR2Learn project, aimed at assessing the usability, effectiveness, and relevance of the platform, its ecosystem, and associated services. Through a combination of in-person workshops, online surveys, and continuous feedback collection, the project engaged Open Call beneficiaries 1 & 2 to gather both qualitative and quantitative insights into their experience.

These activities enabled the identification of key strengths, challenges, and areas for improvement, supporting the iterative refinement of the XR2Learn platform and ensuring alignment with users' needs, expectations, and development practices, and strengthening the ecosystem support to facilitate platform adoption, application development, and overall usage.

2.1 AWE EU 2024 – Workshop

The qualitative validation activities involving OC1 beneficiaries were conducted during the **XR2Learn workshop organised at AWE EU 2024** (Vienna, 29–30 October 2024), where Open Call winners participated in collective reflection sessions, interviews, and platform feedback activities. The workshop involved representatives from the OC1-funded projects **XR2IND**, **XR4HRC**, **X-Alfy**, **PaperXR**, **EVROSH5**, **PROXIMA**, and **CARATE**. A structured **three-phase qualitative and user-centred reflection methodology** was adopted to capture beneficiaries' experiences before, during, and after engagement with the XR2Learn platform, combining emotional reflection exercises, participatory validation activities, peer discussion sessions, and impact assessment discussions. The methodology explored participants' initial organisational challenges and expectations (**Phase 1 – Baseline Reflection**), their direct interaction with XR2Learn services and tools (**Phase 2 – Platform Experience**), and the perceived impact of the platform on innovation capacity, collaboration, and future development perspectives (**Phase 3 – Impact and Future Outlook**).

The activities highlighted the **added value of the XR2Learn platform and ecosystem** in supporting visibility, networking, collaboration, and innovation processes. In particular, beneficiaries positively assessed the Community, Forum and Catalogue services for improving project visibility and facilitating knowledge exchange, while development enablers and interactive XR tools were recognised for supporting solution development and accelerating experimentation processes. At the same time, participants identified areas for further improvement, particularly regarding commercialisation support, onboarding processes, IPR guidance, and the transition from prototype development to market-ready solutions. Overall, the platform received a generally positive evaluation, with beneficiaries acknowledging its contribution to fostering collaboration opportunities and strengthening access to the XR innovation ecosystem. A detailed description of the workshop methodology, reflection framework, qualitative findings, participant feedback, and illustrative examples is provided in Annex A.

2.2 OC1 Platform Feedback at Project Completion Phase– Survey

In addition to the workshop feedback, a survey including a more detailed and targeted focus on the platform's technical features was conducted with selected OC1 projects

(CARATE, PROXIMA, XR2IND, PaperXR, XR4HRC, and X-ALFY) to assess the impact of the XR2Learn platform on development processes, collaboration practices, and end-user outcomes.

Respondents reported a range of **common XR-related technical challenges**, including device and middleware limitations, tracker recognition issues, performance optimization of complex 3D models, robotics kinematics implementation, multiplayer infrastructure constraints, and interaction and graphics design challenges. Addressing these issues required iterative development cycles and extensive experimentation across projects.

The XR2Learn Community was **consistently identified as a significant enabling factor and a key success element** across all respondents. Features such as the forum, shared development tools (e.g. Unity plugins), Wiki resources, and peer-feedback mechanisms supported problem-solving, reduced duplication of effort, and accelerated development cycles.

From a tooling perspective, the **INTERACT Unity plugin** emerged as the most impactful technical enabler, supporting physics-based interactions, robotics systems, and natural hand interaction design. This allowed teams to focus on user experience and scenario design rather than low-level implementation tasks. In some cases, teams estimated that development time would have increased by approximately **75% without XR2Learn tools**.

End-user pilots reported highly positive outcomes, particularly in terms of intuitive and immersive experiences and immediate applicability in training contexts. Some projects also reported measurable improvements, including a **25% reduction in training time and a 30% increase in knowledge retention**.

Overall, respondents rated the impact of XR2Learn support as significant to very significant, confirming its role in accelerating XR development and improving solution quality. The results were made available through the XR2Learn Community platform for internal dissemination and discussion.

Developer Testimonials What Developers Love



From a developer's perspective, the ability to publish and manage our training content on a centralized platform was extremely helpful. It gave structure to our process and ensured our outputs were visible and easy to review.

The community also served as a useful channel for exchanging ideas and maintaining alignment with best practices.



Without XR2Learn, development would have taken approximately 75% longer due to the need to build foundational systems manually.

WITH XR2LEARN, WE HAD IMMEDIATE ACCESS TO ROBUST TOOLS LIKE INTERACT

Which significantly accelerated implementation. The platform also helped us organize and publish our content efficiently, while the community offered valuable feedback and support throughout the process.

XR4HRC




Funded by the European Union

FIGURE 1: DEVELOPER TESTIMONIALS “WHAT DEVELOPERS LOVED” AND USERS EXPERIENCES FROM OC1, PUBLISHED ON THE XR2LEARN COMMUNITY

These posts present developer testimonials collected within the OC1 survey, including contributions from projects such as [XR4HRC](#); [PAPERXR](#); [X-Alfy](#); [Proxima](#); [XR2IND](#); [CARATE](#), highlighting developer experiences and feedback on XR2Learn tools and services. The campaign, titled “What Developers Love,” was published on the XR2Learn Community Forum, showcasing insights into how developers engaged with and benefited from XR2Learn tools and solutions. These publications supported the dissemination of project results across the ecosystem, while fostering peer exchange and increasing the visibility of OC1 outcomes.

Overall, the testimonial posts achieved consistent visibility on the platform, reflecting active engagement from the XR2Learn community. For example, posts in this section reached up to approximately 370 views, indicating sustained interest in the shared results. Full testimonial content can be found at the following [link](#).

Testimonial



Berk Kaan Cetincan
Lider Teknoloji Geliştirme (LTG)

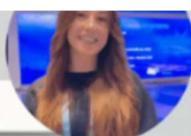
Lessons learned:

Adjustments based on real use experiences significantly improves engagement and learning outcomes

how much has the XR2Learn project influenced your strategic direction or long-term vision for XR in education?

★★★★★ A great deal!

Watch the interview



Despina Tomkou
Innov-acts

The XR-based industrial training app stood out thanks to its integration of AI. Interacting with the AI assistant made the experience far more engaging — users weren't just learning, they were inspired to explore further and even felt motivated to start creating their own tools

Watch the interview

FIGURE 2: TESTIMONIALS: “YOUR VOICE IN SHAPING THE FUTURE OF XR LEARNING” – OC1

3. STAKEHOLDER ANALYSIS: OC2 ONBOARDING AND EMERGING STAKEHOLDERS – COMPARATIVE PERSPECTIVE WITH OC1

This section presents the stakeholder analysis activities carried out during the second phase of the project, (M16–M42) with a primary focus on the onboarding and engagement of **OC2 beneficiaries** and newly involved stakeholders within the XR2Learn ecosystem. The stakeholder analysis methodology adopted within XR2Learn is based on the **Platform Design Toolkit (PDT)**, which was consistently applied across the different project phases. The PDT supports platform owners and ecosystem builders in defining, validating, and refining digital platform strategies through a structured and iterative set of visual canvases, typically developed collaboratively during dedicated workshops or co-creation sessions. The PDT methodology was extensively described in the previous versions of this deliverable (D2.1 and D2.3).

In particular, the stakeholder analysis evolved across three main phases:

1. the identification and definition of stakeholders relevant to the XR2Learn platform;
2. the mapping and refinement of stakeholders involved in OC1 beneficiary projects;
3. the identification and onboarding of new stakeholders associated with OC2 beneficiaries.

Together, these phases contributed to the progressive expansion and consolidation of the XR2Learn ecosystem, ensuring alignment between platform development and the needs of its diverse stakeholder groups. As outlined in Deliverable 2.3, this framework was initially developed during the early project phases and subsequently applied in the second phase.

In the **initial phase of the project**, the stakeholder analysis was conducted by the **consortium partners** with the objective of identifying and analysing the stakeholders relevant to the XR2Learn platform itself. This partner-led analysis focused on **defining the main stakeholder categories**, their roles, needs, expected gains, and potential value exchanges, in order to shape the platform vision and establish the foundational XR2Learn ecosystem model.

Subsequently, the same PDT-based methodology was employed with the beneficiary of OC1, enabling them to analyse the stakeholders of their own XR-based applications while positioning them within the broader XR2Learn ecosystem. This step allowed the consortium to validate and refine its initial ecosystem assumptions through real-world use cases and early adopter perspectives, leading to structured feedback collection activities and initial platform refinements, as documented in Deliverable D2.3.

Building on this consolidated methodological baseline, the present deliverable describes the application of the same framework to the analysis of OC2 beneficiaries. In this phase, stakeholder analysis is used to:

- assess how newly onboarded beneficiaries position themselves within the XR2Learn ecosystem;
- identify evolving stakeholder roles and value propositions;
- collect structured feedback on XR2Learn tools and services;

- refine ecosystem mapping and support sustainability-oriented planning activities.

Within XR2Learn, the PDT methodology was applied in a **streamlined and iterative manner**, focusing on core tools such as the:

- **Ecosystem mapping**

Through the Ecosystem Canvas, key entities within the XR2Learn ecosystem were identified and clustered according to their roles (platform owners, partners, peer producers, peer consumers, and external stakeholders). This step supported the assessment of how newly onboarded OC2 beneficiaries position themselves within the ecosystem and how they relate to the overall platform strategy.

- **Stakeholder profiling**

The Ecosystem Entity-Role Portraits were used to analyse selected stakeholders in terms of context, goals, pressures, capabilities, and expected gains. This enabled the identification of evolving stakeholder roles, needs, and value propositions emerging from OC2 beneficiaries.

- **Analysis of value exchanges**

Using the Motivation Matrix, existing and potential value flows between ecosystem actors were examined in order to identify engagement drivers and collaboration opportunities, and to validate how the XR2Learn platform can support value creation for different stakeholder categories.

- **Identification of core relationships and transactions**

Priority entities and relationships were selected for further analysis, and the Transaction Board was used to describe and validate the key interactions enabled by the platform and the associated value exchanges.

- **Iterative validation and refinement**

Insights derived from the canvases were iteratively validated and refined through workshops and surveys involving OC2 beneficiaries (and, where relevant, OC1 beneficiaries). This process enabled the collection of structured feedback on the XR2Learn platform, informed updates to ecosystem mapping, and supported platform evolution and sustainability-oriented planning activities.

This provides a consistent analytical baseline that supports the comparative assessment of stakeholder dynamics across OC1 and OC2, while enabling the progressive evolution of the XR2Learn ecosystem and its value creation mechanisms over time.

3.1 Stakeholders' analysis – Onboarding and second iteration with OC2

As part of the **XR2Learn General Assembly held in May 2025**, a dedicated **in-person onboarding meeting**, followed by targeted workshops, was organised to welcome the **OC2 beneficiaries** into the XR2Learn ecosystem. During this process, the newly selected OC2 teams presented their projects, application contexts, and consortium compositions to the XR2Learn partners, enabling direct interaction and exchange with the consortium and facilitating a shared understanding of project objectives, development stages, and anticipated needs.

Dedicated sessions were then conducted during the General Assembly to onboard participants to the platform, followed by workshops aimed at carrying out the second iteration of the **stakeholder analysis**. These activities combined a structured reflection on the XR2Learn platform with an in-depth discussion of the OC2 beneficiaries' individual ecosystems, stakeholder configurations, and concrete use cases. This

approach supported both the positioning of OC2 projects within the broader XR2Learn ecosystem and the identification of emerging stakeholder roles, relationships, and value exchanges. Early engagement with the XR2Learn platform was observed during the onboarding phase, with participants already making active use of the forum tool, demonstrating initial uptake and interaction within the ecosystem.

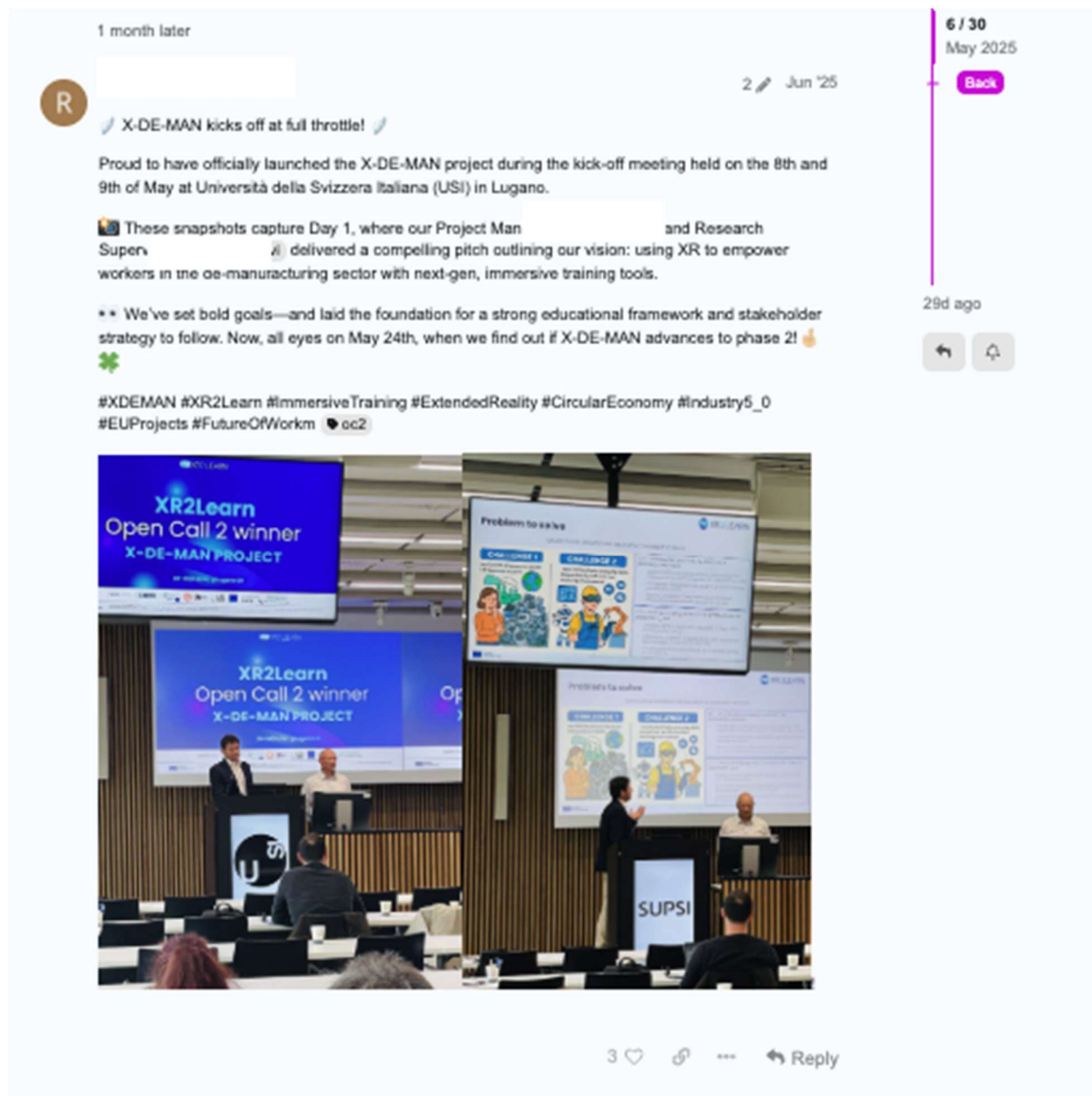


FIGURE 3: OC2 ONBOARDING AND PRESENTATION OF SELECTED PROJECTS DURING THE XR2LEARN GENERAL ASSEMBLY

3.1.1 OC2 Stakeholder Analysis: Scope and Key Insights

With the onboarding of the new beneficiaries, the project **further expanded its application domains of XR based application to be developed**, extending the scope already explored in previous phases. In particular, **OC2** introduced a wider and more heterogeneous set of sectors, including automotive and mobility, food sanitation and

hygiene, healthcare and medical training, remanufacturing and circular-economy processes, logistics and port operations, electrical and industrial training. This expansion confirms the **cross-sector scalability** and adaptability of the XR2Learn platform across diverse industrial, educational, and professional contexts. Compared to OC1. The level of detail of OC2 ecosystems is therefore reported in the Annex B. The following section summarises the key insights emerging from the analysis of OC2 stakeholders' perspectives.

- **Broader and more inclusive stakeholder perspectives**

Beyond direct users (operators, trainees, and trainers), OC2 ecosystems explicitly include indirect and extended stakeholders, such as policy makers, regulatory bodies, insurance companies, industry associations, and public authorities. While these actors may not directly interact with XR applications, they benefit from improved safety outcomes, reduced operational risks, and enhanced transparency and accountability enabled by XR-based training systems.

- **Stakeholders as both users and contributors**

Stakeholders within the XR2Learn ecosystem act not only as users, but also as active contributors. Training providers, companies, developers, and end users continuously provide feedback, requirements, data, and content, while simultaneously benefiting from the solutions. This establishes a co-creation dynamic in which XR applications are progressively refined through real-world usage and stakeholder input.

- **Multi-directional value exchange across the ecosystem**

Value within OC2 ecosystems does not follow a linear provider-to-user model. Instead, it emerges through continuous and multi-directional exchanges among actors. These exchanges include knowledge, feedback, behavioural data, technical know-how, and training services. In addition to learning outcomes, stakeholders derive value in terms of risk reduction, cost efficiency, certification support, and operational improvement, reflecting a highly interconnected and dynamic ecosystem.

- **Data, feedback, and performance measurement as strategic assets**

User data, behavioural insights, and performance indicators play a central role across all use cases. XR platforms enable the collection of real-time data on user interactions, learning progress, and task execution, which supports training optimisation, evaluation, and continuous improvement. At the same time, measurable performance indicators and analytics enhance transparency, enable objective assessment, and support certification and accountability processes.

- **Personalisation and adaptive training as core value drivers**

XR solutions in OC2 increasingly leverage data and analytics to deliver adaptive and personalised training experiences. Training content, difficulty levels, and learning pathways can be tailored to individual users' profiles, skills, and behaviours, improving engagement, knowledge retention, and overall effectiveness. Personalisation emerges as a key differentiating factor of XR-based training systems.

- **XR-based training as an enabler of safety and operational performance**

Beyond training effectiveness, XR applications are strongly associated with safety improvement, risk reduction, and performance monitoring across sectors. In safety-critical domains—such as mobility, industrial operations, healthcare, logistics, and agri-food—XR enables controlled simulation environments, supports procedural validation, and reduces exposure to real-world risks. This positions XR as a tool not only for learning, but also for prevention and operational reliability.

- **From pilot experimentation to scalable deployment**

OC2 stakeholders highlight a clear transition from pilot experimentation to scalable deployment. XR solutions are increasingly designed to be replicable across organisations, sectors, and geographical contexts, supporting cross-border collaboration and broader adoption. Scalability is enabled through modular

architectures, reusable components, and platform-based approaches, allowing training solutions to reach larger and more diverse user groups.

- **Ecosystem interactions in practice**

These dynamics are reflected in concrete interactions observed across OC2 use cases. Trainers exchange knowledge, guidance, and feedback with trainees through both direct interaction and XR-based environments, where time and competencies represent key units of value. At the same time, XR platforms provide immersive training experiences while collecting user data and behavioural insights that feed continuous improvement processes. XR developers contribute by providing authoring tools, streaming infrastructures, and personalisation components to training providers, enabling advanced content creation and transferring technological know-how. End users actively contribute by generating feedback, performance data, and usage insights, which are reintegrated into the system to improve training effectiveness, system responsiveness, and overall ecosystem value.

- **XR2Learn as an ecosystem-level adoption enabler**

While reusability, modularity, and cost reduction remain key benefits, OC2 findings show that these capabilities are increasingly embedded within domain-specific operational ecosystems. Within this context, XR2Learn acts as an ecosystem-level enabler, supporting the integration, scaling, and adoption of XR-based solutions in real-world, time-constrained, and safety-critical environments.

3.1.2 Stakeholder Analysis: Consolidated Perspective OC1 & OC2

Across the XR2Learn project lifecycle, and with the onboarding of OC1 and OC2 beneficiaries, the XR2Learn stakeholder ecosystem shows a clear evolution from an emerging collaborative platform to a more mature and operational ecosystem.

From the outset, XR2Learn has been designed as a platform-based ecosystem, structured to orchestrate interactions among different types of actors and to enable value creation through defined roles, relationships, and transactions.

In practice, this design logic translates into structured and interdependent exchanges among key stakeholders: for example, XR developers provide technological solutions, XR content, and technical expertise, while receiving feedback, testing, and real-world requirements from users and industry actors; academia contributes educational content and training methodologies while benefiting from access to XR technologies and visibility within the ecosystem; learners and trainees actively participate by providing feedback, user needs, and performance data, while accessing immersive learning experiences; and industry actors, including Small-Medium Enterprises (SMEs) and professionals, contribute real-world use cases and skills requirements while gaining access to training solutions and process improvements.

These interactions demonstrate that stakeholders are not isolated, but operate within a system of continuous and mutual exchanges of value, where value is co-created through interconnected relationships rather than generated by individual actors alone. The platform design, grounded in the PDT approach, enabled the identification of these roles and the mapping of their needs, capabilities, and expected value flows.

In this context, the platform was conceived not only as a technological solution, but as an enabling infrastructure designed to facilitate and structure interactions across stakeholders, supporting the exchange of knowledge, content, tools, and data through

dedicated channels and interaction mechanisms, including reusable XR assets, shared tools, and continuous feedback loops.

In both phases, XR2Learn consistently enables collaboration among multiple stakeholders, including XR technology providers, Educational Technologies (EdTech) actors, training providers, and user organisations. A key common aspect is that many stakeholders act as both users and contributors, assuming “prosumer” roles and actively co-developing training content, providing feedback, and contributing to the continuous improvement of XR-based solutions.

Similarly, in both OC1 and OC2, value exchange goes beyond monetary transactions and includes knowledge, skills, tools, data, and feedback. These exchanges are not linear but circulate across the ecosystem, supporting iterative improvement and stronger integration among actors. For example, learners generate feedback and usage data, training providers contribute educational content and methodologies, and developers continuously refine tools and functionalities based on these inputs, creating ongoing feedback loops that enhance system performance.

Early evidence of the validity of this stakeholder analysis emerged already during the project implementation phase. In particular, several OC2 projects confirmed the relevance of the identified stakeholder groups through concrete engagement activities.

For example, in the X-DE-MAN project, stakeholders initially mapped during the onboarding and analysis phase – including academic institutions, industrial operators, and manufacturing companies – were actively involved in subsequent validation activities. The solution was first tested in an academic environment, through a structured pilot involving university students and researchers, and was later validated in real industrial contexts, where operators and practitioners were trained within dismantling facilities. The Forum publication on testing and validation activities performed by X-DE-MAN can be found at this [Link](#).

