XRinVET

Enhancing Digital Innovation (Web 4.0) and Attractiveness of VET Through Extended Reality (VR/AR) Training for better skills-match

WP2: Digital Transformation in VET schools for work-based learning

Activity 3: Transnational Peer-review - Comparative analysis report

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CONSORTIUM: PARTNER LIST

- University of Crete (UoC) - Greece
- CONFEDERACION ESPANOLA DE CENTROS DE ENSENANZA ASOCIACION C.E.C.E. (CECE) - Spain
- DIRECTORATE OF SECONDARY EDUCATION OF PELLA (DSEP) - Greece
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- National Center for Scientific Research "Demokritos" (NCSRD) - Greece
- CODEARRAYS Ltd (CODE) – Cyprus

1 Contents

Executive summary

This report summarizes the findings of the XRinVET project's Activity 2.2: Open Consultation with the labour market and VET actors, conducted to assess the readiness, needs, and barriers regarding the integration of Extended Reality (XR) technologies in Vocational Education and Training (VET). The comparative analysis draws upon data collected from **Belgium, Spain, Cyprus, and Greece**, engaging the 3 main stakeholder groups: VET trainers, VET students, and labour market representatives. The primary objective was to evaluate how XR (VR/AR) can bridge the gap between theoretical education and the practical skills demanded by the modern labour market.

The consultations utilized a hybrid methodology, combining quantitative questionnaires with qualitative interviews and focus groups. The scale and scope varied according to each partner's approach:

- Greece provided the most extensive quantitative data, surveying 32 trainers, 15 students, and 4 labour market actors.
- Belgium and Cyprus focused on qualitative depth with targeted interviews of trainers, students, and experts from specific sectors like ICT and Healthcare.
- Spain utilized focus groups with educators and students from specific vocational fields, such as Forestry and Early Childhood Education, alongside industry surveys.

Key Findings per target group

Across all four nations, there is a consensus that XR technologies hold transformative potential for VET, particularly in improving student engagement and safety. However, the transition from traditional teaching to immersive learning is still in its infancy and faces significant challenges.

1. **VET trainers:** While trainers across the consortium recognize the value of XR, their current teaching methods remain predominantly traditional (presentations and video tutorials). Confidence in using XR varies significantly. In Greece, only 9.4% of trainers reported feeling "very confident" with the technology. In Cyprus, trainers expressed a strong desire for integration but lacked the necessary technical confidence. The lack of training is a universal barrier. In Cyprus, 100% of trainers cited "Teacher training" as a necessary resource. Belgian educators specifically requested "micro-credentialing" courses to formalize their XR skills. Spanish trainers emphasized that without pedagogical training and technical support, XR adoption would lead to increased workload and stress.

2. **VET students:** Students consistently viewed XR as a tool to make learning "more fun and interactive" and to provide a "safe environment" for practicing high-risk tasks. Despite the

digital shift, students in all countries (e.g., 86.7% in Greece) still prioritize hands-on workshops. They view XR not as a replacement for physical labs, but as a preparatory tool for complex or dangerous procedures. Access remains an issue; in Greece, over 86% of students had never used VR/AR in a classroom setting.

3. **Labour market:** Industry participants from sectors including Manufacturing, Healthcare, and ICT highlighted the need for employees skilled in equipment handling and safety procedures. While some large enterprises (e.g., in Belgium) actively use XR, others remain in the exploration phase. There is strong agreement that XR should support, not replace, physical training. Industry experts in Belgium and Greece emphasized "blended learning" to ensure trainees do not lose touch with tangible, real-world conditions.

Conclusion and recommendations

The consultations reveal a **high readiness of attitude** but a **low readiness of infrastructure**. The primary bottlenecks identified are the cost of hardware and the lack of specialized teacher training.

To successfully integrate XR into VET curricula, the consortium recommends the following:

- **Infrastructure investment:** Addressing the funding gap for hardware to ensure equity.
- **Curriculum integration:** Developing "hybrid/blended" modules where XR is used specifically for safety training and risk simulation—areas identified as high-value by industry partners.
- **Empowering educators:** Implementing structured "Train the Trainer" programs, potentially utilizing micro-credentials, to build both technical proficiency and pedagogical confidence.

1 Introduction

This report presents the results of Activity 2.2: Open Consultation with the labour market and VET actors within the framework of the XRinVET project. As part of WP2, which focuses on the digital transformation of Vocational Education and Training (VET) schools for work-based learning, these consultations were designed to assess the current landscape of Extended Reality (XR) integration across the consortium countries.

The primary objective of this study was to gather comprehensive qualitative and quantitative insights into the readiness, needs, and barriers perceived by key stakeholders regarding the adoption of Virtual Reality (VR) and Augmented Reality (AR). By analyzing these perspectives, the project aims to identify how immersive technologies can best bridge the gap between theoretical vocational education and the practical skills needed by the labour market.

