

Opening Session

Insights from project INSPIRER (participation in urban planning processes in virtual and real spaces):
Options for public participation using VR and AR & a plea for standards

by:
Virtual Dimension Center
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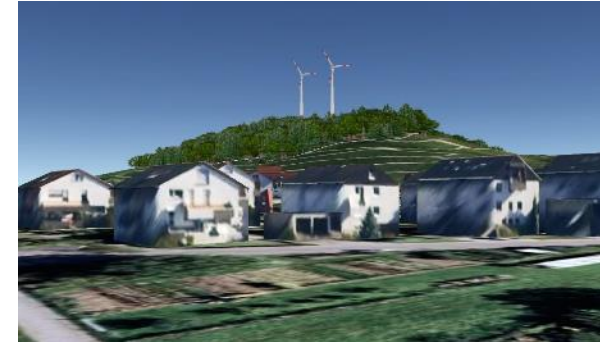
This project was funded by the
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Bundesministerium
für Bildung
und Forschung

Content

- motivation & requirements
- basic technological approaches:
 1. photomontage
 2. download Google Earth kmz files
 3. VR app for desktop, cardboards, VR headsets, even distributed-collaborative
 4. 360° live stream
 5. citizens' meeting with mixed data visualisation
 6. augmented 3D model of the construction project
 7. augmented cadastral plan
 8. projections on buildings
 9. on-site inspection with AR smart glasses
 10. on-site inspection with AR handheldss
- evaluation
- further reading and links



Why XR for participation and involvement?

VR can

- convey a highly immersive, very impressive experience,
- transport a 360° environment,
- teleport people,
- enable spatial, natural interaction with the environment.

AR can

- add new 3D content to the real, physical environment,
- thereby ensuring the continued use of the real environment.

XR can

- provide a glimpse into the future and the past
- convey positional, structural, behavioral and procedural knowledge.

What is it all about? Overcoming barriers



imagination



immobility



mental
transfer
limit



presentation and
interaction limits
of simple media



visual impairments

(can be overcome by new displays)



accessibility,
large audiences

Requirements: what must XR-based participation be able to achieve?



- Outreach, possible number of users
- Enabling dialogue (e.g. acceptance of criticism, suggestions, proposals)
- Accessibility: for non-tech-savvy people, for people with disabilities (e.g. mobility), for people living far away
- Agnostic to the end device (e.g. costs, complexity)
- Requirement of infrastructure, equipment (e.g. room, projection technology, smart glasses hire, VR collaboration platform)



- Possibility for citizens to choose their own perspective
- 1:1 representation, i.e. in realistic size
- Prevent the view from being manipulated, especially with regard to the choice of lens (focal length / FoV)
- Consideration of the status quo, the existing situation
- Place of participation: at home, town hall/city hall, building site

1st approach: photomontages

- 2D overlay of plan and as-built data (no VR, AR)

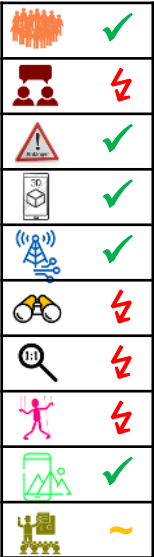


source:
privaet /
nh, HNA



source:
<http://www.come-on.de>

source: Z&M 3D-Welt



1st approach: photomontages

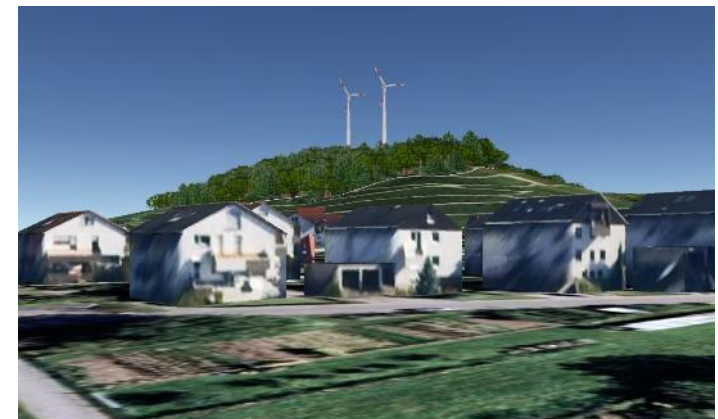
- problem: often no focal length specification, thus tendentious representations possible



Focal lengths from left to right: 18 mm, 24 mm, 35 mm, 55 mm (source: www.rofrisch.de)

2nd approach: Download Google Earth kmz files

- loading geometric 3D model into Google Earth environment
- distribution: Provision of Google Earth kmz files for download
- viewing via desktop or VR end device



Wind turbines on the Kappelberg, Fellbach
[Source: VDC]

3rd approach: VR app for desktop, Cardboard, VR headset

- VR cardboard visualization: distribution of digital 3D content at home



Visualization Neue Mitte Göppingen
[Source: Imsimity GmbH]



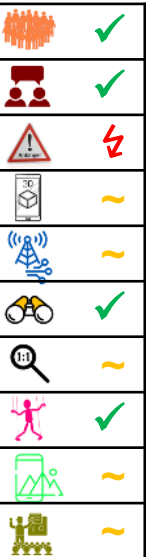
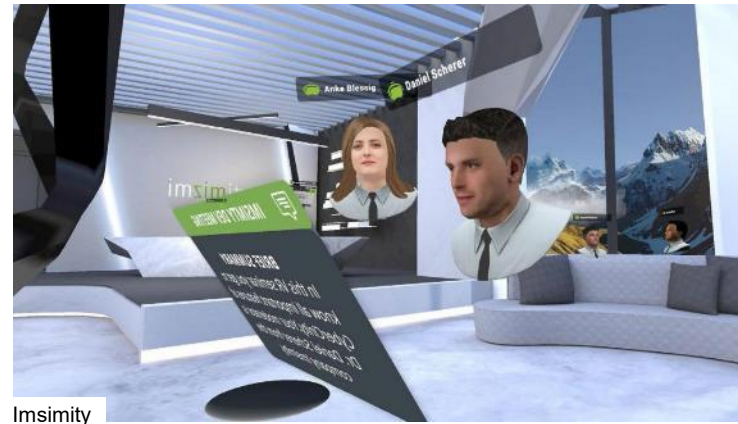
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3rd approach: VR app. Feature: distributed-collaborative VR

- Provision of a distributed, collaborative 3D environment in which citizens can participate via desktop systems or VR (Cardboard with VR headset)
- Community experiences such as concerts
- Recording criticism, suggestions and proposals

Plans for a redesign of the town center of St. Georgen in the Black Forest are presented (ongoing project) within the distributed-collaborative VR solution “Cybercinity”. Participation via multiple front-end device options is possible. Participants can navigate, react, annotate, chat, converse and create.

