



Europäische und deutsche Normen

Welche gibt es und was bringt uns das?

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Director - Virtual Dimension Center (VDC)

VP Industry & End Users – EuroXR

Founder - XR EXPO

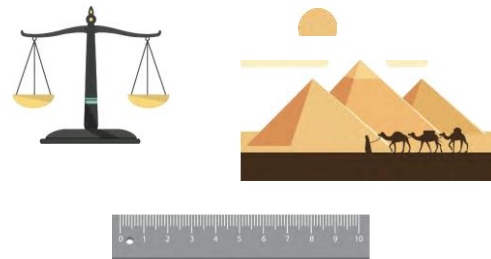


Metaverse
STANDARDS FORUM™



Introduction

- standards support everyday life much more than people think
 - society recognized importance of standardized measurements thousands of years ago: e.g. weight, distance or length
 - development of a common reference system agreed upon people and institutions
-
- rapid technological progress -> need for standardization grows
 - especially in the area of Information and communications technologies (ICT)
 - standardization and standards boost progress and create basis upon which technology can evolve



Standards in everyday life

Using a Smartphone for browsing
(some of possibly involved standards) :

- User equipment regarding hardware
- characteristics, also taking into account safety issues
- Connectivity among user devices and wireless network as well as the functionality of the same network
- Functionality of the Internet and the protocols to support web browsing

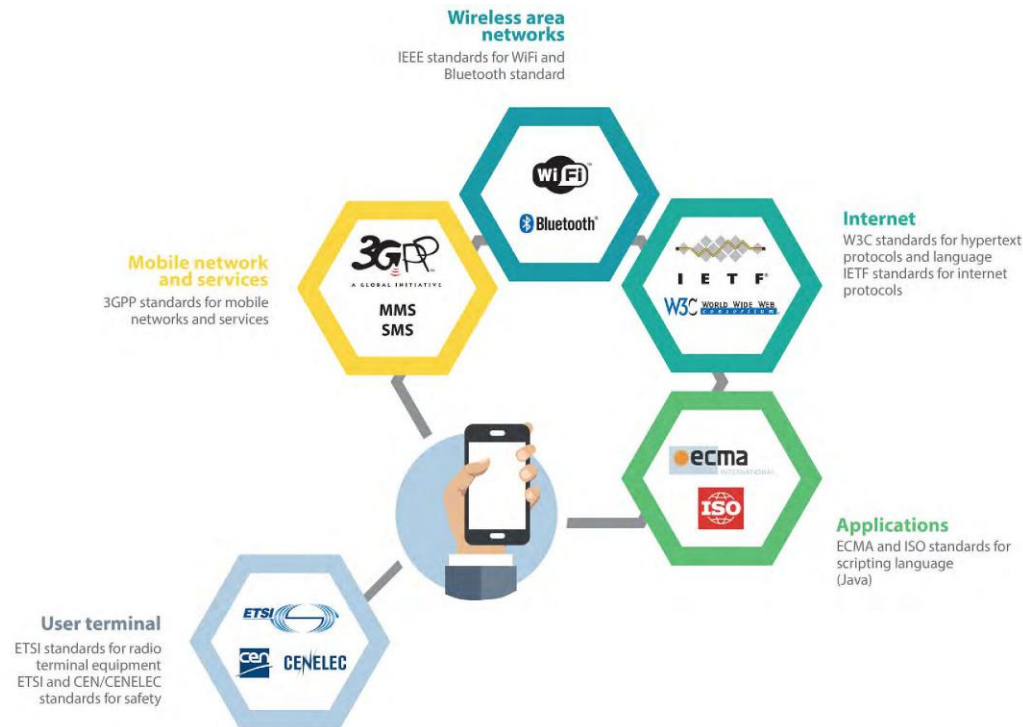


Fig. ETSI

Formal standardization, SDO standards, and regulation

- Standards are not laws.
- Standards are voluntary NOT compulsory
- Standards are NOT regulations.
- Standards are NOT a set of thorough design rules.
- Yet, they may inspire both

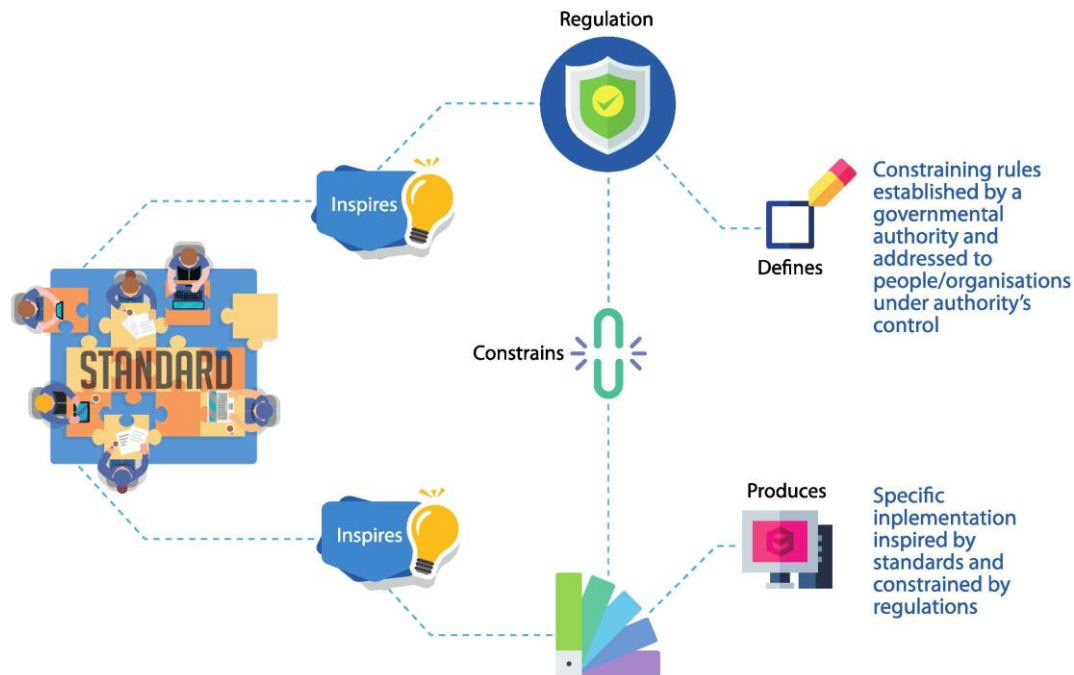
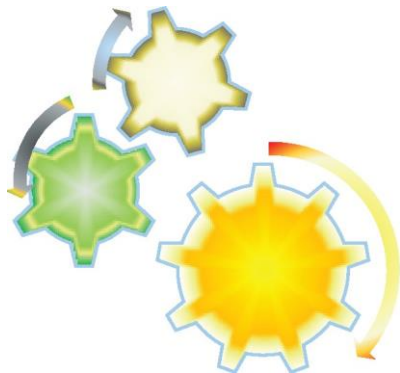


Fig.: ETSI

As a consensus-built set of rules for doing something, a Standard benefits **innovation**, by



- reducing development time, costs and risks, by steering designers' activity, which facilitates the uptake of innovation in the marketplace
- legal certainty



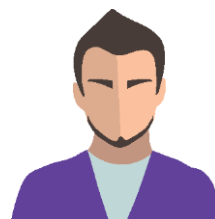
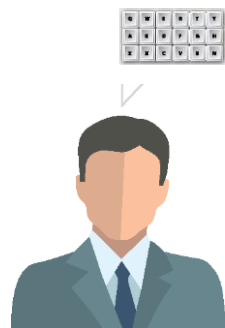
- improving quality
- decreasing time to market
- promoting the interoperability of products, services and processes
- attract customers

Two main different types of "*standards*"

- Different types of standards according to the development process (standardization)

SDO standards are produced by devoted organizations, called organizations whose purpose is to develop standards and Standards Development Organizations (SDOs). SDOs are that put in place formal well-defined procedures to guarantee a fair development process. De facto standards can become formal standards if they are approved by a SDO. Examples: HTML PDF

De facto standards, or standards in actuality, are adopted widely by an industry and its customers. These standards arise when a critical mass simply likes them well enough to collectively use them.