Similarly, the XRTwinScape project engaged a diverse set of stakeholders across multiple use cases, including vocational training providers, industrial workers, and secondary school students. Pilot activities involved adult learners, company employees, and students in XR-based training scenarios for industrial engineering, decision-making in electrical systems, and career guidance. These activities confirmed the relevance of the identified stakeholder groups and highlighted the adaptability of XR solutions across different user profiles, sectors, and skill levels.

These activities confirm the accuracy of the stakeholder identification process and demonstrate how the XR2Learn methodology effectively captures real ecosystem actors, enabling their active involvement across different stages of solution development and validation. The Forum publication on testing and validation activities performed by XRTwinScape can be found at this [Link](#).

Another relevant example is provided by the EcoDrive XR project, which actively involved vocational education institutions and regional stakeholders. Through hands-on workshops with teachers and school representatives, XR tools were tested and progressively integrated into teaching practices, particularly in the context of electric vehicle manufacturing and green skills. Feedback from educators and institutional stakeholders contributed to refining both content and usability, while supporting the alignment of XR-based training with industry needs and sustainability objectives.

These activities confirm the accuracy of the stakeholder identification process and demonstrate how the XR2Learn methodology effectively captures real ecosystem actors, enabling their active involvement across different stages of solution development, validation, and adoption. The Forum publication on testing and validation activities performed by EcoDrive XR can be found at this [Link](#).

The comparison between the Key Takeaways emerging from OC1 and OC2 provides important insights into the evolution of the XR2Learn platform concept, particularly in terms of target definition and intended use.

In OC1, the platform is primarily conceptualised as an enabling environment for XR-based learning, with a clear focus on supporting content creation, reuse, and scalable training delivery. The target is relatively well-defined and centred on core user groups directly involved in training and upskilling processes, such as learners, training providers, and XR developers. The utilisation of the platform is therefore oriented towards educational and training purposes, with an emphasis on experimentation, validation, and early adoption of XR technologies.

In contrast, OC2 reflects a shift towards a more mature and operational perspective, where the platform is positioned within broader socio-technical ecosystems. The target expands beyond primary users to include extended stakeholder networks, such as organisations involved in safety management, compliance, certification, and governance. Consequently, the utilisation of the platform becomes more application-oriented, aimed not only at delivering training but at supporting real-world processes, decision-making, and organisational practices.

Despite this evolution, the core idea of XR2Learn remains consistent across both phases. Rather than representing a change in direction, OC2 refines and consolidates the original vision by demonstrating how the platform can transition from a training-focused environment to an ecosystem-level infrastructure. This progression highlights increasing clarity in the identification of target groups and in the practical deployment of XR solutions, reinforcing XR2Learn as a platform designed to enable adoption, integration, and impact in real-world contexts.

3.2 OC2 Platform Feedback at Project Completion Phase – Survey

A survey was conducted with OC2 beneficiaries, collecting **7 valid responses** across a representative set of funded projects, including XRTwinScape, RTXRoom, XPOTLESS, X-DE-MAN, NEONATAL, EcoDrive XR, XRive, XCC, Portal-XR, and XR2LabTrain. The survey aimed to assess **technical challenges, perceived platform value, ecosystem engagement, and long-term sustainability expectations** related to the XR2Learn platform.

Across responses, beneficiaries consistently reported significant technical challenges associated with advanced XR solution development, particularly in relation to the integration of personalisation and emotion-aware mechanisms, interactive 3D object manipulation, performance constraints on standalone XR devices, and the implementation of complex physics-based interactions and multi-tool workflows. XR2Learn resources were widely acknowledged as instrumental in addressing these challenges. In particular, the **INTERACT Enabler** was frequently cited for accelerating the implementation of realistic user interactions, while the **Personalisation and Inference Enablers** enabled the deployment of adaptive learning features without

requiring teams to build artificial intelligence pipelines from scratch. In addition, beneficiaries highlighted the relevance of **clear technical documentation**, Command-Line Interface (CLI) **tools**, and **continuous direct support**, which together reduced integration risks and allowed development efforts to focus on user experience design and pedagogical value rather than low-level engineering.

When comparing development processes with and without the support of XR2Learn, all respondents reported a **substantial increase in efficiency** thanks to the platform. Several projects estimated a **reduction in development time ranging from 25% to 50%**, while others indicated that achieving a comparable level of maturity independently would have required six to twelve additional months of work. XR2Learn was therefore perceived as enabling more structured, interoperable, and reliable development workflows, significantly lowering technical uncertainty and fragmentation.

The most frequently valued aspects of the platform included the **Enablers ecosystem**, the **XR2Learn Wiki and technical documentation**, the **Community Forum**, and the **Catalogue and Marketplace**, which enabled rapid lesson publishing and increased project visibility. These features were perceived not only as technical assets, but also as mechanisms supporting peer learning, validation, dissemination, and ecosystem positioning.

How important are the following aspects and which features are essential for your continued use of the platform?

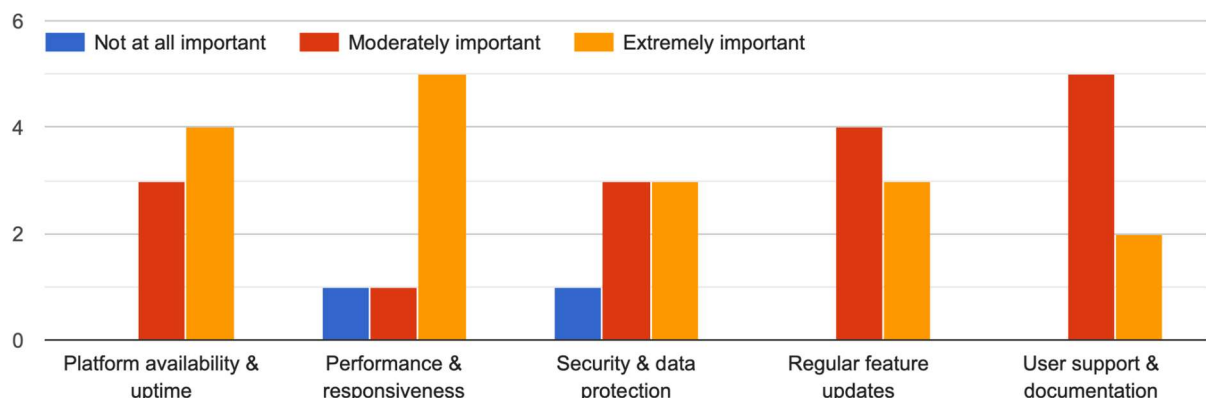


FIGURE 4: USER RESPONSES ON KEY FEATURES SUPPORTING CONTINUED PLATFORM USE

From an ecosystem perspective, survey results indicate a clear **expansion of stakeholder engagement** compared to the initial analysis conducted during the OC2 workshop held in May 2025. Most beneficiaries reported establishing **new business contacts and collaboration opportunities** with industrial actors, educational institutions, healthcare organisations, and XR technology providers. In several cases, pilot partners evolved into **active co-creation stakeholders**, contributing to scenario design, evaluation, and dissemination activities. This confirms XR2Learn's role as an **ecosystem connector**, facilitating structured interaction among heterogeneous actors rather than acting solely as a technical platform.

Strong evidence of real-world impact also emerged from the survey. Beneficiaries reported improvements such as a **43% increase in learning outcomes** in large-scale educational pilots, **32% higher execution accuracy** and up to **83% error reduction** in VR-based training tasks, and significant gains in **clinical skills, reaction times, and decision-making performance** within healthcare training contexts. Across use cases, users consistently reported high levels of immersion, acceptance, and confidence, even among individuals with limited prior XR experience, confirming the applicability of OC2 solutions in **safety-critical and operational environments**.

Would you be willing to pay for continued access to the platform?

If yes: what improvements would increase your willingness to pay?

if no: What would need to change for you to consider paying in the future?

7 responses

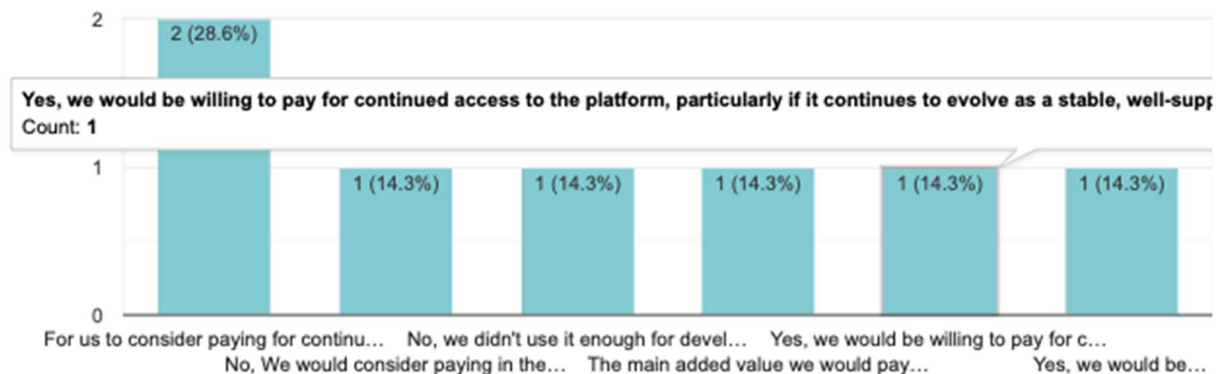


FIGURE 5: EXAMPLE OF USER RESPONSES ON SUSTAINABILITY AND CONTINUED USE OF THE PLATFORM

In terms of sustainability and business value, the platform received a **high overall evaluation**, with an average score of **4 out of 5** for perceived value and a **strategic impact score of 4.29 out of 5** in terms of influence on long-term vision. Most respondents foresee **continued long-term use of XR2Learn**, particularly in professional, commercial, and research contexts. Preferred business models include **pay-per-use, basic or premium access, and subscription-based approaches**, with willingness to pay strongly linked to enhanced marketplace features, networking and visibility opportunities, platform stability, and high-quality user support.

Overall, the findings confirm that XR2Learn is increasingly perceived as a **trusted ecosystem enabler**, capable of supporting adoption, scalability, and long-term exploitation of XR-based training solutions.

 Strategic Impact

On a scale of 1-5, how much has the XR2Learn project influenced your strategic direction or long-term vision for XR in education?

7 responses

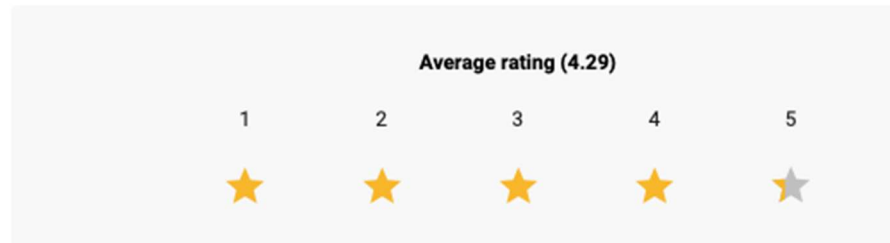


FIGURE 6: FEEDBACK ON THE XR2LEARN PROJECT AND ITS INFLUENCE ON THE LONG-TERM VISION FOR XR IN EDUCATION

4. ECOSYSTEM BUILDING STRATEGY

The overarching goal of the XR2Learn ecosystem-building strategy in WP2 is to **establish, develop, and sustain a vibrant and self-growing community** around the XR2Learn platform and the wider XR ecosystem. This objective is pursued by leveraging the consortium partners' expertise, their pre-existing programmes, sectoral networks, thematic communities, and proven experience in organising outreach, engagement, and community-building activities.

The strategy builds on the onboarding and mobilisation of the OC1 and OC2 winners' networks and communities, while further supporting ecosystem growth through collaboration with other relevant initiatives and projects, including clusters and communities of practice in the XR domain (e.g. the [*Beyond XR cluster*](#)). In addition, ecosystem expansion has been supported through participation in events, fairs, exhibitions, and online initiatives, contributing to the continuous enlargement of the XR2Learn network. Together, these combined networks and partner-led channels have enabled XR2Learn to reach a diverse and representative set of stakeholders across the XR value chain.

Community-building actions are designed to **attract, onboard, and retain stakeholders**, organisations, end users, students, educators, amateurs, and other relevant actors throughout the project lifecycle, while fostering active participation, collaboration, and long-term commitment to the XR2Learn ecosystem. This approach aims to ensure continuity and sustainability of the community beyond the project's end.

The ecosystem-building and engagement strategy were guided by the targets defined in the project DoW:

- 1600 potential early adopters in our ecosystem by M18 (June 2024).
- 2200 potential early adopters in our ecosystem by M42 (June 2026).

The ecosystem-building and engagement strategy has been structured into **two main phases** aligned with the XR2Learn platform development lifecycle. The first phase focused on **awareness-raising, collection of user needs, and identification of potential early adopters** prior to the platform's first release. The second phase, following the initial release of the XR2Learn platform, concentrated on **showcasing core functionalities and supporting adoption**, through ecosystem webinars, workshops, platform demonstrations, business case presentations, training sessions, and targeted activities to explore application scenarios and engage intermediaries and third parties. At the current stage, XR2Learn is at the end of the second phase, with activities increasingly oriented towards ecosystem consolidation, sustainability, and growth. Ongoing actions include continued ecosystem webinars, participation in external events, and other community-driven initiatives supporting sustained engagement with the platform. A particular focus is placed on leveraging early adopters and intermediaries as multipliers, enabling them to reach additional organisations through their own networks, contribute to the validation and refinement of successive platform versions and support longer-term uptake. The contribution of these actors represents a key enabler for platform consolidation, scalability, and future exploitation, and is supported through targeted recognition and incentive mechanisms.

These support actions are continuing beyond the core project activities, including the planning of post-project ecosystem events and joint participation in external initiatives, such as upcoming industry fairs. For example, selected OC2 winners are expected to

contribute to XR2Learn ecosystem visibility through participation in events such as the **We Make Future fair**, reinforcing continuity of engagement and long-term community involvement.

4.1 Status of the Ecosystem

The steady growth and consolidation of the XR2Learn ecosystem are confirmed by a set of quantitative indicators collected across communication, community, and engagement channels. To date, the project has reached **over 4,500 contacts** through events, webinars, social media, newsletters, and the XR2Learn Community Forum. This broad outreach is complemented by a more engaged core, with 471 registered users on the XR2Learn platform, representing active early adopters.

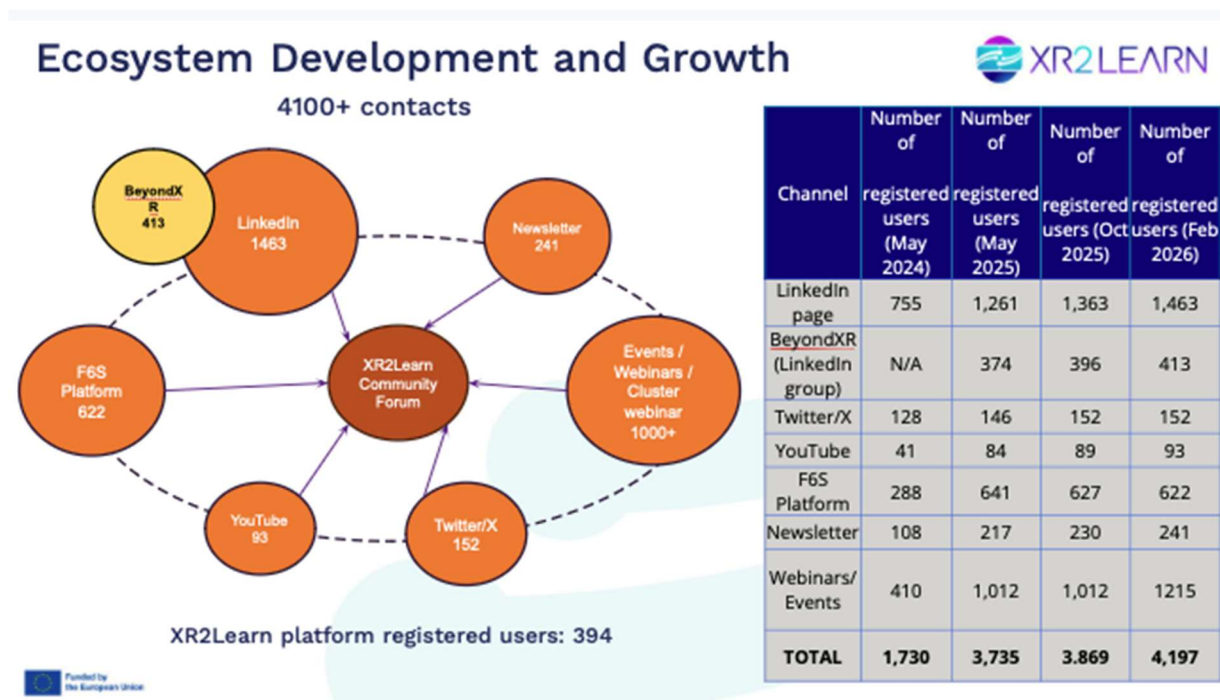


FIGURE 7: ECOSYSTEM STATUS ACROSS XR2LEARN CHANNELS

Participation figures from webinars, fairs, and workshops, together with positive feedback gathered through surveys (including the OC2 sustainability survey), demonstrate increasing interest in long-term platform usage and confirm the transition from awareness-raising to active adoption. Overall, these indicators highlight a maturing ecosystem, well positioned for sustainable growth and exploitation beyond the project's lifetime.

TABLE 1 REGISTERED USERS AND PARTICIPANTS ACROSS XR2LEARN DISSEMINATION CHANNELS

Channel	Number of Registered Users (June 2026)	Notes
LinkedIn Group	1548	

Twitter/ X	150	
YouTube	95	
F6S Platform	615	
Newsletter	243	
BeyondXR	419	
Webinars/ Events	1500	Considering only the events arranged by XR2Learn, for which we have the list of registered participants

From the beginning of the project, ecosystem engagement has been supported through a combination of online and onsite activities. In total, **22 online events** have been organised, including business support webinars, Beyond XR cluster webinars, PUSH events, Open Call webinars, exploitation-focused webinars, and community-building webinars. In parallel, XR2Learn has been presented at **8 onsite conferences and events** by consortium partners, while OC1 winners participated in an additional **14 industry-related events**, further amplifying the project's visibility and reach.

Ecosystem sustainability is further reinforced through strategic clustering and synergies, particularly within the BeyondXR cluster, which currently brings together **15 EU-funded XR projects** (increased from 12 in the previous reporting period), including CORTEX2, XR5.0, XR4ED, MASTER, HECOF, augMENTOR, SERMAS, Transmixr, XR2Learn, MOTIVATE XR, SPIRIT, Openverse, XR2Industry, VOXReality, and GenAI4ED.

The cluster is supported by a joint LinkedIn group with over 400 members, with a dedicated presentation section on XR2Learn forum which can be found at this [link](#).

In the context of strategic clustering and collaboration activities, XR2Learn actively contributed to joint dissemination and engagement initiatives. These included the co-organisation of webinars, joint participation at **Laval Virtual 2026** alongside the Motivate XR project, and the development of a communication campaign entitled **"Breaking Barriers: How Open XR Standards Unlock Interoperability and Compliance"** (July 2025), carried out in collaboration with the XR5.0 project. The webinar and its follow-up activities, coordinated by the XR2Learn project — including interview series and "Meet the Expert" sessions — were disseminated through the XR2Learn Community Forum, where additional materials, expert interviews, and post-event discussions were published, generating high visibility and active community engagement. This initiative illustrates the practical implementation of cross-project collaboration within the BeyondXR Cluster and highlights the role of XR2Learn in supporting coordinated dissemination, community-building, and knowledge-exchange activities across the XR ecosystem. In this context of collaboration, it is planned to continue leveraging the XR2Learn Community Forum as a common reference point, fostering cross-project interaction, dissemination of outcomes, and long-term

ecosystem sustainability, also involving new and ongoing initiatives (e.g. *UPRAISE*, *MOTIVATE XR*).



FIGURE 8: PREVIEW OF BREAKING BARRIERS: HOW OPEN XR STANDARDS UNLICK INTEROPERABILITY AND COMPLIANCE CAMPAIGN

Additional synergies include collaboration with **Women TechEU** (second edition of the *Women in XR* workshop, March 2026), cooperation with the **MANTRA project** to support success-story Key Performance Indicators (KPIs), and joint dissemination activities with the **TALLHEDA project**, further contributing to ecosystem consolidation and long-term sustainability, where XR2Learn Open Call winners were invited to present their solutions and innovation outcomes, further strengthening cross-project visibility and ecosystem consolidation, specific for food sector. Ecosystem collaboration with **Women TechEU** also played a key role in supporting inclusion and diversity within the XR community, through the organisation of two dedicated Women in XR webinars, aimed at increasing visibility of women innovators, fostering networking opportunities, and strengthening community engagement around inclusive XR innovation.