The comparative analysis synthesizes data collected between March and May 2025 from four participating countries: **Greece, Spain, Cyprus, and Belgium**. To ensure a holistic view of the VET ecosystem, the consultations targeted three distinct stakeholder groups:

1. **VET trainers and teachers:** To evaluate digital maturity, pedagogical needs, and attitudes toward technology.
2. **VET students:** To understand learning preferences, engagement levels, and accessibility issues.
3. **Labour market actors:** To align educational outcomes with industry requirements and explore potential partnerships.

The consultations utilized a hybrid methodology, adapting to local educational contexts while maintaining a cohesive inquiry framework. The approach combined online questionnaires with face-to-face interviews and focus groups:

- **Greece** conducted the most extensive quantitative study, organizing hybrid sessions at the 1st Laboratory Centre of Heraklion and the Laboratory Centre of Giannitsa. This resulted in a robust dataset comprising 32 trainers, 15 students, and 4 labour market representatives from sectors including automotive and healthcare.
- **Belgium** adopted a qualitative focus, conducting targeted interviews and questionnaires with two specialized VET schools (focusing on IT and Chemistry) and industry experts from ICT, manufacturing, and healthcare.
- **Spain** utilized a focus group approach, facilitating in-depth discussions with educators from Florida Universitaria and students from Escuelas Familiares Agrarias (EFAs) in Castilla-La Mancha and Madrid. This allowed for a nuanced exploration of pedagogical barriers and the specific needs of forestry and early childhood education sectors.
- **Cyprus** employed a mixed approach, engaging VET trainers, students, and industry partners in open consultations to gather data on the readiness for XR in technical fields.

This report is structured to provide a comparative analysis of these national findings. It begins by examining the perspectives of **VET Trainers**, focusing on their digital confidence and professional development needs. It then analyzes **VET Students'** attitudes toward immersive learning and perceived benefits. Subsequently, it reviews the **Labour Market's** demand for digital skills and willingness to co-develop curricula. The report concludes with a cross-country synthesis and a set of recommendations for policymakers, curriculum developers, and VET institutions to facilitate the successful integration of XR technologies.

2 Methodology and demographic overview

The consultation process, conducted between March and May 2025, employed a hybrid methodology designed to capture both broad statistical trends and deep qualitative insights. While all partners utilized a common framework of online questionnaires to ensure data comparability, the specific engagement strategies were adapted to local educational contexts:

- **Greece** adopted a **quantitative-heavy approach**, organizing hybrid sessions (in-person and via Webex) across multiple schools and laboratory centers in Heraklion, Crete and Pella.
- **Belgium** and **Cyprus** focused on **qualitative depth**, conducting targeted interviews and consultations with specific VET schools and industry partners to gather detailed feedback on technical requirements and sectoral needs.
- **Spain** utilized a **mixed-methods approach**, combining anonymous online surveys for industry actors with in-depth **focus groups** for VET trainers and students to explore pedagogical attitudes and barriers.

The consultations engaged three core stakeholder groups across the four countries. The following breakdown details the specific profiles of the participants:

VET trainers and teachers

- Greece had thirty-two (32) participants. The majority (84.4%) possess over 10 years of experience. Subject areas were diverse, with Technology (40.6%) leading, followed by Health Sciences, Engineering, and Agriculture.
- Belgium had three (3) trainers interviewed from two distinct institutions: the Miniemeninstituut (specializing in IT) and the Institut Communal Technique Frans Fischer (specializing in Chemistry/Biology).
- Spain had three (3) professionals participate in a focus group from Florida Universitaria, including two subject teachers and one representative with a management role, providing both pedagogical and institutional perspectives.
- Cyprus had three (3) trainers, all specializing in technology subjects (Computer Studies, Electronics). Experience levels were mixed, ranging from 2-5 years to over 10 years.

VET students

- Greece had fifteen (15) students participating (8 female, 7 male). The age distribution was nearly split between minors (15-17 years old) and adults (18+). The primary field of study was Health Professionals (60%), with others in Engineering and ICT.
- Spain had five (5) students who completed the questionnaire, supplemented by a focus group of 3 students. Participants were predominantly female (60%), and all were over 18. Fields of study included Forestry and Humanities/Social Sciences.
- Cyprus had three (3) students, all male and aged 15-17. Their studies focused heavily on Engineering and ICT.
- Belgium had three (3) students (2 female, 1 male), all over 18. Fields of study included Computer Science/ICT and Health. This group included international perspectives from Erasmus students.

Labour market actors

- Greece had four (4) representatives from micro (1-9 employees) and large (250+) enterprises. Sectors included Automotive, Healthcare, and Services/Repairs.
- Belgium had three (3) experts representing ICT (ARHS Group), Manufacturing (Lighting Europe), and Healthcare (Brussels hospitals). Company sizes ranged from small to large.
- Spain had three (3) representatives from small and large enterprises. Sectors represented were Industry/Manufacturing, Education, and Services.
- Cyprus had three (3) representatives, all operating within the ICT/Technology sector. The companies were primarily small (10-49 employees) to medium in size.