Recognized SDOs:

- These are officially recognized by regulation systems or political bodies
- ITU, UN specialized agency for information and communication
- UE regulation 1025/2012 rules the standardization at an European level and lists a set of reference SDOs with either an international (ISO, IEC, and ITU) or European scope (CEN, CENELEC, and ETSI)



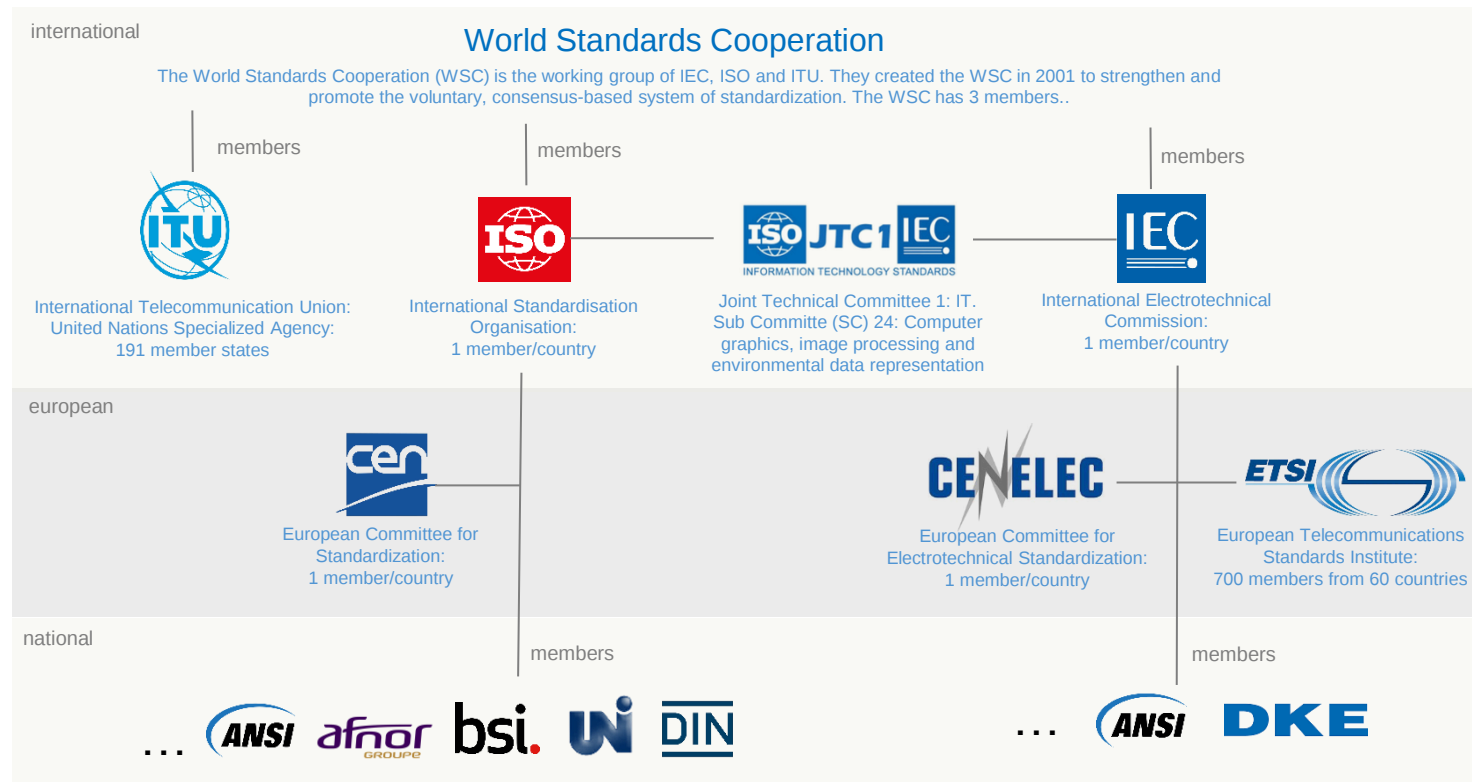
Not Recognized Organizations:

- These are not recognized by any political bodies
- IEEE is a primary SDO with a large number of active technical standards, ranging from wireless communications and digital health to cloud computing, power and energy, 3D video, electrical vehicle standards, and the Internet of Things. It was created by the Institute of Electrical and Electronics Engineers (IEEE), the American association of Electrical and Electronics Engineers and it brings together and organizes members from all over the world.



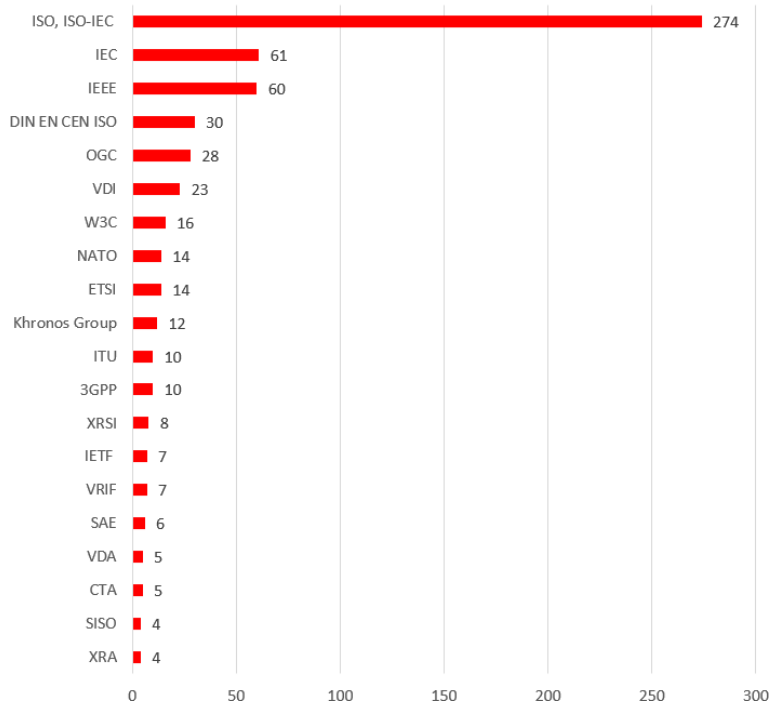
Structure of International Standardization

National SDOs organize so-called "mirror committees" to ISO and IEC committees. They represent national input and interests in ISO and IEC and feed information from ISO and IEC back to their homeland.



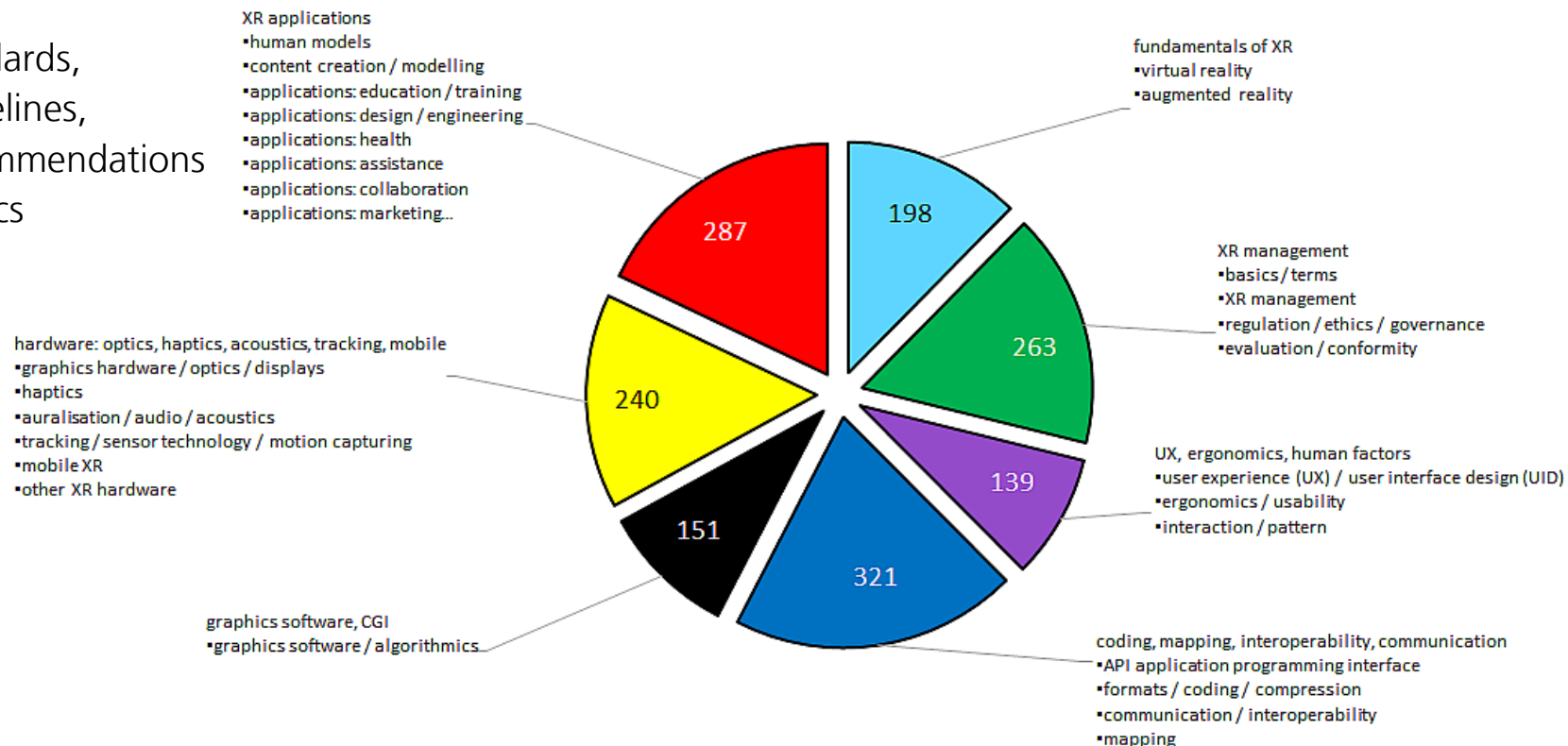
Anything about XR in this topic?!

