OpenVerse

Concrete Applications of Virtual Worlds in Europe

Drivers, Challenges, Use Cases, and Real-Life Case Studies

Funded by the European Union

Project funded by

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

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IDC VUB VRIJE UNIVERSITEIT BRUSSEL imec

OPENVERSE Webinar

May 26th, 2026

Welcome

- The webinar will be recorded (recording will be distributed in the next days)
- Only the speakers can use camera, mics and share the screen
- Please feel free to put your questions in the Q+A box, if you'd like to interact with the speakers

Agenda

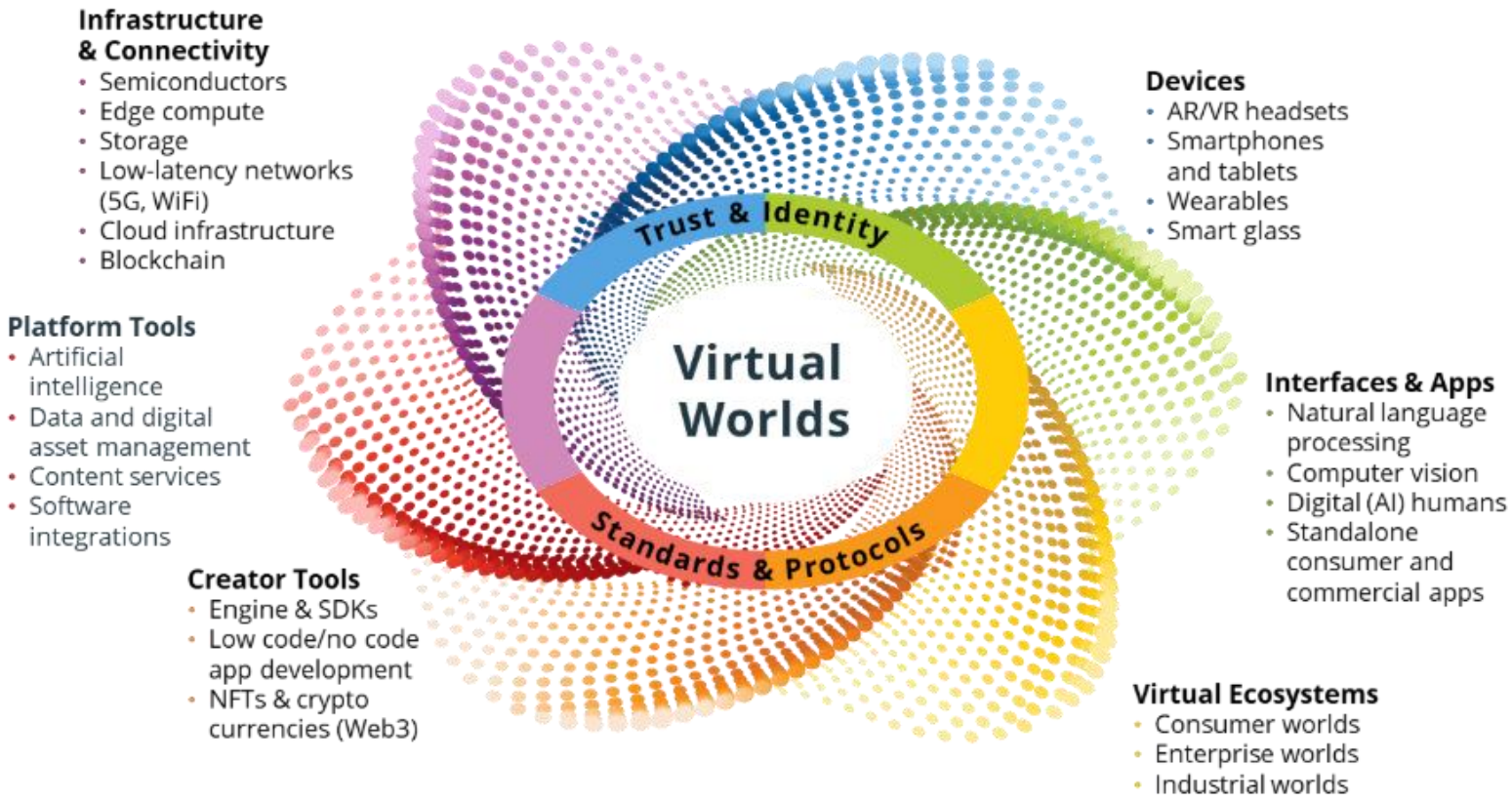
- *State of the Market of Virtual Worlds Use Cases: Key Applications, Drivers, and Challenges*
- *Developing Industry-Focused Use Cases for Enhanced Collaboration*
- *Q&A*

Concrete Applications of Virtual Worlds in Europe

Drivers, Challenges, Use Cases, and Real-Life Case Studies

What are Virtual Worlds?