Below is the summary of the sample sizes:

Country	VET trainers	VET students	Labour market actors	Primary Method
Greece	32	15	4	Hybrid (Questionnaires + Webex)
Belgium	3	3	3	Interviews & Questionnaires
Spain	3 (Focus Group)	5 (Survey) + 3 (Focus Group)	3	Focus Groups & Anonymous Survey
Cyprus	3	3	3	Open Consultations
Total	**41**	**29**	**13**	

3 Comparative analysis: VET trainers

This section synthesizes the consultation data from the four partner countries to evaluate the current state of digital maturity, attitudes toward Extended Reality (XR), and the professional development needs of Vocational Education and Training (VET) educators. The analysis contrasts the quantitative data available from Greece with the qualitative insights gathered from Belgium, Spain, and Cyprus.

3.1 Current digital maturity and adoption

Across the consortium, there is a clear distinction between the use of general digital tools and immersive technologies.

- **Traditional vs. Immersive:** The majority of trainers across all four countries continue to rely on traditional hands-on methods supported by basic digital tools. In **Greece**, where the largest sample was surveyed (N=32), 93.8% of trainers deliver training via real-world labs, and while 71.9% use presentations, only 4 out of 32 (12.5%) have ever used VR/AR in their classrooms. Similarly, **Spanish** trainers reported that while they frequently use presentations and video tutorials, XR technologies remain restricted to isolated subjects or specific events.

- **Pockets of advanced adoption:** Exceptions exist within specific sectors. In **Belgium**, while general experience remains exploratory, trainers in computer science and chemistry are already leveraging tools like lab simulations and open-source VR platforms. In **Cyprus**, a divide was noted between the public sector, where XR is limited, and private institutions, some of which already possess active VR labs for student use.

3.2 Attitudes and confidence levels

While enthusiasm for innovation is high, trainer confidence in operating immersive technology is notably low, revealing a significant "capability gap."

- **The confidence deficit:** In **Greece**, only 9.4% of educators reported feeling "very confident" in using VR/AR tools, with a significant portion (34.4%) feeling only "somewhat confident". **Belgian** trainers echoed this, reporting low confidence despite recognizing the potential of the technology.

- **Pedagogical concerns:** In **Spain**, attitudes are cautiously optimistic but tempered by concerns over workload. Trainers emphasized that without proper support, the introduction of XR could lead to increased teacher stress rather than enhanced learning. **Cypriot** trainers expressed familiarity with the concepts of VR/AR but admitted to lacking the practical experience required to implement them effectively.

3.3 Identified barriers to integration

The consultations revealed a hierarchy of barriers, with infrastructure and cost serving as the primary bottlenecks, followed closely by a lack of time and training.

- **Hardware and infrastructure:** This is the universal barrier. In **Greece**, 84.4% of trainers cited insufficient hardware/technical infrastructure as the main obstacle. **Cypriot** trainers similarly identified the lack of high-quality XR equipment as a major challenge.
- **Time and administration: Spanish** trainers highlighted a unique barrier: regulatory changes in the national VET system have limited classroom time, making it difficult to experiment with new technologies like XR without structured integration plans.
- **Teacher training:** A lack of professional development was cited by 68.8% of **Greek** trainers. In **Belgium**, trainers noted that a lack of institutional backing and funding prevents the "culture of experimentation" necessary for XR adoption.

3.4 Professional development and resource needs

There is a strong consensus on the type of support required. Trainers are requesting structured, recognized, and pedagogically sound training pathways rather than ad-hoc technical workshops.

- **Micro-credentials:** Trainers in both **Belgium** and **Cyprus** specifically requested "micro-credentialing" courses. They desire structured training that offers formal recognition of their skills, making it easier to justify the implementation of XR in their teaching.
- **Pedagogical vs. Technical training: Spanish** trainers emphasized that training must go beyond how to operate the hardware; they require pedagogical training on how to integrate XR into learning sequences to ensure methodological coherence. **Greek** trainers prioritized hands-on workshops (100% agreement among those willing to pilot) and ready-made VR/AR content tailored to their specific curricula.
- **Content alignment:** Across all nations, trainers expressed a need for XR content that is not just "flashy" but aligned with specific curricular goals, such as safety training and equipment simulation.

The following tables highlight the contrast between the high demand for training and infrastructure versus the currently low levels of confidence and implementation.

This table contrasts the quantitative confidence levels reported in Greece and Cyprus. While a majority of trainers in Greece feel unsure, the small cohort in Cyprus shows a polarized split.