published XR norms, standards, guidelines, recommendation
[by organizations]



clustering

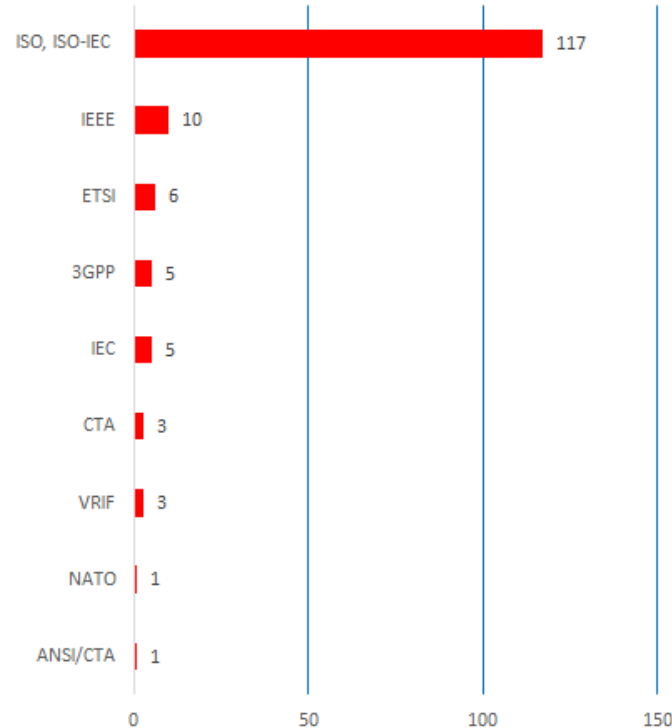
- XR standards,
 - XR guidelines,
 - XR recommendations
- into 7 topics



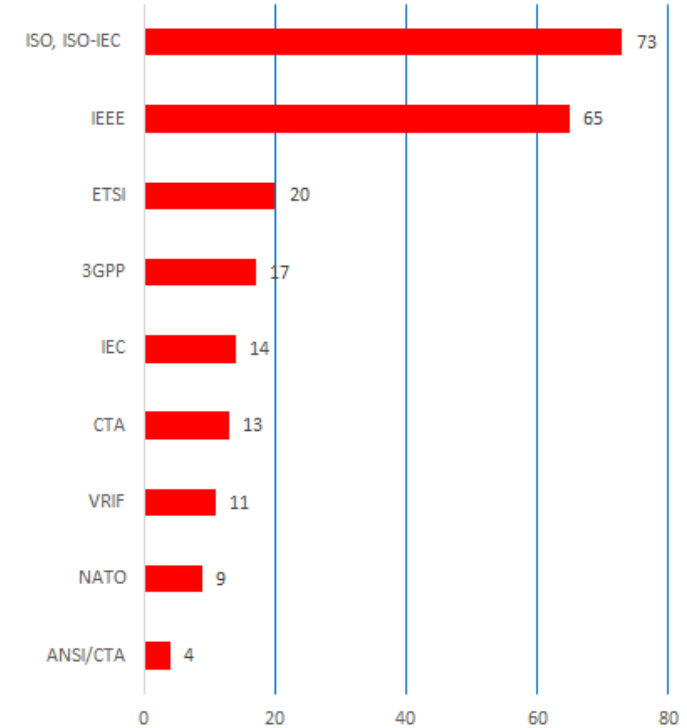
analysis on the right hand side shows XR SDOs contributing with own documents to certain XR fields.

It becomes further obvious that certain XR topics are treated by SDOs in different number at total.

graphics software, CGI



hardware: optics, haptics, acoustics, tracking, mobile

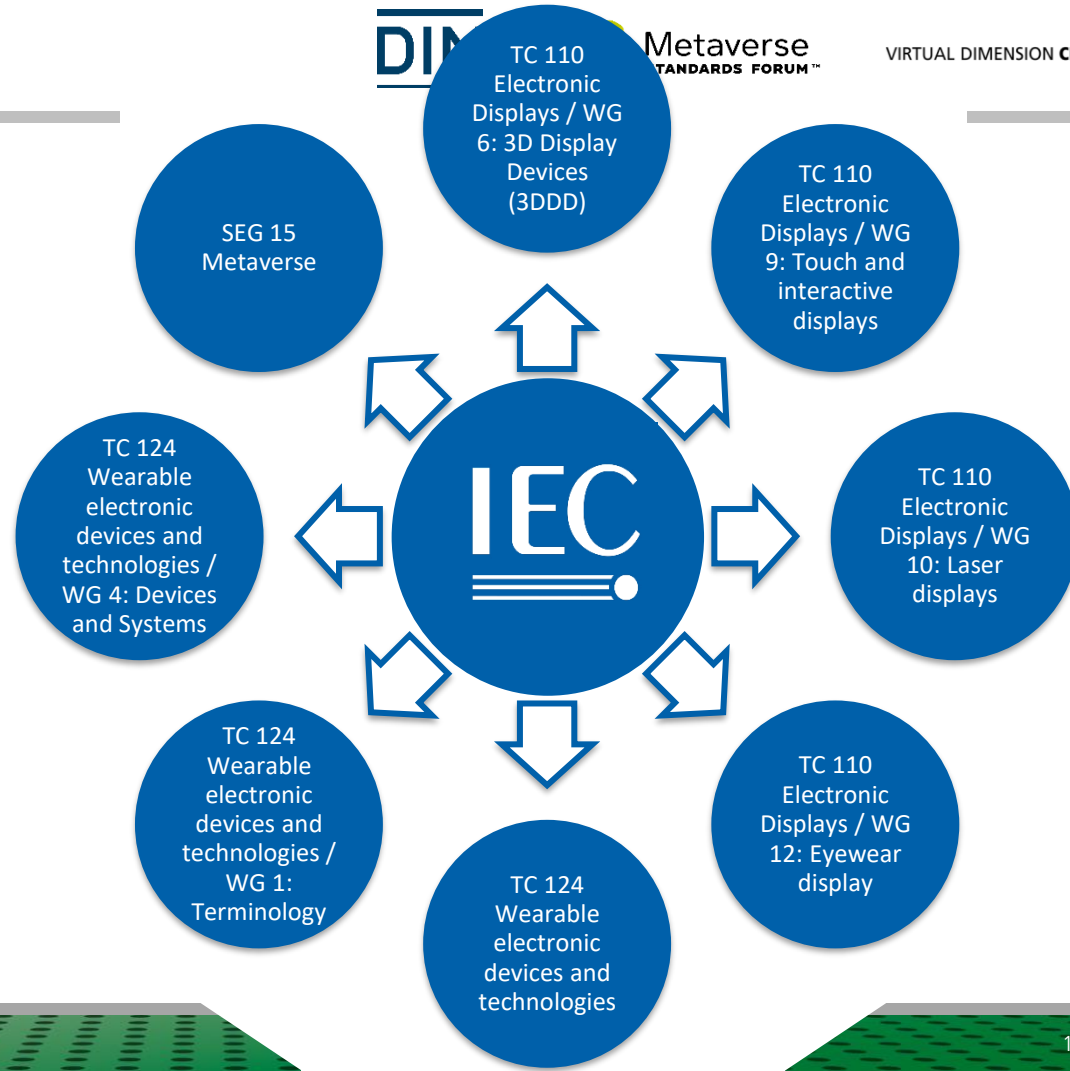


The **International Organization for Standardization (ISO)** is an independent, non-governmental organization, whose members consist of various national standardization bodies. As of 2022, there are 167 members who represent ISO in their country, with each country having only one member. The organization develops and publishes international standards in all technical and non-technical areas, except for electrical engineering and electronics, which fall under the jurisdiction of the International Electrotechnical Commission. By February 2023, ISO has developed over 24,676 standards that cover all areas from industrial products and technology to food safety, agriculture, and healthcare. **The Moving Picture Experts Group (MPEG)** is a group of experts dealing with the standardization of video compression and related areas, such as audio data compression or container formats. Colloquially, "MPEG" usually refers not to the group of experts, but to a specific MPEG standard. The MPEG meets three or four times a year for five-day meetings. About 350 experts from 200 companies and organizations from 20 countries participate in these meetings, the MPEG meetings. MPEG is part of ISO/IEC JTC 1/SC29.

