

XR is XR: Revisiting the Evolution and Governance of XR-Related Terminology

Takeshi Kurata

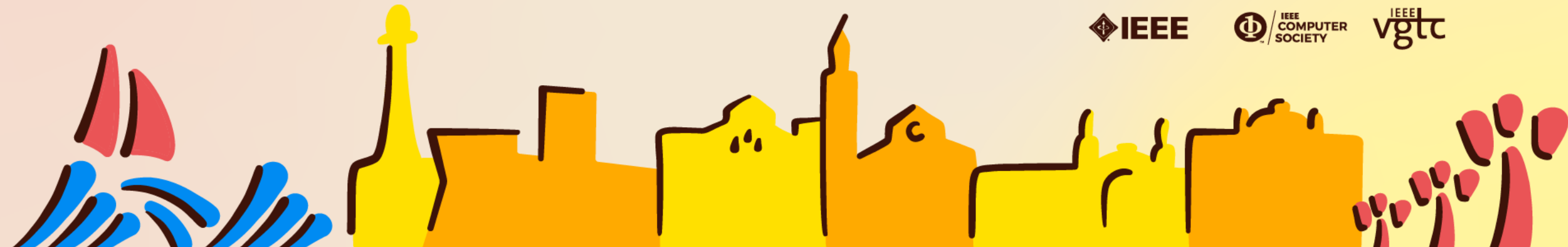
*Research Institute on Human and Societal Augmentation, AIST
Acting Chair, ISO/IEC JTC 1/SC 24 (XR and Metaverse)*



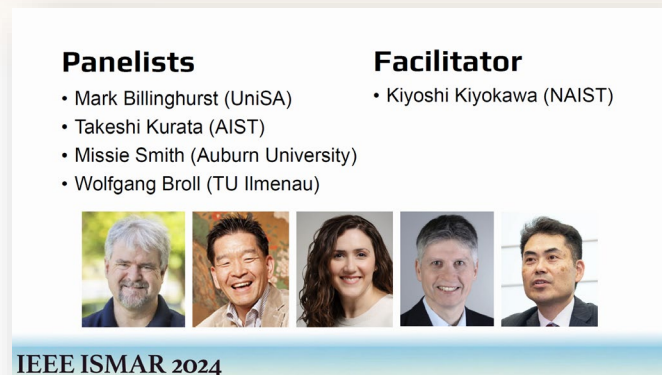
ISMAR 2026

October 5 – 9, Bari, Italy

The 25th International
Symposium on Mixed
and Augmented Reality



ISMAR 2024 panel on Terminology



The usefulness of reinterpreting and redesigning existing terminology

The current status of the term XR, and its usefulness and limitations (XR = XR)

The context-dependency of language use (which term to use, for whom, and in what situation)

The appropriate timing and modality of standardization (whether it should take the form of a de jure or a forum standard)

The lack of shared understanding regarding the origin, definition, and classification of terminology

The mismatch between academic and standardization organizational structures and terminological systems

Insufficient involvement of academic experts in standardization activities and its consequences

The proliferation and misuse of terms based on psychological and social backgrounds

The impact of terminology use on evaluation, and the visibility and dissemination of research (awards, recognition)

"No Terminology, No Standards, No Future: Semantic Interoperability for Bridging Stakeholders in XR," in Proc. IEEE ISMAR-Adjunct, pp. 505–509, 2025.

Standardization Committee in ISMAR 2025, 2026, IEEE VR 2026

❖ Establishment Purpose

- Strengthen the continuous collaboration between academic activities, such as ISMAR, and standardization activities, with the goal of enhancing the value of both.
- Bridge the gap between academia and industry.



<https://xrstandards.org/>

Events

2026
ISMAR

Tutorial · IEEE ISMAR 2026 · October 5, 2026

XRStand 2026: XR Standards and Open Science Practices

System-level standard APIs such as OpenXR, study reproduction methodologies in XR research, and experiment and data-sharing infrastructure.

Organized by the IEEE ISMAR 2026 Standardization Committee

Event page →

Committee

3 resources

2026
IEEE VR

Panel · IEEE VR 2026 · March 25, 2026

Standardization in XR/VR: Challenges and Priorities Beyond Terminology

Reproducibility gaps in VR research, open standards such as OpenXR versus proprietary ecosystems, and whether standardization should mandate benchmarks.

Organized by the IEEE VR 2026 XR/VR Standardization Committee · Moderator: Jen-Shuo Liu · Panelists: Neil Trevett, Tim Weissker, J. Edward Swan II, Richard Skarbez

Event page →

Committee

1 resource

2025
ISMAR

Workshop · IEEE ISMAR 2025 · October 8, 2025

XRStand 2025: 1st International Workshop on Standardization in XR

Keynote on virtual worlds interoperability, 10 accepted papers (lightning talks and posters), and invited talks on the Reality–Virtuality Continuum and metaverse platforms.