[Symbolic image. Source: Imsimity GmbH:
<https://imsimity.de/produkt/cybercinity/>]



4th approach: 360° live stream

- Neighborhood inspection via 360° 3D live streaming (e.g. of public spaces, events, etc.)
- Idea: On-site inspection from a distance (question of how the view into the future will be presented remains open for the time being).

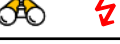
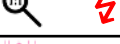
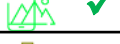


5th approach: Citizens' meeting with mixed data visualization

- Inventory and planning data
- Presentation and discussion

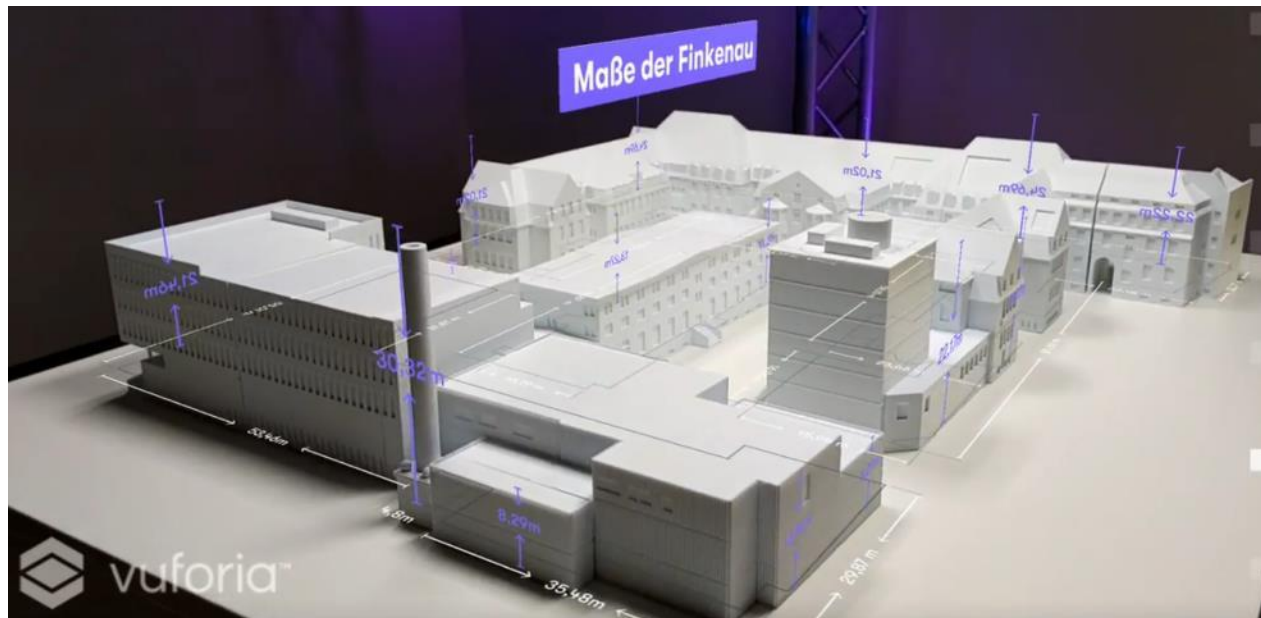


[source: Z&M 3D-Welt]

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6th approach: Augmented 3D model of the construction project

- Information transfer in community centers, town halls
- Augmentation of 3D-printed models



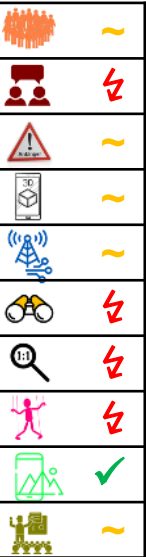
„AREAL“, Paulina Porten
[source: <https://paulinaporten.com/areal-dive-into-finkenau>]

7th approach: Cadastral plan augmentation

- Information transfer in community centers
- AR visualization of development plans

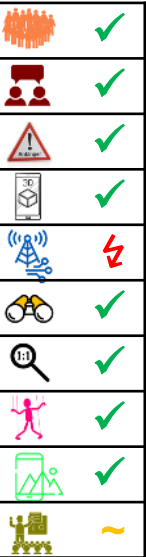
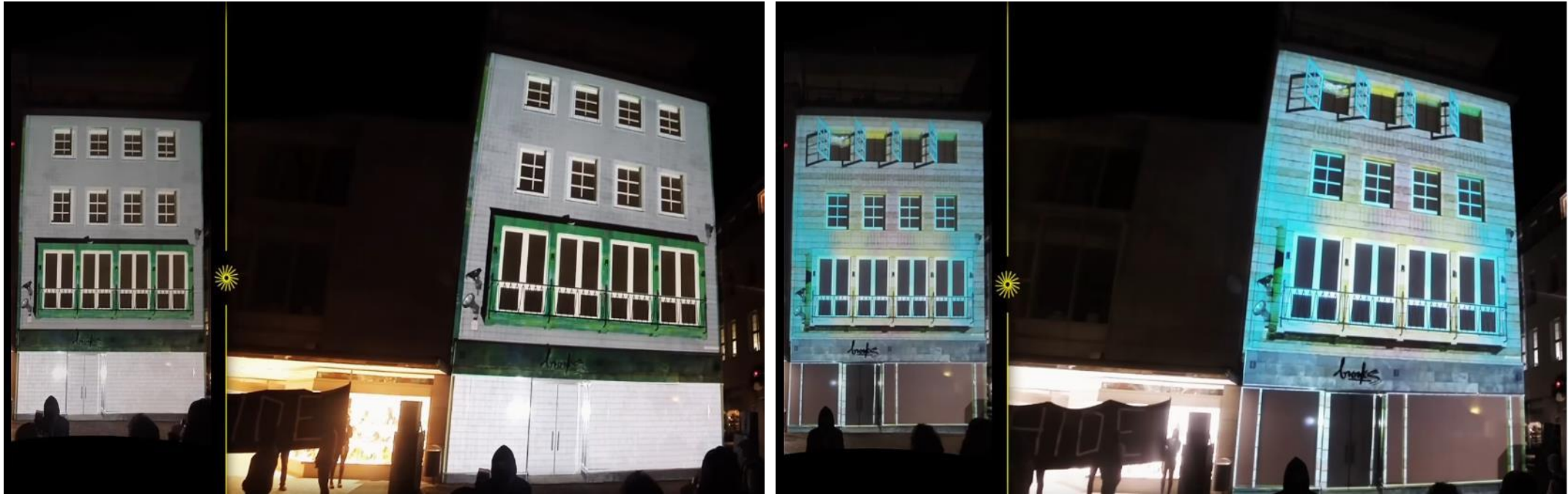


[source: Broschart et al.: „Augmented Reality as a Communication Tool in Urban Design Processes“. Proceedings REAL CORP 2013 ; 20-23 May 2013, Rome, Italy.]