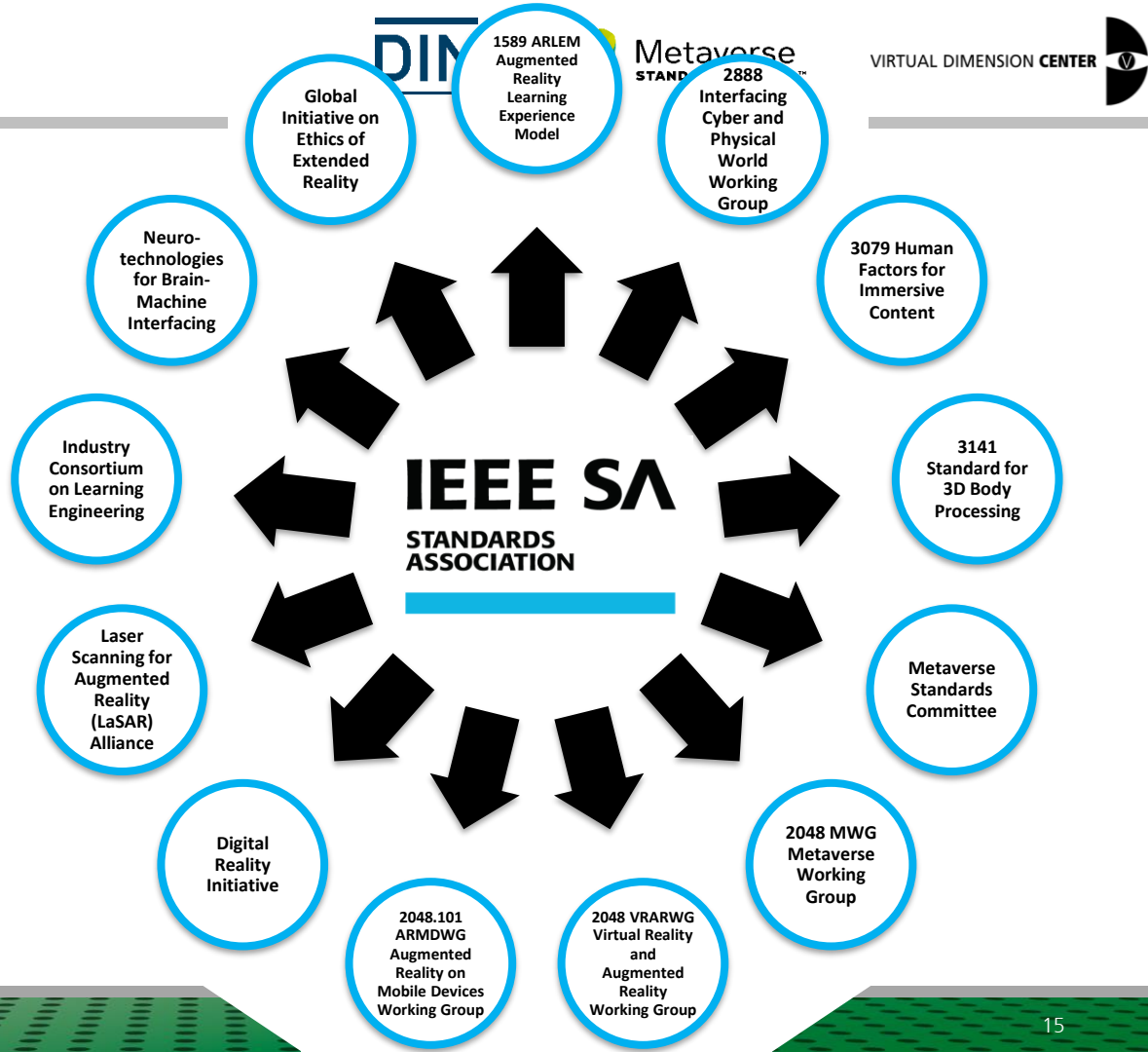




The **International Electrotechnical Commission (IEC)** is an international standardization organization for standards in the field of electrotechnology and electronics, based in Geneva. Some standards are developed jointly with ISO (International Organization for Standardization). IEC was founded in 1906 and is located in Geneva. IEC played a crucial role in standardizing units of measurement, particularly Gauss, Hertz, and Weber. It also first proposed a system of standards, the Giovanni-Giorgi-System, which ultimately became the SI, the International System of Units. The IEC charter encompasses the entire field of electrotechnology, including the transformation and distribution of energy, electronics, magnetism and electromagnetism, electroacoustics, multimedia, telecommunications, and medical technology as well as general disciplines such as terminology and symbols, electromagnetic compatibility, measurement technology and operational behavior, reliability, design and development, safety, and the environment.

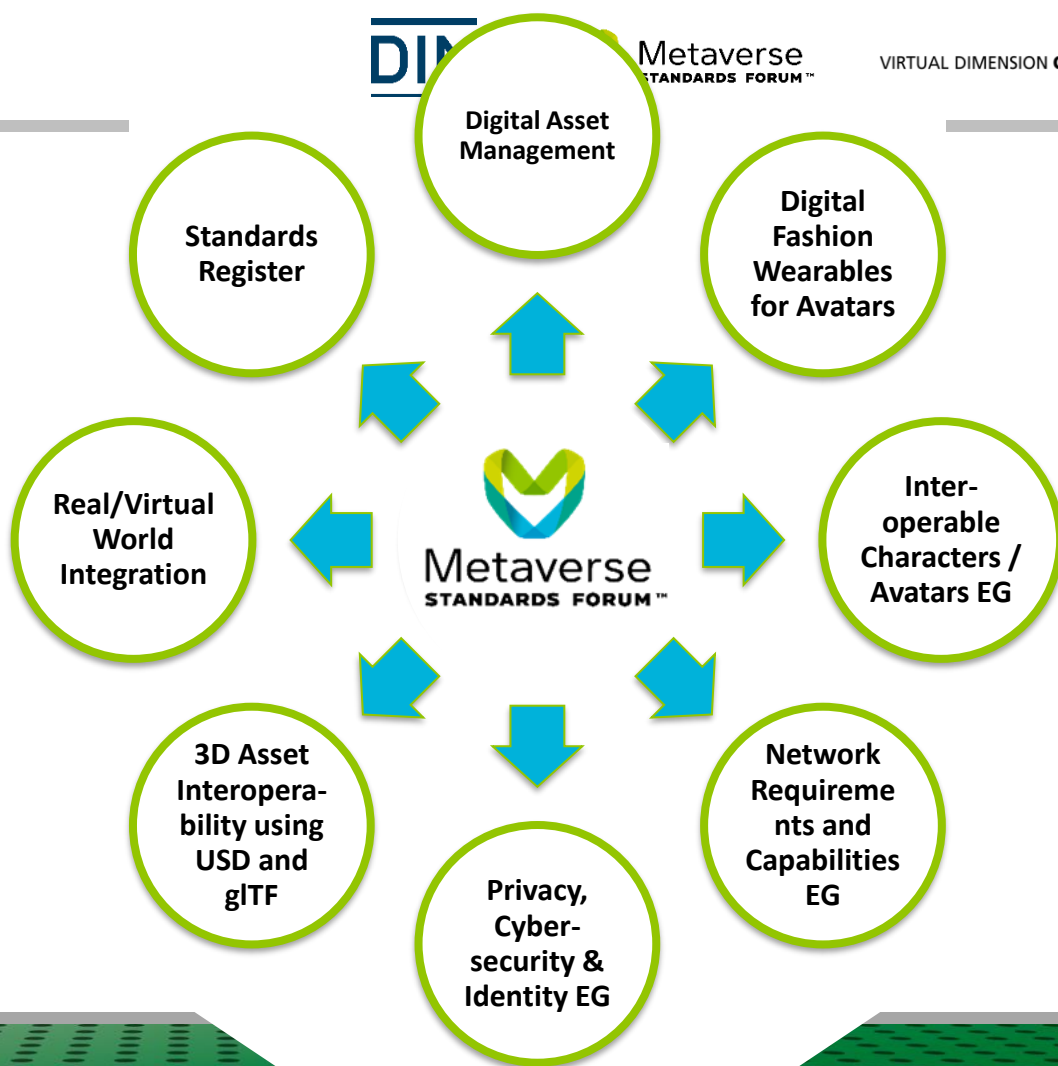


The **Institute of Electrical and Electronics Engineers (IEEE)** is a global professional association of engineers primarily from the fields of electrical engineering and information technology, legally based in New York City with operational headquarters in Piscataway, New Jersey. It organizes professional conferences, publishes various professional journals, and forms committees for the standardization of techniques, hardware, and software. Scientific contributions in journals or to IEEE conferences are generally presumed to be of particularly high professional quality. With publications like the IEEE Spectrum journal, the organization also promotes interdisciplinary information and discussion on the societal impacts of new technologies. The IEEE organizes several subgroups addressing VR or AR topics, including (1) Digital Reality, (2) Augmented Reality Learning Experience Model (AR-LEM), the (3) IEEE 2048 VR/AR Working Group (VRARWG), and a (4) Smart Glasses Interest Group. Additionally, the IEEE operates a Standards Group. Where the latter collaborates with one of the aforementioned four theme groups, V/AR-relevant norms, standards, and guidelines are created..