Organized by the IEEE ISMAR 2025 Standardization Committee · General Chairs: Yahya (Yohan) Hmaiti, Ryosuke Ichikari, Seonji Kim

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14 resources



ISMAR 2026 Standardization Committee Members

Chairs



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AIST, Japan



Jen-Shuo Liu
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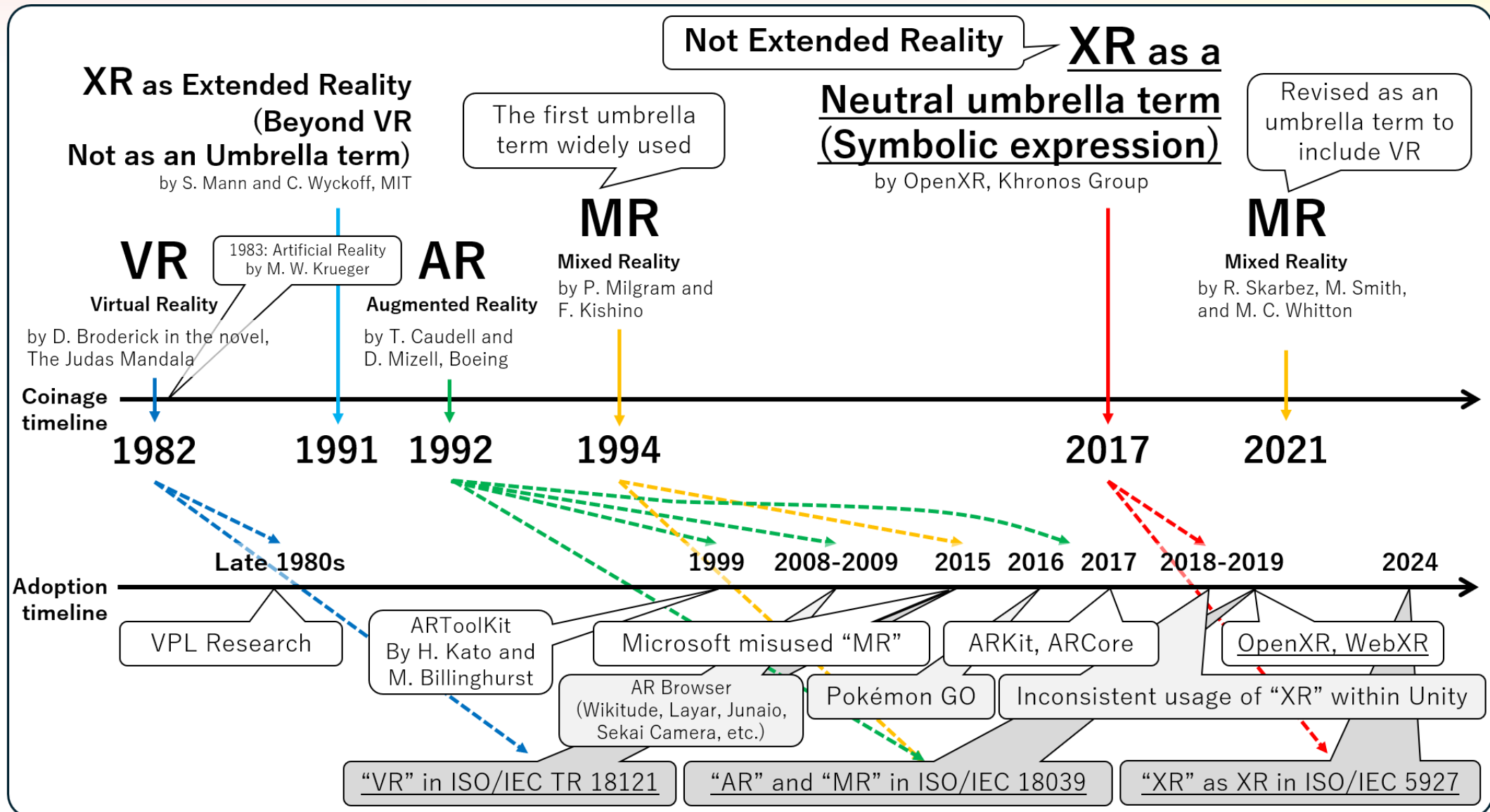
Tim Weissker
RWTH Aachen University