8th approach: projection onto existing or specially created projection surfaces

- True scale projection of the future design onto the corresponding building or scaffolding



3D Video Mapping „Brooks“, Bielefeld (TNL)

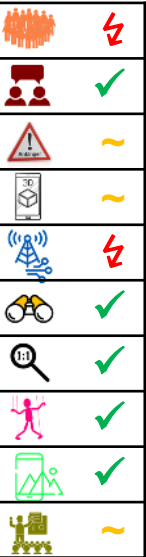
[source: <https://www.tnl.de/de/projekte/3d-video-mapping/fassadenprojektion-guerilla-marketing>]

9th approach: On-site inspection with AR smart glasses

- AR tour on site with smart glasses
- Guided tours with hardware provided



[source: afca. ag
(HoloPlanning)]



10th approach: On-site inspection with AR handhelds

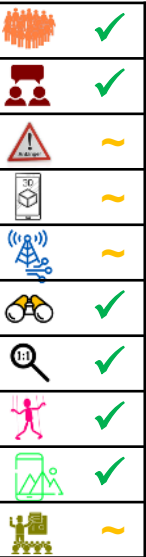
- Tablet PCs and augmented reality on site: A look into the future/at the invisible
- Anchoring information at construction sites and sights, vantage points, etc.



LARA: X-ray vision for civil engineering - augmented reality support for excavation work [Source: DFKI]



Stuttgart TV Tower app
[Source: Stuttgart Marketing GmbH]



9th/10th approach: On-site inspection with AR: Features

Smartwalk: Guided tour and navigation of a visualized building project: Smartwalk "Stadtmitte am Fluss", Saarbrücken (Research Group CPE, Kaiserslautern). [Source: Broschart et al: "Augmented Reality as a Communication Tool in Urban Design Processes". Proceedings REAL CORP 2013 Conference Proceedings 20-23 May 2013, Rome, Italy]



Navigation to the planned building. Wikitude "Drive". [Source: <https://www.extremetech.com/mobile/94326-wikitude-drive-for-android-review-its-about-the-journey-not-the-destination>] Google Maps "Live View" [Source: <https://arvr.google.com/ar/>]



Navigation to the planned building object: camera captures georeferenced objects, AR application supplements field of vision with route information. Navigation using augmented reality and 2D screen view. [Source: Kluge, M.: The use of augmented reality in pedestrian navigation. 2012. University of Potsdam].



Geo-tagging: Marking and commenting on real objects and locations, e.g. damage, potential danger spots etc.. Report damage to public objects with SEKAI CAMERA [Source: Schrenk, M. et al.: Mobile Augmented City-New Methods for Urban Analysis and Urban Design Processes by using Mobile Augmented Reality Services. Proceedings REAL CORP 2011 Conference Proceedings 18-20 May 2011, Essen].

Interactive tour: Automatic questioning of users on site at viewpoints of the visualized building design; response via (audio) commentary. "Augmented Participation", Paulina Porten [Source: <https://paulinaporten.com/augmented-participation-1>]



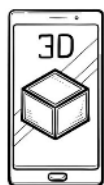
First evaluation



technologische Ansätze		Ort	theor. Reichweite, Nutzeranzahl	Bürger-Dialog	zugänglich für nicht-Technikaffine	komplexes, teures Endgerät	Voraussetzungen, Infrastruktur	selbst wählbare Perspektive	1:1-Darstellung	Eindruck manipulierbar (z.B. über Brennweite)	Berücksichtigung Bestand
1	Fotomontage	beim Bürger daheim	> 1000	nein	Ja	nein	nein	Nein	Nein	ja	Ja
2	Download-Angebot von Google-Earth-kmz-Dateien		> 1000	nein	evtl.	(Handheld-)PC, Smartphone (evtl. VR-Headset)	nein	Ja	abhängig von Endgerät	nein	abhängig von Modell
3	VR-App für Desktop, Cardboards, VR-Headset		> 1000	nein	Nein	Desktop oder Smartphone, VR-Cardboard	Cardboards bei der Bürgerschaft	Ja	abhängig von Endgerät	nein	abhängig von Modell
	single User multi User, verteilt-kollaborative VR		> 1000	ja	Nein	Desktop oder VR-Headset	VR-Kollaborationsplattform	Ja	abhängig von Endgerät	nein	abhängig von Modell
4	360°-Livestream		> 1000	je nach Konzept	Nein	(Handheld-)PC, Smartphone (evtl. VR-Headset)	nein	eingeschränkt	abhängig von Endgerät	nein	Ja
5	Bürgerversammlung mit Mischdaten	im Rathaus	100-1000	ja	Ja	nein	Saal verfügbar	Nein	Nein	ja	Ja
6	Augmentiertes 3D-Modell des Bauvorhabens		100-1000	nein	evtl.	Handheld	physisches 3D-Modell der Planung	eingeschränkt	Nein	nein	abhängig von Modell
7	Augmentierter Katasterplan		100-1000	nein	evtl.	Handheld	Handheld	Nein	Nein	ja	Ja
8	Gebäude-Aufprojektion	bei Baustelle	> 1000	ja	Ja	nein	Projektionsfläche, Projektor(en)	Ja	Ja	nein	Ja
9	Vorort-Begehung mit AR-Smart Glasses		< 100	ja	je nach Betreiber-Konzept	je nach Betreiber-Konzept	AR-Smart Glasses bei der Bürgerschaft oder Betreuung AR-Smart-Glasses-Verleih	Ja	Ja	nein	Ja
10	Vorort-Begehung mit AR-Handhelds		< 100	ja	je nach Betreiber-Konzept	Handheld	Handheld	Ja	Ja	nein	Ja

Acceptance

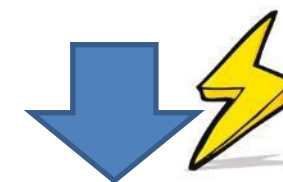
Target group 1: The citizenry



- Enabling a dialog (e.g. acceptance of criticism, suggestions, proposals)
- Accessibility: for non-tech-savvy people, for people with disabilities (e.g. mobility), for people who are far away
- Device agnostic (e.g. costs, complexity)
- Possibility for citizens to choose their own perspective
- Convenience; depending on the chosen solution



- 1:1 representation, consideration of the status quo, the inventory; simple & clear comprehensibility



but: not enough for acceptance!