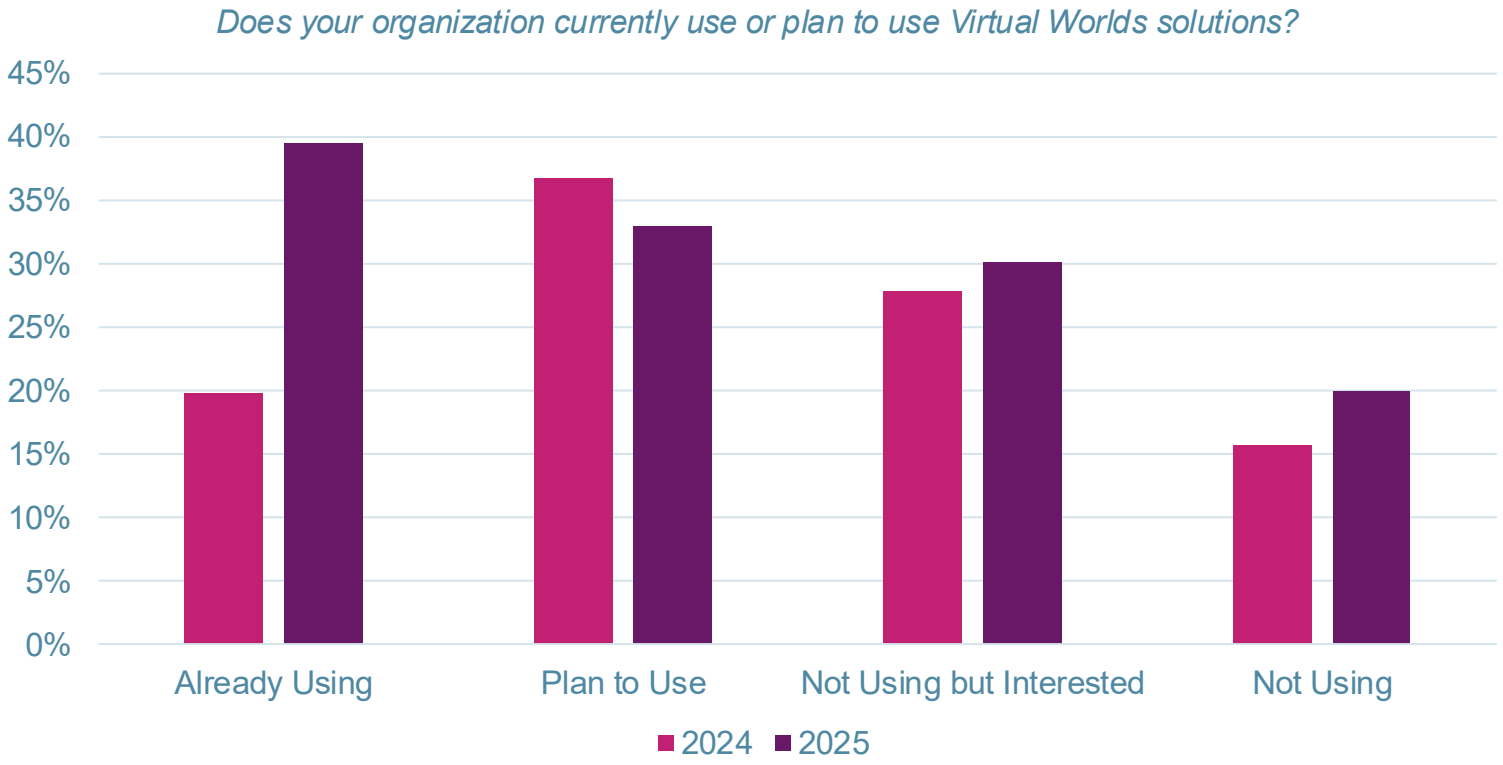
"Persistent, 3D, real-time, immersive environments, blurring the line between real and virtual, for socializing, working, learning, transacting, playing, and creating."