Table 1: Trainer confidence in using VR/AR tools

Confidence Level	Greece (N=32)	Cyprus (N=3)	Spain & Belgium (Qualitative)
Very Confident	9.4%	66.7%	**Low/Exploratory**: Trainers expressed high interest but emphasized a lack of technical fluency and a need for "micro-credentials" to build confidence.
Somewhat Confident	34.4%	0%	
Neutral	18.8%	0%	
Unconfident / Very Unconfident	37.5%	33.3%	

Across the consortium, "Hardware" and "Training" are the consistent top barriers. Interestingly, Greek trainers perceive hardware as a greater hurdle than training, whereas Cypriot trainers view training as the absolute priority.

Table 2: Top barriers to VR/AR integration (percentage of trainers)

Barrier	Greece	Cyprus	Trend Analysis
Insufficient Hardware / Infrastructure	84.4%	66.7%	The universal bottleneck. Without headsets, adoption is impossible.
Limited Teacher Training	68.8%	100%	A critical gap. Teachers are willing but unskilled.
Lack of Funding/Budget	56.3%	66.7%	High costs prevent scalability beyond pilot phases.
Limited Content Availability	46.9%	33.3%	Hardware exists, but software aligned to VET curricula is scarce.

When asked what they need to start using XR, trainers across all countries prioritized "Training" and "Hardware" above all else. This chart compares the specific requests from the quantitative datasets.

Table 3: Essential resources requested for implementation

Resource Needed	Greece	Cyprus	Consensus
Teacher Training & Prof. Dev.	81.3%	100%	**Highest Priority:** Aligning with Belgium's request for micro-credentials.
VR/AR Hardware (Headsets)	75.0%	100%	Essential prerequisite.
Technical Support Staff	40.6%	100%	Cyprus emphasizes ongoing support more strongly than Greece.
Custom Curriculum Integration	68.8%	66.7%	Strong demand for content that fits existing lessons, not just generic demos.

4 Comparative analysis: VET students

This section analyzes the perspectives of VET students across Belgium, Spain, Cyprus, and Greece. Despite differences in sample sizes and fields of study—ranging from **Forestry** and **Early Childhood Education** in Spain to **ICT** and **Health** in Belgium and Greece—the data revealed a unified student voice regarding the disconnect between their personal digital lives and their educational reality.

4.1 The "Digital Native" Gap: Personal vs. Educational Use

A striking finding across all four countries is the gap between students' familiarity with XR technologies in their personal lives versus their exposure to them in the classroom.

- **High personal familiarity:** Students are generally comfortable with the technology. In **Spain**, 80% of respondents reported using VR/AR outside of school, primarily for gaming and entertainment. Similarly, in **Cyprus**, 100% of the students interviewed had used both VR and AR outside the classroom. In **Greece**, 60% of students reported outside-the-classroom exposure.
- **Low educational implementation:** Conversely, in-school usage is negligible. In **Greece**, 86.7% of students stated they have never used VR/AR in a classroom setting. This trend holds true in **Cyprus** (100% had not used it in class) and **Belgium**, where none of the interviewed students had used XR in a formal educational setting. In **Spain**, 80% of students confirmed their centers lacked the necessary equipment.

4.2 Learning preferences: The demand for "hands-on" simulation

Students across the consortium do not view XR as a replacement for physical training, but as a necessary bridge to it.

- **Preference for practicality:** The overwhelming majority of students prefer "hands-on" learning over passive methods. In **Greece**, 86.7% selected hands-on tasks as their preferred learning method. This was echoed in **Spain** (80%) and unanimously in **Cyprus** and **Belgium**.
- **XR as a safe rehearsal:** Students view XR as a tool to "practice without fear". In **Spain**, students highlighted the value of "trial and error" in a safe environment, noting that making mistakes virtually prepares them for real consequences. **Cypriot** students specifically mentioned the value of practicing technical skills like welding or electrical work safely. **Belgian** students noted that XR allows for the repetition of complex tasks without the risk or cost of wasting real materials.

4.3 Perceived benefits: engagement and job readiness

There is a consensus that XR technologies can cure the "boredom" of traditional theory while enhancing employability, thus increasing the attractiveness of VET education.

- **Engagement:** "Making learning fun and interactive" was a top benefit cited by 100% of students in **Cyprus** and strongly supported in **Belgium**. In **Greece**, 81.3% of students associated VR/AR with improved student engagement.
- **Employability:** Students believe XR makes them more attractive to employers. In **Spain**, 80% of students felt immersive tech would make them better prepared for real work situations. **Cypriot** students noted it would help build confidence before entering the workforce.

4.4 Barriers to adoption: cost, time, and support

Students identified practical and logistical hurdles that mirror those identified by their teachers.