Who else needs to be considered?

Acceptance

Target group 2: town halls, municipal service providers, developers, etc.



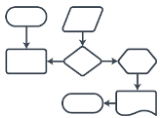
- Limiting trolls



- Regulation, permissibility



- Legal clarity of scope, objectives, ...



- Process integration: meaningful integration into planning and decision-making processes



- (at least medium-term?) operation of the platform



- Compliance with norms, standards



- Range, possible number of users



- Infrastructure and equipment requirements (e.g. hall, projection technology, smart glasses rental, VR collaboration platform)



- Resilience of the statements: non-manipulability

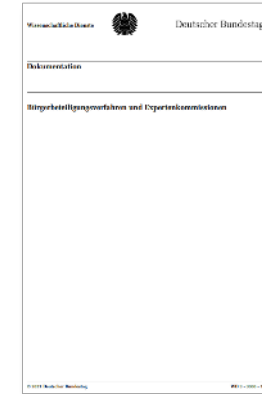


- depending on the requirements; depending on the chosen solution ...?

Acceptance.

Customer perspective participation, involvement: what framework?

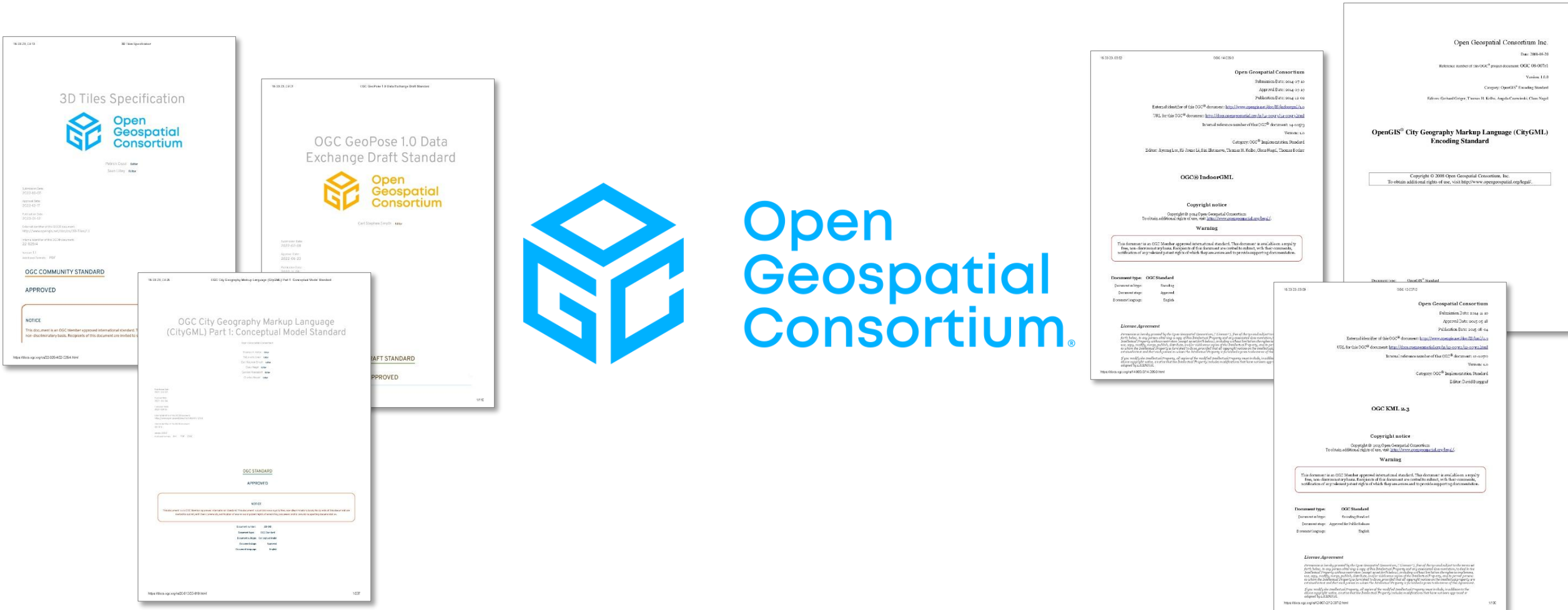
- most common in building and planning law; in Germany, the Building Code requires public participation in the preparation of a development plan
- Accessibility Reinforcement Act in Baden-Württemberg
- Participation procedures in local authorities (usually municipalities) mostly so-called guidelines for participation
- Scientific Services of the German Bundestag: Documentation on public participation procedures and expert commissions
- VDI Guideline 7001: Communication and public participation in the planning and construction of infrastructure projects - Standards for engineering service phases. 2021