Matt Whitlock
NIST



Coinage is not Adoption



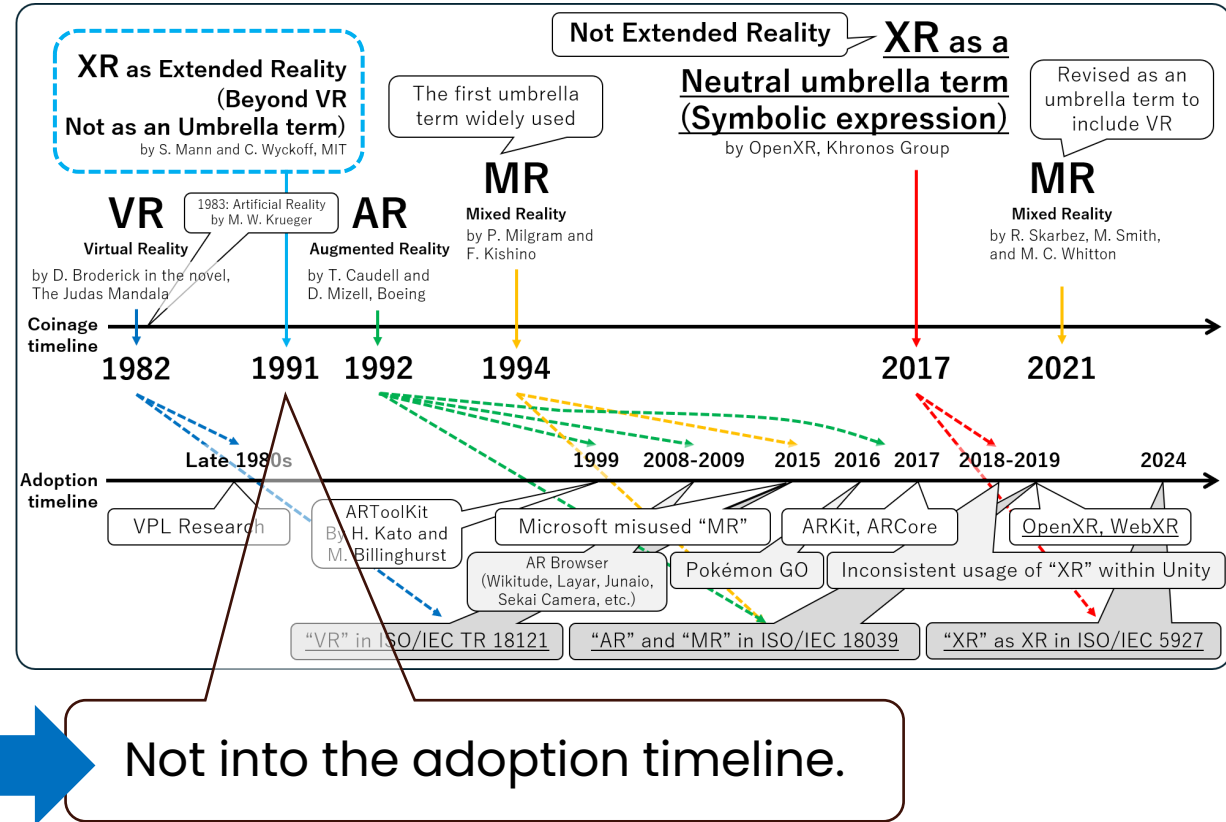
“Extended Reality” existed — but where was umbrella XR?

1991 Mann & Wyckoff: Extended Reality

- Proposed before AR (1992) and MR (1994).
- Described environments extending human perception **beyond VR**.
- Not introduced as an umbrella covering VR + AR + MR.

Historical gap

Little (No) evidence that XR was used as an umbrella term before around 2017, while MR largely fulfilled that role.



If Extended Reality had already been established as today’s umbrella concept, why was another umbrella concept, Mixed Reality, needed?