Source: IDC, 2026

Market Adoption

Evidence of Growing Adoption and Stable Interest in Virtual Worlds Solutions



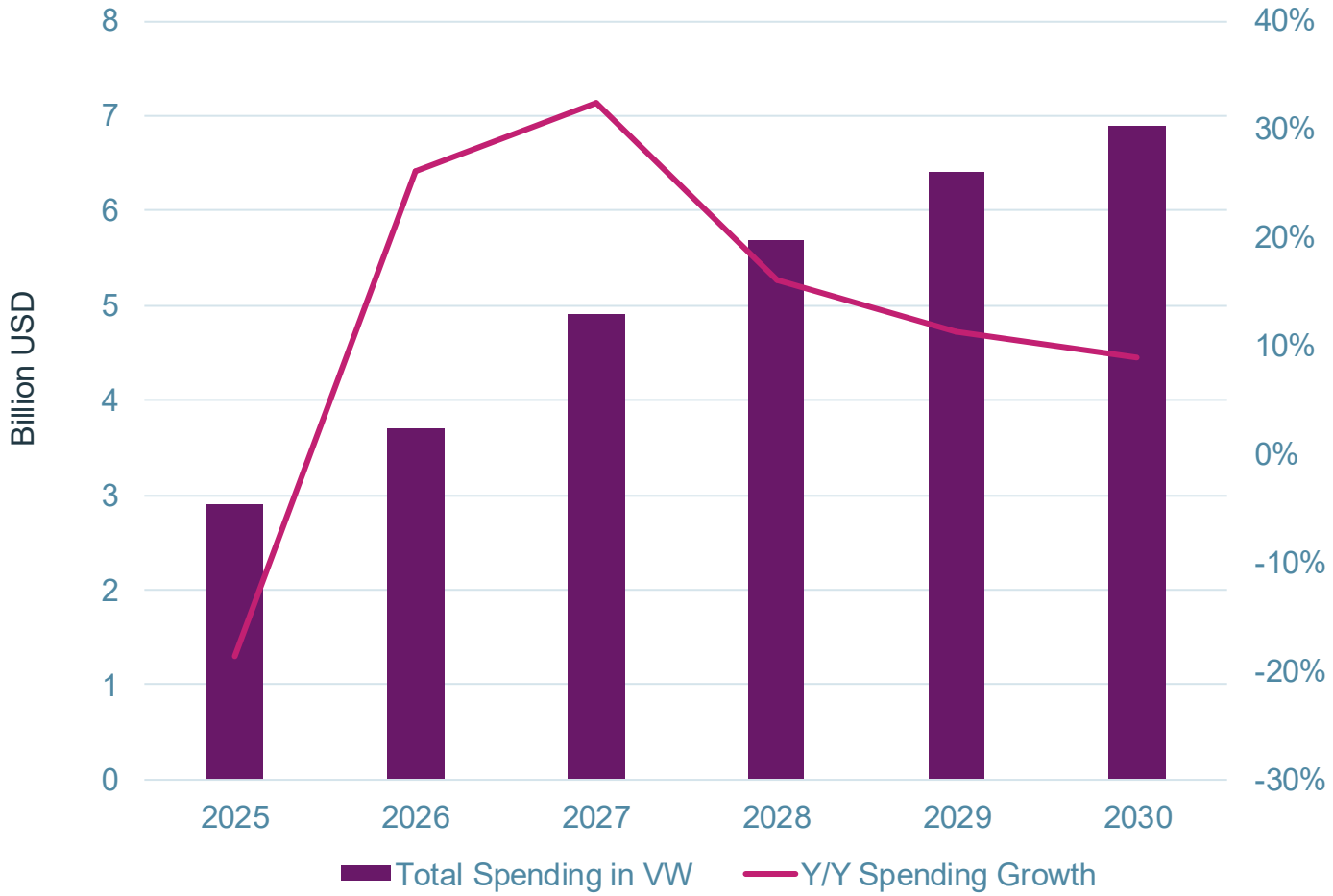
Key highlights

- Engagement **growing** from 2024 to 2025.
- Active users near **40%** — real deployments, not pilots.
- "Plan to use" shrinking — planners turning into users.
- **~30% interested** but not yet adopting — strong pipeline.
- ~20% **not using** — barriers: cost, skills, unclear value.

Takeaway: intent is converting into adoption.

Source: IDC Emerging Technologies Survey, 2024 (Europe n=640), IDC Emerging Technologies Survey, 2025 (Europe n=370)

Where Investments Go



Source: IDC Worldwide AR and VR Spending Guide, 2026

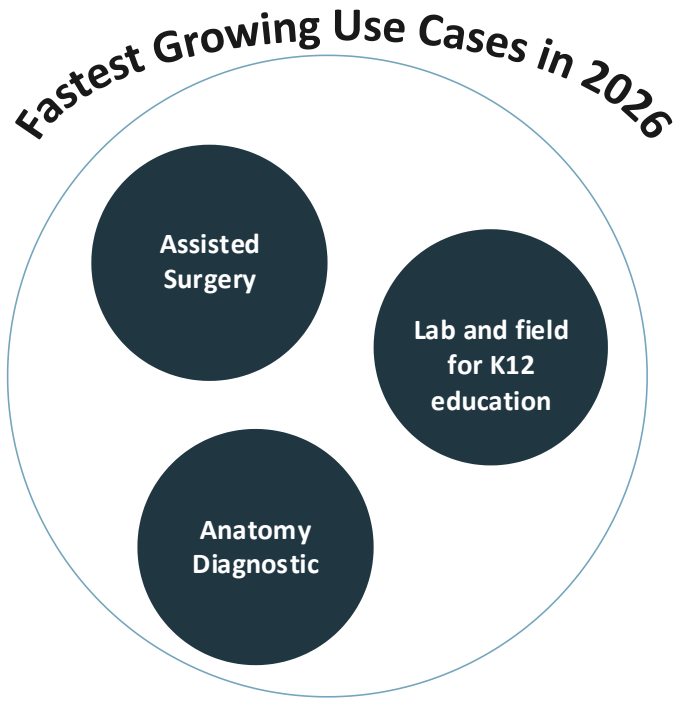
Three phases, one trajectory

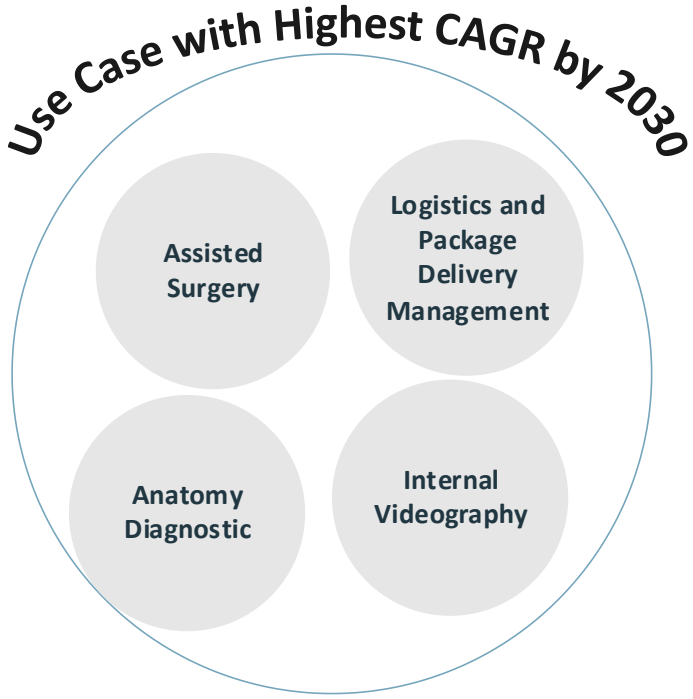
$2.9B in 2025 → $6.9B in 2030 (~19% CAGR, 2.4x)

- **2025 dip:** VR headsets exit as vendors shift to mixed and extended reality. A product transition, not a demand collapse.
- **2026–27 rebound:** +26% then +32%, driven by new MR hardware and smart glasses like Meta Ray-Bans.
- **2028–30 maturation:** growth settles to ~9–16% as enterprise use cases scale — training, manufacturing AR, collaboration.

Takeaway: Europe is moving from hardware experimentation to enterprise deployment. The next five years are about embedding XR into how work gets done.