Some norms and standards in the context of XR-Geo and mobile XR

- OGC CityGML City Geography Markup Language (CityGML) Encoding Standard
- OGC GML OpenGIS Geography Markup Language (GML) Encoding standard
- OGC Indoor-GML IndoorGML Encoding Standard
- OGC KML 2.3 Keyhole Markup Language (KML)
- OGC WMS OpenGIS Web Map Server Implementation Specification
- 3GPP TR 26.905 Mobile stereoscopic 3D video
- 3GPP TR 26.918 Virtual Reality (VR) media services over 3GPP
- 3GPP TR 26.926 Feasibility Study on Typical Traffic Characteristics for XR Services and other Media
- 3GPP TR 26.928 Extended Reality (XR) in 5G
- 3GPP TR 26.929 QoE parameters and metrics relevant to the Virtual Reality (VR) user experience
- 3GPP TR 26.998 Support of 5G glass-type Augmented Reality / Mixed Reality (AR/MR) devices
- 3GPP TR 26.999 Virtual Reality (VR) streaming interoperability and characterization
- 3GPP TR 26.118 Virtual Reality (VR) profiles for streaming applications
- 3GPP TR 26818 Virtual Reality (VR) streaming audio; Characterization test results
- 3GPP TR 26.962 Immersive Teleconferencing and Telepresence for Remote Terminals (ITT4RT) Operation and Usage Guidelines
- ISO/IEC 14496-2 Coding of audio-visual objects -- Part 2: Visual
- ISO/IEC 23000-9 Multimedia application format (MPEG-A) — Part 9: Digital Multimedia Broadcast-ing application format — Amendment 1: Conformance and reference software.
- ISO/IEC 14496-3 Coding of audio-visual objects -- Part 3: Audio (AAC)
- ISO/IEC 14496-16 Coding of audio-visual objects -- Part 16: Animation Framework eXtension (AFX)
- ISO/IEC 23005-5 Media context and control (MPEG-V)
- ISO/IEC 23000-12 Multimedia application format (MPEG-A) — Part 12: Interactive music application format
- ISO/IEC 23000-13 Multimedia application format (MPEG-A) -- Part 13: Augmented reality application format (ARAF)
- ISO/IEC 23003 MPEG audio technologies -- Part 2: Spatial Audio Object Coding (SAOC)
- ISO/IEC 23090-2 Coded representation of immersive media
- ISO/IEC 23090-1 Coded representation of immersive media - Part 1: Immersive media
- ISO/IEC 23090-9 Coded representation of immersive media - Part 5: Graphics-based Point Cloud Compression
- IETF RFC 5870 A Uniform Resource Identifier for Geographic Locations
- IETF RFC 7946 The GeoJSON Format
- W3C WMS Geolocation API Specification 2nd Edition
- W3C GeoVRML 2.0 GeoVRML
- PROFIBUS Nutzer-organisation e.V. omlox omlox open locating standard
- Microsoft AZURE Spatial Anchors
- IEEE P2048.07 P2048.7 - Standard for Virtual Reality and Augmented Reality: Map for Virtual Objects in the Real World
- IEEE P2048.08 Standard for VR and AR: Interoperability between Virtual Objects and the Real World
- IEEE IC16-004-02 [closed] Augmented Reality in the Oil/Gas/Electric Industry
- ISO/IEC 86012 JPEG Pleno Point Cloud Use Cases and Requirements v1.3
- ISO/IEC 88014 Final CfE JPEG Pleno PCC (Point Cloud)
- ISO/IEC 90022 Report on JPEG Pleno PCC Call for Evidence Results (Point Cloud)
- ISO/IEC 91041 JPEG Pleno Point Cloud Scope and Timeline
- ISO/IEC 91058 JPEG Pleno Point Cloud Common Test Conditions
- ISO/IEC 23090-5 Coded representation of immersive media -- Part 5: Video-based Point Cloud Compression
- ARTwin (EU-Horizon-2020-Projekt) AR Cloud

Some norms and standards in the context of XR-Geo and mobile XR



Some norms and standards in the context of XR-Geo and mobile XR



ISO/IEC 16739

Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries.



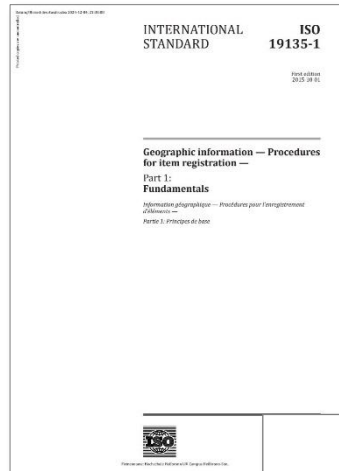
Industry Foundation Classes (IFC)

Industry Foundation Classes (IFC) are a set of standardized, digital descriptions of the built asset industry. It is an open, global standard published under a Creative Commons license, and as ISO 16739.

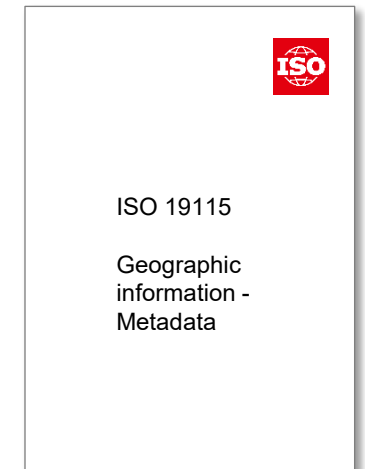
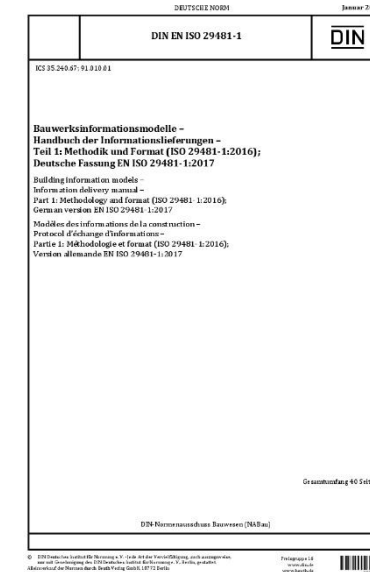
IFC provides machine interpretability of information and thereby enables automation of workflows. It is vendor-neutral and available to everyone.