MR filled the umbrella role — then its meaning became unstable

1994

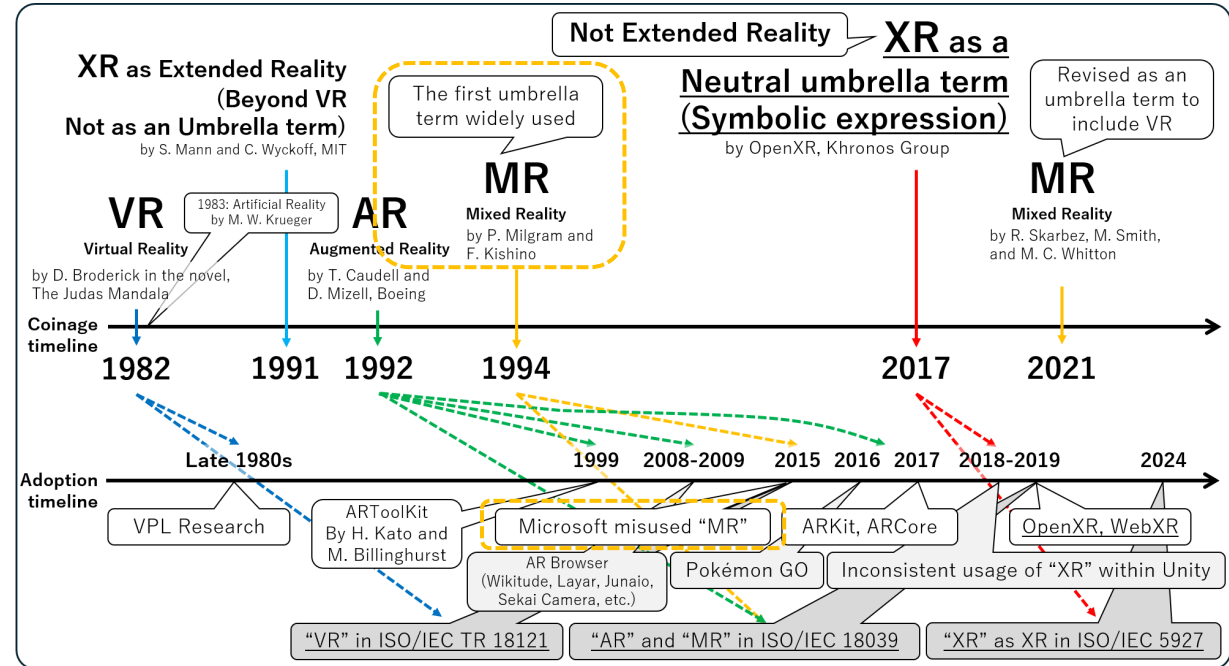
Milgram & Kishino: Reality–Virtuality Continuum

- MR covered an intermediate region and became an early umbrella concept.
- Fully virtual VR could be interpreted as outside MR.

2015

Microsoft HoloLens

- “Mixed Reality” was used for optical see-through AR experiences.
- A narrower/different use from the original conceptual scope.



Why was “XR” chosen for OpenXR?

2017

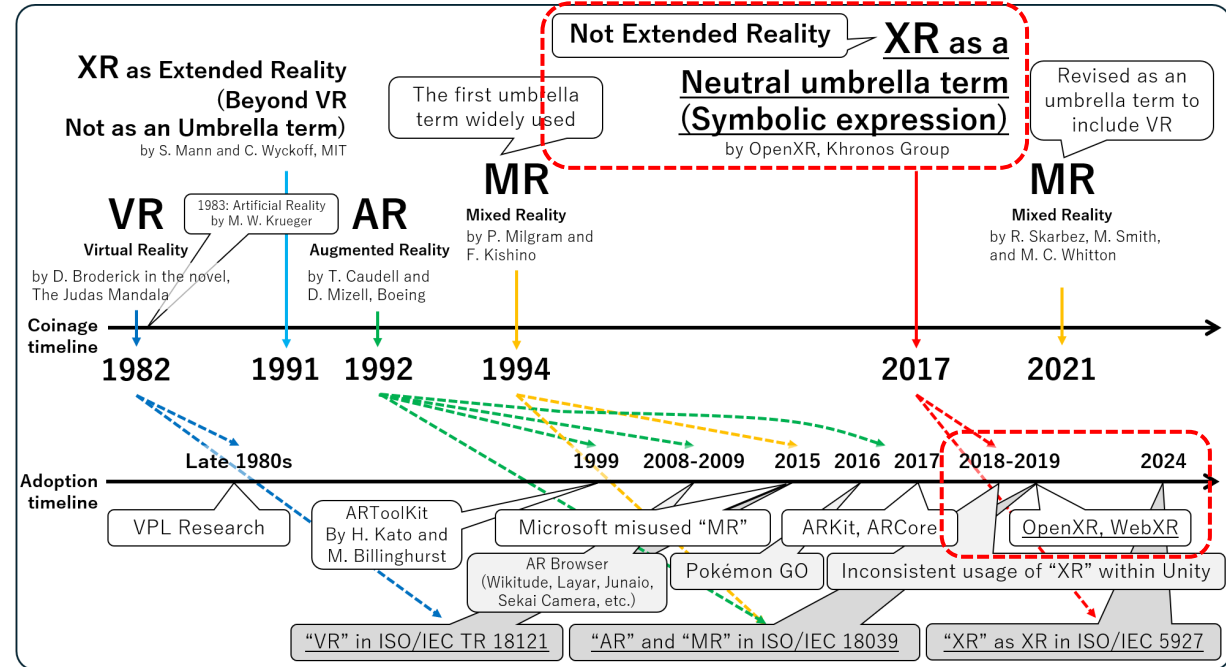
When naming OpenXR, the working group in Khronos Group needed a neutral label

- Created a neutral label that “does not take sides” but includes all.