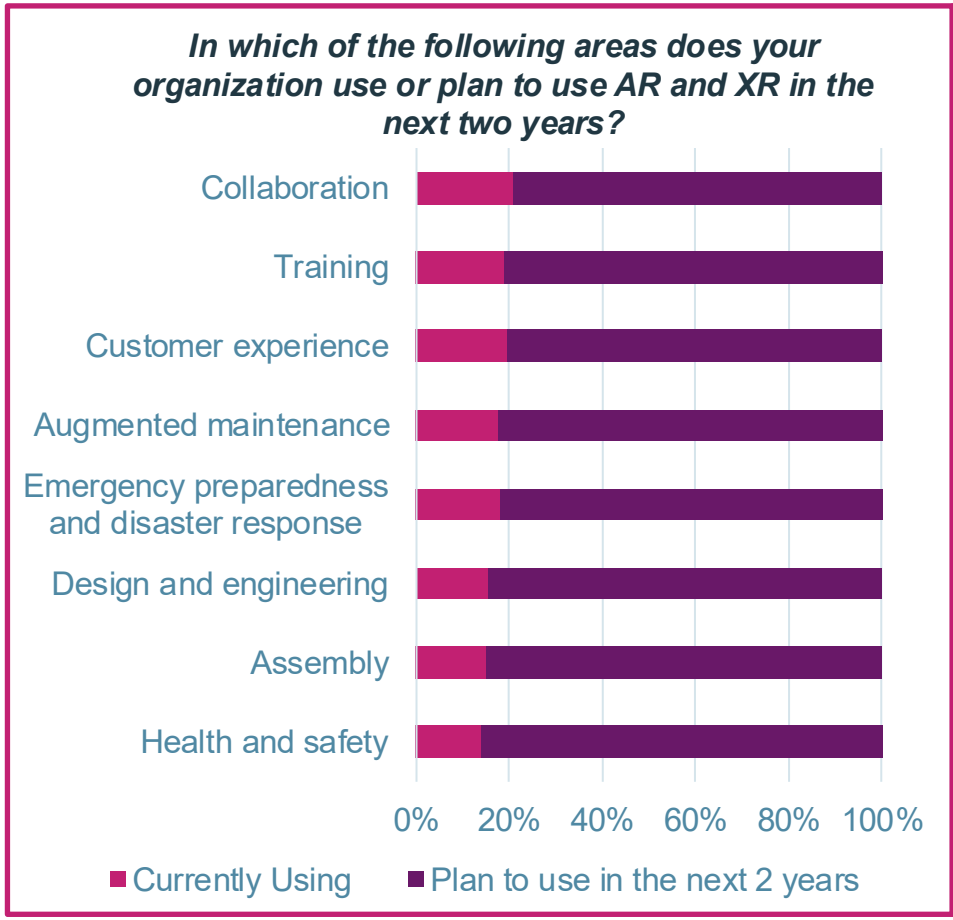
Where Investments Go – Key Use Cases

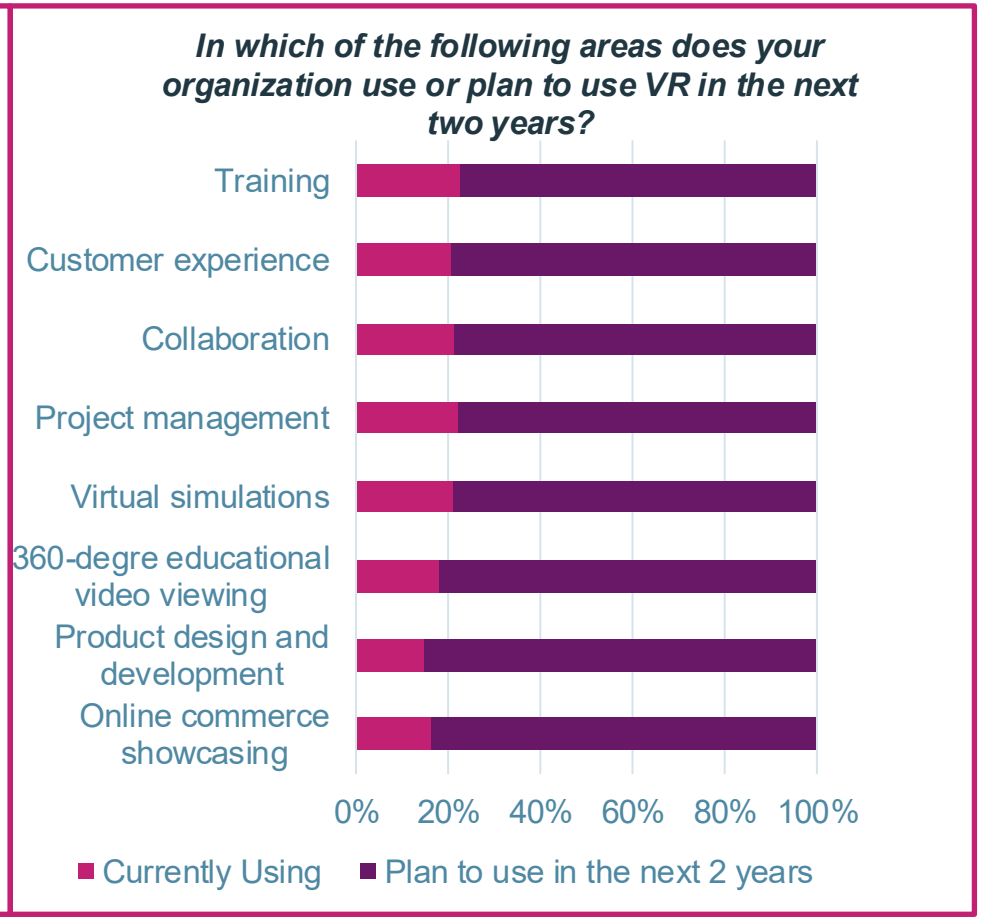




Source: IDC Worldwide AR and VR Spending Guide, 2026

Where Companies Focus – Key Applications





Source: IDC Emerging Technologies Survey, 2025 (Europe n=370)

From pilots to deployment

Today, only **10–18%** of European firms use AR/XR or VR. Within two years, **50–63%** plan to — roughly a 4x jump.