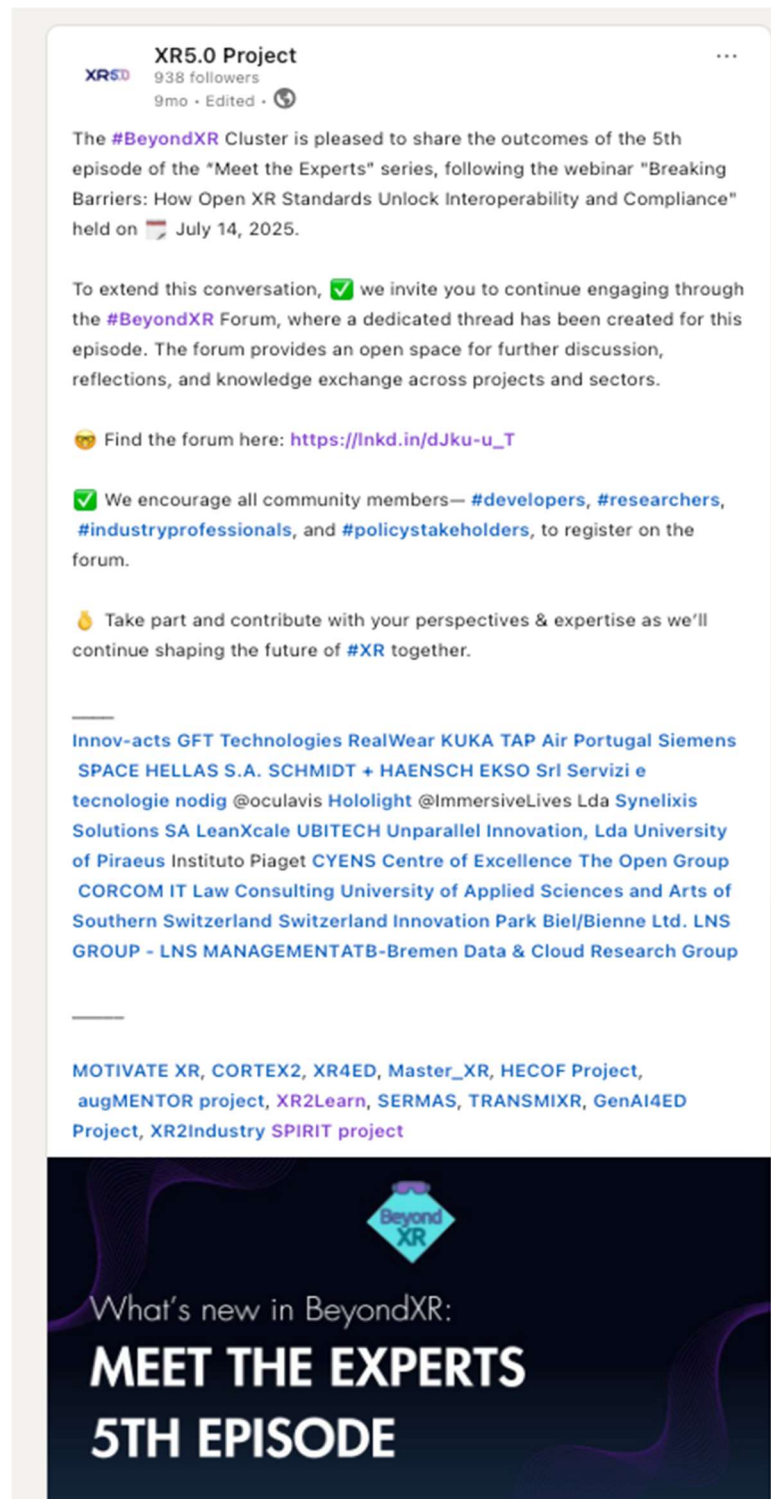


FIGURE 9: EXAMPLES OF COMMUNITY SUPPORT AND CONTENT RESHARING ON THE FORUM

From an exploitation and sustainability perspective the project aims to positioning XR2Learn as a trusted, community-driven platform, where value is co-created by active users and intermediaries. XR2Learn fosters organic growth, supports future market uptake, and lays the foundations for long-term commercial exploitation beyond the project's lifetime.

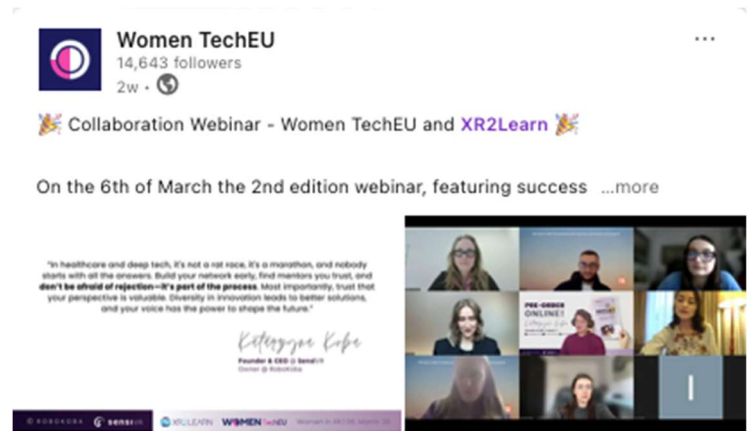


FIGURE 10: COLLABORATION ACTIVITIES BETWEEN XR2LEARN, MANTRA AND WOMEN TECHEU

5. XR2LEARN FORUM – STRUCTURE, ENGAGEMENT AND IMPACT

5.1 Evolution of the XR2Learn Forum: Governance and Strategic Development

Following the launch of the XR2Learn Forum in March 2024, the project entered, from **August 2024**, a consolidation and structuring phase aimed at maximising the Forum’s value as a **central community, knowledge-sharing, and engagement hub**. After the initial setup phase—focused on technical configuration, content seeding, and user registration, the emphasis shifted towards long-term governance, content strategy, and sustained participation.

With the Forum established as the main digital space for interaction, visibility, and collaboration, a structured content creation and management strategy was introduced to ensure continuity, relevance, and meaningful engagement. This approach moved the Forum beyond a simple communication channel towards a living ecosystem asset supporting project exploitation and sustainability.

A comprehensive content plan was defined for each Forum section, specifying:

- objectives and target audience,
- typologies of content,
- publication frequency,
- and mechanisms for discussion stimulation and collaboration.

This strategy built on early contributions from consortium partners and **OC1 winners**, transforming initial project outputs into reusable and searchable knowledge assets.

Welcome and Introduction EIT Manufacturing Introduce new members to the forum’s purpose, guidelines, and community norms.	Content Creation Hellenic Open University Discussions on creating training materials, courses, and educational resources.	Technical Aspects LS Group Discussions on XR technology issues and problem-solving	Showcases Synelixis Highlight members’ work projects, and success stories related to XR learning.
General Discussion Supsi Provide a space for broad discussions on XR and advanced learning news, markets and trends.	Announcements F6S Share updates on XR2Learn project progress, events, and forum guidelines.	Networking EIT Manufacturing Connections among forum members for collaboration, mentorship, and knowledge sharing	Feedback and Discussion Maggioli Input from members to improve the forum experience and content offerings

FIGURE 11: DRAFT CONTENT CREATION PLAN AND PUBLICATION FRAMEWORK

In parallel, a moderation framework was implemented to ensure a respectful, inclusive, and supportive environment, monitor discussions, and provide timely assistance to users. Responsibilities were distributed across partners according to expertise:

- EIT Manufacturing: onboarding and networking activities
- Hellenic Open University: educational and training content moderation
- LS Group: technical support and Q&A management
- Synelixix: Showcase section for Open Call projects
- SUPSI: general discussions, news, and trends
- F6S: announcements and project updates
- Maggioli: feedback collection and continuous improvement

Through this coordinated governance model, the Forum evolved into a structured, interactive ecosystem fostering collaboration, knowledge exchange, and sustained community growth.

5.1.1 Community Onboarding and Engagement Strategy

Dedicated onboarding actions were implemented for OC1 and OC2 winners, including welcome kits, access instructions, and dissemination guidelines.

Community expansion was supported through:

- Newsletters
- LinkedIn pages and groups
- YouTube channels
- webinar-based engagement

Partner-led communication efforts reinforced participation, with speakers and panelists actively promoting Forum registration and interaction during key events such as the Vienna workshops, AWE EU, and the OC2 onboarding phase. These coordinated actions ensured **continuous growth, visibility, and engagement** within the Forum ecosystem.

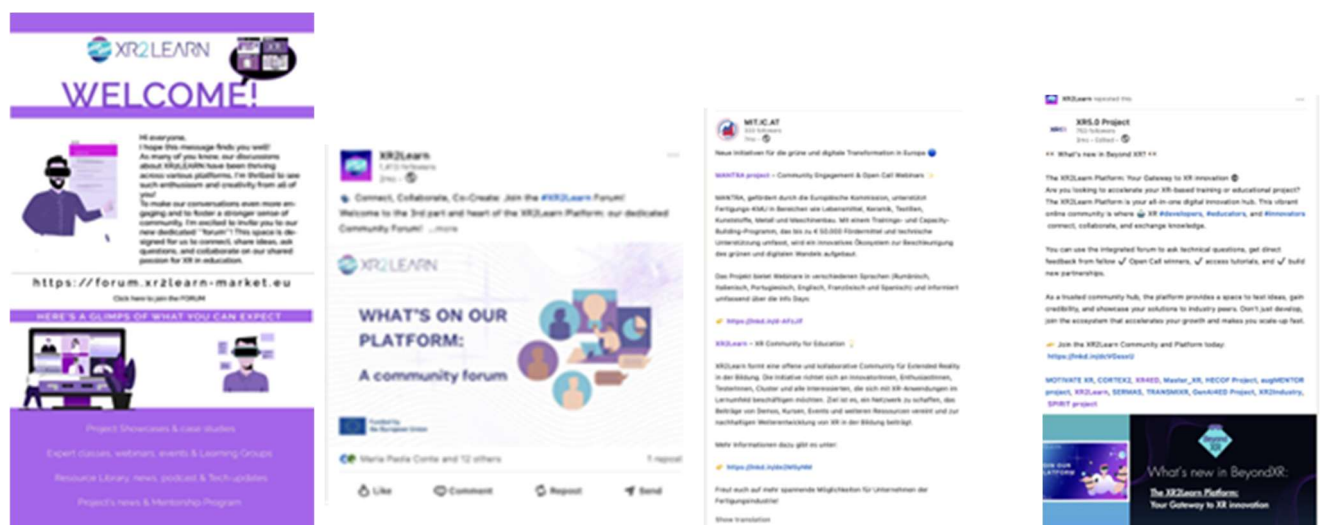
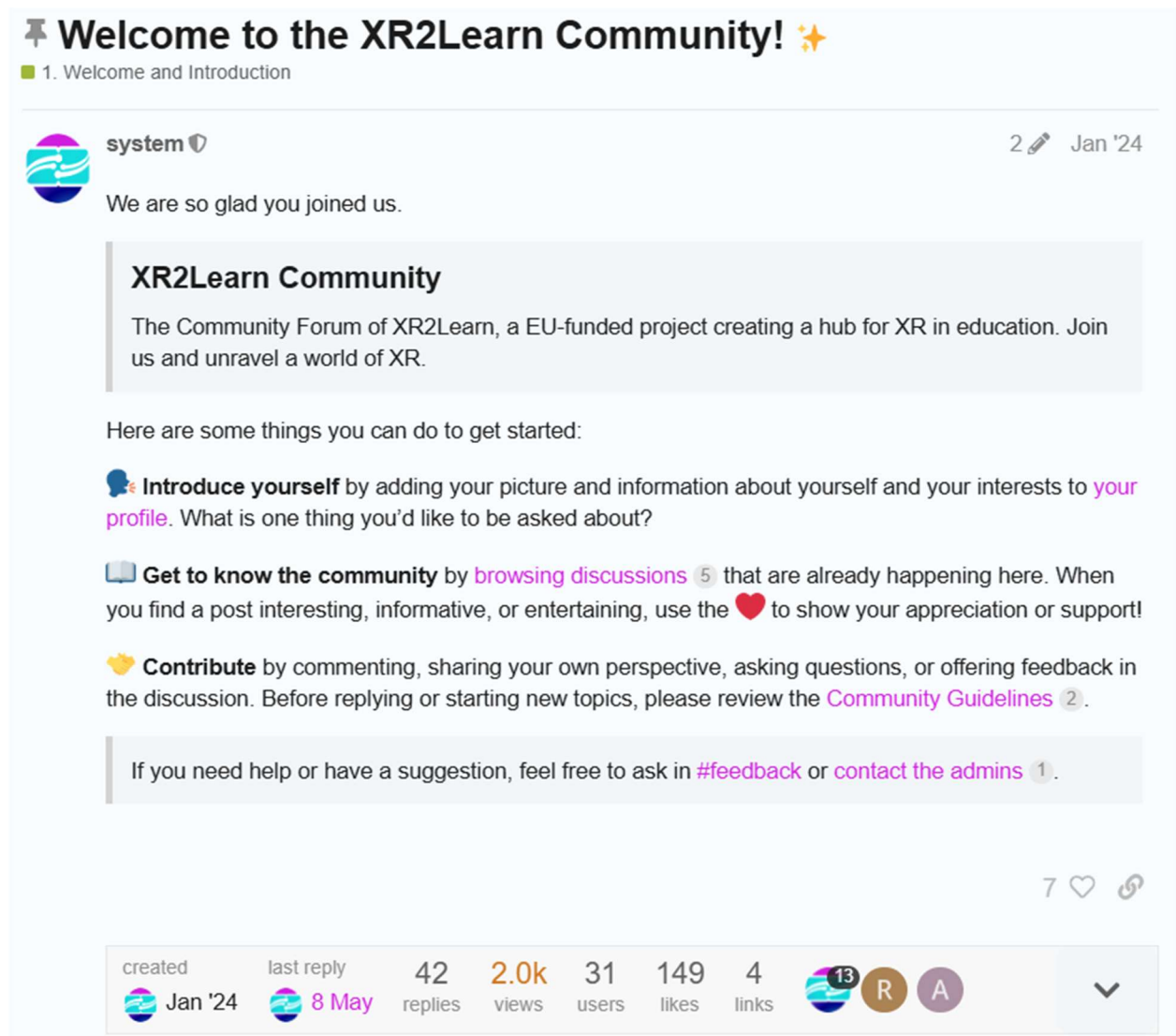


FIGURE 12: WELCOME KIT TO ONBOARD PARTICIPANTS IN THE FORUM AND COMMUNICATION CAMPAIGN TO SUPPORT FORUM ENGAGEMENT

5.1.2 Forum Structure and Content Strategy

The XR2Learn Forum is organised into **clearly defined macro-sections**, each supported by a dedicated content strategy aligned with its specific purpose. A mandatory onboarding step for new users is the introduction post in the [Welcome and Participant Introduction section](#), which has recorded **more than 2000 views**, confirming its effectiveness as an engagement entry point.



Welcome to the XR2Learn Community! ✨

1. Welcome and Introduction

system 2 Jan '24

We are so glad you joined us.

XR2Learn Community

The Community Forum of XR2Learn, a EU-funded project creating a hub for XR in education. Join us and unravel a world of XR.

Here are some things you can do to get started:

- Introduce yourself** by adding your picture and information about yourself and your interests to [your profile](#). What is one thing you'd like to be asked about?
- Get to know the community** by [browsing discussions](#) 5 that are already happening here. When you find a post interesting, informative, or entertaining, use the ❤️ to show your appreciation or support!
- Contribute** by commenting, sharing your own perspective, asking questions, or offering feedback in the discussion. Before replying or starting new topics, please review the [Community Guidelines](#) 2.

If you need help or have a suggestion, feel free to ask in [#feedback](#) or [contact the admins](#) 1.

7 ❤️ 🔗

created	last reply	42	2.0k	31	149	4	13	R	A	▼
Jan '24	8 May	replies	views	users	likes	links				

FIGURE 13: WELCOME TO THE COMMUNITY

The forum architecture is reflected in the following main thematic categories:

- Welcome and Introductions
- Content Creation
- Technical Aspects
- Showcase

- General Discussion
- Announcements
- Networking
- Feedback and Suggestions

This structure supports different stages of user interaction, ranging from onboarding and technical exchange to dissemination, collaboration, and feedback collection.

Dedicated sections were also created for OC1 and OC2 projects and shared tagging practices (OC1, OC2). This approach improves content discoverability, navigation, and cross-project interaction, while enhancing external visibility. Engagement metrics confirm the effectiveness of this structure, with individual project sections exceeding 430 views, indicating interest beyond the core consortium.

Forum content was organised into **recurring, recognisable formats** designed to support engagement, structured knowledge sharing, and reuse of project results. These formats transform project activities into accessible resources for both technical and non-technical audiences.

Key content typologies include:

- **Implementation Resources and Tutorials** (e.g. Magic Room, publishing and implementation guides)
- **XR2Learn Value – Feedback** (platform features, benefits, and best practices)
- **Educational Impact Posts** (insights from OC projects and surveys)
- **Educational Pills** (short, practical XR use cases and design tips)
- **Event-based Dissemination Posts** (webinar recaps, workshops outcomes, key takeaways)
- **Networking Content** (collaboration requests, mentoring discussions, knowledge exchange)

These formats provide **continuous support across technical, pedagogical, and community dimensions**, enabling onboarding, peer learning, and cross-project collaboration.

These formats ensured continuous support across technical, pedagogical, and community dimensions of the platform. In particular, tutorials and implementation guides addressed technical onboarding and platform usage, while dedicated networking and discussion posts facilitated peer exchange, collaboration opportunities, and cross-project interaction among OC1, OC2, partners, and external stakeholders. User engagement within the forum shows differentiated participation patterns across stakeholder groups. Open Call beneficiaries (OC1 and OC2) represent the most active contributors, regularly sharing project updates, validation results, and technical insights. In addition, a subset of users, including XR practitioners and participants who experienced the developed applications, contributed through feedback, discussions, and targeted interactions. At the same time, a large proportion of users engage primarily as content consumers, accessing content without actively contributing. This is reflected in the relatively high number of views per post (ranging from approximately to >800, >1.100 views), indicating sustained interest and content consumption. This behaviour aligns with typical patterns observed in online communities, where a majority of users act as knowledge consumers, supporting dissemination, visibility, and overall ecosystem impact. An example of a Forum post showing engagement metrix and user interaction patterns (>1.100 views) can be found at this [link](#).

5.1.3 Forum Restructuring for Improved Navigation and User Experience

To improve navigation and overall user experience, several online communities and forums based on Discourse were analysed in order to identify effective approaches to content organisation and interface clarity. The analysis showed that overly complex hierarchical structures do not necessarily enhance usability, while simpler layouts supported by clear categories, concise text, and visual elements tend to be more intuitive for users. Based on these findings, the forum was reorganised to prioritise a clear set of main categories, minimising the use of subcategories and enhancing readability through simplified descriptions and visual cues. In addition, dedicated sections were created for OC1 and OC2 projects, introducing a harmonised naming convention (e.g. “[PROJECT NAME]: Get to know the #OCN”) and shared tagging practices (OC1, OC2), ensuring greater consistency, easier content discovery, and improved user orientation across the platform. The forum had already been introduced in the initial version of the wiki, where guidance on how to access, use, and engage with it was provided to the community; all recent updates have now also been reflected in the wiki, further supporting knowledge sharing and improving overall navigability across the ecosystem.

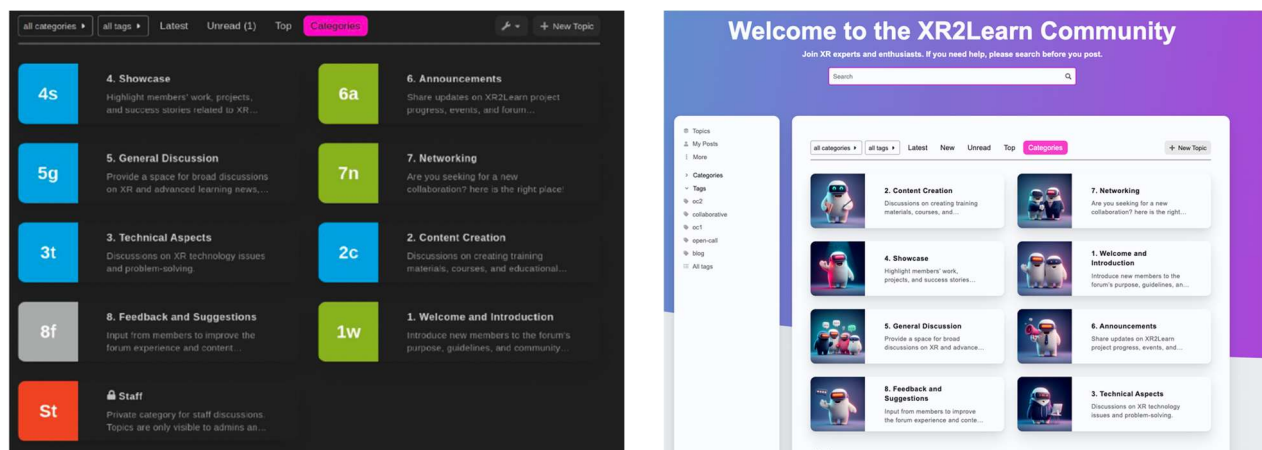


FIGURE 14: FORUM RESTRUCTURING PROCESS – BEFORE AND AFTER IMPLEMENTATION

5.1.4 Implementation Activities and Results from Open Call Winners

Implementation activities and results from Open Call winners represent a core content pillar of the Forum, offering robust evidence of XR2Learn adoption across diverse educational and industrial contexts. Projects such as *EcoDrive XR* demonstrated how targeted design choices (e.g. persistent user personalisation) can significantly enhance immersion, user engagement, and learning continuity over time.

Further contributions from projects such as *FMTS Group* and *XRTwinScape* provided comprehensive examples of XR-based training applied to vocational education, industrial upskilling, and secondary school career guidance. These implementations explicitly operationalized the XR2Learn Educational Framework (ASSURE, TPACK, and Bloom’s Taxonomy), translating pedagogical models into structured learning pathways

that integrate guided instruction, immersive XR exploration, and structured reflection activities within a blended learning approach.

The learning experience was further strengthened through **gamified mechanisms**, including activity progression systems and achievement badges, which supported learner motivation, engagement, and progression tracking throughout the training journey.

Pilot activities across multiple use cases confirmed the effectiveness of XR in addressing heterogeneous learner groups (e.g. students, adult trainees, employees, and first-time XR users), while enabling safe and realistic exploration of industrial environments. The availability of both immersive VR and web-based access further demonstrated the flexibility and accessibility of XR2Learn solutions across different technological and educational settings.

Importantly, several solutions were **validated in real industrial environments**, including manufacturing plants and engineering facilities, demonstrating scalability and applicability beyond controlled pilot conditions. These real-world implementations highlighted XR's potential to support high-responsibility tasks such as system assembly, fault detection, operational decision-making, and industrial safety procedures.

Evaluation results, based on pre-/post-assessments and user feedback surveys, consistently showed **measurable improvements** in knowledge acquisition, procedural understanding, decision-making capabilities, and learner confidence. In parallel, career-oriented use cases demonstrated increased awareness of Industry 5.0 professions and improved alignment between personal skills and potential career paths.

Emerging applications also extended XR beyond traditional training domains. Notably, use cases such as **XR-supported de-manufacturing and circular economy training** illustrated the potential of immersive technologies to address sustainability-related industrial challenges, including product disassembly and resource optimization.

From a technological perspective, implementations leveraged advanced features such as **OpenXR integration, hand tracking, and gesture-based interaction systems**, enabling more natural and intuitive user experiences and improving overall training realism.

In parallel, consortium partners enriched the Forum with operational, step-by-step resources (e.g. *Magic Room* usage, class publishing, and session management guides), supporting technical onboarding and facilitating the practical integration of XR tools into educational and training workflows.

5.1.5 Community Value, Networking and Dissemination

A key added value for OC1 and OC2 participants was the opportunity to share reflections and testimonials based on direct experience with XR development and implementation. Feedback consistently highlighted faster prototyping processes, reduced technical barriers, improved management of complex XR workflows, and intuitive interaction design, even for first-time XR users. Participants also emphasized the strong benefits derived from peer exchange and community support.