- **Equipment Costs:** The high cost of equipment was the most frequently cited barrier by students in **Spain** (60%), **Cyprus** (100%), and **Belgium**.
- **Time constraints:** A lack of time in the schedule was a significant concern, particularly in **Spain** (60%) and **Belgium**, suggesting that students worry XR might add to an already packed curriculum rather than streamline it.
- **Need for guidance:** Students emphasized that technology is useless without support. **Belgian** students stressed the need for "clear instructions and guidance" and "technical support". **Spanish** students similarly identified "technical or internet problems" as a major potential difficulty.

4.5 Equity and access

The consultations highlighted concerns regarding equal access to these technologies.

- In **Greece**, while most students have smartphones, access to VR headsets at home is nearly non-existent (only 2 out of 15 reported having one).
- **Belgian** students noted that XR could benefit learners in remote areas or those with limited access to traditional apprenticeships by offering virtual alternatives. This sentiment was echoed in **Cyprus**, where XR is seen as a way to support students in rural areas.

The following tables illustrate the disconnect between student readiness and institutional readiness, as well as the universal demand for engaging, practical learning tools.

This comparison highlights that while students are digitally literate and familiar with XR technologies in their personal lives (often through gaming), their formal education has yet to capitalize on this familiarity. Greece and Cyprus provided the most distinct statistical evidence of this gap.

Table 4: The "Digital Gap" – Students' exposure to XR (Classroom vs. Personal Use)

Usage Context	Greece (N=15)	Cyprus (N=3)	Insight
Used XR in Classroom	13.3%	0%	Institutional adoption is negligible across the board.
Used XR Outside School	60.0%	100%	Students are already "XR-ready" and comfortable with the tech.

Across all three countries with available quantitative data, there is a near-unanimous consensus that XR improves engagement. Notably, not a single student in Spain or Cyprus disagreed with this premise.

Table 5: Student agreement: "XR would make training more engaging"

Response	Greece	Spain	Cyprus
Strongly Agree	40%	60%	100%
Agree	40%	20%	0%
Neutral	13.3%	20%	0%
Disagree / Strongly Disagree	6.7%	0%	0%
Total Positive Consensus	**80%**	**80%**	**100%**

Students were asked how they prefer to learn practical skills. The results underscore that XR is viewed as a tool to support "Hands-On" practice, not to replace it with passive video watching.

Table 6: Preferred learning methods (top selections)

Learning Method	Greece	Cyprus	Trend Analysis
Doing Hands-on Tasks	**86.7%**	**100%**	The clear favorite. Students want active participation.
Group Projects	53.3%	0%	Greece shows a higher preference for collaborative work.
Watching Demonstrations/Videos	40.0%	100%	Cyprus students value visual demos highly, aligning with XR's visual strengths.
Using Simulations/Virtual Env.	13.3%	33.3%	Currently lower preference, likely due to lack of exposure/familiarity (see Table 4).

5 Comparative analysis: Labour market actors

This section synthesizes the perspectives of industry representatives from **Belgium, Spain, Cyprus, and Greece**. While the sample sizes and sectoral focuses varied—ranging from ICT-heavy consultations in Cyprus to service and automotive industries in Greece—a remarkably consistent set of demands and concerns emerged regarding the role of XR in workforce development.

5.1 Sectoral needs and skills demand

Across all four countries, the labour market signals a critical need for digital adaptability, but the specific application of XR varies by industry sector.

- **Technical proficiency & safety:** There is a universal consensus that XR is most valuable for **Safety Training** and **Equipment Simulation**. In **Greece**, 100% of employers identified "Equipment handling" and "Safety training" as the areas benefiting most from VR/AR. Similarly, **Belgian** experts from manufacturing and healthcare highlighted XR's utility for simulating risk situations and equipment handling. **Spanish** companies also agreed with this, identifying "technical process simulation" and "risk prevention" as the primary use cases.
- **Digital literacy: Cypriot** partners, representing the ICT sector, emphasized a demand for high-level digital skills such as automation, CAD, and cybersecurity, viewing XR as a tool to simulate complex engineering environments. **Spanish** respondents unanimously (100%) identified "digital competences" and "adaptability to new technologies" as the most in-demand skills.

5.2 Readiness and adoption barriers

While interest is high, actual adoption differs by country and company size, with cost serving as the universal brake on implementation.

- **Adoption Levels: Belgium** showed the highest maturity, with some large enterprises actively using XR for training. In contrast, **Greece** and **Spain** reported lower current usage but high interest; in Greece, most companies have not yet used XR but express strong interest in piloting it.
- **The cost barrier:** The call for **"Affordable and Scalable"** solutions was unanimous. In **Spain**, 100% of companies cited this as a necessary condition for adoption. **Greek** employers similarly listed "High initial investment" as a top challenge.
- **Realism concerns:** A specific barrier highlighted by **Greek** employers (75%) was concern regarding the "realism or effectiveness of simulations". This skepticism was mirrored in **Belgium**, where a healthcare expert noted that certain physical procedures (e.g., cardiac massage) cannot be effectively replaced by VR.