Training leads both

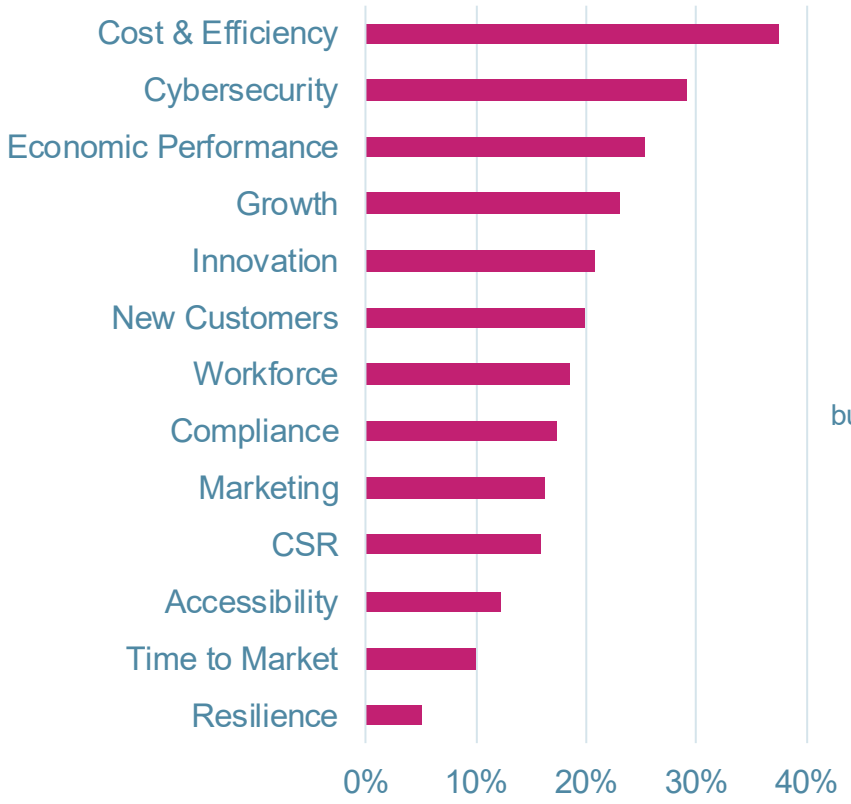
#1 planned use for AR/XR (63%) and VR (61%). Customer experience and collaboration follow closely.

AR/XR vs VR split

AR/XR skews operational — health & safety, assembly, maintenance. VR skews experiential — simulations, product design, commerce.

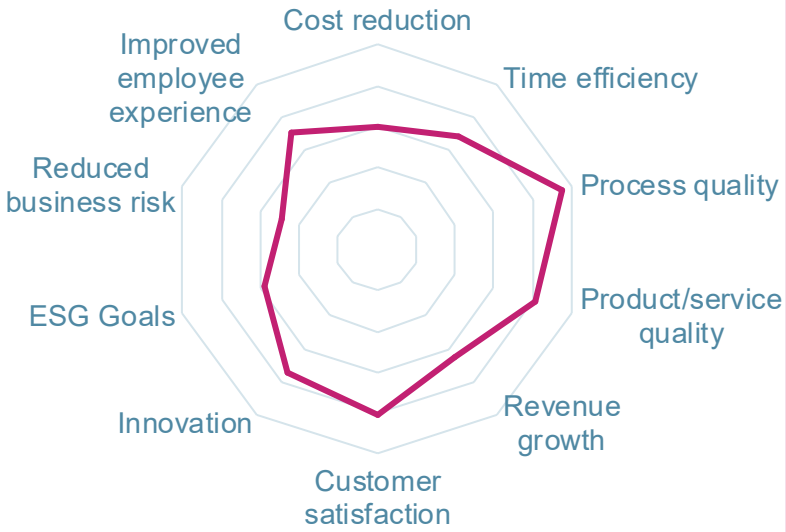
Key Benefits and Drivers to Adoption

Key Drivers



Expected Benefits

Which of the following measurable results has your organization achieved or expects to achieve thanks to the implementation of Virtual Worlds technologies?