“X” = any reality you like

not a fixed expansion such as “Extended” or “Cross”

WebXR (W3C) takes a similar placeholder philosophy: “Your Reality Here”



The activities that helped popularize umbrella XR did not require X = Extended.

Why umbrella XR is not simply “Extended Reality”

1 Historical evidence

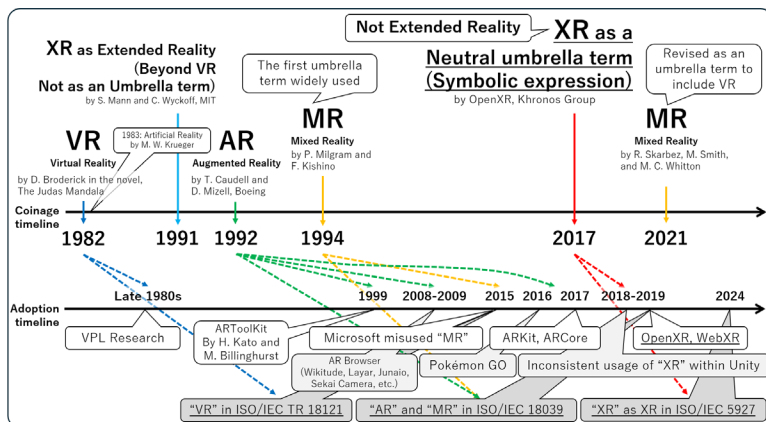
- 1991 Extended Reality was not today’s umbrella concept.
- Little evidence of umbrella XR until ~2017; MR largely filled that role.

2 Mann et al. [33] – 2018

- In 2018, Mann et al. used “Extended Reality” as an umbrella concept **after** XR had begun gaining visibility through OpenXR / WebXR.
- They also proposed Multimediated Reality as a higher-level concept.
 - If XR = Extended Reality, the **hierarchy conflicts** with today’s umbrella use of XR.

3 Rauschnabel et al. [34]

- Independent conceptual argument:
- **VR replaces reality rather than extending it.**
- They therefore keep “XR” but interpret it as **xReality**
 - **x as a variable/placeholder.**



Different routes → the same direction: X works better as a neutral symbol / placeholder.

When an acronym acquires a meaning later

SOS

... — — — ...

- The 1906 distress signal was chosen as a simple, unmistakable Morse pattern
- The letters had no intrinsic meaning.

“Save Our Ship” / “Save Our Souls”
are later popular interpretations
— But not the original meaning.

BACKRONYMS:
plausible expansions,
not historical meanings

A familiar academic habit

Student writes only an acronym



Advisor: “Write out the full term first.”

Usually good advice
But what if the acronym itself is
the intended form?

XR-only sources + “Extended Reality (XR)”
sources

→ Newcomers may naturally infer
“XR = Extended Reality.”

XR is not historically identical to SOS.

But SOS shows how a plausible expansion can be mistaken for the original meaning.

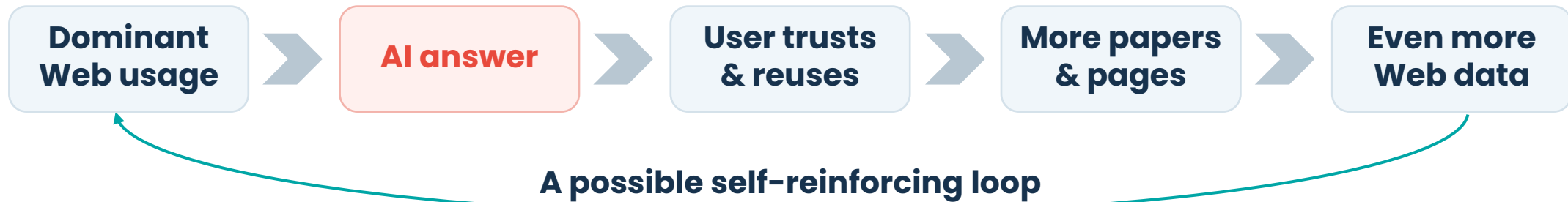
Popularity $\neq$ consensus $\neq$ historical evidence

Wikipedia / collaborative knowledge

- High visibility does not necessarily mean community consensus.
- If one interpretation edited by someone/some party dominates a page, alternative historically grounded interpretations can become difficult to introduce.