5.3   Collaboration with VET institutions

Employers across the consortium are willing to collaborate with VET providers, but they impose strict conditions to ensure training meets market standards.

- **Conditional collaboration:** In **Greece**, **Belgium**, and **Spain**, collaboration is largely viewed as "conditional on sector relevance". Employers are not interested in generic partnerships; they require specific, industry-aligned training modules.
- **Co-creation:** There is a strong demand for industry involvement in curriculum design. **Cypriot** partners suggested mentorship programs and curriculum co-development. **Greek** employers (50%) and **Spanish** respondents stressed that industry experts must be involved in content creation to ensure relevance.
- **Internships as a bridge: Spanish** companies highlighted that they already collaborate 100% via internships, providing a strong existing foundation to introduce XR-based "hybrid apprenticeships," a concept also supported by **Cypriot** partners.

5.4   The consensus on "blended learning"

Perhaps the most significant finding is the rejection of XR as a standalone solution. The labour market overwhelmingly favors a **Blended Learning** approach.

- **Supplement, not substitute:** In **Belgium**, experts explicitly stated that XR must not replace hands-on training but rather supplement it. **Greek** representatives reinforced this, noting that while VR is pioneering, students should "not be deprived of training in real laboratory conditions".
- **Preparation for the real world:** Employers agree that XR enhances **employability** by acting as a "confidence builder." **Cypriot** respondents noted that it allows trainees to experience problem-solving scenarios before entering the job market. **Spanish** (33% yes, 66% maybe) and **Greek** (75% yes) employers generally agreed they would find students trained with VR/AR more attractive candidates, provided the training was rigorous and relevant.

5.5   Summary of industry requirements

Requirement	Greece	Spain	Belgium	Cyprus
Top Use Case	Safety & Equipment Handling	Risk Prevention & Onboarding	Risk Simulation & Remote Training	Engineering & Hybrid Apprenticeships
Primary Barrier	Cost & Realism	Affordability & Scalability	Scalability & Staff Resistance	Cost & Infrastructure
Collaboration	Conditional on Relevance	Strong (via Internships)	Conditional on Relevance	Open to Mentorships
Key Insight	XR must align with industry standards.	Need for "gradual" implementation.	Cannot replace physical touch (e.g., healthcare).	XR bridges the theory-practice gap.

The following tables synthesize the priorities and barriers expressed by industry representatives across the four nations.

Employers were asked which areas of training would benefit most from XR. Across all four countries, "Safety" and "Equipment Handling" emerged as the absolute priorities, significantly outweighing soft skills or onboarding.

Table 7: Top Areas for XR implementation (industry consensus)

Priority Area	Greece (N=4)	Cyprus (N=3)	Belgium & Spain (Qualitative)
Equipment Handling & Technical Procedures	**100%**	**100%**	**High Priority:** Cited by Spanish manufacturing and Belgian healthcare experts as the primary use case.
Safety Training & Risk Simulation	75%	**100%**	**High Priority:** Spanish firms specifically requested "risk prevention" modules.
Remote / Distributed Workforce Training	50%	0%	**Medium Priority:** Belgian stakeholders in ICT and Healthcare noted this is useful for specific contexts.
Soft Skills / Onboarding	25%	0%	**Low Priority:** Industry views XR as a "hard skill" tool primarily.

While cost is the universal barrier, distinct secondary concerns emerged. Greek and Belgian employers worry about the "realism" of simulations (e.g., whether VR is effective), while Cypriot employers focus on the lack of skilled staff to manage the tech.

Table 8: Primary barriers to XR adoption in industry

Barrier	Greece	Cyprus	Trend Analysis
High Initial Investment	50%	100%	The entry cost remains the biggest hurdle for Small & Medium Enterprises (SMEs).
Concerns about Realism / Effectiveness	75%	66.7%	A major skepticism: "Can virtual training replace physical touch?"
Lack of Skilled Staff to Implement	25%	100%	Companies lack internal "XR Managers" to run these programs.
Resistance to New Training Methods	50%	66.7%	Cultural resistance within established workforces is significant.

Employers are open to partnership, but they are cautious. The "Maybe" category is dominant, indicating that collaboration is conditional on VET schools proving that their XR modules are relevant to actual industry needs.

Table 9: Industry willingness to co-develop VET curricula

Response	Greece	Cyprus	Belgium	Spain
Yes, definitely	25%	33.3%	Mixed*	Mixed*
Maybe (If relevant to our field)	75%	66.7%	Dominant	Dominant
No / Not at the moment	0%	0%	Minority	Minority

Note: Belgium and Spain data derived from qualitative interview summaries indicating "conditional openness" dependent on sector relevance.

6 Cross-country findings

This section integrates the findings from the four national consultations to identify the converging narratives that define the current European VET landscape regarding XR, while also highlighting the unique, context-specific divergences that must inform a flexible implementation strategy.