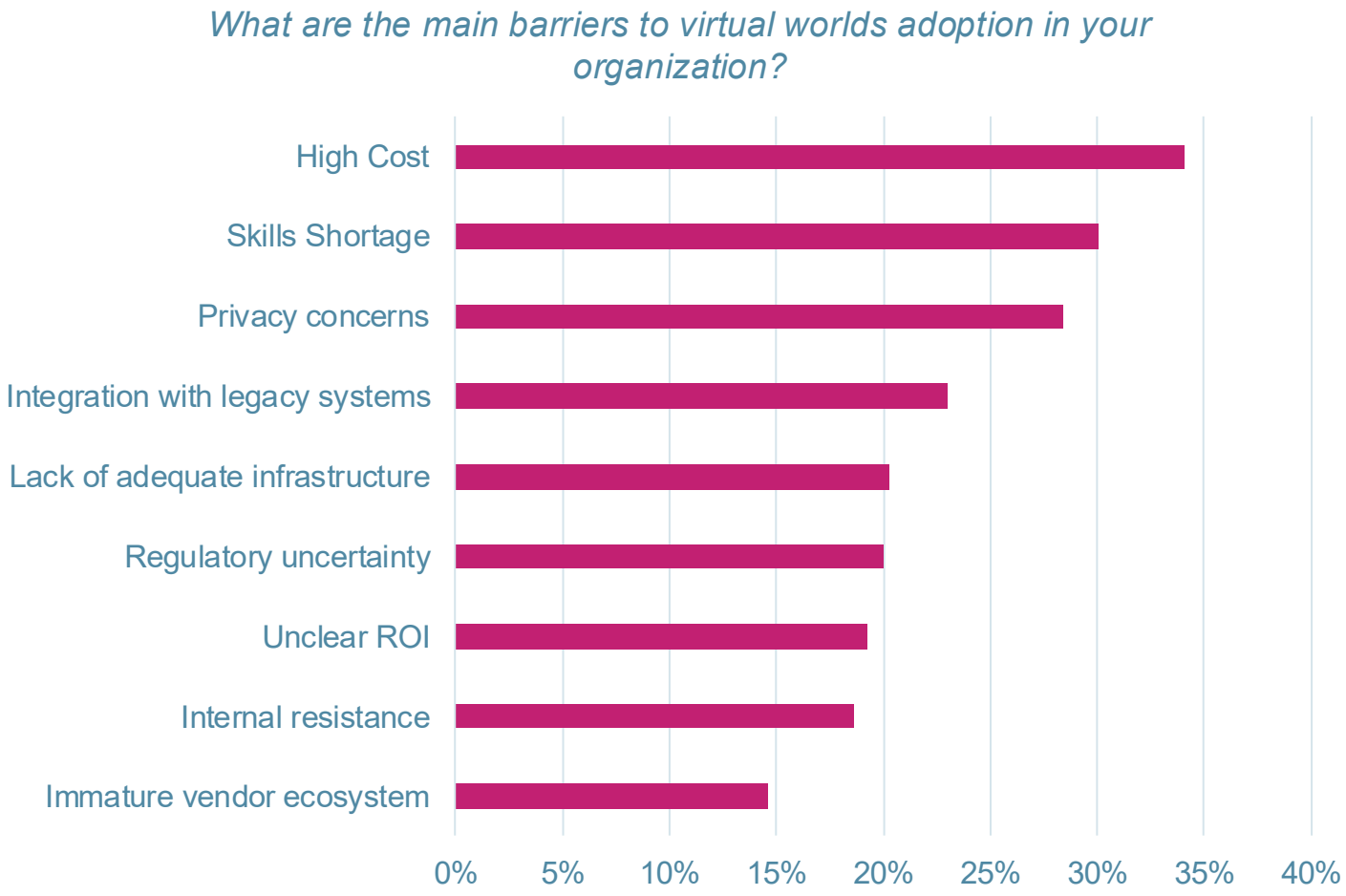
Key highlights

- **Cost & efficiency** is the #1 driver — 38% of organisations.
- **Cybersecurity** is the surprise #2 driver (29%) — trust matters.
- **Quality leads benefits** — process & product quality top the results (24% & 20%).
- **People wins are real** — customer satisfaction (20%) & employee experience (18%).
- Revenue (16%) and cost reduction (15%) confirm **bottom-line impact**.

Bought for efficiency, valued for quality and people.

Source: IDC Emerging Technologies Survey, 2025 (Europe n=370)

Key Challenges – What's Hindering Adoption



Source: IDC Emerging Technologies Survey, 2025 (Europe n=370)

What type of support would most effectively help your organization accelerate its adoption of virtual worlds technologies?

1. Training and upskilling programs
2. Financial incentives for tech adoption
3. Access to cloud-based platforms for experimentation

OPENVERSE USE CASE · WP6

Developing Industry-Focused Use Cases for Enhanced Collaboration

A comparative study of user acceptance in human-robot collaborative order fulfilment

The Problem: Returns are costing European SMEs

E-Commerce Boom

- EU e-commerce turnover grew 65% from 2018-2023
- 68% of EU-27 population now buys goods online

The Return Problem

- Returns generate logistics costs, inspection labour, and waste
- If items can't be resold, they become pure waste
- E-commerce produces 3× the CO_2 of brick-and-mortar retail

54%

return rate

per online buyer in the EU (2024)

5%+

from fulfilment

incorrect or damaged goods

60%

still use paper

picking in EU warehouses

Augmented Reality: The Opportunity

AR overlays digital information onto the physical workspace — giving workers real-time picking guidance, error alerts, and robot status without changing their environment.

Guided Picking

Item name, picture, quantity, and shelf location displayed item-by-item in the worker's field of view

Robot Coordination

Real-time robot status panels reduce anxiety from unexpected robot movements and prevent collisions

Error Prevention

Double-check confirmations and visual alerts catch missing items and wrong quantities before orders ship

The System We Built

Hardware

Meta Quest 3 HMD · Hands-free (XR Hands) · WCAG 2 compliant UI

Software

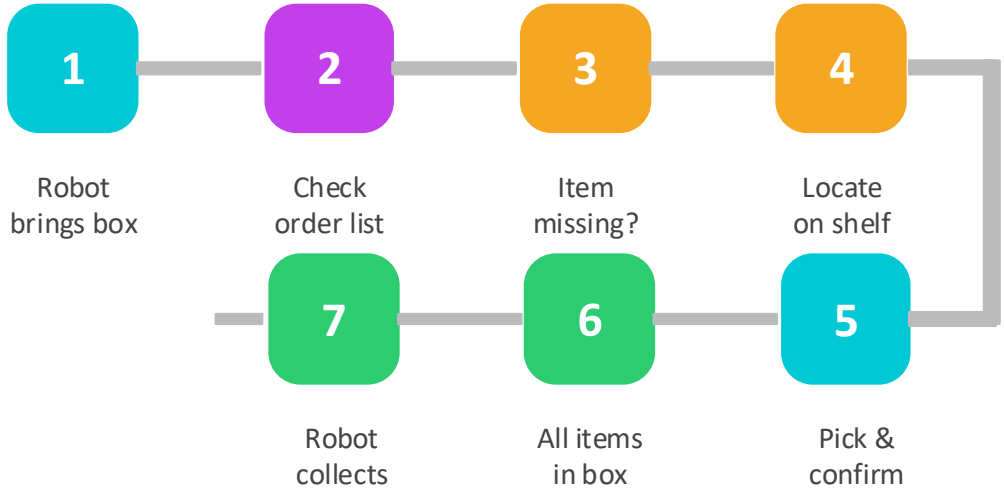
Unity 3D + C# · XR Interaction Toolkit · Meta XR SDK

Robot

Universal Robots UR10e · Conveyors 1 & 2 · Status via AR panels

The Task — 3 Orders, 7 Steps

Complete 3 orders: verify box contents, pick missing items from the shelf, confirm — robot handles transport automatically.



How We Studied It

PHASE 1 — Survey

- 53 responses from 17 European countries
- Avg. 4 years experience in SME order fulfilment
- Assessed: current AR adoption, worker attitudes, barriers to use
- 13.2% had already used AR at work

Informed the design of the AR interface and experiment.

