

AI, Metaverse & Co-Design for Social Innovation

An application protocol integrating artificial intelligence, immersive environments, and participatory design — tested through the OSMOSI action research project.

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What Is Social Innovation?

Manzini's Definition

"A process of change emerging from the creative recombination of existing resources — from social capital to advanced technology — whose goal is to achieve socially recognised objectives in a new way."

Design's Role

Design methodologies, tools, and skills make social innovation more resilient and sustainable, addressing complex systemic problems at both global and local levels.



Co-Design: From Participation to Practice



Co-design "refers to the creativity of designers and people not trained in design working together in the design development process" (Sanders & Stappers, 2008).

→ Roots

Scandinavian participatory design tradition, late 1970s

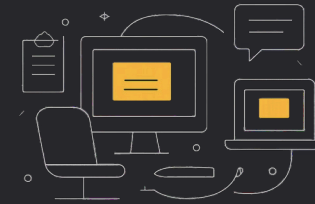
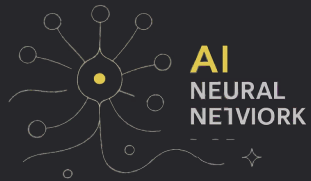
→ Evolution

Extended to urban planning, public services, healthcare, education

→ Core Principle

Democratising design by valuing stakeholders' experiential knowledge

AI & Metaverse: New Frontiers for Co-Design



Generative AI & LLMs

Support ideation, prototyping, and analysis. Text-to-image models translate descriptions into immediate visualisations, bridging technical and non-technical stakeholders.

Metaverse & VR

Immersive environments overcome geographical and temporal barriers, enabling real-time collaborative manipulation of 3D models and shared spatial exploration.

Hybrid Environments

Combine physical and digital elements, integrating gestural, vocal, and textual inputs in fluid co-creation processes.

Application Approaches at a Glance

The integration of GenAI and the metaverse in co-design spans five key domains, each offering distinct added value across the design process.



The OSMOSI Project

OSMOSI (Observation and Study of Models for the Design and Development of Hybrid Spaces) is an EU-funded action research project (PRIN 2022, Next Generation EU) coordinated by Polimi DESIS Lab with the University of Palermo.

Milano

Open Casello — urban lab in a former toll booth supporting youth networks and associations.

Palermo

Museum of the Cities of the World — intercultural platform in the former Convent of the Crociferi.

Scale

100+ hybrid spaces mapped across Lombardy (62) and Sicily (18), combining quantitative and qualitative data.



Three Phases of the OSMOSI Design Process



The process integrates AI and metaverse tools across all three phases to optimise, expand, democratise, and customise activities — from data collection to community-facing outputs.

AI Tools Deployed in OSMOSI



Interpretative AI

LLMs processed hundreds of pages of transcripts and open responses, identifying recurring themes and conceptual clusters — a "computational magnifying glass" complementing human judgment.



Generative AI

Text-to-image models translated each space's identity into coherent visual materials — concept art, icons, and scenario visualisations — maintaining place-specific character while ensuring graphic consistency.



Conversational AI

The OSMOSI Chatbot (Fastbots) acts as a natural-language interface to the project database, enabling citizens and researchers to query mapping data and receive narrative descriptions.

The Metaverse & Application Protocol



OSMOSI Digital Area

Built on Spatial.io, the Digital Area reconstructs both pilot sites in 3D. Users navigate as avatars, explore environments, leave comments, and co-create maps of possible uses — overcoming geographical constraints.

Workshop Structure

- Technical and conceptual onboarding
- Free exploration of virtual spaces
- Guided discussion and co-creation on interactive maps
- Asynchronous feedback phase

Discussion & Conclusions

1 AI & Metaverse as Active Agents

Not minor add-ons — they structurally influence collaborative design, increasing accessibility and replicability while introducing risks of narrative flattening and digital asymmetry.

2 Hybridisation Is Essential

Analog and digital tools must coexist. The protocol enhances — not replaces — traditional co-design, supporting an "augmented" paradigm integrating creativity, rigour, and technology.

3 Replicable & Transferable

Tested in Milano and Palermo, the protocol can be transferred to other territories and cultures, serving researchers, policymakers, and local actors in urban regeneration processes.

- ❏ Key open challenges: balancing automation with human control, ensuring inclusive collaborative engagement, and addressing ethical and accessibility considerations in digital environments.