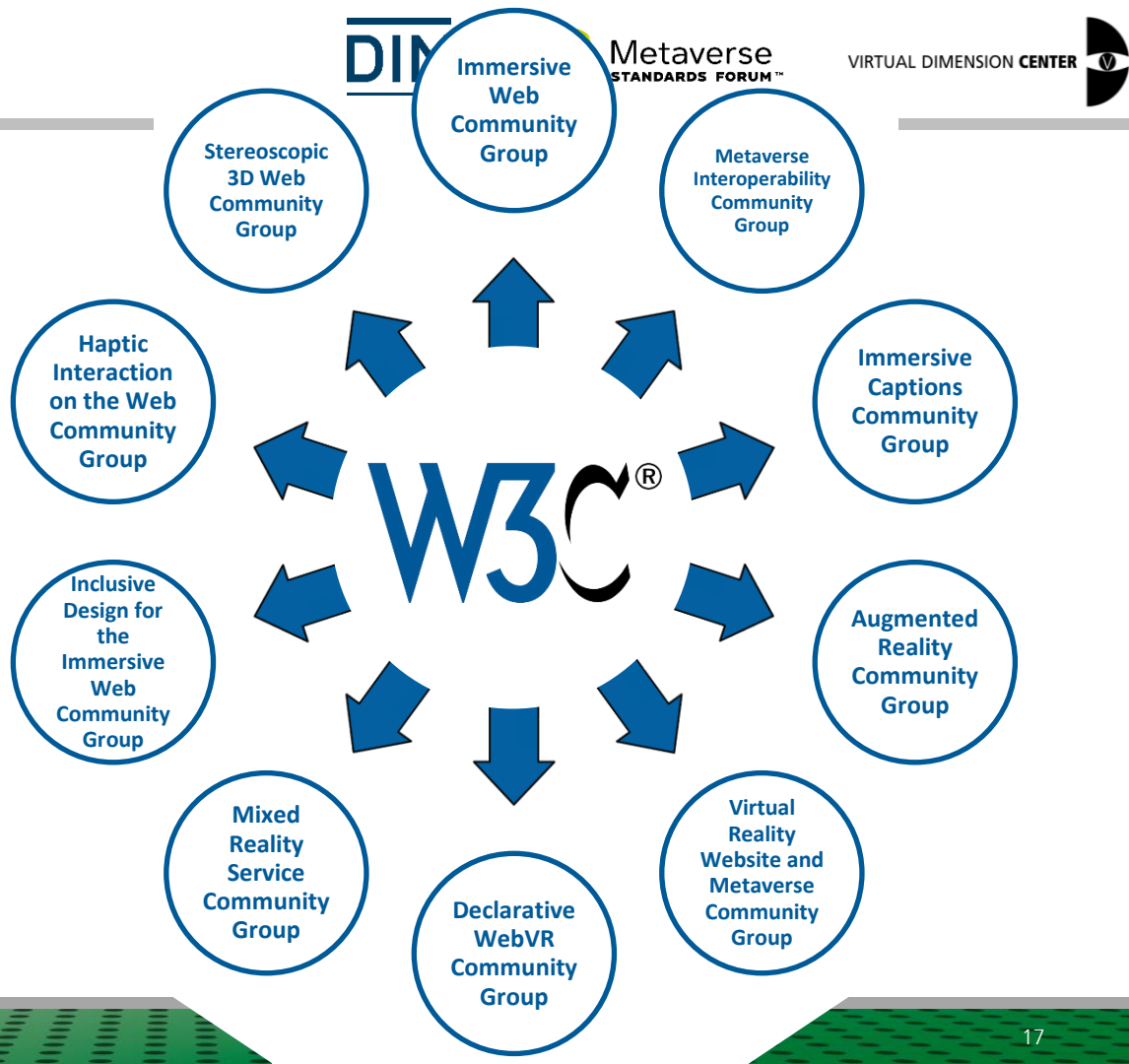




The **Metaverse Standards Forum (MSF)** was founded in June 2022 to foster the development of interoperability standards for an open and inclusive metaverse, and accelerate their development and deployment through pragmatic, action-based projects. Since the vision of the metaverse is still a work in progress, the group also has the stated purpose of bringing some order to the underlying terminology of the metaverse. The MSF is an industry-wide effort to harmonize standards and best practices for the metaverse. Its members, which to date number 1,800, include tech titans Google, Meta, Microsoft and Nvidia; standards bodies Khronos Group and Web3D Consortium; multinational software companies Adobe, Autodesk and Epic; and professional technology services firm Accenture. Members of the forum hope the process will help build trust among the builders of the metaverse. This is important as the industry explores new technologies and new business models. Early blockchain and decentralized finance efforts attempted to address trust programmatically, only to discover new vulnerabilities and types of abuse no one had previously imagined. The MSF is free for all participants, including companies, standards organizations, non-profit organizations, industry associations and universities.

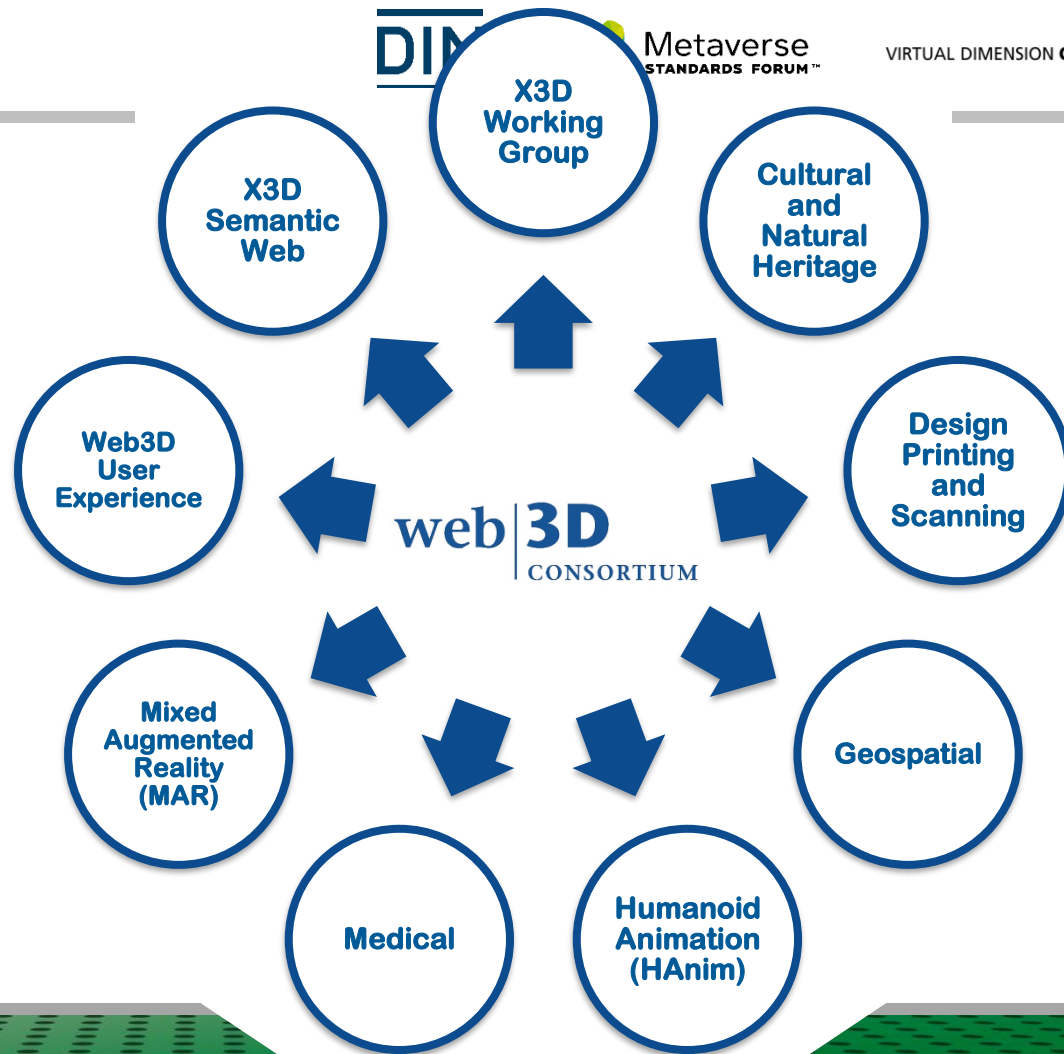


The **World Wide Web Consortium (shortly W3C)** is the body responsible for standardizing technologies on the World Wide Web. It was founded on October 1, 1994, at the MIT Laboratory for Computer Science in Cambridge, Massachusetts. The W3C is a membership organization. It develops technical specifications and guidelines through a mature, transparent process to achieve maximum consensus about the content of technical protocols, high technical and editorial quality, and approval by the W3C and its followers. Examples of technologies standardized by the W3C include HTML, XHTML, XML, RDF, OWL, CSS, SVG, and WCAG. Within its "Immersive Web Community Group," the W3C addresses VR and AR topics. Already in the early 1990s, ideas for a 3D extension of the internet emerged at the first HTML conferences, which then resulted in the Virtual Reality Language (VRML) as a counterpart to HTML.