User testimonials further confirmed high levels of satisfaction and the effectiveness of XR compared to traditional learning approaches, particularly in enabling safe, engaging, and efficient skill acquisition. Overall, these contributions reinforced the perception of XR2Learn as a **community-driven ecosystem**, supporting collaboration, experimentation, and real-world deployment of XR solutions. Several projects are now entering a growth phase, engaging new stakeholders and exploring further adoption and scaling opportunities across sectors.

In parallel, the Forum integrated structured dissemination and networking activities through the Announcements and Networking sections, centralising communication on events, pilots, webinars, and broader ecosystem initiatives. Key activities included the organisation of **BeyondXR and XR5.0 webinars**, as well as participation in major events such as AWE EU showcases, SPS Italia demonstrations, and education-focused deployments, strengthening visibility and stakeholder engagement.

Targeted inclusion and engagement initiatives further expanded participation beyond the Forum, including XR2Learn contests and participation drives, Women in XR initiatives, Women TechEU collaborations, and EcoDrive XR workshops for girls. Together, these actions reinforced the Forum's role as a hub for **inclusive, collaborative, and sustainable ecosystem development**, while fostering knowledge exchange across diverse stakeholder groups.

5.1.6 Forum Adoption and Engagement – Key Indicators

To monitor adoption and engagement, a set of **quantitative indicators** was tracked across the XR2Learn Forum. Since its launch, the platform has recorded:

- **470+ registered users**, including project partners, Open Call winners, educators, developers, and external stakeholders
- **170,000+ total number of pageviews**, reflecting active exploration of technical resources, announcements, and community discussions
- Steady growth in registrations and interactions and continuous engagement, independent of single events.
- **High visibility for key sections**, including Open Call project showcases, Technical Aspects, and participant introductions

These indicators confirm the Forum's role as **a central hub for engagement, knowledge exchange, and onboarding**, supporting the project's objective of reaching early adopters and sustaining long-term community participation.

6. BUSINESS MODELS

The sustainability and long-term exploitation of the XR2Learn platform rely on a thorough understanding of the evolving e-learning, XR and Web3 ecosystems. To establish a resilient, market-ready framework, the project analyzed established paradigms across three distinct but converging domains: Educational Platforms, Web3/NFT tokenomics, and 3D/XR asset marketplaces. The insights synthesized below directly shape the hybrid business model of the XR2Learn platform, ensuring a balanced equilibrium between infrastructure monetization and value generation for the community.

6.1 Educational Platform Business Models

Strategic Shift: From Educational Experimentation to Socio-Technical Deployment

A comparison with the baseline phases (D2.1 and D2.3) reveals a major strategic shift in how these models are applied. Initially, educational platform models were conceptualized primarily to support standard content creation, reuse, and basic training experimentation. In this final phase, the strategy has moved towards positioning the platform within broader socio-technical ecosystems. The target has expanded beyond primary learners and trainers to include extended networks focused on safety management, compliance, certification, and institutional governance. This transitions the platform from a standard learning repository into an ecosystem-level infrastructure optimized for real-world deployment.

The global expansion of the digital learning sector has established clear monetization and engagement baselines for online education. To guide the platform architecture, several industry-leading models were evaluated to assess their monetization mechanisms, target audiences, and structured learning delivery:

- **Coursera (Institutional & Subscription-Driven):** This platform leverages strategic partnerships with prestigious academic and corporate entities to deliver certified, structured learning pathways, including specialisations and degree programs. Through its "Coursera Plus" model, it ensures unhindered access to an extensive catalogue via a subscription-based framework, demonstrating the viability of predictable recurring revenue streams within the professional upskilling domain.
- **Udemy (Transactional Course Marketplace):** Operating as an open-access repository, Udemy enables individual subject-matter specialists to produce and distribute video-centric educational content. The platform maintains centralised control over promotional pricing, discounts, and revenue-splitting mechanisms, serving as a representative model for high-volume transactional marketplaces within the EdTech sector.
- **LinkedIn Learning (B2B Skill-Centric Subscription):** Seamlessly integrated as a premium service within a global professional social network, this platform specialises in corporate upskilling and workforce development. It leverages data-driven personalisation engines to align individual user profiles with industry-recognised micro-credentials, fostering continuous professional growth and skill validation.
- **Skillshare (Community & Subscription-Based):** With a primary focus on creative industries, Skillshare emphasises community interaction and peer-to-peer engagement through discussion boards and project portfolios. Monetisation is achieved via flat subscription tiers, prioritising experiential and project-based learning over formal academic certification within its specific ecosystem.
- **Open-edX and EdX.org:** (Open-Source Infrastructure vs. Commercial Portal)
 - These entities demonstrate a dual-layer ecosystem approach, where Open-edX functions as an open-source content management infrastructure, while EdX.org operates as the public-facing commercial learning portal. This configuration facilitates the distribution of advanced university-level specialisations and academic content within a scalable, platform-based framework.

The evaluation of digital learning archetypes reveals that long-term platform viability depends on a carefully structured, multi-layered monetization strategy. While transactional, pay-per-course options offer immediate commercialization channels

that appeal directly to independent creators, they lack the predictable, recurring revenue streams needed to support continuous platform hosting and feature updates. Conversely, enterprise licensing and structured subscription frameworks demonstrate the highest capacity for capturing the professional upskilling and corporate markets.

To optimize the balance between infrastructure monetization and value generation, XR2Learn should deploy a hybrid approach: maintaining a Freemium model to accelerate user acquisition and open testing among early adopters, while simultaneously tiering premium access via SaaS Subscriptions and Enterprise Licensing focused on advanced analytics, specialized modules, and high-fidelity industrial simulations. This transition from a simple learning repository to an ecosystem-level infrastructure ensures a sustainable framework optimized for real-world socio-technical deployment.

Typologies Evaluated for XR2Learn Integration

To align with these industry standards, educational platforms generally leverage specific operational archetypes:

TABLE 2: DIFFERENT OPTIONAL ARCHETYPES FOR EDUCATIONAL PLATFORMS

Model	Mechanism	Target Audience	Relevance to XR2Learn
Freemium	Core features and open enablers are free; specialized plugins, analytics, or advanced modules require a fee.	Independent Developers, Early Adopters	High: Drives initial ecosystem user acquisition and platform testing.
Subscription (SaaS)	Regular recurring fee (monthly/yearly) for tiered access to premium platform services.	Training Centers, EdTech Corporates	High: Ensures steady operating revenue to support hosting and continuous feature updates.
Pay-Per-Course / Transactional	One-time direct payment or royalty split for specialized, standalone learning tracks.	Specialized Trainees, Independent Professionals	High: Directly matches monetization formats preferred by creators for commercialization.
Corporate / Enterprise Licensing	Bulk seat licensing or customized runtime environments for organizational workforce development.	Large Enterprises, Industry Players	Very High: Captures enterprise value via high-fidelity, safety-critical industrial simulations.

6.2 NFT-Based Business Models

Changing the landscape: Transition to Marketplace Maturation and Revenue-Splitting Realism

The XR2Learn platform operationalises Web3 frameworks by moving beyond speculative asset tokenization toward a functional utility-based infrastructure grounded in operational reality. Instead of serving as mere digital collectibles, NFTs act as functional utility containers used to register provenance, safeguard IPR, and monitor the reusability of modular software components and 3D simulation templates. This technical architecture leverages smart-contract logic to enable transparent, real-time peer-to-peer revenue distributions. When a marketplace transaction occurs, royalties are automatically split between primary XR developers, instructional designers, and relevant validation authorities. This structured approach directly anchors tokenomics to tangible marketplace value drivers and automated revenue-sharing mechanisms.

While in the early phases of the project blockchain and NFTs were introduced as a theoretical capability for tracking intellectual property, this final phase reveals a distinct shift toward operational reality. Speculative terminology has been replaced by structured transaction logic. Survey data from final ecosystem users indicates that willingness to engage with Web3 tools is now explicitly tied to clear marketplace value drivers, such as automated royalty splitting for paid XR lessons and direct co-investment opportunities. The focus has firmly transitioned from pure asset tokenization to supporting a mature, multi-stakeholder revenue-sharing infrastructure.

Web3 frameworks and distributed ledgers provide non-fungible tokens (NFTs) with distinct operational capabilities to register provenance, establish ownership, and automate cryptographic royalty splits. To design the automated IPR mechanism for the platform, the project analyzed established blockchain frameworks:

- **OpenSea (Multi-Chain Aggregated Marketplace):** This platform operates as a pioneer in decentralized asset exchange, emphasizing intuitive self-service minting and high-liquidity secondary trading across diverse public protocols, including Ethereum, Polygon, and Solana.
- **Rarible (Decentralized Governance & Metadata Verification):** Centred on a decentralized governance model, this marketplace leverages its native utility token to enable token holders to participate in policy-making. Its strategic integration with established enterprise tech stacks reinforces the value of secure metadata validation for digital content within the ecosystem.
- **Binance NFT (Centralized Exchange Ecosystem):** Leveraging a proprietary and optimized blockchain architecture, this platform demonstrates the operational efficiency of centralized exchange environments. By implementing highly competitive flat-rate transaction fees (1%), it highlights how minimal infrastructure overhead can sustain high-velocity transaction flows.
- **SuperRare & Nifty Gateway (Premium Curated Repositories):** These high-end digital art repositories utilize rigorous curation pipelines and exclusive release strategies. Through centralized custody mechanisms, they cater specifically to institutional investment profiles and corporate collections, ensuring high-value asset management.

Operational Integration within the XR2Learn Ecosystem

Moving beyond the conceptualisation of tokens as speculative digital collectibles, XR2Learn operationalises NFT technologies strictly as functional utility assets designed to orchestrate the distribution of software components and educational content:

- **IPR Protection & Transparent Licensing:** Reusable code enablers, 3D simulation templates, and validated pedagogical workflows published on the marketplace are encapsulated within NFT containers. This mechanism establishes an unalterable registry of authorship, effectively safeguarding developer intellectual property while enabling the dynamic tracking of component reusability across the ecosystem.
- **Smart-Contract Automated Royalties:** The deployment of custom metadata frameworks directly into smart contracts allows the platform to automate peer-to-peer revenue distributions. For example, upon the purchase of an advanced safety lesson by an industrial trainer, the embedded logic facilitates the instantaneous splitting of royalties among the primary XR developer, the instructional designer, and the relevant validation authority.

6.3 XR-Based Applications Business Models

Reusability Embedded in Domain-Specific Operational Ecosystems

The final phase of the XR2Learn shows an important shift from general XR tool creation to domain-specific operational scaling. While the earlier phases treated 3D models and code enablers as generic assets to reduce technical fragmentation, the final deployment demonstrates that these capabilities are now deeply embedded within specific industrial sectors. As shown in the previous deliverables, the business value of the platform is no longer measured solely by tool reusability, but by its capacity to solve high-responsibility tasks - such as real-time electric vehicle disassembly, defect inspection using AI libraries, port crane handling, and emergency clinical decision-making - transforming XrRive into an ecosystem connector for safety-critical environments.

The commercialization of immersive 3D and automated XR tools requires reliable distribution infrastructures capable of managing complex spatial assets. The project evaluated three dominant web-based 3D ecosystems to formulate its positioning:

- **Sketchfab:** The industry baseline for browser-native 3D asset viewing, collaborative pipeline review, and direct-to-consumer asset trading. Sketchfab operates on a flat transaction commission model (taking a 30% cut on all sales), demonstrating the commercial weight of user-friendly asset integration and embedded viewing tools.
- **CGTrader:** A professional repository heavily backed by an elite designer community. It targets large corporate buyers requiring high-quality architectural or engineering assets. By offering a tiered structure where returns can reach up to 90%, it underscores the strategic value of creator-centric financial incentives.
- **TurboSquid:** A large, high-end content library that leverages strict exclusivity agreements to guarantee distribution advantages and algorithmic promotion features for top-tier publishers.

Consolidating the XR2Learn Value Proposition

The strategic synthesis of these models highlights a distinct market fragmentation; while platforms like Coursera handle pure educational delivery and Sketchfab manages generic 3D models, there is a clear gap for an integrated repository that combines both

technical enablers and verified educational frameworks. XR2Learn serves as an ecosystem-level orchestrator, generating measurable business values across the entire stakeholder spectrum as validated by feedback from the Open Call 1 and Open Call 2 cohorts.

On the supply side, the platform accelerates time-to-market by offering plug-and-play development enablers - such as the INTERACT Enabler for physics-based interaction and advanced robotics, or specialized Personalization & Inference Enablers - which cut integration barriers drastically. Survey feedback confirms a substantial increase in efficiency, with several projects reporting a 25% to 50% reduction in development time, directly saving developers from building complex machine learning pipelines or hand-tracking frameworks from scratch.

On the demand side, the platform enhances operational ROI for user organizations and industrial enterprises operating in safety-critical, time-constrained settings like healthcare upskilling, logistics, or automotive manufacturing by delivering verified pedagogical outcomes. Field pilots demonstrated highly positive results, including a 25% contraction in user training time combined with a 30% boost in overall knowledge retention, proving that high-fidelity immersive learning directly translates into lowered operational risks, minimized error rates, and increased user confidence.

7. CONCLUSIONS

This deliverable represents the final update of the work carried out on the activities related to the Ecosystem, needs analysis, set up and growth and the Novel business models and business model support, consolidating results achieved across the full lifecycle of the XR2Learn project. From the initial stakeholder mapping and platform setup activities in the early phases, through the onboarding of OC1 and OC2 beneficiaries, to the ecosystem consolidation and sustainability-oriented actions of the final phase, the work documented here reflects a continuous and iterative process of platform development, community building, and value creation. Together, these activities have contributed to shaping XR2Learn into a comprehensive ecosystem supporting the adoption, development, and deployment of XR-based solutions for education and training across Europe.

The results achieved across both Open Call cohorts demonstrate the platform's growing maturity and real-world relevance. Through structured stakeholder analysis, user-centred validation workshops, and systematic survey activities, the project has progressively refined its understanding of the XR value chain and the diverse needs of its ecosystem actors. Survey results and pilot outcomes confirm tangible impact: significant reductions in development time, measurable improvements in training effectiveness, and growing engagement from stakeholders spanning education, industry and research. The expansion from OC1 to OC2 also revealed an important strategic shift from early experimentation with XR tools to scalable, domain-specific deployment in safety-critical and operationally demanding environments.

At the ecosystem level, XR2Learn has grown into a trusted infrastructure connecting XR developers, training providers, learners, and industry actors through structured value exchanges, shared tools, and an active community forum. With over 4,500 contacts reached, 471 registered platform users, and a steadily expanding network of cross-project collaborations, including the BeyondXR cluster, the ecosystem is well positioned for sustainability and continued growth beyond the project's lifetime.

Looking ahead, the foundations established through the business modelling work, the growing base of early adopters, and the platform's demonstrated capacity to support real-world XR deployment provide a solid basis for long-term exploitation. XR2Learn is positioned not merely as a project outcome, but as an enduring platform for the advancement of XR-based learning and training in Europe, capable of evolving alongside the needs of its community and the broader XR landscape.

ANNEX A

OC1 Winner Workshop in AWE Vienna (October 29 – 30, 2024)

Following the first in-person workshop on stakeholder analysis held in Paris during the XR2Learn General Assembly on 21 March 2024, a second in-person workshop gathering all Open Call winners was organised. The activity aimed at collecting feedback on the XR2Learn platform, ecosystem, and functionalities took place during **AWE EU 2024 (29–30 October 2024, Vienna, Austria)**, one of Europe’s leading events dedicated to XR technologies, immersive learning, and digital innovation. Within this context, the XR2Learn project participated with a dedicated booth showcasing the Open Call 1 (OC1) winning solutions, with the active involvement of OC1 beneficiaries.



FIGURE 15: XR2LEARN PARTICIPATION AT AWE EU 2024 (BANNER)

This engagement was complemented by the organisation of the XR2Learn General Assembly and a dedicated workshop involving OC1 participants. The overall objective was to foster interaction among Open Call winners, encourage knowledge exchange, and gather qualitative insights on their experience with the platform, its services, and their development processes, identifying strengths, challenges, and areas for improvement.

The workshop specifically aimed to collect structured qualitative feedback on beneficiaries’ experiences, focusing on the development progress of their XR-based solutions using the XR2Learn platform and their interaction with its services. The session also supported the validation of preliminary findings, the identification of improvement areas, and the collection of suggestions to further enhance the usability and relevance of the project’s platform.

The workshop opened with short presentations by OC1 beneficiaries, who introduced their projects, technological approaches, and application domains. These presentations were followed by an open discussion session, enabling collective reflection on shared challenges, lessons learned, and future development opportunities. The following OC1-funded projects participated in the workshop: **XR2IND, XR4HRC, X-Alfy, PaperXR, EVROSH5, PROXIMA, and CARATE.**



FIGURE 16: OC1 BENEFICIARIES PARTICIPATING IN THE XR2LEARN WORKSHOP AT AWE 2024

In parallel with the workshop activities, individual interviews with OC1 beneficiaries were conducted during the event. These interviews supported both the showcasing of project results and the qualitative assessment of beneficiaries' experiences with the project, with particular attention to the innovation level of their solutions and the support provided by the XR2Learn platform. Selected insights and testimonials were subsequently shared through social media channels and the XR2Learn Community Forum, contributing to the visibility of Open Call solutions, the promotion of success stories, and the communication of the value and impact of the XR2Learn ecosystem.

[LinkedIn publication example](#); [Forum publication example](#):

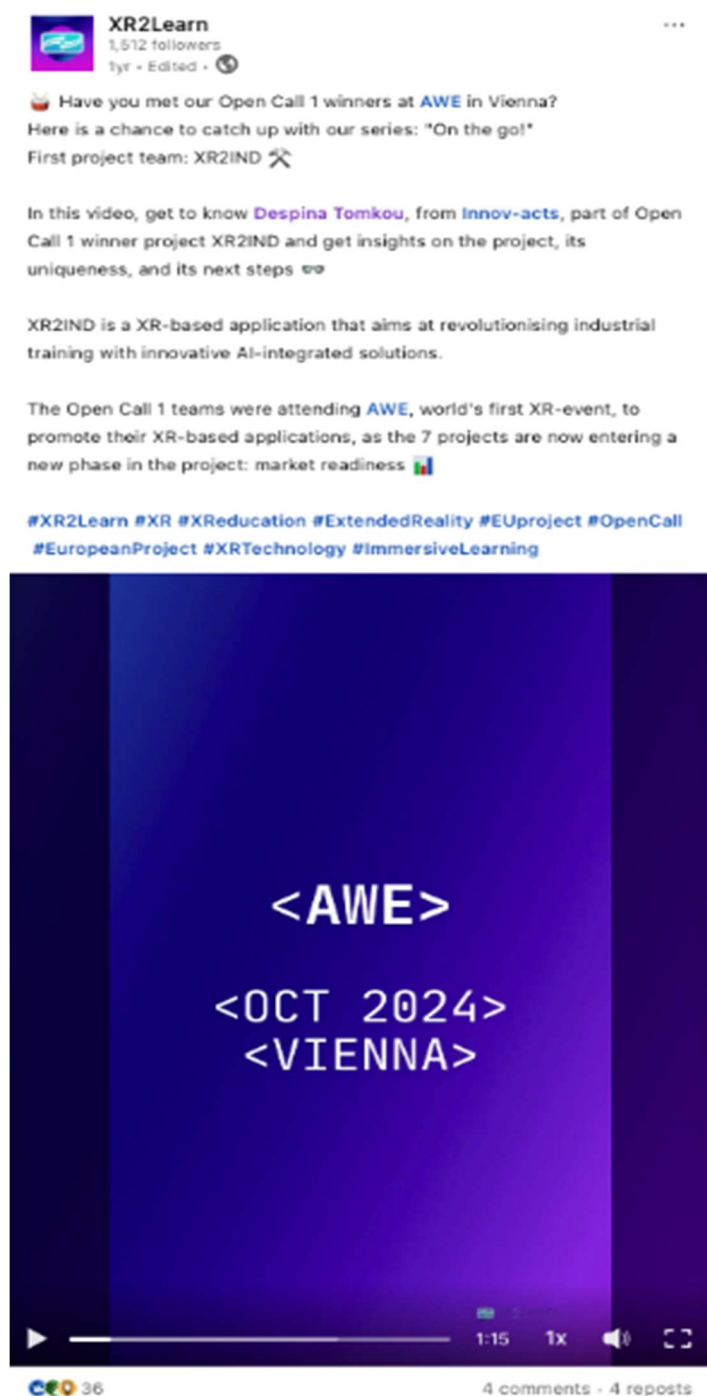


FIGURE 17: EXAMPLE OF BENEFICIARIES INTERVIEWS ON XR2LEARN LINKEDIN PAGE

Three-Phase Structured Methodology

To systematically capture feedback across different stages of the beneficiaries' journey, a structured three-phase reflection approach was adopted, enabling the collection of insights before, during, and after engagement with the XR2Learn platform:

- **Phase 1 – Baseline Reflection (Pre-Engagement):** capturing initial conditions, challenges, emotional states, experiences, and organisational values prior to engagement with XR2Learn platform;
- **Phase 2 – Platform Experience (During Engagement):** exploring direct experiences with XR2Learn tools and services, with a focus on usability, collaboration, and perceived benefits;
- **Phase 3 – Impact and Future Outlook (Post-Engagement):** assessing perceived impact on project development, innovation capacity, collaboration, and future expectations.

Phase 1 – Baseline Reflection (Pre-Engagement)

Phase 1 began with a visual presentation of the services developed within the XR2Learn platform (Figure 18), illustrating its tools, functionalities, and overall ecosystem. This introduction provided participants with a shared understanding of the platform's scope and its intended support for XR project development. OC1 participants were then invited to reflect on the status of their projects prior to engaging with XR2Learn through a structured emotional self-reflection exercise supported by a visual board (Figure 19). The exercise was designed to capture perceptions and emotional responses across different phases of the project lifecycle, with a focus on motivations, decision-making processes, and collaboration dynamics. Participants reflected on key moments, experiences, and lessons learned, sharing insights into interpersonal dynamics and project development challenges.

The activity highlighted recurring organisational challenges, including limited innovation capacity, fragmented collaboration, and difficulties in accessing support networks. These reflections established a qualitative baseline for assessing the added value of XR2Learn in subsequent phases.