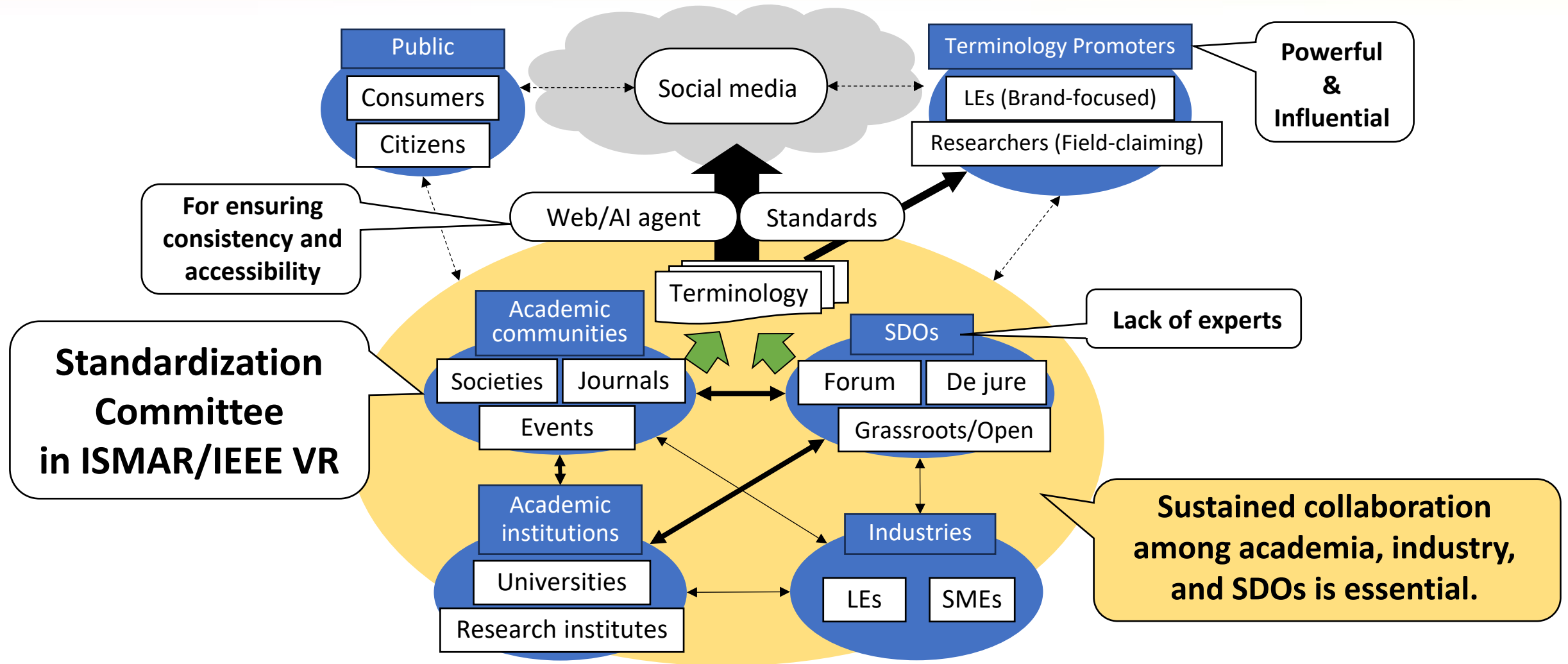
AI / large-scale Web data

- Once one interpretation dominates the Web, AI systems may reproduce it as the default answer
 - Even when historical evidence is more nuanced.
 - Only with careful prompting, a different answer may emerge.



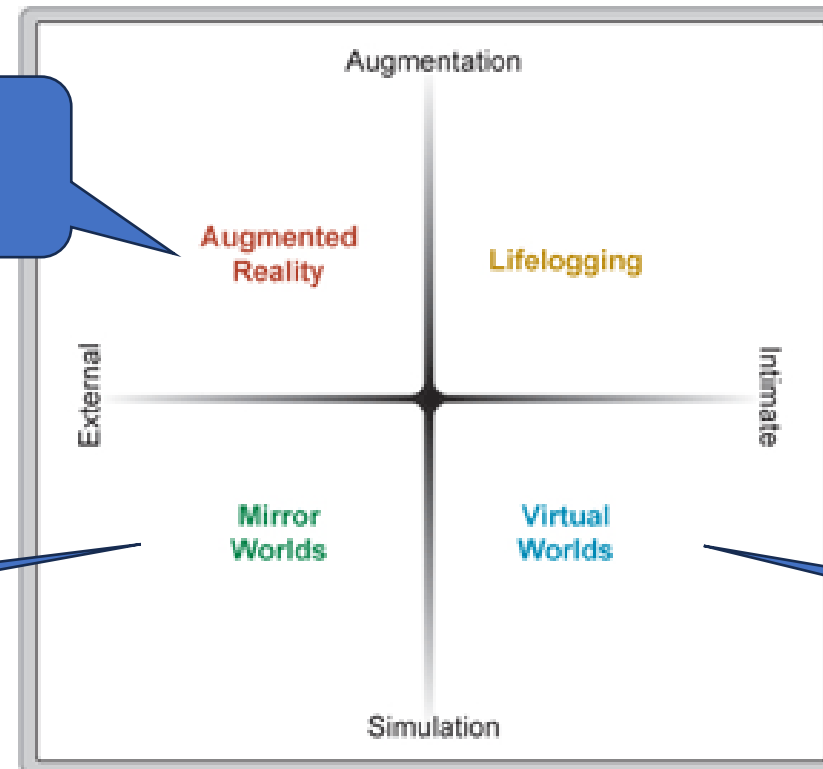
**Frequency can become apparent authority.
Apparent authority can generate more frequency.**