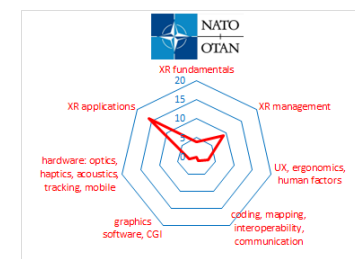
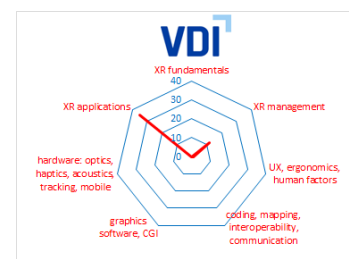
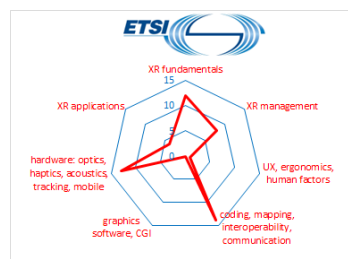
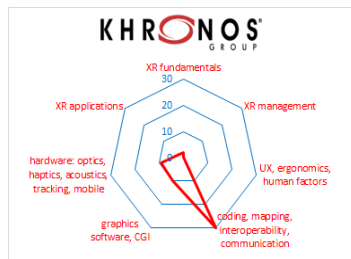
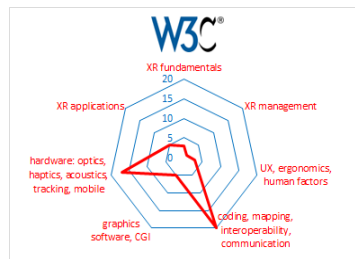
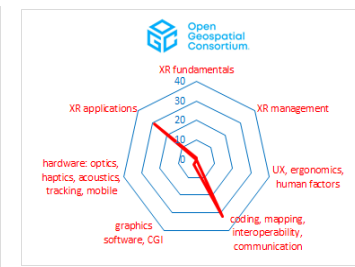
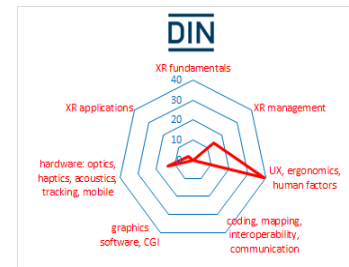
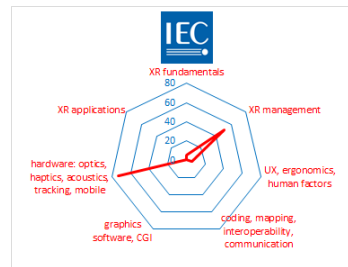
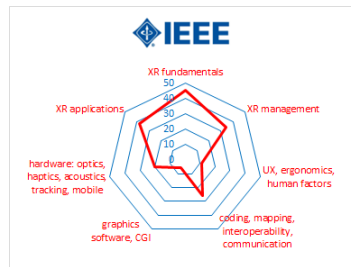
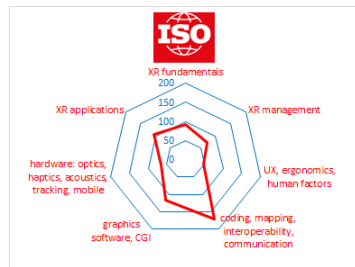




The **Web3D Consortium** is an international, non-profit, member-funded, industry organization dedicated to the development of standards (SDO) established in 1997. The Web3D Consortium champions the deployment of ISO-ratified X3D standards for communicating interactive 3D scenes across various applications, use cases, platforms, and industries. It provides robust web-based 3D capabilities and long-term stability for enterprise solutions, as well as interoperability with other standards. Members collaboratively work on the development of the X3D standards and tools to ensure their broad dissemination across various markets, catering to academia, government, industry, and individual users. Today, the Web3D Consortium leverages its extensive industry backing to continue the evolution of the X3D specification..

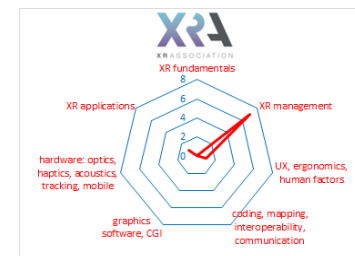
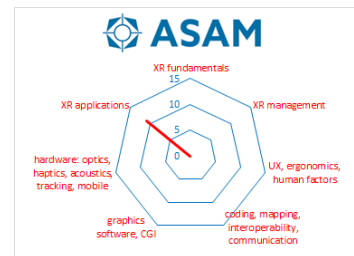
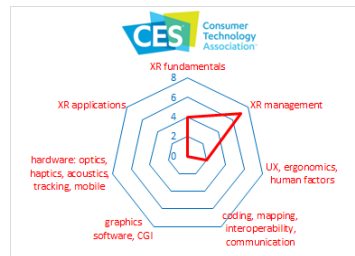
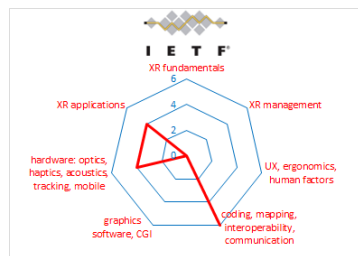
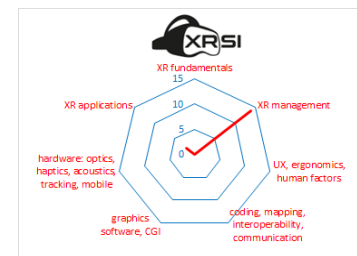
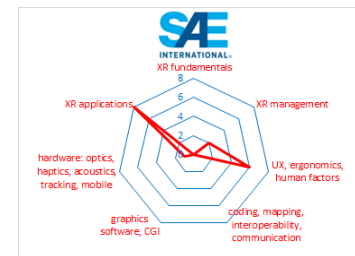
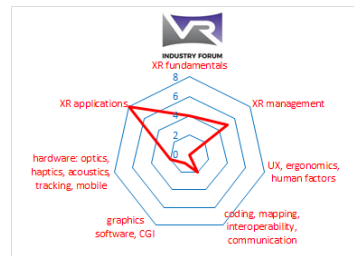
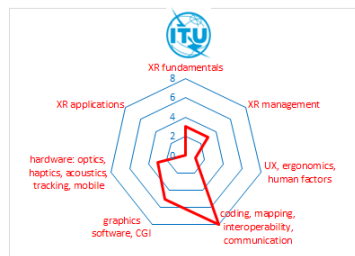
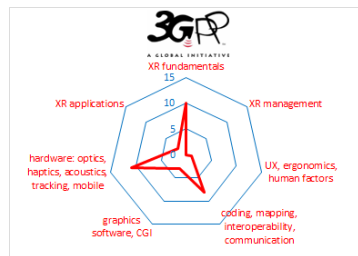


Focuses of XR standardization organizations varying





Focuses of XR standardization organizations varying

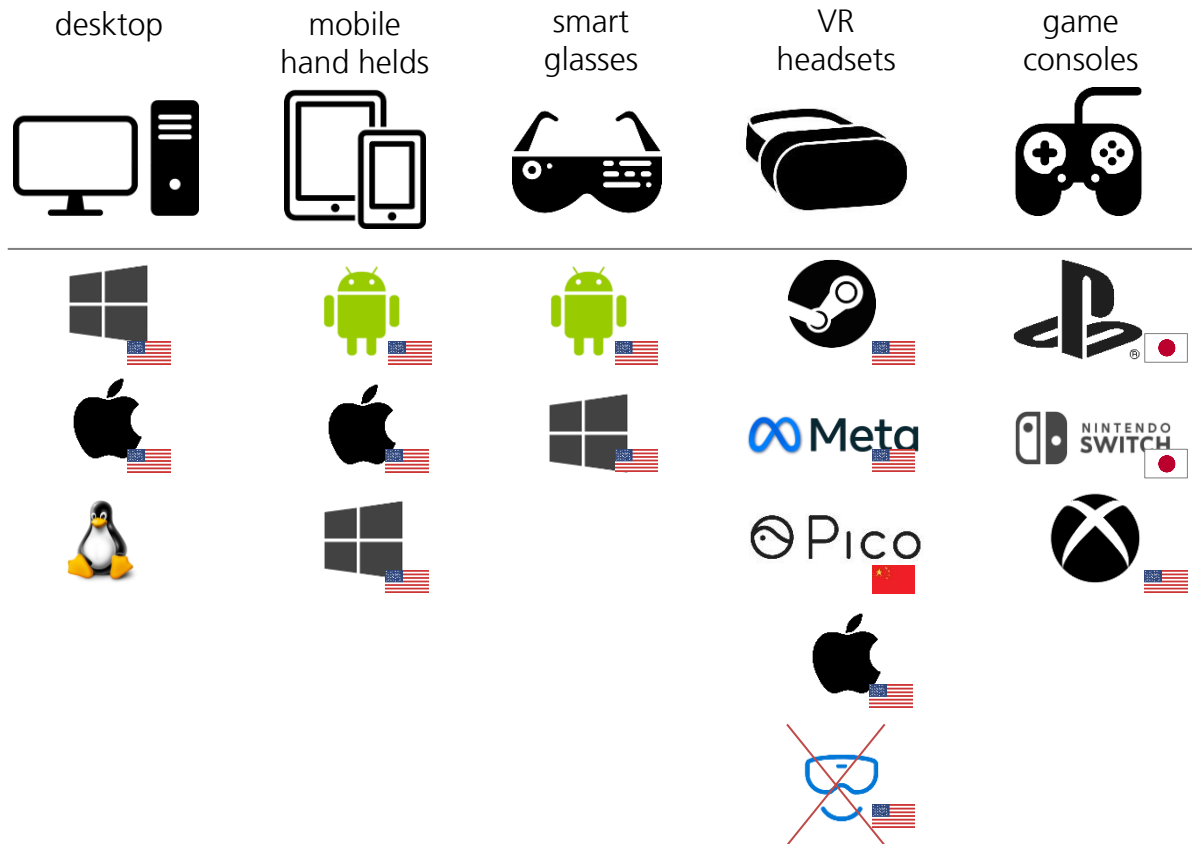


Europe finds itself only at the sideline of a fight for global XR ecosystems.

problem:

- Europe does not provide a huge, global platform provider
- platform providers aim at vendor lock-in

⇒ standardization and regulation could be valid options for us





Chris Kremidas-Courtney, senior fellow at Brussels think tank „Friends of Europe“ and Lecturer for Institute for Security Governance (ISG) in Monterey, California.