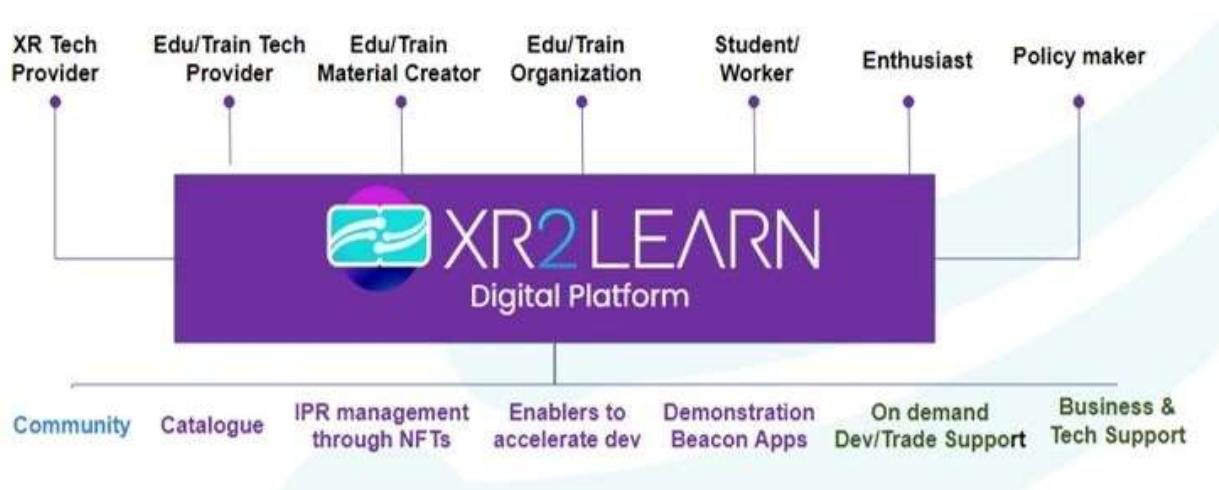


FIGURE 18: XR2LEARN PLATFORM VISUAL BOARD FOR THE REFLECTIVE EXERCISE

The Emotional Reflection Board is structured in four complimentary dimensions: **Keywords, Emotions, Experiences, Values** inviting participants to reflect with an holistic approach on the challenges and issues experienced prior to adopting the XR2Learn platform.

Participants were encouraged to express these challenges by selecting keywords and discussing them collectively, fostering an open exchange of ideas and a collaborative brainstorming process.

The keywords dimension covered both positive and negative concepts. Positive terms included innovation, collaboration, creativity, and growth, while negative challenges were represented by stagnation, rigidity, conflict, resistance, and mediocrity.

*Before using the **XR2LEARN platform** list the challenges and the issues encountered – you can choose keywords, emotions, experiences, or values and elaborate your thoughts:*

KEYWORDS	EMOTIONS	EXPERIENCES	VALUES
•Innovation •Collaboration •Growth •Flexibility •Creativity •Stagnation •Conflict •Resistance •Rigidity •Mediocrity	•Fulfillment •Joy •Hope •Appreciation •Confidence •Frustration •Anxiety •Stress •Fear •Dissatisfaction	•Achievement •Success •Learning •Enrichment •Mastery •Insight •Customer-centricity •Burnout •Frustration •Disillusionment	•Accountability •Excellence •Innovation •Sustainability •Transparency •Complacency •Inequity •Neglect •Short-sightedness •Miscommunication

Example: Before discovering my learning platform, I struggled with stagnation and rigidity, feeling stuck in outdated methods and unable to adapt to new ideas.

FIGURE 19: XR2LEARN EMOTIONAL REFLECTION BOARD (PHASE 1)

The **keywords presented** served as an initial entry point for reflection and included a balanced set of positive and negative concepts representing typical organisational states. Positive keywords such as *innovation, collaboration, creativity, growth, openness, and experimentation* were contrasted with critical terms including *stagnation, rigidity, resistance to change, conflict, isolation, and mediocrity*, enabling participants to clearly position their projects and organisations within their pre-engagement context.

The **emotional dimension** captured a wide spectrum of feelings, ranging from *fulfilment, joy, hope, and confidence* to *frustration, anxiety, stress, fear, and dissatisfaction*, reflecting both positive motivations and existing sources of pressure.

Similarly, the **experience dimension** contrasted positive experiences, such as *achievement, success, learning*, and, with more challenging ones, including *burnout, frustration, and disillusionment*.

The **values dimension** highlighted core principles such as *accountability, excellence, innovation, sustainability, transparency, and integrity*, while also acknowledging critical issues including *neglect, short-sightedness, and miscommunication*.

An illustrative example, displayed at the bottom of the board and presented to participants as a starting point for the analysis, depicted a scenario marked by stagnation and rigidity, in which dependence on outdated practices constrained adaptability and hindered innovation prior to engagement with the XR2Learn platform.

Each Open Call beneficiary representative, participating at the workshop was then asked to reflect on their own **pre-engagement situation** by selecting relevant keywords, emotions, experiences, and values that best represented their organisational and project context. Through this shared reflective process,

several recurring organisational challenges emerged, particularly related to creativity, leadership, collaboration, and innovation, providing a qualitative baseline for assessing the added value of the XR2Learn platform.

The following table summarises the key findings from the pre-engagement reflection exercise.

TABLE 3: OVERVIEW OF KEY PRE-ENGAGEMENT INSIGHTS IDENTIFIED ACROSS THE FOUR REFLECTION DIMENSIONS

Dimension	Key Findings
Keywords	Stagnation emerged as the dominant theme, associated with limited innovation capacity, rigid processes, and a strong reliance on established practices that constrained creativity and experimentation.
Emotions	Participants reported high levels of frustration, dissatisfaction, stress, and uncertainty , often linked to limited progress, insufficient support structures, and isolation in decision-making roles.
Experiences	Recurring issues included burnout, missed opportunities, ongoing uncertainty , and difficulties initiating collaborative innovation activities due to limited access to networks and market knowledge.
Values	A perceived lack of collaboration, partnership, and shared vision was highlighted, alongside a strong aspiration for openness, innovation, and collective problem-solving.

Participants' statements further reinforced and contextualised the qualitative findings emerging from the reflective exercise. Representative reflections include:

"We experienced stagnation in creativity and dissatisfaction in progress, coupled with a lack of support for innovation."
(Feelings: frustration, disappointment, helplessness – high perceived impact)

"Frustration and dissatisfaction hinder the development of innovative ideas, leading to missed opportunities."
(Feelings: frustration, dissatisfaction, regret – high perceived impact)

"Limited knowledge of the marketplace has left group leaders feeling isolated, resulting in stress and uncertainty about project leadership."
(Feelings: isolation, stress, insecurity – high perceived impact)

"Seeking freedom, collaboration, and partnership in the development of business solutions."
(Feelings: hope and desire for collaboration – moderate to high positive expectation)

Across all reflections, recurring patterns of high frustration, dissatisfaction, anxiety, and stress were identified. These emotional and experiential challenges were largely attributed to stagnation, insufficient structural support for innovation, and limited collaboration and networking opportunities.

Collectively, these findings establish a clear qualitative baseline and underline the need for a learning and innovation platform capable of fostering creativity, connection, and shared growth. This context helps explain the motivation for engagement with the XR2Learn ecosystem, positioning the platform as a response to pre-existing organisational constraints and unmet innovation needs.

Phase 2 – Platform experience (During Engagement)

Building on the **baseline reflection**, **Phase 2** explored participants' **direct experience with XR2Learn services and support** during engagement with the platform. This phase leveraged the beneficiaries' experiences to **stimulate collective reflection and discussion among OC1 winners**, enabling peer exchange on practical usage, benefits, and challenges encountered while interacting with XR2Learn.

Participants provided structured feedback on the platform's main components, including the Community, Catalogue, IPR management through NFTs, development enablers, demonstration and beacon applications, on-demand development tools, and business and technical support services.

Overall, the Community and Catalogue and marketplace were identified as the most valuable features, particularly for improving project visibility, enabling networking opportunities, and supporting knowledge exchange across projects. Development enablers and interactive tools were also positively assessed for their contribution to solution development, acceleration of design processes, and enhanced user engagement within XR environments. Participants recognised their potential to support scalable innovation workflows.

At the same time, participants highlighted several areas for improvement. In particular, some services showed partial or limited utilisation, suggesting that certain functionalities were not yet fully and systematically adopted. Despite a clearly expressed and strong interest in their integration and future use.

This indicates opportunities to further enhance support, including more structured onboarding processes, clearer documentation, and additional guidance to facilitate a more consistent and effective use of the platform's services. Additional needs were also identified in relation to IPR management and commercialisation pathways, where beneficiaries expressed the need for stronger structured support and clearer frameworks to facilitate the transition towards market uptake.

In particular, participants highlighted the need for enhanced support in the following areas:

- Marketing and project visibility
- Commercialization and go-to-market strategies
- Co-investment and funding opportunities
- Faster transition from prototypes to market-ready solutions

To consolidate these findings and improve readability, Table 4 presents a simplified summary of the feedback collected from OC1 beneficiaries across XR2Learn services, using the following scale:

✓ used / positive feedback

● partially used or interest expressed

— not used or not applicable at the time of assessment

TABLE 4: USE AND PERCEIVED VALUE OF XR2LEARN SERVICES BASED ON FEEDBACK FROM OC1 BENEFICIARIES

Service Area	Mostly Used	Partially Used/ Interested	Needs Support
Community	✓		
Catalogue	✓		
Development Enablers		●	
IPR Management (NFTs)		●	—
Business/ Technical Support			—

Phase 3 – Impact and Future Outlook (Post-Engagement):

This final third phase of the workshop synthesised participants' overall assessment of the XR2Learn platform, focusing on perceived impact and future development needs.

The feedback confirmed the platform's overall usefulness in supporting project development and increasing visibility. Participants highlighted its added value in enabling access to innovation ecosystems and fostering collaboration opportunities across stakeholders.

However, several areas for further improvement were identified, particularly in relation to usability, commercialisation support, and strengthening business-oriented services to facilitate market uptake.

Participants emphasised the importance of more structured support to enable the transition from prototype development to market-ready solutions, as well as enhanced guidance for scaling and sustainability.

Overall, the platform received an average evaluation score of 4 out of 5, reflecting a generally positive impact combined with clear opportunities for future enhancement. To complement and further substantiate these

qualitative insights, a post-engagement survey was subsequently conducted with OC1 beneficiaries to collect structured feedback following the use of the XR2Learn platform and the completion of validation activities as presented in section below.

ANNEX B

OC2 Stakeholder Analysis

Following the onboarding of **OC2 beneficiaries**, a dedicated workshop was organised in **Lugano in May 2025**, focusing on the second iteration of the stakeholder analysis and on collecting insights into the **XR2Learn platform experience**. In parallel, **surveys were administered to OC2 participants** to gather consolidated feedback on stakeholder perspectives, platform usability, and overall effectiveness.

The onboarding of new beneficiaries within OC2 enabled the exploration of additional XR-based application domains and the validation of XR2Learn ecosystem dynamics across a broader range of sectors. Building on the methodological approach adopted in OC1, the analysis of OC2 projects was structured using the PDT, focusing on the same three components:

- **Ecosystem Canvas:** to classify stakeholders involved in each project
- **Ecosystem Entity-Role Portrait:** to analyse one representative entity per ecosystem
- **Transaction Board:** to describe key interactions and value exchanges

Each subsection below introduces the OC2 project and highlights the most relevant aspects emerging from the corresponding ecosystem representations.

XRTwinScape

Full title: XRTwinScape: Advancing Contextualized Learning and Training for Industry 5.0 Through Immersive Virtual Environments

Short description: XRTwinScape develops immersive XR training solutions based on high-fidelity 1:1 digital twins of real workplaces, enabling safe and repeatable workforce training. The platform allows rapid digitalisation of real environments and creation of scenario-based XR content using advanced rendering techniques such as image-based capture and Gaussian Splatting. The solution is validated through three pilot use cases in industrial training, context-based problem-solving, and career guidance, covering sectors including electrical workspaces, industrial operations, and food production. Integrated within the XR2Learn ecosystem, XRTwinScape supports personalised training pathways and scalable, human-centred upskilling aligned with Industry 5.0.



57

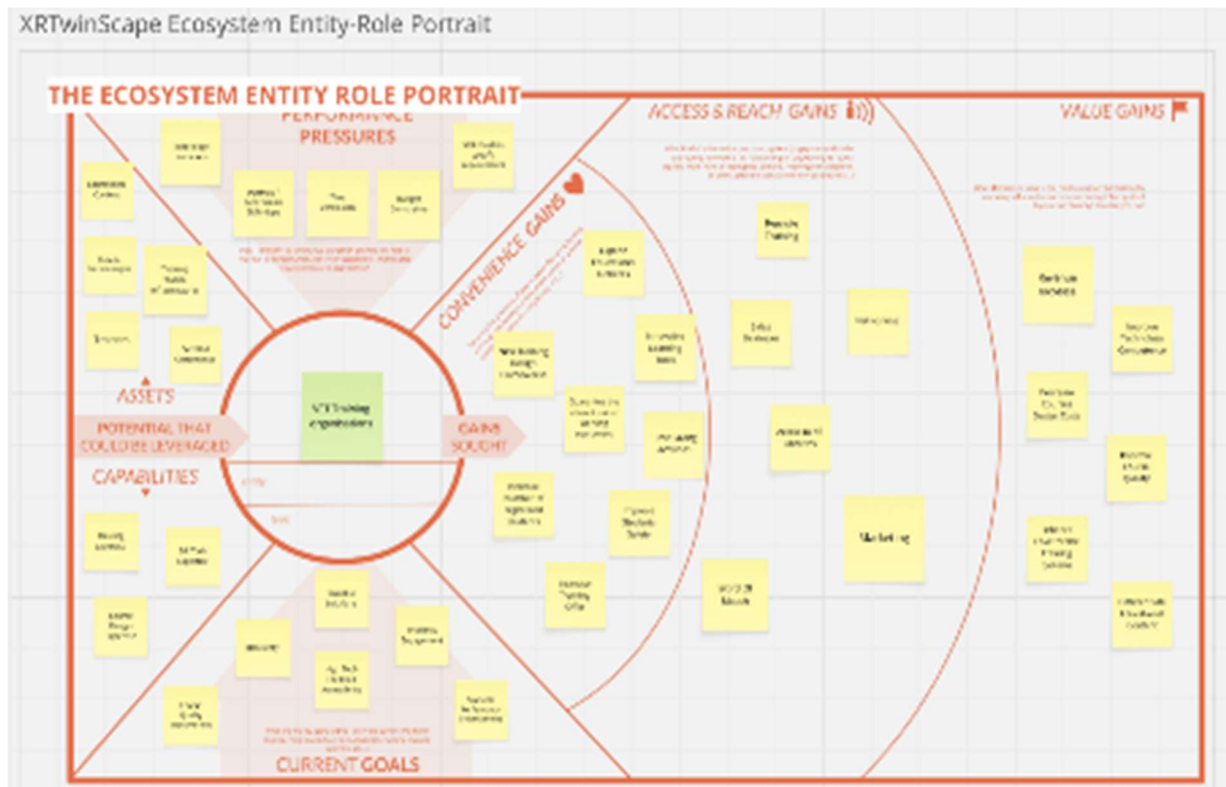


FIGURE 21: XRTWINSCAPE ECOSYSTEM ENTITY-ROLE PORTRAIT

XRTwinScape Ecosystem Entity-Role Portrait highlighting the main pressures, goals, and expected gains and value gains of a target training organisation, and illustrating how the XRTwinScape solution supports safer, more scalable, and personalised digital twin-based training.

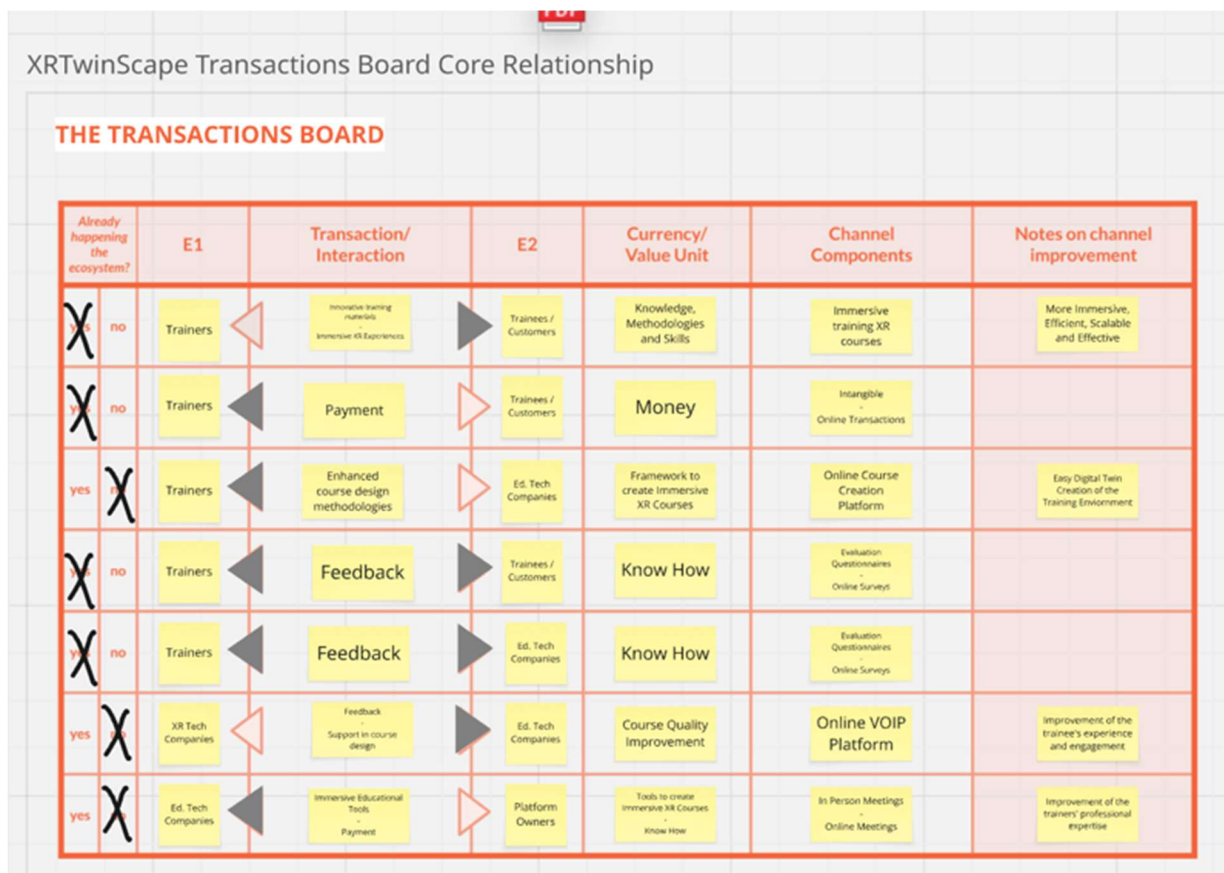


FIGURE 22: XRTWINSCAPE TRANSACTION BOARD

XRTwinScope Transaction Board illustrates the core relationships and value exchanges among key ecosystem actors, highlighting how training content, knowledge, services, and revenues are exchanged through the platform. The board also indicates which transactions are already active and which represent potential areas for further improvement and development.

XRive:

Full Title: XRive: Immersive XR Training Applications for Human-Centric Safety and Innovation in the Automotive Industry

Short Description: XRive is an immersive training project developed by a multidisciplinary consortium combining expertise in XR technologies, human-machine interaction, artificial intelligence, ergonomics, and user-centred design. The project addresses the growing complexity of modern vehicles by supporting drivers in understanding, trusting, and effectively using advanced driver assistance systems (ADAS) and automated driving features. By leveraging augmented and virtual reality, XRive provides safe, interactive, and personalised training experiences that enhance situational awareness, reduce stress, and improve decision-making in critical driving scenarios, including the interaction with advanced in-vehicle Human-Machine Interfaces (HMIs). Integrated within the XR2Learn ecosystem, XRive adopts XR-based educational principles, tools, and guidelines to design adaptive training applications that place drivers and end users at the centre of innovation. The project contributes to safer, smarter, and more inclusive

mobility by bridging the gap between emerging automotive technologies and real-world user needs.

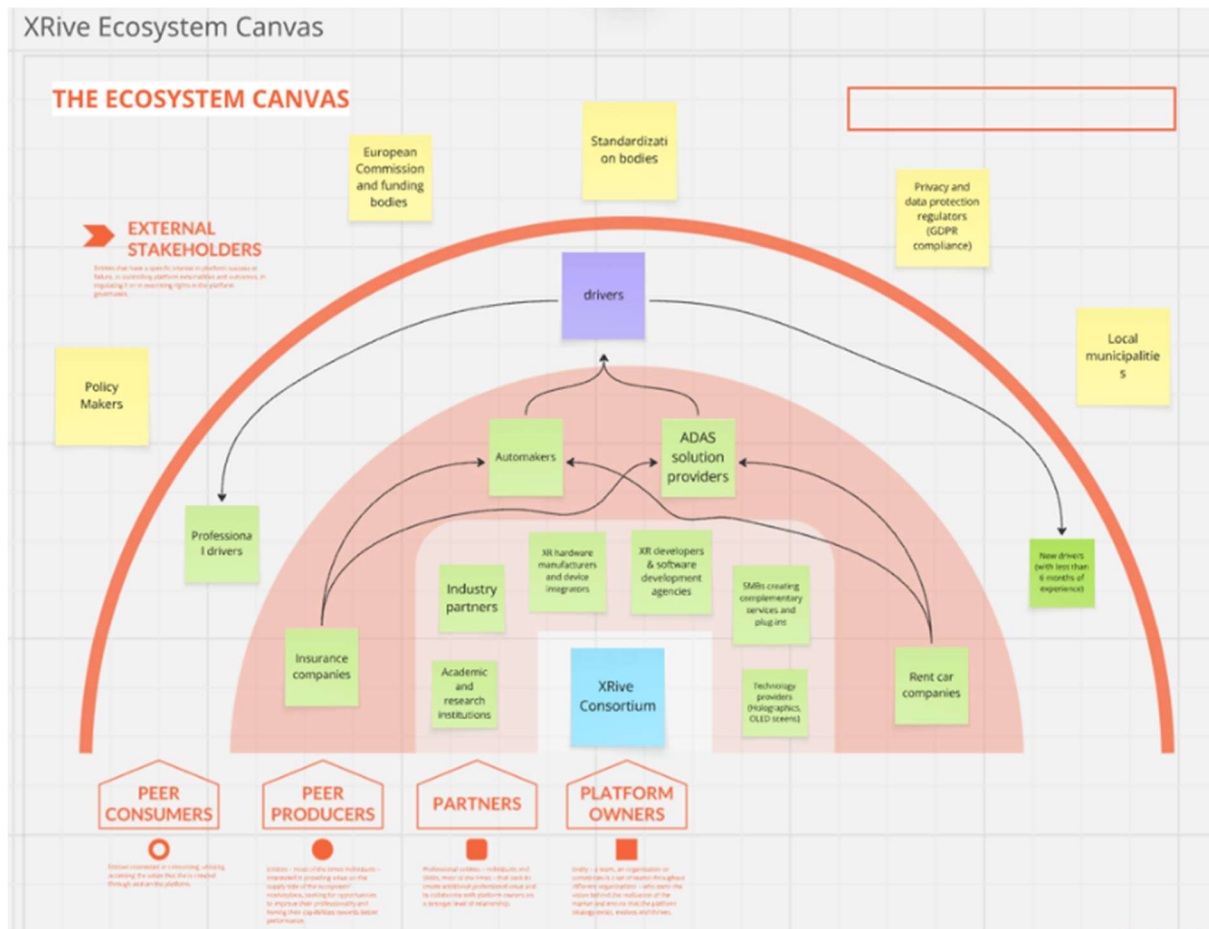


FIGURE 23: XRIVE ECOSYSTEM CANVAS

Xrive Canvas illustrates a structured and comprehensive ecosystem centred on driver training, highlighting multiple connections among peer consumers (drivers), including both professional and new drivers. These actors are connected through peer producers such as insurance companies, ADAS providers, and car rental companies, while industry and technology partners support the ecosystem. XRIVE Acts as the ecosystem owner, coordinating interactions based on the specific needs of immersive and adaptive driver education.