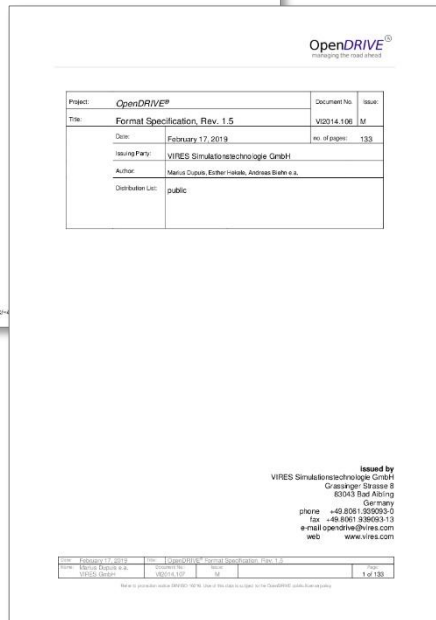
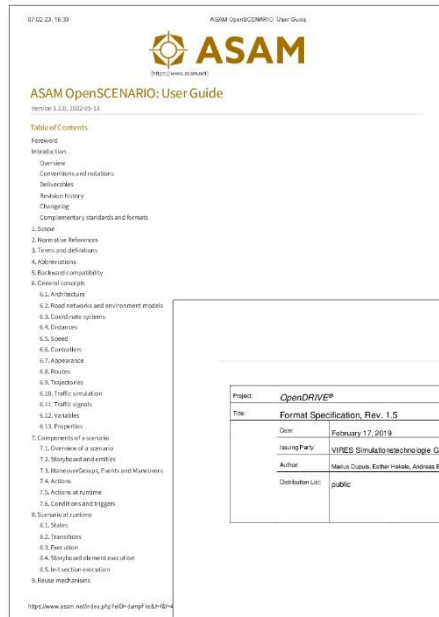
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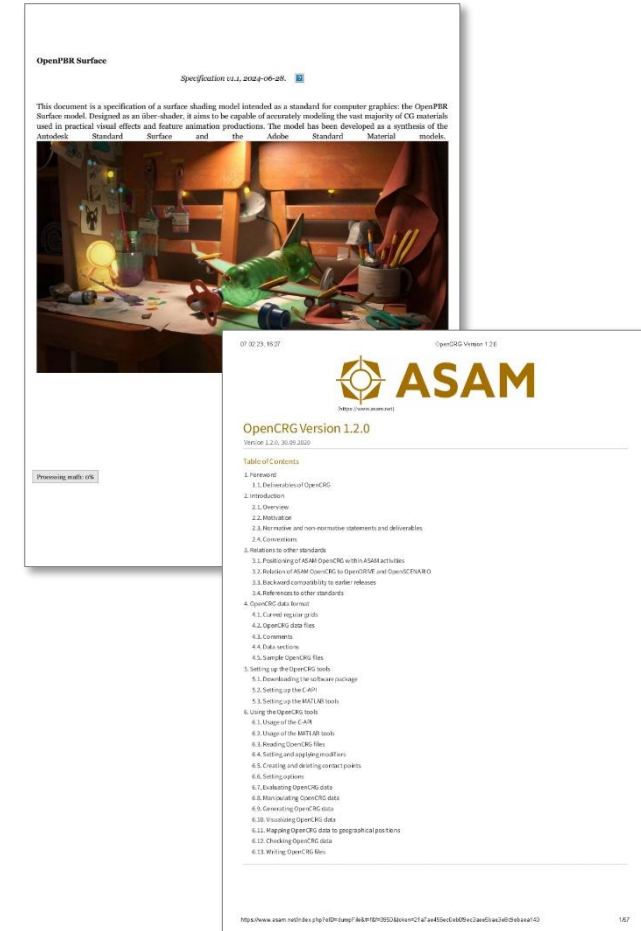
**International
Standardisation
Organisation**



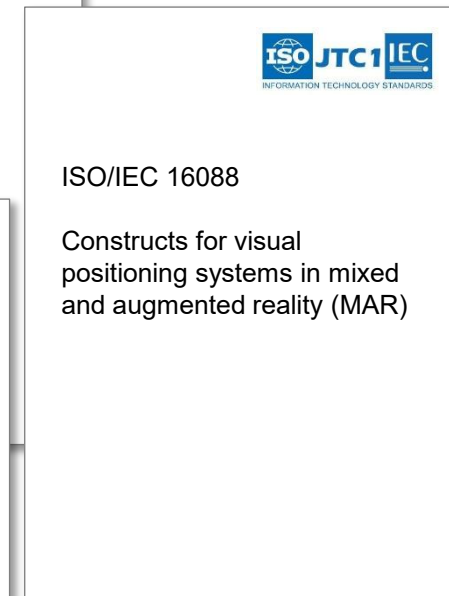
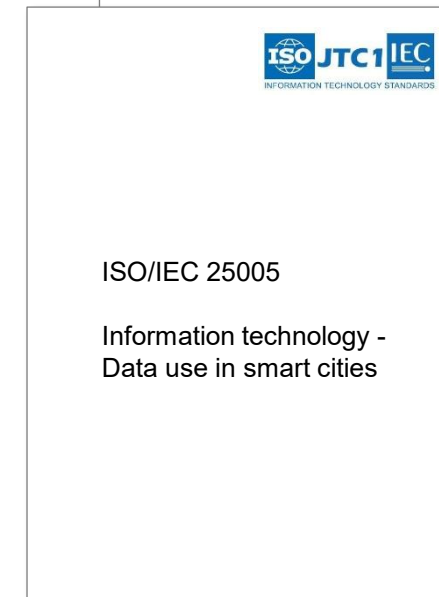
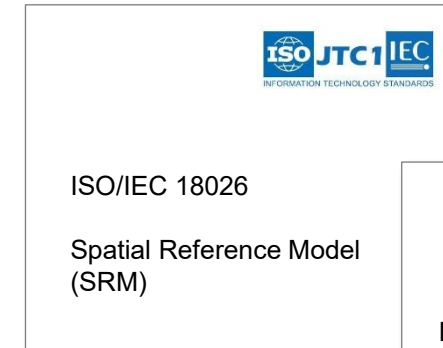
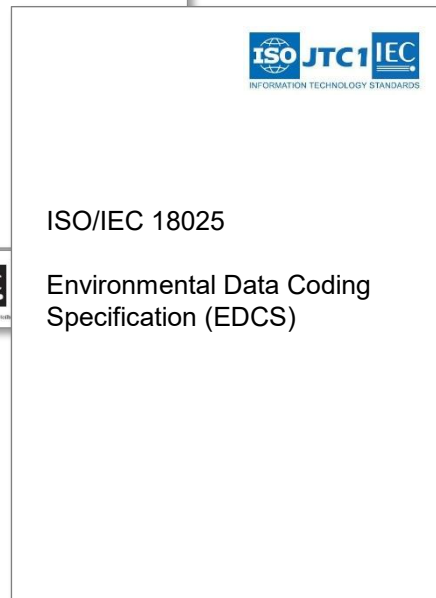
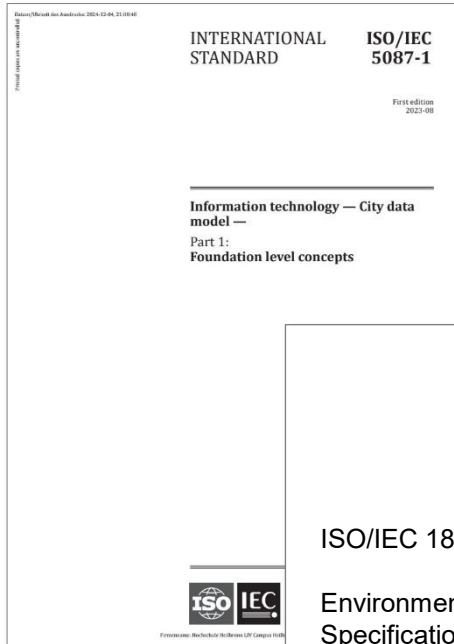
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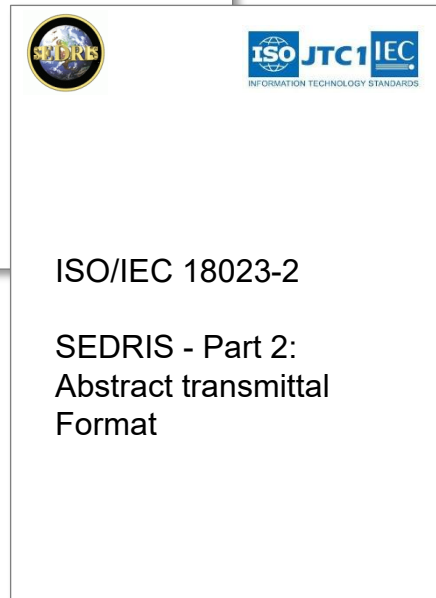
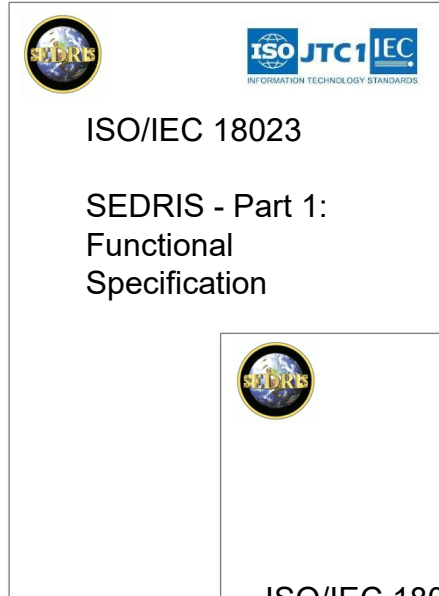
Association for Standardization of
Automation and Measuring Systems