He said that China plans to “*be the world leader in metaverse development,*” a technology that dovetails with its plan for a state-controlled digital renminbi. Standard-setting is the natural first step in that roadmap.

“If you want to seize the future,
you set the standards for it”

Chris said.

POLITICO

Enter keyword



EXPLORE ▾

NEWSLETTERS & PODCASTS ▾

POLITICO PRO

FROM POLITICO PRO

Beijing is coming for the metaverse

Proposals reviewed by POLITICO show China wants to assert state control over virtual environments.



Experts that reviewed the proposal at the request of POLITICO said it risks violating principles of privacy and freedom | Jade Gao/AFP via Getty Images

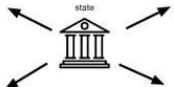
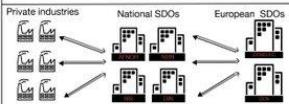
BY GIAN VOLPICELLI

AUGUST 20, 2023 | 4:00 PM CET | 5 MINUTES READ

Global Metaverse Strategies Comparison

strategy goals	target groups	strategy key elements	discrete measures
 China - world-leading industrial mature metaverse ecosystem - Metaverse as an important growth pole of the digital economy - establish three to five companies with global influence - establish a number of specialised SMEs - establish three to five industrial development clusters - establish yuan / renminbi universe - secure and efficient governance system for the metaverse	- industry - public administration - society	- upgrade key technologies - Promote an industrial ecosystem - enable the industrial metaverse - strengthen the industrial base (incl. standardization)	- metaverse business parks - MV infrastructure - MV standardization agencies - create MV best practices - create MV applications for digital life
 Dubai - turn Dubai into one of the world's top 10 metaverse ecosystems - turn Dubai into a global hub for the metaverse community - attract more than 1,000 companies - support more than 40,000 virtual jobs by 2030 - foster innovation; promote advanced ecosystems - foster talent - invest in future capabilities - create new governmental work models	- tourism - education - government services - retail and real estate [health care]	- XR and MV technologies - foster MV innovation and economic contribution - cultivate MV talent through education and training - develop MV use cases and applications in Dubai government - Adopting and scale globally - Dubai as the "crypto-capital" of the world - UAE as a "test bed" for new technologies	- over fifteen initiatives and strategies were announced in the 2022 assembly - MV virtual embassy - Emirates Airlines training in the MV
 European Union - boost the EU's technological capabilities - accelerate the uptake of new business models and solutions - support access to finance to support creators and to scale up innovative business models - support societal progress and improve public services	- industry - creative industry - society / consumers	- foster a supportive business environment; support SMEs, start-ups - Interoperability, standardisation, open standards and interfaces - support open-source community - build a talent pool of virtual world specialists - empower and protect children in virtual worlds - EU's robust legislative framework - IP protection	- skills development for MV technologies (Digital Europe programme) - guiding principles for virtual worlds through citizens' panel - research on impact of MV on people's health through Horizon Europe - develop a MV toolbox for the general public - create European initiative on Virtual Worlds - create EU partnership on virtual worlds - analysis of XR & MV standards landscape
 Finland - establish Finland as a leading architect and enabler for the Metaverse - Finland to be considered as a benchmark society - attract major foreign direct investments in all parts of the Metaverse value chain - avoid domination by a single company or country	- society - healthcare - industry	- Finish vision, values and strengths - boost economic growth - cross-boundary collaboration - education for the Metaverse - marketing and sales on a global scale - advance metaverse research	- Metaverse in Action Program (however just recommendations!): - support technology enablers - create / support business Networks - showcase industrial Metaverse - showcase Metaverse society - showcase Metaverse healthcare
 Japan - respond to rapidly growing demand for digital transformation (DX) for enterprises and government agencies - enable interoperability and collaboration between Metaverse platforms - serve as new social infrastructure for enterprise DX and employee experience (EX) transformation - promote metaverse business - expand the "Japan Metaverse Economic Zone" globally - respond to MV risks	- society / consumers - government services - enterprises	- agreement of numerous companies using their respective mature technologies to create an open Metaverse infrastructure supporting authentication, digital twins, NFTs, etc. - analysis by the "Study Group on Utilization of Metaverse, etc. for the Web3 Era" established by the Ministry of Internal Affairs and Communications	- create Metaverse economic zone „Ryugukoku“ - media conference
 Saudi Arabia - gaming and e-sports market: US\$ 13.3 billion to gross domestic product (GDP) and 39.000 jobs by 2030 - create digital MV twin of futuristic megacity NEOM	- e-games, e-sports - real estate - society / consumers	- MV is key part of Vision 2030 - launch of national „Gaming and e-Sports Strategy“	- the US\$ 500 billion futuristic megacity NEOM shall have its own metaverse - investment in metaverse gaming
 South Korea - take the upper hand in the global metaverse market (5th largest market share by 2026) - train metaverse experts (total of 40,000 people by 2026) - nurture metaverse service providers (220 companies by 2026) - discover metaverse best practices (total of 50 cases by 2026)	- society / consumers - government services - enterprises	- create world-class metaverse platform - create and support MV ecosystem - train Key players in the metaverse era - nurture specialized corporations that could lead the metaverse industry - build an exemplary metaverse world	- metaverse platform of the city of Seoul - diverse types of funds to be provided "Expanded Virtual World" marketing campaign - K-Metaverse pavilion: further showcases

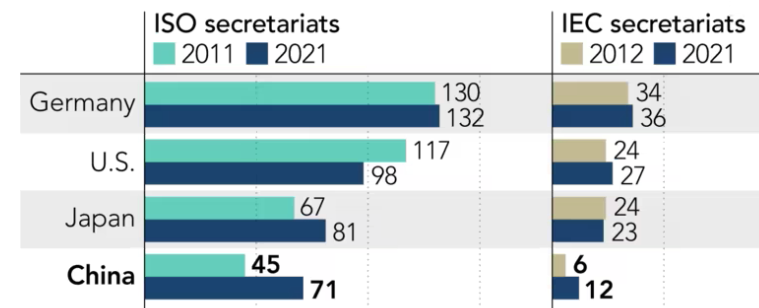
Setting standards in China, Europe and the US

 CHINA a state-driven process  Coordinated by the Standardization Administration of China (SAC), which lies under the State Administration for Market Regulation (SAMR), an arm of the State Council.	 EUROPE a structured, market-driven process  Private industry actors coordinate largely under the auspices of non-governmental standards development organizations (SDOs) at the national and European level. This process typically respects a clear hierarchy.	 UNITED STATES a loose, market-driven process  600 standards development organizations, mostly industry associations, set standards for their industries in the spirit of competition. The American National Standards Institute (ANSI) represents US interests at the international level but plays a comparatively limited role.
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Source: John Seaman, "China and the New Geopolitics of Technical Standardization", Notes de l'Ifri, Ifri, January 2020

China's growing clout in standardization organizations

(Number of secretariat positions by country)



ISO stands for International Organization for Standardization, IEC for International Electrotechnical Commission; includes twinned ISO secretariats
Source: ISO, IEC, U.S. National Institute of Standards and Technology