Stakeholders involved in the formation, dissemination, and maintenance of terminology



How about the definition of Metaverse

- Snow Crash: the novel in which the term "metaverse" was first used written by Neal Stephenson
 - (Original) Metaverse: VR Environments + society within the environments
- Where should the boundaries of the term 'metaverse' lie?



Is AR also a metaverse?

- Real World Metaverse by Niantec
- Spatial computing

Apple uses spatial computing differently...

Industrial Metaverse

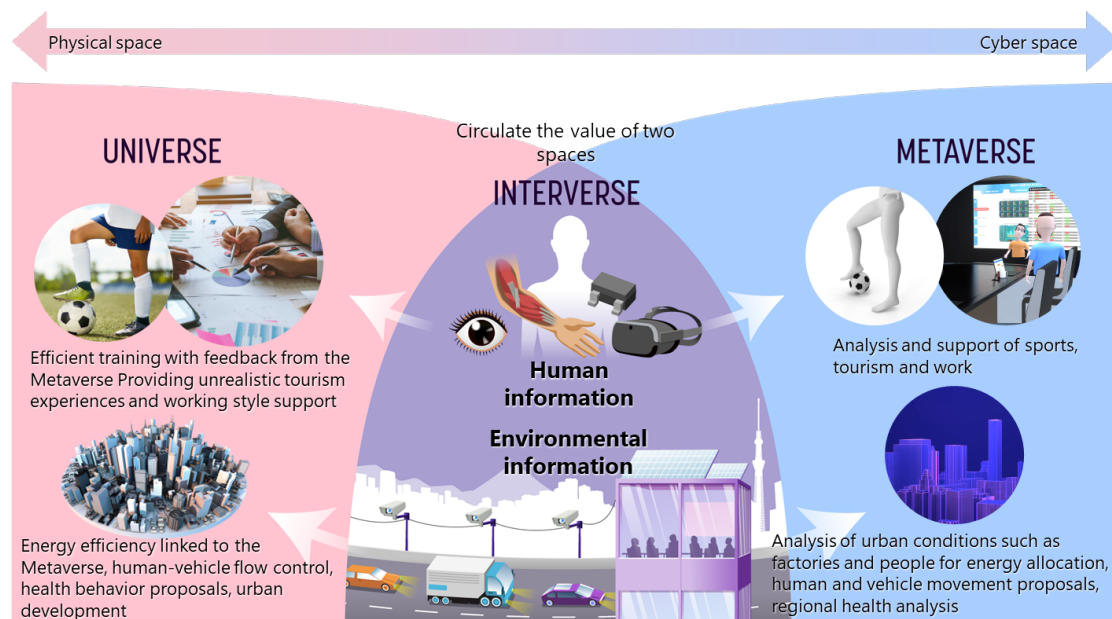
Source: Metaverse Roadmap Overview (2007-2025)

Is this roadmap diagram the cause of the confusion? !