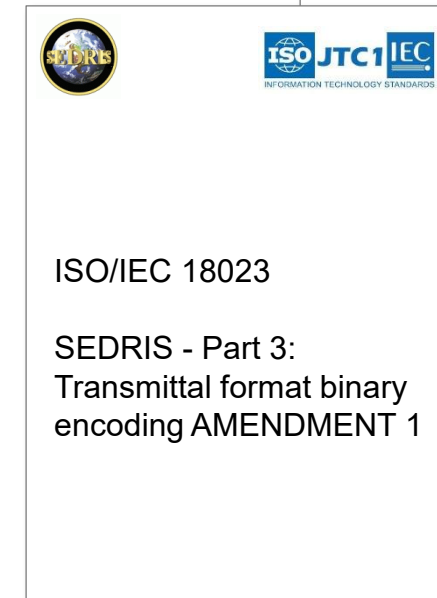
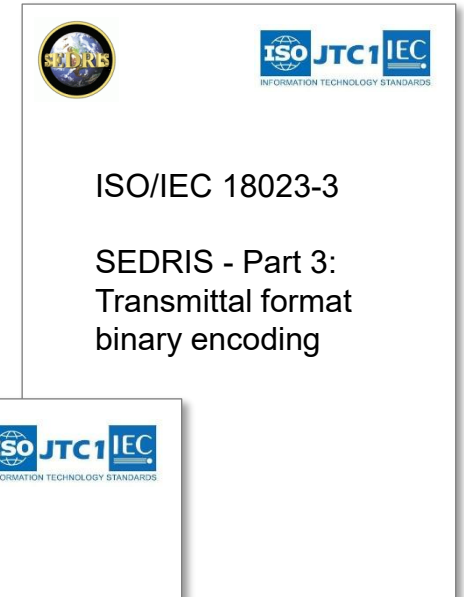
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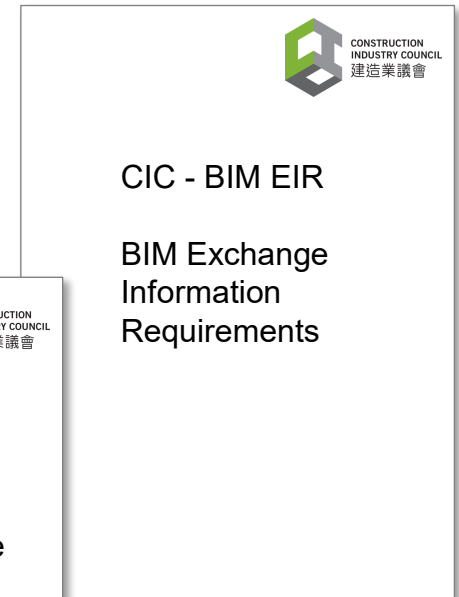
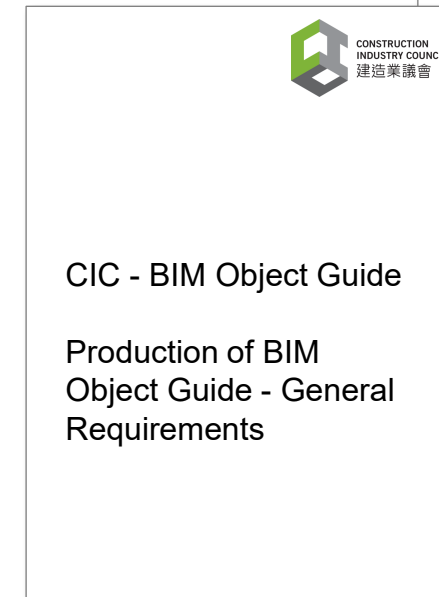
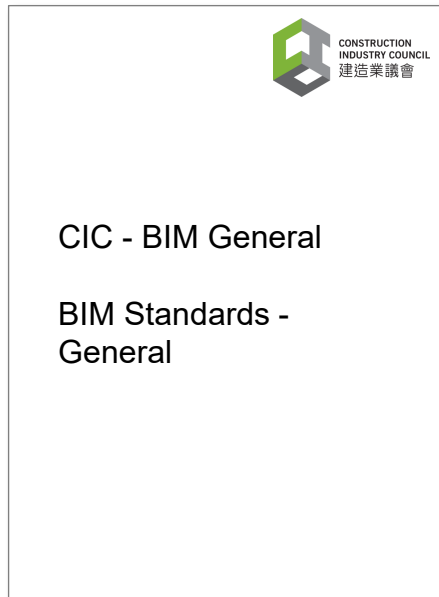
Some norms and standards in the context of XR-Geo and mobile XR



Source for Environmental Data Representation & Interchange



Some norms and standards in the context of XR-Geo and mobile XR



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.