XRive Ecosystem Entity-Role Portrait

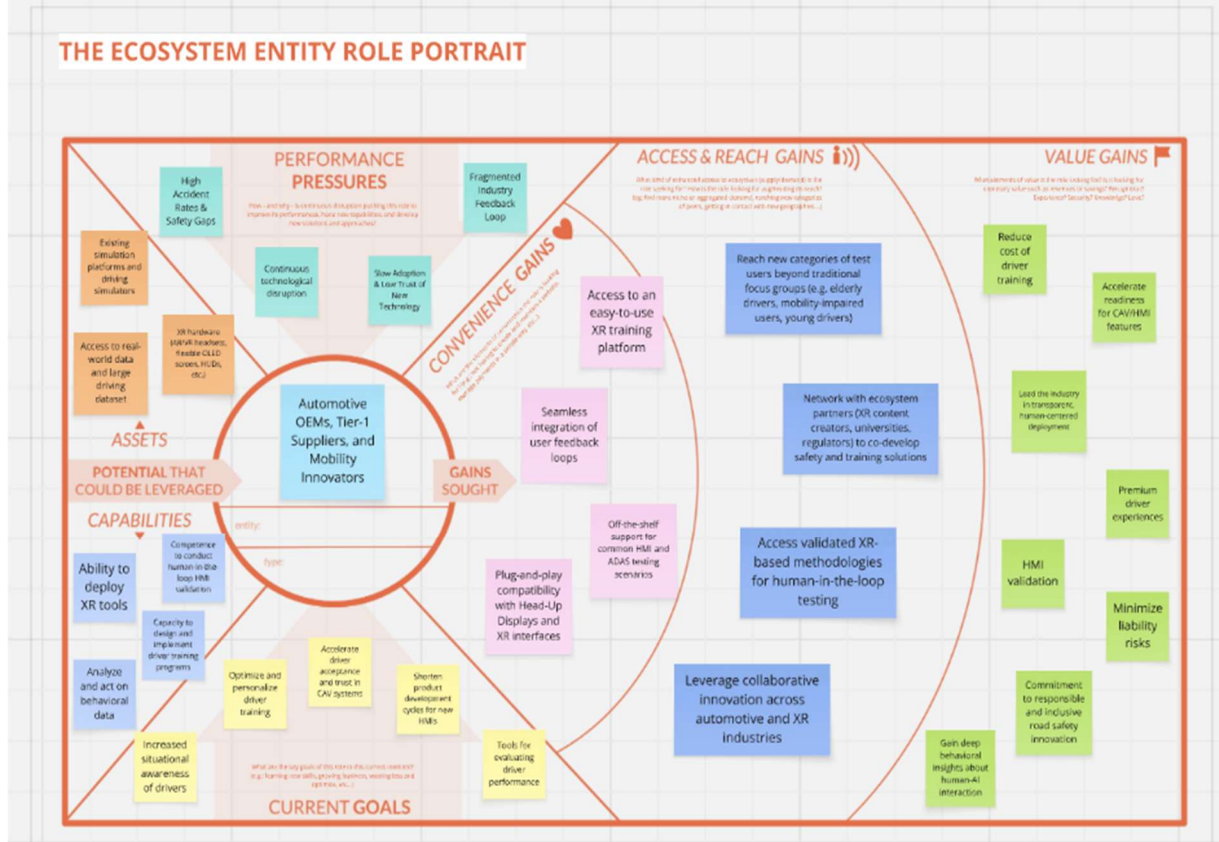


FIGURE 24: XRIVE ENTITY ROLE PORTRAIT

Xrive Entity Role Portrait highlights the role of automotive suppliers and mobility innovators within the XRIVE ecosystem, outlining key challenges such as road safety, technological disruption, and fragmented training processes. It also presents current objectives related to development acceleration, performance optimisation, and XR-based driver training, together with expected benefits including access to XR training platforms, collaborative safety solution development, cost reduction, and improved safety engagement.

XRive Transactions Board Core Relationship

THE TRANSACTIONS BOARD

Already happening the ecosystem?	E1	Transaction/Interaction	E2	Currency/Value Unit	Channel Components	Notes on channel improvement
yes no	XRive platform	Provision of XR-based training applications and tools	Automotive OEMs, Tier-1 suppliers	License fees, training fees, data exchange	Online platform portal, API integration, direct partnership	Develop onboarding guides and SDK for easier adoption
yes no	XRive platform	Access to real-world driver behavioral data from pilot users	Mobility Innovators, Training Centers	Anonymized behavioral datasets	Controlled test campaigns, cloud-based data collection	Implement standardized data formats and dashboards
yes no	XRive platform	Provision of XR-based safety alerts and collaborative perception tools	Peer Consumers (Drivers)	Free access (early phase), future subscription	Mobile app store, automotive HMI integration	Simplify mobile onboarding, enhance UX for older users
yes no	Automotive OEMs	Sharing CAV data, HMI requirements, and UX challenges	XRive platform	Access to optimized tools and insights	Direct EU28 collaboration, project steering meetings	Automate parts of the data exchange pipeline
yes no	Partners (Training Centers, Driver Schools)	Offering XR-based training programs to drivers	Peer Consumers (Drivers)	Training fees, course certification	On-site XR training sessions, online modules	Develop hybrid training formats (on-site + online)
yes no	XRive platform	Dissemination of white papers, standards contribution, and advocacy	External Stakeholders (Regulators, SDGs)	Knowledge sharing, influence in standards	Workshops, conference papers, technical committees	Engage earlier in EU & ISO working groups
yes no	Peer Consumers (Drivers)	Providing usage data, feedback, gaze/eye-tracking, posture data	XRive platform	Data exchange, in-app engagement, gamification	In-app feedback forms, sensor-based data capture	Incentivize participation through rewards, badges
yes no	XRive platform	Collaboration on complementary XR and safety tech	Partners (XR hardware vendors, XR dev studios)	Revenue sharing, co-branding opportunities	Joint development agreements, technical workshops	Improve cross-hardware compatibility and QA standards

FIGURE 25: XRIVE TRANSACTIONS BOARD

Xrive transactions board illustrates the core relationships and value exchanges among XRIVE ecosystem actors, indicating which interactions are already active and already active, representing potential transactions requiring further developments to support the adoption of scaling of XR-based driver driver training solutions.

EcoDrive XR:

Full Title: EcoDrive XR – Human-Centred Holographic Training for Sustainable Automotive and Electric Vehicle Education

Short Description:

EcoDrive XR is an immersive, holographic training initiative developed through a strategic partnership between the deep-tech company MATSUKO and the Secondary Vocational School of Industrial Technologies in Košice-Šaca. The project aims to prepare the next generation of green industry professionals by delivering human-centred and sustainable training solutions for the automotive and electric vehicle manufacturing sectors.

Leveraging real-time holographic communication, AI-based 3D reconstruction, and immersive XR environments, EcoDrive XR enables students to experience electric

vehicle production processes—from battery technologies to vehicle assembly—through guidance provided by lifelike holographic teachers.

Integrated within the XR2Learn ecosystem, the project exploits personalisation and emotion-aware learning enablers to adapt training pathways to individual learners' needs, fostering inclusive, engaging, and future-oriented vocational education aligned with Industry 5.0 principles and EU Green Deal objectives.

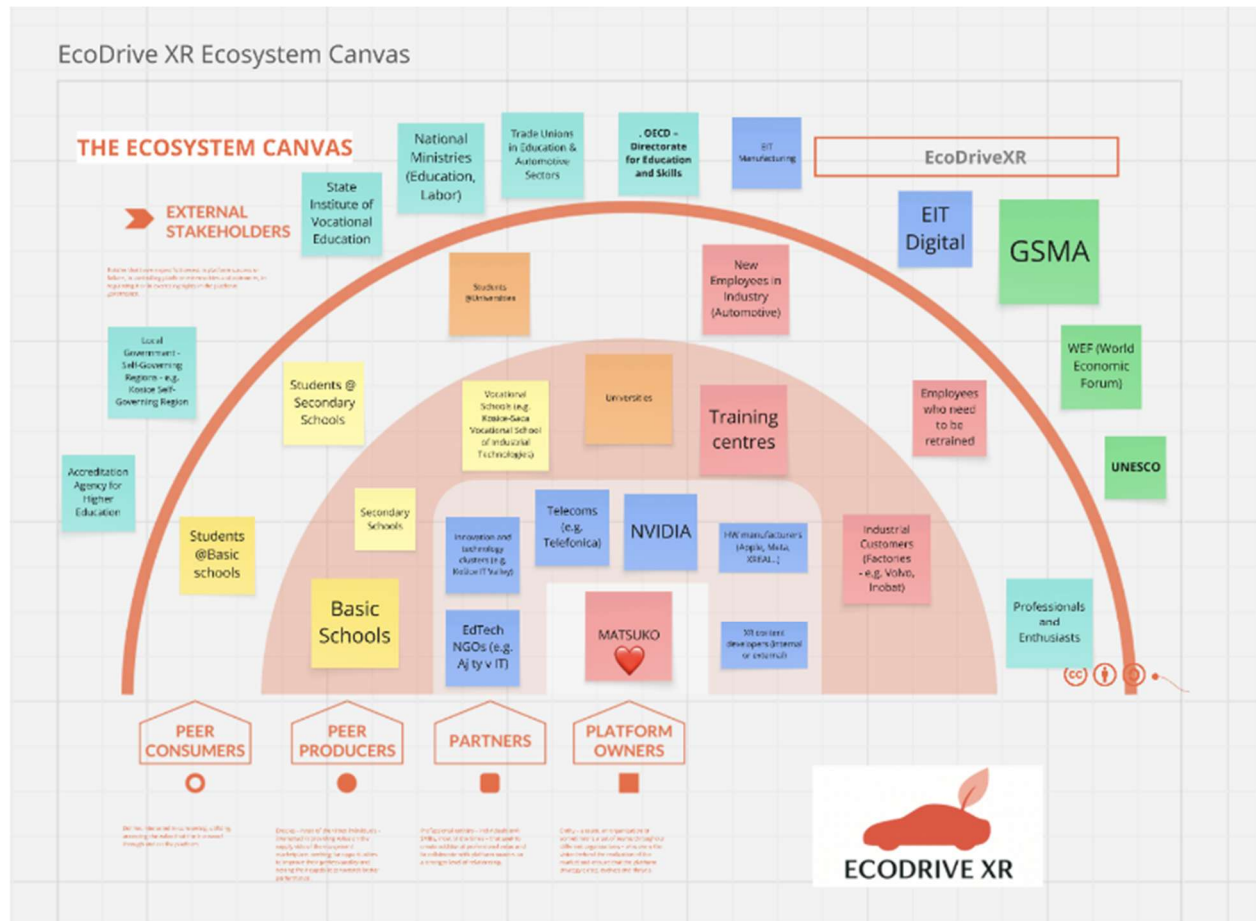


FIGURE 26: ECODRIVE XR ECOSYSTEM CANVAS

EcoDriveXR Ecosystem Canvas illustrates a broad, education-driven ecosystem centred on EcoDrive XR, involving multiple peer consumers (e.g. students and trainees), peer producers (e.g. education and content providers), and a wide range of institutional, industrial, and technological partners. The ecosystem reflects the application's focus on XR-based education, training, and awareness, requiring coordination across schools, training centres, public authorities, and international organisations.

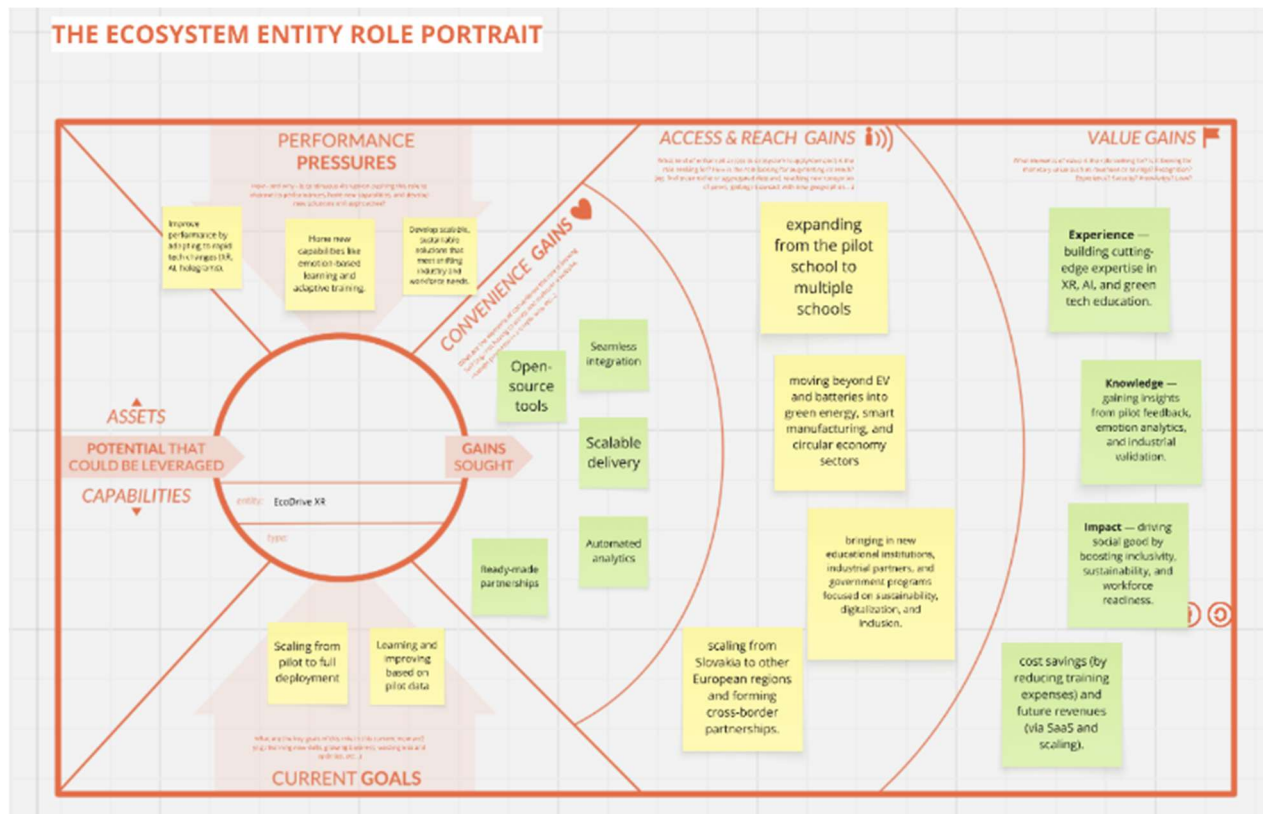


FIGURE 27: ECODRIVE XR ENTITY ROLE PORTRAIT

The entity role portrait highlights the key performance pressures related to scaling XR-based education and awareness, such as adoption beyond pilot initiatives and sustainable delivery in educational contexts. It outlines core assets and capabilities including open and scalable XR content, educational expertise, and data from pilot deployments. Current goals focus on expanding from pilot schools to broader educational system, improving accessibility and sustainability and strengthening partnerships. Expected gains include increased access and reach within schools and training centres, knowledge transfer and awareness building, and the development of scalable XR-based educational solutions supported by a networked ecosystem.

EcoDrive XR Transactions Board Core Relationship

THE TRANSACTIONS BOARD

Already happening the ecosystem?	E1	Transaction/ Interaction	E2	Currency/ Value Unit	Channel Components	Notes on channel improvement
yes 	MATSUKO	 Knowledge	 Kosice-Saca School	Knowledge time	VR training methodology Holographic Teacher	
yes 	EcoDriveXR	 Training	 Students	Knowledge time	VR training Holographic Teacher	
yes 	Kosice-Saca School	 Feedback	 MATSUKO	reviews	Surveys	
yes 	EcoDriveXR	 trained future workers	 Volvo Košice	workforce	Cooperation	
yes 	Kosice-Saca School	 trained future workers	 Volvo Košice	workforce	Training Center	
yes 	MATSUKO	 Feedback	 Volvo Košice	reviews	Surveys	
yes 	MATSUKO	 Feedback	 XR developers	integrations	Enabler: Holographic Teacher API	
yes 	EcoDriveXR	 Support	 XR developers	integrations	Enabler: Holographic Teacher API	

FIGURE 28: ECODRIVE XR TRANSACTIONS BOARD

Figure 28 shows the main educational transaction among EcoDriveXR ecosystem actors highlighting active exchanges related to training, knowledge sharing, feedback, and skills development.

X-DE-MAN

Full Title: eXtended Reality Platform Enabling Self-Resilient Operators in the De-Manufacturing Industry.

Short description: X-DE-MAN is an XR-based training and assistance platform that improves safety, resilience, and efficiency in the de-manufacturing of consumer electronics. By combining immersive virtual training with real-time operational guidance, the project supports workers during complex disassembly processes, reducing errors, processing time, and workplace risks. Through adaptive learning paths, digital disassembly maps, and shop-floor assistance tools, X-DE-MAN promotes continuous workforce upskilling, sustainable resource management, and Industry 5.0-ready operations for European SMEs.

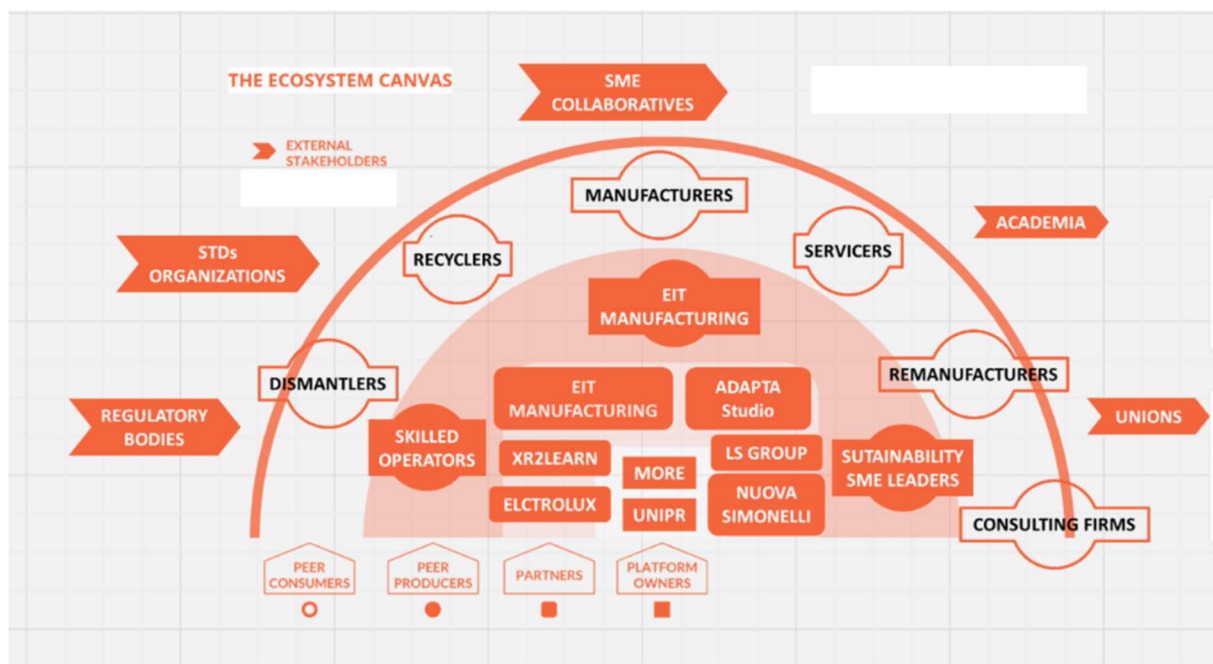


FIGURE 29: X-DE-MAN ECOSYSTEM CANVAS

X-DE-MAN Ecosystem Canvas illustrates a complex industrial ecosystem centred on advanced and sustainable manufacturing, involving multiple peer consumers and producers across the manufacturing value chain, including manufacturers, remanufacturers, recyclers, dismantlers, and service providers. The ecosystem is supported by SME collaboratives, industry and technology partners, academia, consulting firms, and institutional stakeholders such as regulatory and standardisation bodies, reflecting the broad and structured scope required by the X-DE-MAN application.