6.1 Converging narratives: the "universal truths"

Despite the differences in economic context and educational systems between Belgium, Spain, Cyprus, and Greece, four fundamental pillars of agreement emerged across all stakeholder groups.

1. The consensus on "Blended Learning": There is a unanimous rejection of XR as a replacement for physical training. Across all four nations, stakeholders envision a **"Hybrid" or "Blended"** model.

- **VET Trainers:** In **Spain** and **Greece**, educators emphasized that XR should be used for preparation and reinforcement, not to replace the tactile experience of a real workshop.
- **Industry:** Employers in **Belgium** and **Greece** explicitly stated that while virtual simulations are excellent for safety and process memorization, they cannot replicate the "touch and feel" required for tasks like cardiac massage or fine mechanics.
- **Students:** Students in all countries prefer hands-on tasks above all else. They view XR as a "safe space" to fail before attempting the real task, bridging the gap between theory and the workshop.

2. The Infrastructure and Skills Bottleneck: The "Readiness Gap" is identical across borders. Attitude is high, but capacity is low.

- **Hardware:** This is the primary barrier. In **Greece**, 84.4% of trainers cited insufficient infrastructure. In **Cyprus** and **Spain**, the high cost of equipment and lack of high-speed internet were flagged as critical hurdles for scalability.
- **Training:** A lack of teacher competence is universal. **Belgian** and **Cypriot** trainers specifically requested "micro-credentialing" to validate their skills. **Spanish** trainers noted that without training, XR adds to their stress load rather than reducing it.

3. The "Safety and Engagement" Value Proposition: The perceived benefits of XR are uniform.

- **Safety: Greek** and **Spanish** industries identified "Safety Training" and "Risk Prevention" as the highest-value application for XR.
- **Engagement:** "Making learning fun" and "increasing motivation" were the top benefits cited by students in **Cyprus** (100% agreement) and **Belgium**.

6.2   Diverging perspectives

While the challenges are similar, the specific local contexts provided distinct insights.

1. Regulatory vs. infrastructural constraints

- **Spain** presented a unique administrative barrier: **Time**. Due to recent regulatory changes in the Spanish VET system, trainers felt their schedules were too compressed to experiment with new tech without a structured plan.
- **Greece** and **Cyprus** focused more heavily on **Equity**. The "Homework Gap" was prominent in Greece, where students have smartphones but no access to VR headsets at home, raising concerns that it could exclude lower-income students.

2. Sectoral focus and application

- **Belgium** and **Cyprus** leaned heavily into **ICT and High-Tech**. Their consultations focused on using XR for coding, cybersecurity, and advanced engineering simulations.
- **Spain** provided a unique perspective from the **Agricultural/Forestry** sector. Here, XR is valued for simulating outdoor machinery and environmental management, differing from the factory/lab focus of other partners.
- **Greece** had a strong representation from **Service and Automotive** sectors, driving a demand for highly realistic mechanical simulations that can mimic specific engine repairs.

6.3   Maturity of Adoption

- **Belgium** appears to be the most "industry-ready," with large enterprises already actively using XR for internal training. The challenge there is connecting VET schools to these existing industry standards.
- In **Greece** and **Cyprus,** interest is high (enthusiastic trainers and students), but actual implementation in classrooms is near zero (only 12.5% of Greek trainers have used it).

Table 10: Summary matrix of national priorities

Feature	Belgium	Spain	Cyprus	Greece
Primary Focus	ICT, Chemistry, Health	Forestry, Education, Industry	ICT, Engineering	Mechanics, Health, Tourism
Top Trainer Need	Micro-credentials	Pedagogical Integration	Technical Confidence	Hardware & Content
Student Demand	Remote/Hybrid Access	Practice "Trial & Error"	Interactive/Fun Learning	Access to Hardware
Industry View	Useful for Remote Teams	Essential for Risk Prevention	Digital Literacy Tool	Must be "Realistic"

7   Recommendations

Based on the comparative analysis of findings from Belgium, Spain, Cyprus, and Greece, the following actionable recommendations are proposed to facilitate the successful integration of Extended Reality (XR) into Vocational Education and Training (VET). These recommendations address the identified gaps in infrastructure, teacher capability, and curriculum alignment.

7.1   For VET institutions: Empowering the educators

The consultation data reveal that while enthusiasm is high, teacher confidence is low due to a lack of technical and pedagogical know-how.

- **Implement "micro-credentialing" programs:** Drawing on the specific requests from **Belgian** and **Cypriot** trainers, VET schools should establish short, focused training modules (micro-credentials) that validate specific XR skills. This provides formal recognition for teachers, motivating them to upskill in areas like "VR/AR equipment operation" and "lesson design".
- **Establish technical support structures:** To reduce teacher stress—a key concern in **Spain**—institutions must provide dedicated technical support staff. Teachers should not be expected to be IT technicians; their focus must remain on pedagogy. **Greek** data supports this, with over 40% of trainers identifying technical staff as a critical resource.
- **Create "XR labs" for equity:** Since student access to VR headsets at home is negligible (as seen in **Greece** and **Cyprus**), schools must centralize investment in on-campus XR labs. This ensures all students have equal access to immersive learning, regardless of their socioeconomic background.