53
participants

17
countries

PHASE 2 — User Acceptance Study

- 27 participants (20M / 7F), mean age 25.3 yrs
- Within-participant design, counter-balanced order
- Each condition: up to 10 mins, 3 orders completed
- Measured: 9 Almere constructs + task completion time
- Ethics approved; data pseudonymized at VUB

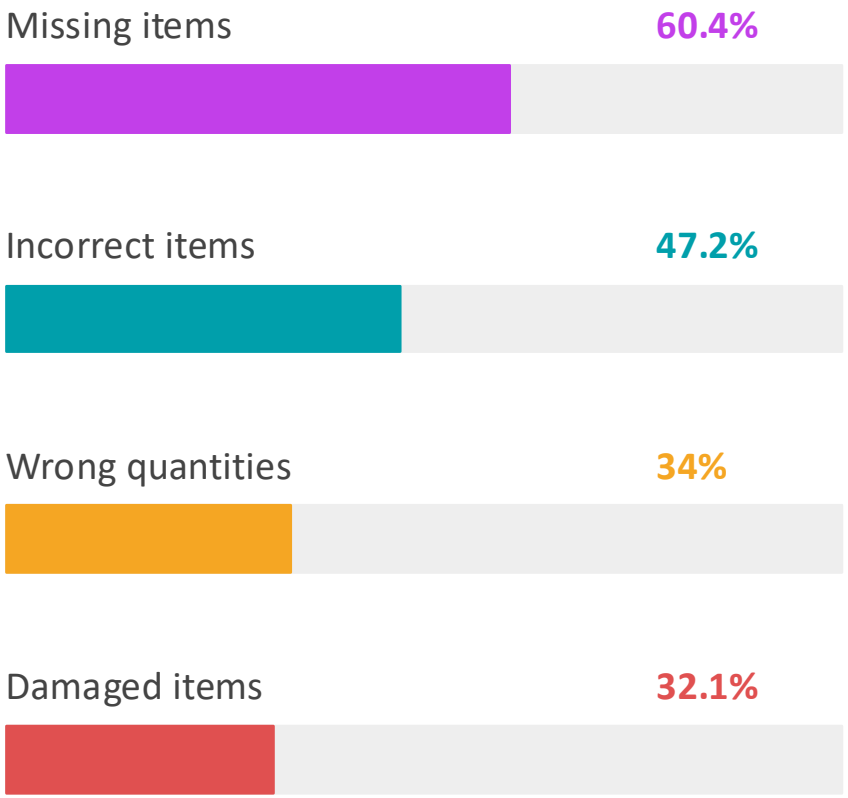
Almere model: Anxiety · Intention to Use · Enjoyment · Ease of Use · Usefulness · Facilitating Conditions · Attitude · Social Influence · Trust

27 participants

9 constructs

Survey: What Workers Think About AR

Today's Error Landscape



Willingness to Adopt AR

83%

expect increased productivity

67.9%

see themselves using AR soon

51%

willing to use AR right now

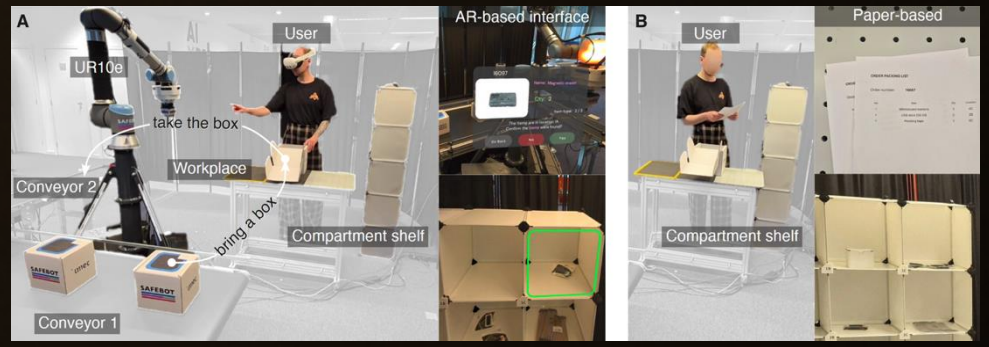
69.8%

expect decreased physical workload

⚠ *Main concern raised by workers: eye strain, headaches, nausea, neck pain from current HMD hardware — highlighting the need for lighter, more ergonomic devices.*

The Experiment

Each participant completed the 3-order task twice — once with AR, once with paper — in counter-balanced order. Up to 10 minutes per condition.



Condition A — AR Application (Meta Quest 3)

- AR app displays augmented picking list item-by-item
- Green frame highlights item location on shelf
- Robot interaction fully managed via AR interface

Condition B — Paper Picking List (baseline)

- 6 paper lists matched to boxes by order ID
- Box reception controlled manually via pushbuttons
- Most common method in European SMEs today

Video link:
https://www.youtube.com/watch?v=5HAckcJIjfk

Results: Where AR Wins

Perceived Enjoyment — significant

AR scored significantly higher (M=4.19 vs 3.25 paper).
Effect size: very large (rbc=0.87, p<0.001).
Workers found AR more engaging and immersive.

Social Influence — significant

AR scored higher on social norms and peer expectations (M=3.91 vs 3.57 paper, rbc=0.5, p<0.05).
Workers feel AR aligns them with modern practices.

Anxiety — no increase

Despite being novel technology, AR did not raise anxiety (M=2.28 vs 2.22 paper, n.s.). Well-designed AR interfaces can feel intuitive even for first-time users.