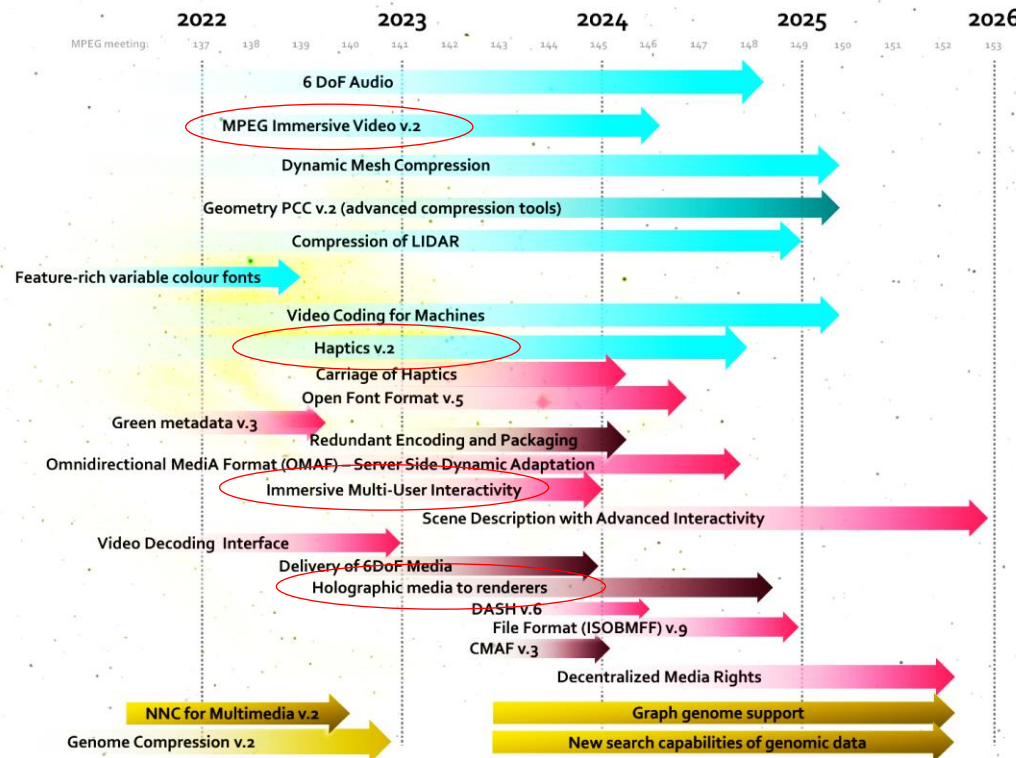
What's further interesting?

Many SDOs publish standardization roadmaps.

These roadmaps provide an excellent, combined perspective on many topics and their corresponding timelines.

This could well help to find a good starting point for an engagement.

Example on the right hand side: the MPEG roadmap



Media
Coding

Systems
and Tools

Beyond
Media



A free, online accessible database for the entire XR community with references to

- 830 XR standards, specifications, guidelines and recommendations
- 145 standardization working groups
- 55 SDOs

They are qualified (by tags) and with a searchable description. The group's entry further comprises the organizing/leading SDO and a link to this resource in the WWW.

Please support by adding standards and SDOs.

We may offer database as an iFrame for interested organizations' websites.

The screenshot displays the 'search database' interface. At the top, there are filters for 'type', 'SDO', 'status', 'year', and 'tags'. Below these are active filters: 'standard (industry)', 'specification', '3GPP', and 'published'. A table lists four standards:

identifier	title English	Prop
3GPP TR 26.118	Virtual Reality (VR) profiles for streaming applications	type: specification status: published year: 2022 tags: communication / interoperability, virtual reality, auralisation / audio / acoustics, mobile XR
3GPP TR 26.818	Virtual Reality (VR) streaming audio; Characterization test results	type: specification status: published year: 2022 tags: communication / interoperability, virtual reality, auralisation / audio / acoustics, mobile XR
3GPP TR 26.905	Mobile stereoscopic 3D video	type: specification status: published year: 2022 tags: communication / interoperability, virtual reality, auralisation / audio / acoustics, mobile XR
3GPP TR 26.918	Virtual Reality (VR) media services over 3GPP	type: specification status: published year: 2022 tags: communication / interoperability, virtual reality, auralisation / audio / acoustics, mobile XR

On the right, a tag selection menu is open, showing various categories like 'applications: geo & construction', 'applications: health', 'applications: marketing', 'applications: others', 'augmented reality', 'auralisation / audio / acoustics', and 'basics / terms'. A 'Details' button is visible next to each standard entry.

register for XR & metaverse standards

search for actual standards

- example: search for published standard from ANSI and CTA

search database

type SDO status tags % Default order

standard (industry) X standard (official) X technical report X ANSI X CTA X published X Reset all

identifier	title English	Properties
 ANSI/CTA 2085	Definitions and Characteristics for VR Video and VR Images	type: standard (official) status: published year: 2019 tags: basics / terms, virtual reality, graphics software / algorithms
 ANSI/CTA 2087	Recommendations and Best Practices for Connection and Use of Accessories for XR Technologies	type: standard (official) status: published year: 2019 tags: XR management, virtual reality, augmented reality, ergonomics / usability, other XR hardware, applications: others
 ANSI/HFES 100-2007	Human Factors Engineering of Computer Workstations	type: standard (official) status: published year: 2007 tags: evaluation / conformity, ergonomics / usability, graphics hardware / optics / displays
 CTA 2095	Best Practices for Limited Mobility in XR	type: standard (industry) status: published year: 2021 tags: XR management, regulation / ethics / governance, virtual reality, augmented reality, user experience (UX) / user interface design (UID)
 CTA 2103	Best Practices for Diversity in XR	type: standard (industry) status: published

search for recommendations

- example: search for recommendations on regulation / ethics / governance

search database

type SDO status tags % Default order

recommendation / guideline X regulation / ethics / governance X Reset all

identifier	title English	Properties
 ConnectSafe MV & Parents	Metaverse and Virtual Reality Safety Tips for Parents	type: recommendation / guideline status: published tags: regulation / ethics / governance, applications: entertainment / culture
 Council of the European Union Metaverse	Metaverse - Virtual World, Real Challenges	type: recommendation / guideline status: published year: 2022 tags: XR management, regulation / ethics / governance, virtual reality, augmented reality
 Cyber-XR Coalition Cyber XR-2020-1.0	Immersive Technology Standards for accessibility, inclusion, ethics, and safety	type: recommendation / guideline status: published year: 2020 tags: regulation / ethics / governance
 European Parliament Metaverse	Metaverse Opportunities, risks and policy implications	type: recommendation / guideline status: published year: 2022 tags: XR management, regulation / ethics / governance, virtual reality,

register for XR & metaverse standards

search for upcoming standards

- example: search for standards with status "draft" or "work in progress" in the field of graphics hardware / optics / displays

search database

type SDO status tags % Default order

specification X standard (industry) X standard (official) X draft X work in progress X

graphics hardware / optics / displays X Reset all

identifier	title English	Properties	
 IEC 62629-1-3	future IEC/TR 62629-1-3 ED1: 3D display devices - Part 1-3: Depth perception and determination of the position of 3D object on the non-physical screen	type: standard (official) status: work in progress tags: interaction / patterns, graphics hardware / optics / displays	Details
 IEC 62629-1-3 ED1	3D display devices - Part 1-3: Depth perception and determination of the position of 3D object on the non-physical screen	type: standard (official) status: work in progress tags: graphics hardware / optics / displays	Details
 IEC 62629-502-1	3D Display devices - Measurement method of plane-symmetrical real-image-forming optics for aerial display	type: standard (official) status: work in progress year: 2023 tags: evaluation / conformity, graphics hardware / optics / displays	Details
 IEC 62629-52-1 ED1	3D Display devices - Part 52-1: Fundamental measurement methods of aerial display - Optical	type: standard (official) status: work in progress year: 2024 tags: evaluation / conformity, graphics hardware / optics / displays	Details
 IEC 62629-62-12 ED1	3D display devices - Measurement methods for virtual-image type - Image Quality	type: standard (official) status: work in progress year: 2024	Details

search for SDOs and working groups

- example: search for standards development organizations (SDOs) and working groups in the field of education and engineering

search database

type SDO status tags % Default order

SDO X working group X applications: education / training X applications: design / engineering X Reset all

identifier	title English	Properties	
 AREA	Interoperability and Standards program	type: SDO year: 2013 tags: XR management, evaluation / conformity, augmented reality, applications: education / training, applications: design / engineering, applications: assistance, applications: others	Details
 ASAM	Association for Standardization of Automation and Measuring Systems	type: SDO year: 1998 tags: evaluation / conformity, communication / interoperability, applications: design / engineering	Details
 BDSV	BDCG Simulation	type: working group tags: applications: education / training	Details
 DIN	DIN Work Innovation	type: working group tags: applications: education / training, applications: design / engineering, applications: collaboration, applications: others	Details
 DIN	DIN I4.0	type: working group tags: applications: design / engineering, applications: others	Details
 DIN	DIN NIA	type: working group tags: applications: education / training, applications: design / engineering, applications: health, applications: assistance, applications: collaboration, applications: marketing, applications: entertainment / culture, applications: geo & construction, applications: others	Details
ETSI ISG-ARF	Industry Specification Group (ISG)	type: working group	Details

- as cross-cutting technology, XR standardization is scattered among many organizations: thus hard to get an overview.
- individuals and companies are apparently not totally aware of what's on the table; lack of tech transfer
- state support could be an idea, the national approaches worldwide are different anyhow
- there is already vast number of XR standards out there.
- they provide an excellent basis to build on, avoiding to re-invent the wheel and ensuring to concentrate on the real innovative aspects of one's work
- standards pave the way for today's and future markets

=> let's use them and extend them, engage!





*„Without standards,
there can be no improvement.“*

Ōno Taiichi

(* 29 February 1912 in Manchuria; † 28 May 1990) was the inventor of the Toyota production system. He developed today's basic logistics methods, the Kanban system and just-in-time production, between 1950 and 1982. The Japanese management concept Kaizen is also based on his ideas.

Thank you for your attention.

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Chairman - Standardization Committee „eXtended Reality und Metaverse“ at DIN e.V.

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