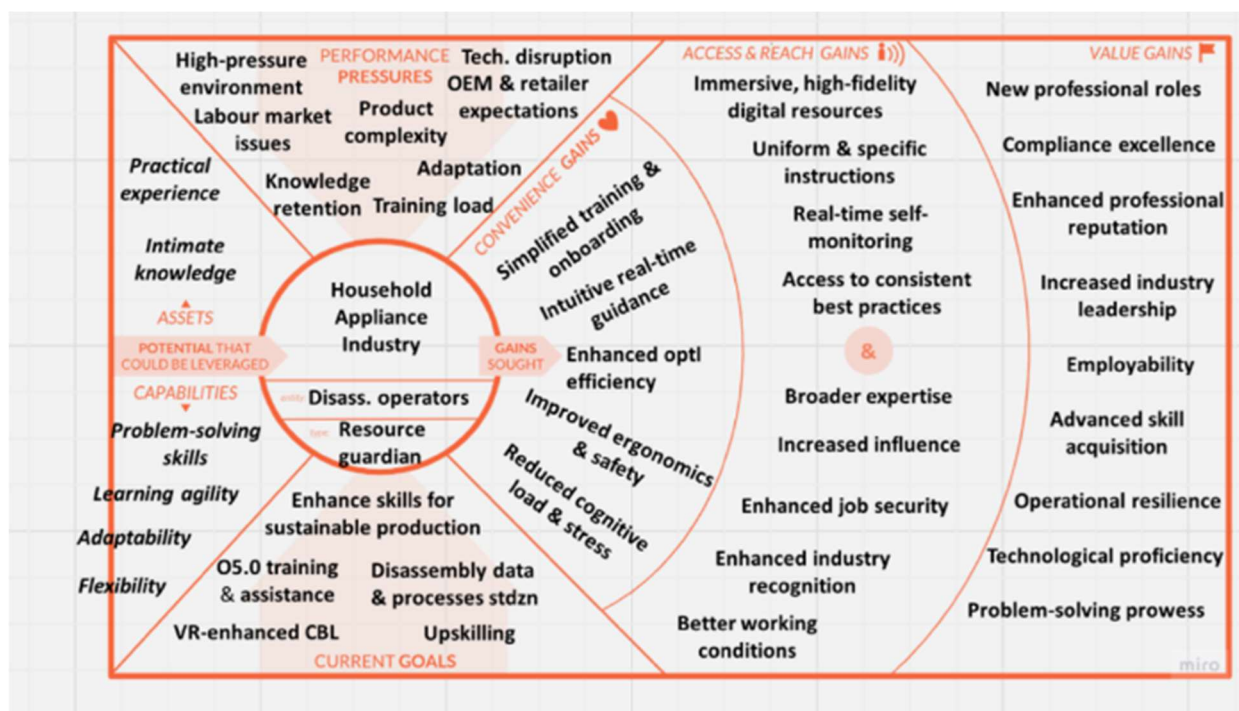


FIGURE 30: X-DE-MAN ENTITY-ROLE PORTRAIT (MANUFACTURERS)

The entity-role portrait places manufacturers at the centre of the X-DE-MAN ecosystem, highlighting performance pressures related to regulatory compliance, production efficiency, skills gaps, and sustainability requirements. It presents key assets such as industrial expertise, data, and XR-enabled training environments. Current goals include optimising operations, reducing errors and training time, and integrating circular economy practices. Expected gains include cost efficiency, improved workforce skills, enhanced operational performance, and increased competitiveness through sustainable and innovative manufacturing.

Already happening in the ecosystem?		E1	Transaction/ Interaction	E2	Currency/ Value Unit	Channel Components	Notes on channel improvement
yes	no	Industrial partners	Asset contribution	Product owners	CAD data	Agreements; transfer protocols	Automatic transfer
yes	no	Industrial partners	User testing	Product owners	Feedback; performance data; errors	Reports	N/A
yes	no	LS Group	Technology enablement	Product owners	Software enabler	Plugin; license	Unlock new capabilities
yes	no	ADATPTA studio	Technology enablement	Product owners	Software enabler	Plugin; license	Unlock new capabilities
yes	no	XR2Learn	Visibility	Product owners	Dissemination tools	XR2Learn Forum	Communic. loop
yes	no	XR2Learn	Solution commercial.	Product owners	ETH	XR2Learn Marketplace	N/A
yes	no	EIT Manufactur.	Education/ Training	Industrial partners; direct peer consumers; other SMEs	Badges; certificates; credits	Education paths/ Journeys	N/A
yes	no	Product owners	Simulation feedback	Industrial partners	Disassembly complexity	Reports	N/A
yes	no	Product owners	Solution distribution	XR2Learn	X-DE-MAN XPress	Software package; license	N/A
yes	no	Product owners	Solution commercial.	XR2Learn	Disassembly repository	XML & PDF files	N/A
yes	no	XR2Learn	Solution distribution	Direct peer consumers; other SMEs	X-DE-MAN Xpress	Software package; license	N/A
yes	no	XR2Learn	Solution commercial.	Direct peer consumers; other SMEs	Disassembly repository	XR2Learn Marketplace	N/A

FIGURE 31: X-DE-MAN TRANSACTIONS BOARD (PARTNERS)

The Partners transactions board illustrates the core value exchanges between X-DE-MAN and its industrial and technological partners, highlighting which interactions are already active and which require further development. Figure 31 shows exchanges related to asset contribution, technology enablement, education and training, and

solution distribution through channels such as the XR2Learn Marketplace and Forum, supporting collaboration and ecosystem integration

Already happening in the ecosystem?		E1	Transaction/ Interaction	E2	Currency/ Value Unit	Channel Components	Notes on channel improvement
yes	no	Skilled operators	Asset contribution	Product owners	Disassembly knowledge	Interviews	Collaborative editing & validation
yes	no	EIT Manufactur.	Training development	Product owners	Training paths/ journeys	EIT learning models	Suggestions on the training tools
yes	no	Sustainab. SME leaders	Best practice sharing	Product owners	Business models; success cases	Round tables; focus groups	N/A

FIGURE 32: X-DE-MAN TRANSACTION BOARD (PRODUCERS)

Already happening in the ecosystem?		E1	Transaction/ Interaction	E2	Currency/ Value Unit	Channel Components	Notes on channel improvement
yes	no	Direct peer consumers	Simulation feedback	Product owners	Usability; Profitability; Viability	Reports	N/A
yes	no	Consulting firms	Solution commercial.	Product owners	EUR	X-DE-MAN Pro	N/A
yes	no	Consulting firms	Solution commercial.	Direct peer consumers; Other SMEs	X-DE-MAN Pro	License sells	N/A
yes	no	Consulting firms	Solution commercial.	EIT Manufacturing	EUR	Training paths/ journeys	N/A
yes	no	Product owners	Solution commercial.	Consulting firms; direct peer consumers	X-DE-MAN Pro	Software package; licenses	N/A
yes	no	Direct peer consumers	Solution commercial.	Consulting firms	EUR	X-DE-MAN Pro	N/A
yes	no	Direct peer consumers	Solution commercial.	EIT Manufacturing	EUR	Training paths/ journeys	N/A
yes	no	Direct peer consumers	Solution distribution	XR2Learn	Public feedback	X-DE-MAN Xpress	N/A

FIGURE 33: X-DE-MAN TRANSACTIONS BOARD (CONSUMERS)

The consumers transactions board illustrates the core value exchanges involving consumers within the X-DE-

MAN ecosystem, highlighting already active transactions related to solution commercialisation, simulation feedback, training pathways, and solution distribution. Figure 33 shows how direct peer consumers, consulting firms, and industrial actors interact with the platform through reporting, licensing, training services, and feedback mechanisms to support adoption and use of X-DE-MAN solutions.

Already happening in the ecosystem?		E1	Transaction/Interaction	E2	Currency/Value Unit	Channel Components	Notes on channel improvement
yes	no	Regulatory & stds bodies	Framework provision	Product owners	Std; CE compliance criteria	Monitoring activities	Two-way loop
yes	no	Unions	Advocacy/Endorsement	Product owners	Worker representation; safety validation	Operator representation	N/A
yes	no	Academia	Validation/Research	Product owners	Peer review; pedagogical improvement	Research collaboration; students	N/A
yes	no	Other SMEs	Solution distribution	Product owners	New VR environments; feedback	X-DE-MAN Xpress	N/A
yes	no	Product owners	Std feedback & co-design	Regulatory bodies	Revised/new stds	New stds/laws proposition	N/A
yes	no	Other SMEs	Solution distribution	XR2Learn	New VR environments; feedback	Disassembly repository	N/A

FIGURE 34: X-DE-MAN TRANSACTIONS BOARD (EXTERNAL STAKEHOLDERS)

The External Stakeholders transactions board illustrates the key interactions between X-DE-MAN and external stakeholders, including regulatory bodies, standardisation organisations, trade unions, academia, and SMEs. It maps value exchanges such as framework provision, validation and research collaboration, advocacy and endorsement, and feedback for continuous improvement of the solution. The diagram highlights that most interactions are already active, supporting regulatory compliance, knowledge validation, and alignment with industrial and societal requirements.

XPOTLESS

Full Title: Immersive and Adaptive VR Training for Safe Cleaning and Disinfection Practices in the Agrifood Sector

Short description: XPOTLESS is an immersive VR-based training project designed to support safe, sustainable, and compliant cleaning and disinfection practices within the agrifood sector. The project provides operators with a risk-free virtual environment in which they can practice critical cleaning tasks, including the handling of hazardous chemicals and the use of industrial machinery, while complying with EU food safety and hygiene standards. By combining immersive VR simulations, emotion-based

adaptation, and adaptive learning approaches grounded in Flow Theory, XPOTLESS personalises training in real time according to operators' emotional state, performance, and learning progress. Integrated interactive tools, such as hand detection for manipulating 3D objects, enhance realism and engagement. Through this approach, XPOTLESS contributes to improving workplace safety, optimising resource use, and supporting workforce upskilling and digital transformation in the food processing industry.

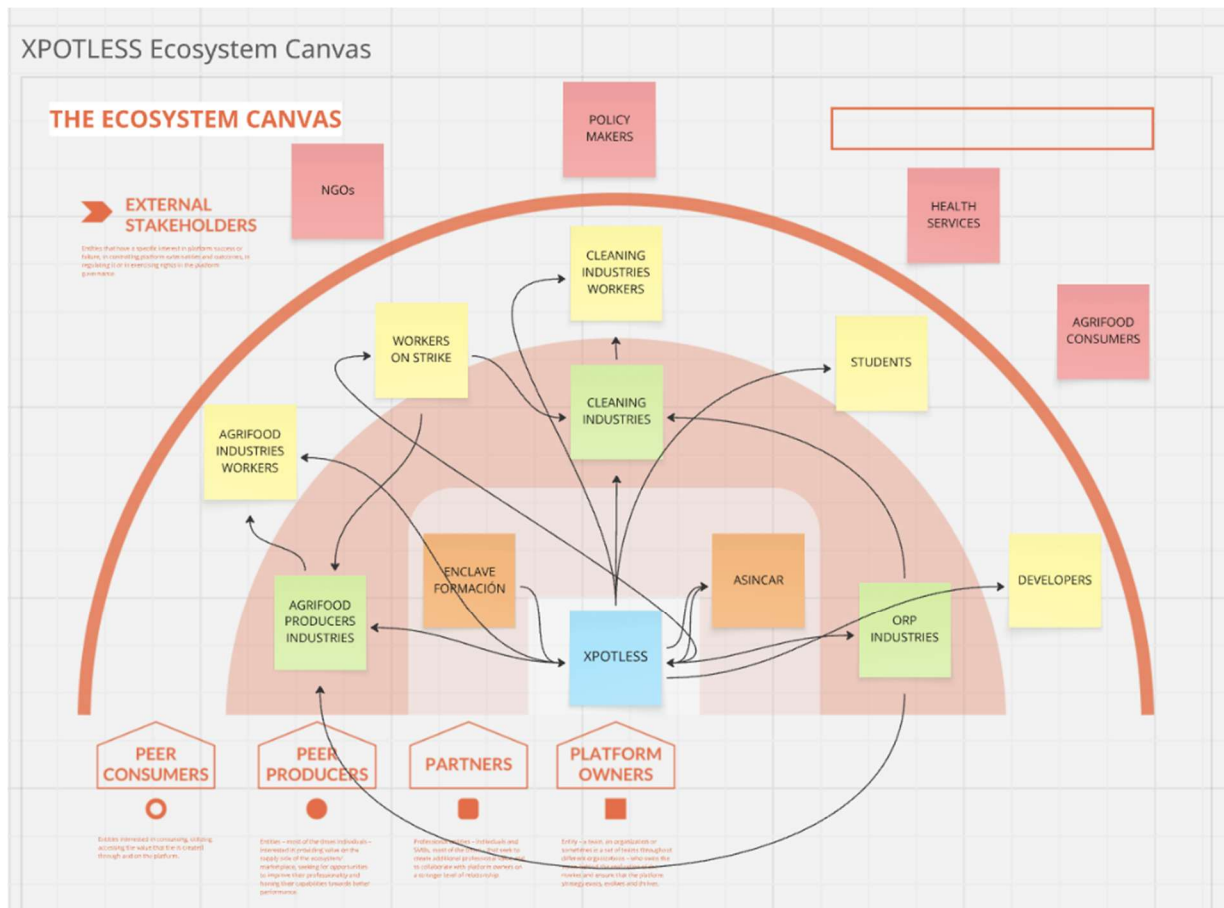


FIGURE 35: XPOTLESS ECOSYSTEM CANVAS

The canvas illustrates a heterogeneous, cross-sector ecosystem centred on XPOTLESS, involving multiple peer consumers such as workers, students, and end users, as well as peer producers and partners from cleaning, agrifood, and healthcare industries. The ecosystem is supported by developers and external stakeholders, reflecting the application's focus on XR-based training, safety, and awareness across diverse industrial domains.

XPOTLESS Ecosystem Entity-Role Portrait

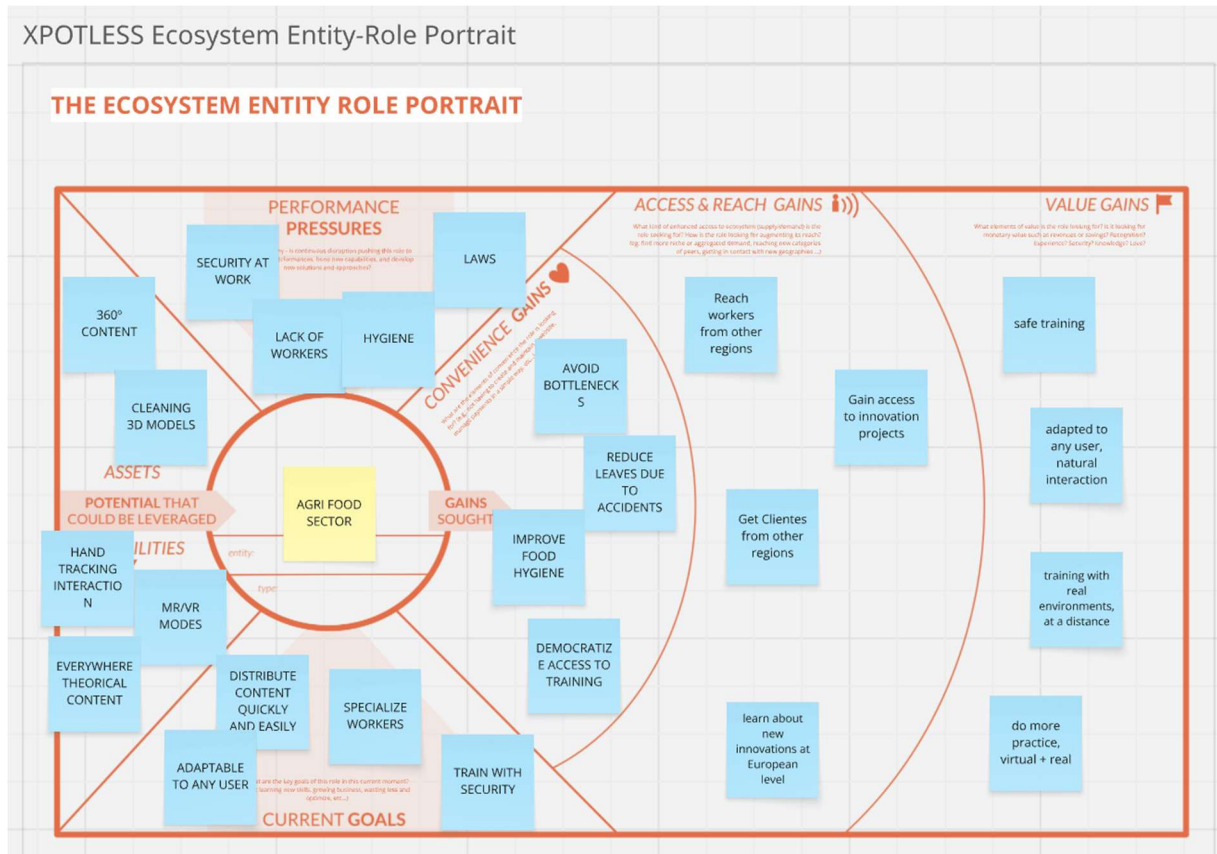


FIGURE 36: XPOTLESS ENTITY-ROLE PORTRAIT

The entity-role portrait highlights the key performance pressures affecting the XPOTLESS ecosystem, including safety at work, hygiene requirements, regulatory constraints, and limited workforce availability. It outlines core assets and capabilities such as XR-based training tools, immersive content, adaptability to different user profiles, and domain-specific expertise. Current goals focus on improving food hygiene and safety, reducing accidents, enhancing training accessibility, and ensuring scalable and secure deployment. Expected gains include increased access and reach across sectors, safer and more effective training practices, knowledge transfer, and improved awareness through XR-based solutions adaptable to diverse industrial and service contexts.

XPOTLESS Transactions Board Core Relationship

THE TRANSACTIONS BOARD

Already happening the ecosystem?	E1	Transaction/Interaction	E2	Currency/Value Unit	Channel Components	Notes on channel improvement
☒ no	Enclave	Technology	Xpotless	Developments Innovation	Mobile application MR Application	
☒ no	ASINCAR	Knowledge	Xpotless	Contents Users	Mobile application MR Application	
☒ yes	XPOTLESS	Knowledge	CLEANING INDUSTRIES/ AGRI-FOOD PRODUCERS/ ORP INDUSTRIES	Contents Facilities	Mobile application MR Application Online Course	
☒ yes	CLEANING INDUSTRIES/ AGRI-FOOD PRODUCERS/ ORP INDUSTRIES	Training	Workers	Contents opportunities	Mobile application MR Application Online Course	
☒ yes	Xpotless	Training	Workers on strike	Contents opportunities	Mobile application MR Application Online Course	
☒ yes	Xpotless	Training	Workers on strike	Contents opportunities	Mobile application MR Application Online Course	
☒ yes	Xpotless	Final product Quality	Agri-food Consumers	food safety Quality	Final Products	
☒ yes						

FIGURE 37: XPOTLESS TRANSACTIONS BOARD

The transactions board illustrates the core value exchanges within the XPOTLESS ecosystem, highlighting interactions related to technology provision, knowledge transfer, and XR-based training delivered to workers through mobile, MR, and online channels. Figure 37 shows that several transactions are already active, supporting skills development, improved working conditions, and enhanced quality of final products across different sectors.

XCC

Full Title: XR CROWD CONTROL (XCC): AI-Based Supervision for Collaborative XR Training

Short Description: XR CROWD CONTROL (XCC) is an AI-driven supervision and analytics solution designed to support collaborative XR training. It enables trainers to monitor group-based XR training sessions in real time, analysing user behaviour, interactions, and task execution. Through a dedicated supervision dashboard, XCC allows trainers to intervene during training activities and provides post-session reports on technical and soft skills, improving the effectiveness, measurability, and scalability of collaborative XR training across industrial and professional contexts.

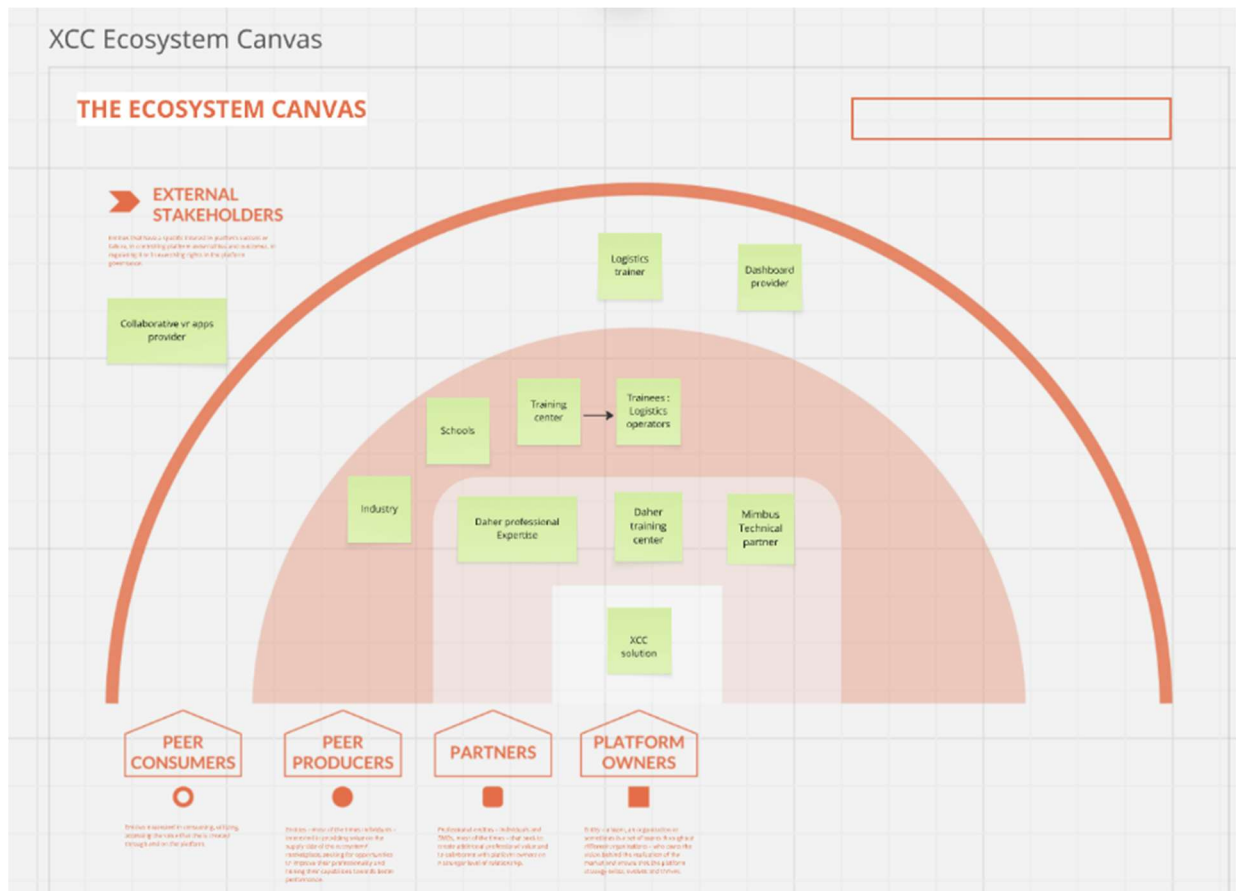


FIGURE 38: XCC ECOSYSTEM CANVAS

The canvas illustrates a structured ecosystem centred on XCC as platform owner, involving peer consumers and producers engaged in XR content creation, training, and validation activities. The ecosystem is supported by industrial and technological partners as well as external stakeholders, reflecting the collaborative and technical nature of the XCC application.