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.

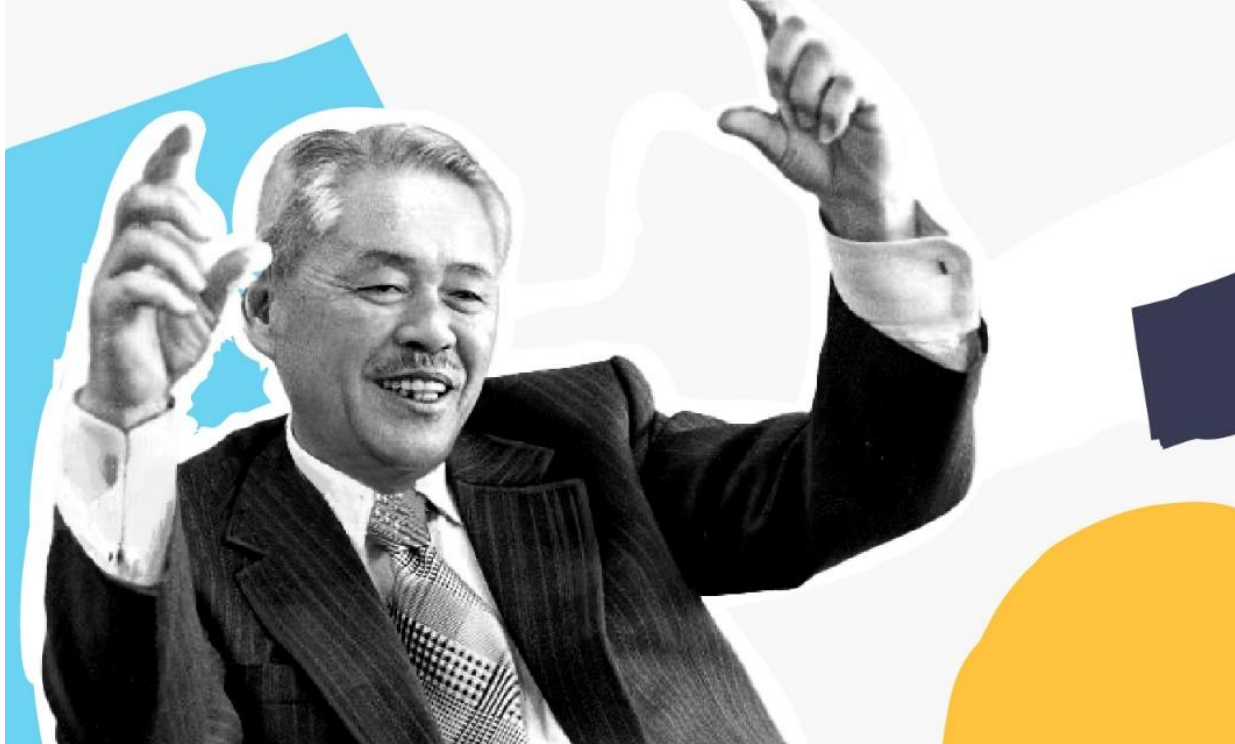


Example here: the OGC (Open Geospatial Consortium) roadmap

OGC Standards Roadmap

Progress of Official OGC Standards **OGC** & **Community Standards** **Community** 2021-05-27

	SWG Work / Work Item	OAB Review	OGC-NA Review	Public Review	Prepare for Approval	TC Approval to Vote	TC Vote	PC Vote	Public Release
Proposed Standards									
OGC Abstract Spec Topic 0 04-084		✓	✓	✓	✓	✓	✓	✓	✓
OGC Abstract Spec Topic 2 - Referencing by Coordinates 18-005		✓	✓	✓	✓	✓	✓	✓	✓
OGC Abstract Spec Topic 20 - Observations, Measurements and Samples 20-082		✓	✓	✓	✓	⚠			
OGC Abstract Spec Topic 21 - DGGs v. 2.0 20-040		✓	✓	✓	✓	✓	✓	✓	⚠
OGC Abstract Spec Topic 22 - Tiling 19-014		✓	✓	✓	✓	✓	✓	✓	✓
OGC Abstract Spec Topic 6 - Schema for coverage geometry and functions	⚠								
OGC CDB 1.2	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC CDB 2.0	⚠								
OGC CityGML 3.0	✓	✓	✓	✓	✓	✓	✓	⚠	
Community CityJSON	✓	✓	✓	✓	✓	✓	✓	⚠	
OGC Common Object Model Container SWG	⚠								
OGC Coverage Implementation Schema - ReferenceableGridCoverage Extension 1.1 16-003r6	✓	✓	✓	✓	⚠				
OGC EO Extension for OpenSearch 13-028r9	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC EO Product Metadata GeoJSON/JSON-LD Encoding 17-003	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC GeoAPI 09-083r4	⚠								
OGC GeoPackage 1.3 12-128r16	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC GeoPose	⚠								
OGC GeoTIFF 19-008	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC GroundwaterML2 v2.3 19-013	✓	✓	✓	✓	✓	✓	✓	✓	⚠
OGC HDF5 Core 18-043	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community IMDF 19-089	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC IndoorGML 1.1 19-011	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC MetOcean Profile and Extensions to WCS 2.1 15-045, 15	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC Moving Features Encoding Extension - JSON 19-045	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC OGC API - Common 19-072	✓	✓	✓	✓	⚠				



*„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.

insights from project

INSPIRER

(participation in urban planning processes in virtual and real spaces)

Thank you very much for your attendance!

by:
Virtual Dimension Center



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