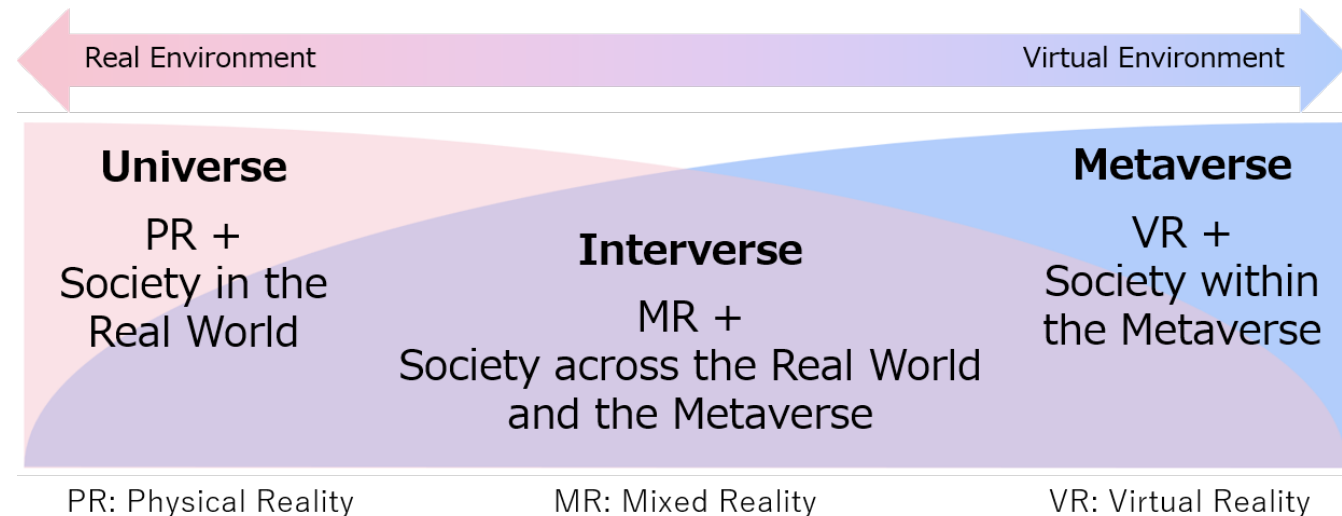
Original metaverse by Snow Crash

One Person, Many Hats (One Person, Different Hats, Different Views)

- Interverse
 - The concept of fusing digital multiverse with the universe
 - Original definition by Japanese national project (SIP): Virtual economy forms and related technologies that return value in cyberspace to physical space
 - My own definition: MR + Society across the Real World and the Metaverse



Source: SIP (Strategic Innovation Promotion Program),
Cabinet Office, Government of Japan

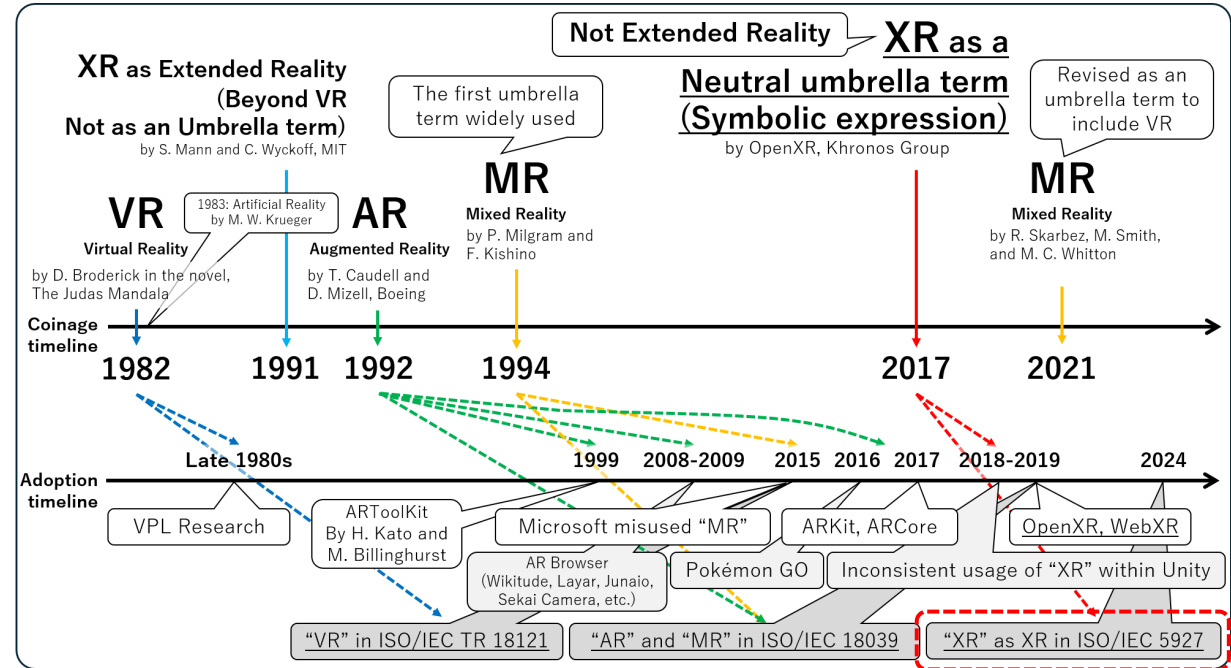


My own interpretation of Interverse

Umbrella XR is XR ($\neq$ Extended Reality)

Current ISO/IEC terminology

- XR is treated as an umbrella concept without expanding “X” as “Extended.”
- After the historical and conceptual developments discussed today, a neutral symbolic definition is a reasonable place to have landed.
- If this discussion matters to you, please consider participating in
 - ISMAR/IEEE VR Standardization Committee or/and
 - ISO/IEC JTC 1 standardization activities.
- Please Contact us to learn how to get involved.



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