74

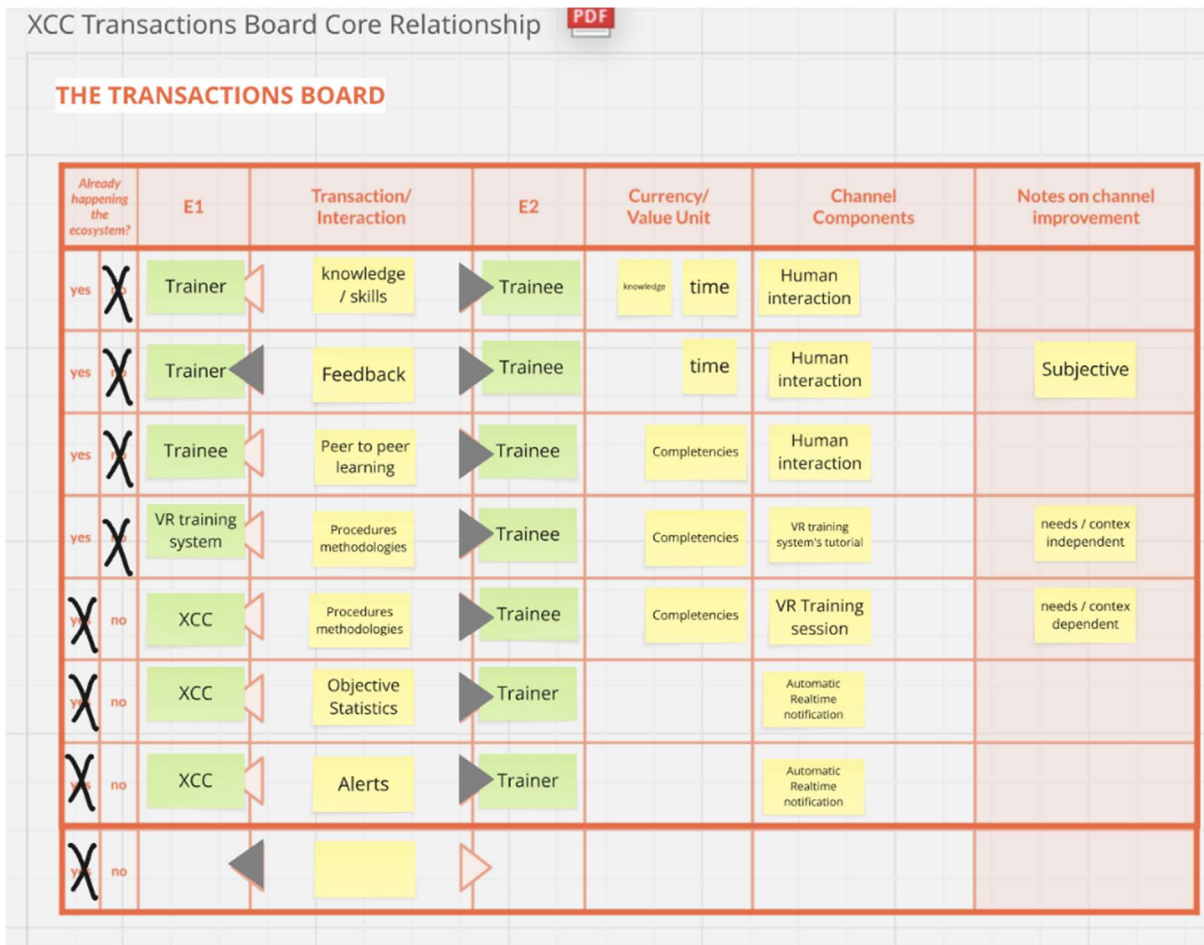


FIGURE 40: XCC ENTITY-ROLE PORTRAIT

The entity-role portrait highlights the key performance pressures related to logistics training, including operational complexity, skill gaps, and the need for flexible training solutions. It outlines core assets and capabilities such as XR-based training tools, domain expertise, and adaptability to different training contexts. Current goals focus on improving skills development, supporting off-site and flexible training, and enhancing training effectiveness. Expected gains include better and more accessible training, improved operational performance, and increased flexibility for logistics and industrial operators

RTXROOM

Full Title: Remote Training XR Room (RTXRoom)

Short description: Industrial assembly training is undergoing a transformation driven by the need for human-centred, flexible, and sustainable learning solutions in the manufacturing sector. RTXRoom addresses this need by providing XR-based training environments for industrial assembly, with a particular focus on aluminium construction processes: The project enables remote, collaborative, and adaptive training experiences through advanced XR technologies, supporting real-time expert assistance, personalised learning paths, and efficient workforce upskilling. By combining immersive environments with collaborative features, RTXRoom supports modern training practices aligned with Industry 5.0 principles and the evolving needs of the manufacturing workforce.

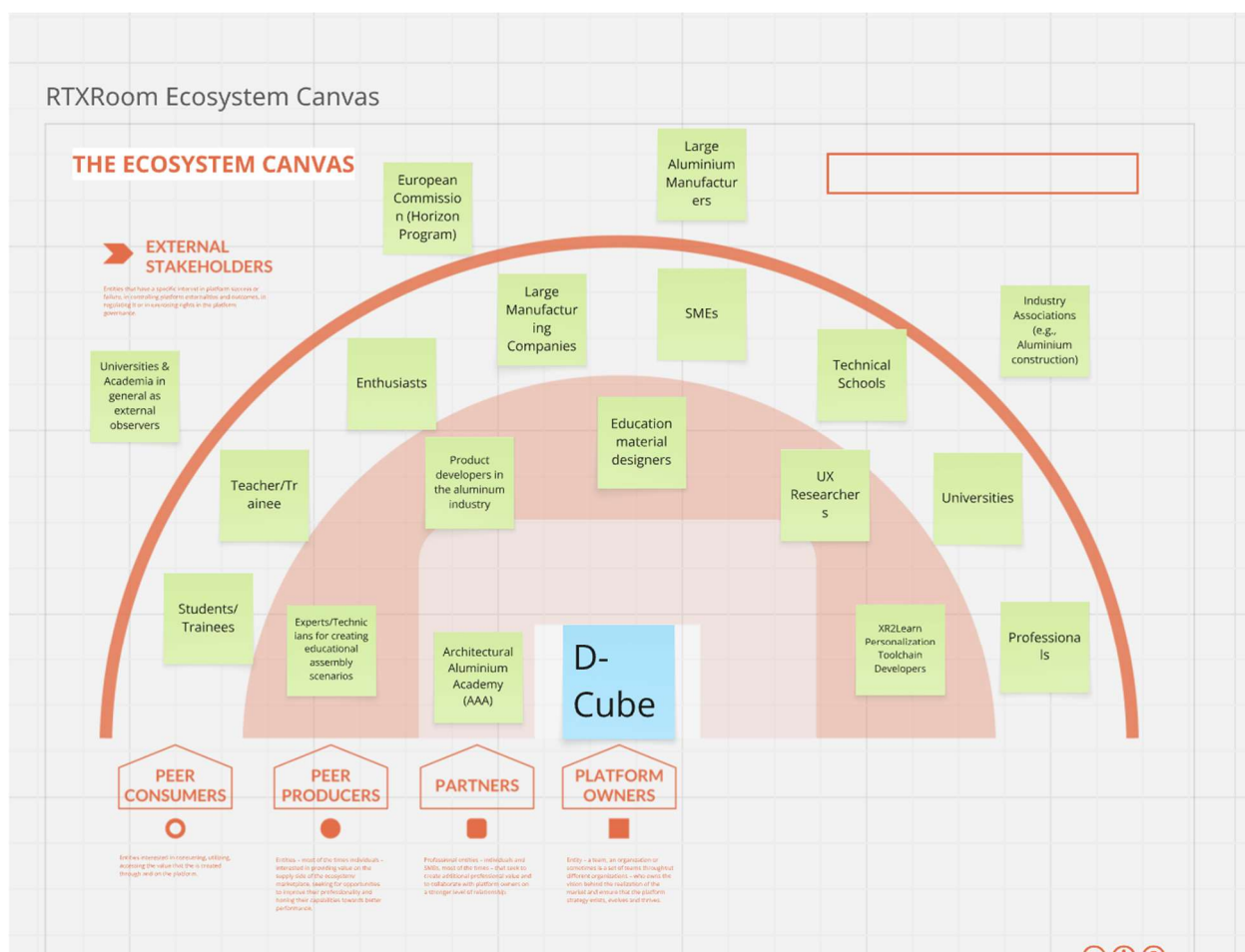


FIGURE 41: RTXROOM ECOSYSTEM CANVAS

The canvas illustrates a broad, education- and research-driven ecosystem centred on D-Cube as platform owner, involving peer consumers (e.g. students, trainees, and professionals), peer producers (e.g. trainers, education material designers, and XR content developers), and a wide range of partners from academia, research, and industry (e.g. universities, research centres, SMEs, and large manufacturing companies). External stakeholders further support the ecosystem, reflecting the collaborative and knowledge-intensive nature of the RTXRoom application.

RTXRoom Ecosystem Entity-Role Portrait

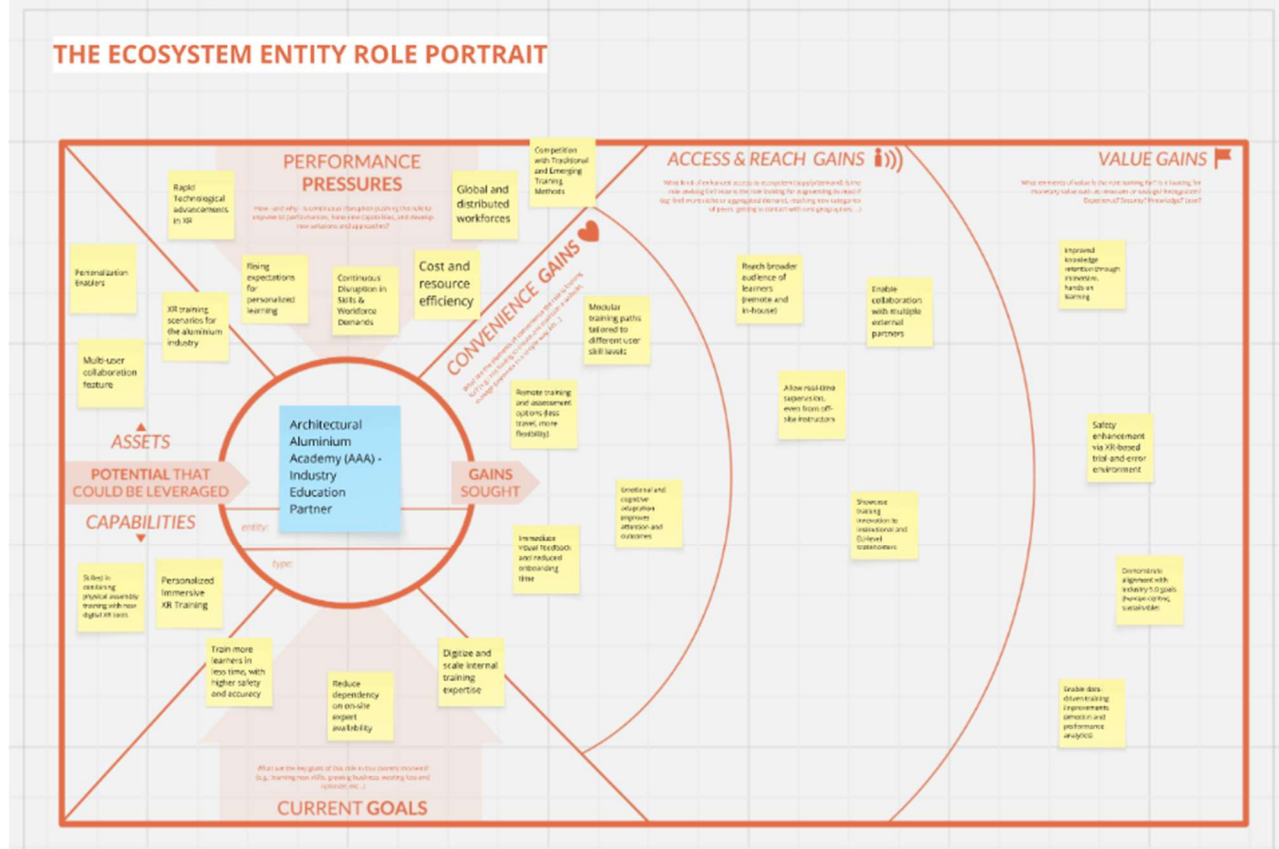


FIGURE 42: RTXROOM ENTITY-ROLE PORTRAIT

The entity-role portrait positions education and industry actors at the core of the RTXRoom ecosystem, highlighting key pressures such as skills gaps and training efficiency. It outlines core capabilities including XR environments and collaborative content, with goals focused on improving learning and digitalisation. Expected gains include wider access, greater flexibility, and enhanced training outcomes.

RTXRoom Transactions Board Core Relationship

THE TRANSACTIONS BOARD

Already happening the ecosystem?	E1	Transaction/ Interaction	E2	Currency/ Value Unit	Channel Components	Notes on channel improvement
☒	(D-Cube - AAA) XR Training Developers	Creation of adaptive XR training scenarios	Training Organizations	Know-how Tools	Narrative Editor (Authoring Tool)	
☒	D-Cube (XR Developer)	Streaming Editor tools and infrastructure	Experts/Remote trainers	Know-how	Streaming Editor	
☒	XR Developer / XR2Learn Consortium	XR Personalization Tools integration	(D-Cube - AAA) XR Training Developers	Know-how Tech insights	Narrative Editor (Authoring Tool)	
☒	Experts/Trainer (Remote or On-site)	Real-time supervision and feedback	Trainee	Guidance feedback	Streaming Editor + Voice	
☒	AAA (Training Provider)	Delivering XR-based training to learners	Learners/T trainees	know-how skills	RTXRoom (HoloLens 2)	
☒	XR2Learn Consortium	Provide personalization Inference pipelines	D-Cube (Integrator)	know-how ML pipelines	Redis, Docker, Personalization Enabler CLI	
☒	Learners / Trainees	Feedback on training quality and usability	D-Cube - AAA	Insights experience points	Surveys, feedback forms in app	
☒						

FIGURE 43: RTXROOM TRANSACTIONS BOARD

The transactions board illustrates the core value exchanges within the RTXRoom ecosystem, highlighting interactions related to XR content creation, publishing, training delivery, and feedback collection among platform owners, developers, trainers, and learners. The figure indicates which transactions are already active and which represent areas for further integration and improvement to support scalable XR-based training.

PORTAL XR:

Full Title: Portal XR – Immersive XR Training for Safe and Efficient Port Operations

Short description: Port operations are becoming increasingly complex, requiring safe, efficient, and flexible training solutions capable of addressing high-risk tasks and evolving operational demands. Portal XR addresses this challenge by providing immersive XR-based training environments for port operations, with a focus on crane handling, hazardous goods management, and emergency procedures. The project supports safe, adaptable, and cost-effective training experiences through advanced XR technologies, enabling realistic simulations, personalised learning paths, and continuous skills development for port operators. By improving preparedness and safety awareness, Portal XR contributes to more efficient port operations in line with modern industrial and safety standards.

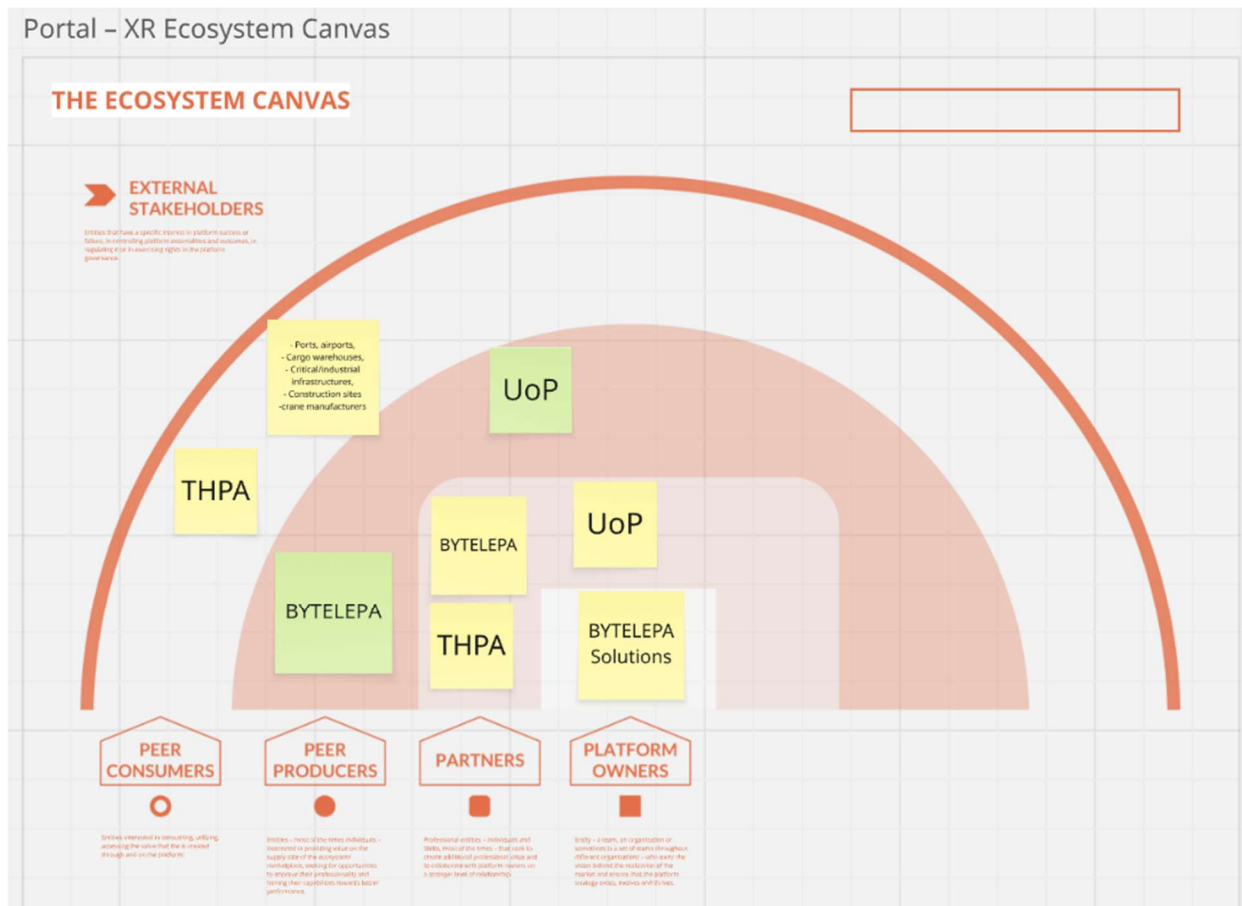


FIGURE 44: PORTAL-XR ECOSYSTEM CANVAS

The canvas illustrates a focused, domain-specific ecosystem centred on Portal-XR, involving peer producers and partners such as universities, technology providers, and port-related organisations. Key stakeholders include port authorities and sector-specific bodies operating in maritime and logistics contexts, supported by external institutional actors. The ecosystem reflects a collaboration-driven model aimed at developing, validating, and adopting XR-based solutions for port operations, training, and innovation.

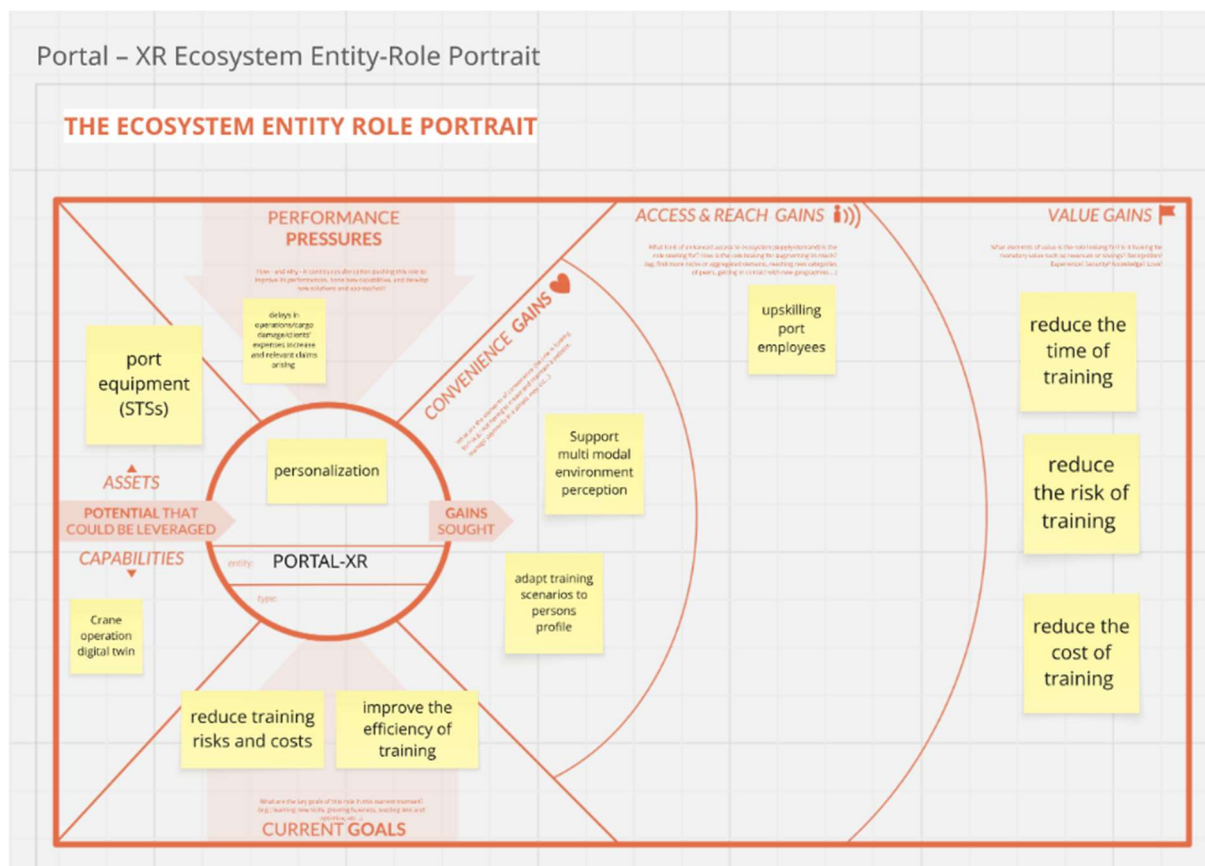


FIGURE 45: PORTAL-XR ENTITY-ROLE PORTRAIT

The entity-role portrait places Portal-XR at the centre of a port-oriented ecosystem, highlighting key performance pressures related to safety, training risks, and operational costs in port environments. It outlines core assets and capabilities such as XR-based training scenarios, personalisation of training paths, and the use of port equipment and digital twins. Current goals focus on reducing training risks and costs, improving training efficiency, and supporting upskilling of port employees. Expected gains include reduced training time, lower training risks, and decreased overall training costs, contributing to safer and more efficient port operations.