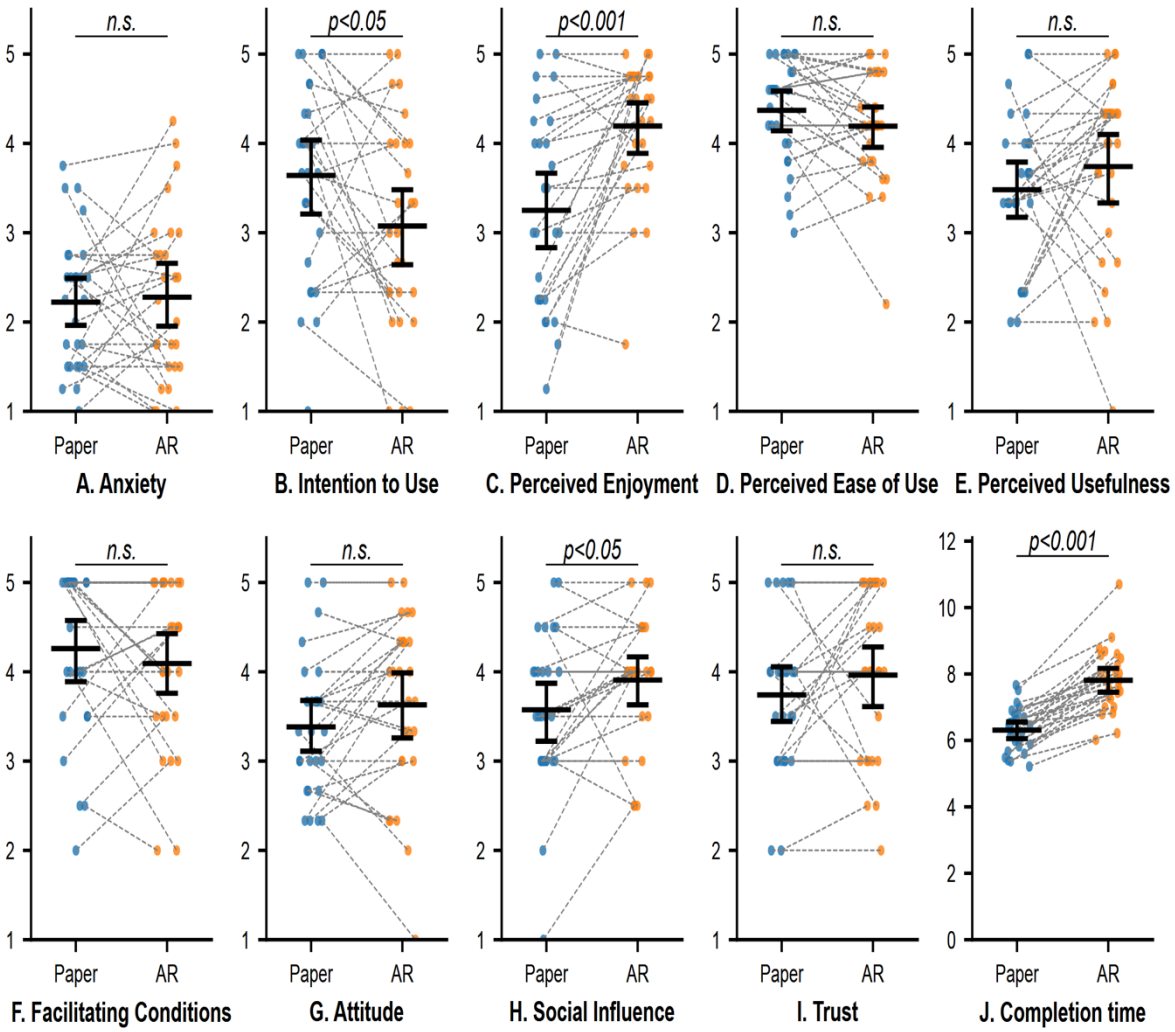


Figure 3 from Burkiewicz et al. (in review) — 10 paired comparisons, AR vs. paper. Highlighted: significant differences.

Results: Where Paper Still Wins (For Now)

Task Completion Time — paper faster

Paper: 6.31 min avg · AR: 7.81 min avg
Difference: 1.5 min per session ($p<0.001$, Cohen's $d=1.84$).
No prior AR experience — learning curve is the main driver.

Intention to Use — paper preferred

Paper scored higher on stated intention to use
($M=3.64$ vs 3.07, $p<0.05$, Cohen's $d=0.49$).
Comfort concerns with HMD hardware (eye strain, headaches, neck pain) were the primary reason.

Why this will change: Lighter hardware (smart glasses, AR contact lenses), interface refinements (fewer confirmation steps, order overview vs. item-by-item), and simple familiarization time all expected to close the gap.

Head-to-Head

Metric	Paper	AR
Completion time	**6.31 min ✓**	7.81 min
Intention to use	**3.64 / 5 ✓**	3.07 / 5
Perceived enjoyment	3.25 / 5	**4.19 / 5 ✓**
Social influence	3.57 / 5	**3.91 / 5 ✓**
Anxiety	2.22 / 5	2.28 / 5
Ease of use	4.37 / 5	4.19 / 5
Trust	3.74 / 5	3.96 / 5

Conclusions

What We Found

AR significantly **improves perceived enjoyment** (rbc=0.87) and social influence (rbc=0.5) — workers find it engaging and socially aligned with modern practice.

Well-designed AR does not raise anxiety — even for first-time users. Intuitive interface design can overcome the novelty barrier.

Paper still wins on speed (6.31 vs 7.81 min) and intention to use — driven by an absence of prior AR experience, not by dislike of the technology.

Hardware comfort is the critical adoption barrier: eye strain, headaches, neck pain from current HMDs — not the concept itself.

Full paper:

Is Augmented Reality ready for the warehouse? A comparative study of user acceptance in human-robot collaborative order fulfillment

Aleksander Burkiewicz, Hoang-Long Cao, Sandra Salloum, Milan Amighi, Nima Roshandel, Dylan Sisavath, Yuwen Shen, Hamed Firouzipouyaei, Constantin Scholz, Antonio Paolillo, Bram Vanderborght

Federated labs AI and Robotics, Applied Mechanics, Faculty of Engineering, Electrical Engineering and Power Electronics, Software Languages Lab, Informatics and Applied Informatics, Faculty of Sciences and Bioengineering Sciences

Research output: Contribution to journal › Article › peer-review

Q&A

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