7.2   For curriculum developers: The "blended" approach

There is a universal consensus that XR cannot replace physical training. Curriculum design must reflect this "hybrid" reality.

- **Design for "Preparation and Reinforcement":** XR modules should be positioned as preparatory tools. Curriculum developers should create sequences where students practice safety procedures and equipment handling in VR *before* entering the physical workshop. This aligns with **Spanish** and **Greek** industry demands for "risk-free" simulation environments.
- **Focus on high-value use cases:** Do not try to digitize everything. Focus development on the areas identified as highest priority by industry partners across all four nations: **Safety Training**, **Risk Prevention**, and **Complex Equipment Handling**.
- **Integrate gamification:** To maximize the engagement benefits cited by students in **Cyprus** and **Belgium**, content should include gamified elements (e.g., scoring, immediate feedback loops) to make technical theory more interactive and memorable.

7.3 For policy makers and funding bodies: Bridging the "readiness gap"

The primary barrier to entry remains cost. Strategic funding is required to move beyond the pilot phase.

- **Targeted infrastructure grants: Greek** and **Spanish** findings highlight "insufficient hardware" and "high initial investment" as the top barriers. Funding streams should be specifically allocated for the acquisition of scalable hardware (e.g., standalone VR headsets) to modernize VET classrooms.
- **Fund cross-sector alliances:** Financial incentives should be offered to companies that collaborate with VET schools. **Cypriot** and **Spanish** industries expressed a willingness to co-develop curricula if it aligns with their needs. Grants that fund "VET-Industry Co-Creation" projects can formalize these partnerships.

7.4 For industry partners: from observers to co-creators

Industry dissatisfaction with the "realism" of current training can only be solved through active participation.

- **Co-develop standards:** Industry partners in **Greece** and **Spain** stressed that XR content must align with recognized industry standards to be valid. Companies should not just accept interns but actively review and accredit the XR scenarios used in schools to ensure they mirror real-world protocols.
- **Hybrid apprenticeships:** Companies should explore the **Cypriot** proposal of "hybrid apprenticeships" or e-apprenticeships, where remote or virtual training supplements on-site work. This is particularly valuable for SMEs that may lack the resources to host full-time physical trainees.

8 Conclusion

The comparative analysis of open consultations in **Belgium, Spain, Cyprus, and Greece** confirms that the European VET ecosystem stands at a critical juncture regarding the adoption of Extended Reality (XR). The data reveal a landscape defined by **eager and willing** participants but with **low structural maturity**. While the economic and educational contexts of the four countries differ, the vision for the future of vocational training is remarkably aligned across all stakeholder groups.

The most defining characteristic of this study is the contrast between enthusiasm and capability.

- **VET trainers** are eager to innovate but feel ill-equipped. The "confidence gap" identified in Greece and Cyprus, coupled with the specific requests for "micro-

credentials" in Belgium and pedagogical support in Spain, indicates that the human element of digital transformation has lagged behind technological advancements.

- **VET students** are digitally native but educationally underserved regarding immersive tech. They are ready to embrace XR for "trial-and-error" learning, yet the vast majority—particularly in Greece and Cyprus—have never encountered these tools within their institutions.
- **The labour market** demands digital proficiency and safety consciousness. Industry actors across the consortium view XR not as a novelty, but as a pragmatic solution for risk prevention and equipment familiarity, provided the simulations meet rigorous professional standards.

The consultations unanimously reject the notion of XR as a replacement for traditional vocational training. Instead, a robust consensus has formed around a **"Blended" or "Hybrid" model**. Stakeholders envision XR as a preparatory layer—a "digital sandbox" where students can master safety protocols and complex internal mechanisms before touching physical machinery. This approach addresses the industry's need for safety, the students' desire for engagement, and the trainers' need for efficient curriculum delivery.

The **XRinVET** project's intervention is timely and necessary. The barriers identified—primarily cost, hardware access, and teacher training—are significant but manageable through the specific collaborative strategies highlighted in this report.

- **Belgium** demonstrates that industry-led innovation is possible.
- **Spain** illustrates the need for pedagogical integration to prevent teacher burnout.
- **Cyprus** and **Greece** highlight the urgency of infrastructure investment to ensure equity.

By moving forward with the recommended **"Train-the-Trainer"** programs and **industry-aligned curriculum co-creation**, the consortium has the opportunity to convert this high potential into high impact, transforming XR from a theoretical possibility into a standard pedagogical instrument for the next generation of the European workforce.