Immersive experience of public data for inclusive urban development: Case of The Hague, The Netherlands

Klaas Jan Mollema[1], Jos van Leeuwen[1],
Rizal Sebastian[2], Lucas Mastenbroek[2], Tyra Polderman[2]

[1] The Hague University of Applied Sciences, Faculty of Information Technology and Design, Research Group Civic Technology, The Hague, The Netherlands – K.J.Mollema@hhs.nl
[2] The Hague University of Applied Sciences, Faculty of Technology, Innovation and Society, Research Group Future Urban Systems, The Hague, The Netherlands – R.Sebastian@hhs.nl

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1. Research problems and objective

Cities in the Netherlands are facing a major challenge: a housing shortage. The Municipality of The Hague is addressing this issue by redeveloping several large areas of the city. This transformation affects many residents, employees, and other people who live, work, and spend their leisure time in these areas. For such large-scale projects, open communication with citizens and stakeholders is essential. In addition to sharing ambitions and plans, it is crucial to provide and discuss information about the use and function of different locations. This requires an inclusive and participatory approach to decision-making.

The Municipality of The Hague has a long-standing tradition of being a transparent government organization. Data from administrative processes are generally made publicly available as open data, unless privacy, unfair competition, or security concerns prevent this. Previously, citizens could request information through the Government Information Act (WOB). Since May 2022, this has been replaced by the Open Government Act (WOO), which obliges government organizations to proactively publish information. Despite these efforts, awareness and usage of open data remain limited.

Datalab, a municipal department for (geo-)data management, explores how visual data representations can improve accessibility and understanding of urban developments. This way, Datalab aims to better inform citizens and involve them in participation processes.

Participation activities often happen in physical meetings with a selected group of citizens, where the municipality invites input and feedback on plans. In this project we explore whether the use of a digital environment for citizen participation (1) reaches a larger group of citizens, (2) provides citizens with more time and space to consider plans, and (3) offers a broader and more integrated perspective through visual data representations.

2. Collaboration and previous work

This project is a collaboration between the Municipality of The Hague, two research groups of The Hague University of Applied Sciences (THUAS) and agency DutchVR

Municipality of The Hague

The Municipality of The Hague has invested in various visual data representations. Datalab developed an online workspace where residents explore data using thematic building blocks. 'Spiegelstad' features the city's Digital Twin, offering 3D insights into issues like water management. 'Den Haag in Cijfers' provides a dashboard with key municipal indicators. While these initiatives share data within their domains, an integrated approach is lacking. Datalab aims to create a more unified representation, combining current data with future plans.

THUAS research group Civic Technology

The Civic Technology research group explores how technology can enhance dialogue between citizens and governments. As part of this effort, the online deliberation platform 'Public Dialogues' (http://www.publicdialogues.nl) was developed. This platform allows participants to engage in discussions, exchange ideas, and collaborate on relevant topics at neighbourhood, city, and regional levels. It provides low-threshold tools for dialogue and co-creation in synchronous, asynchronous, or hybrid settings. While mainly text-based, it accommodates visual contributions. The research group aims to integrate data visualizations and geographical representations to help citizens better understand complex topics during discussions.

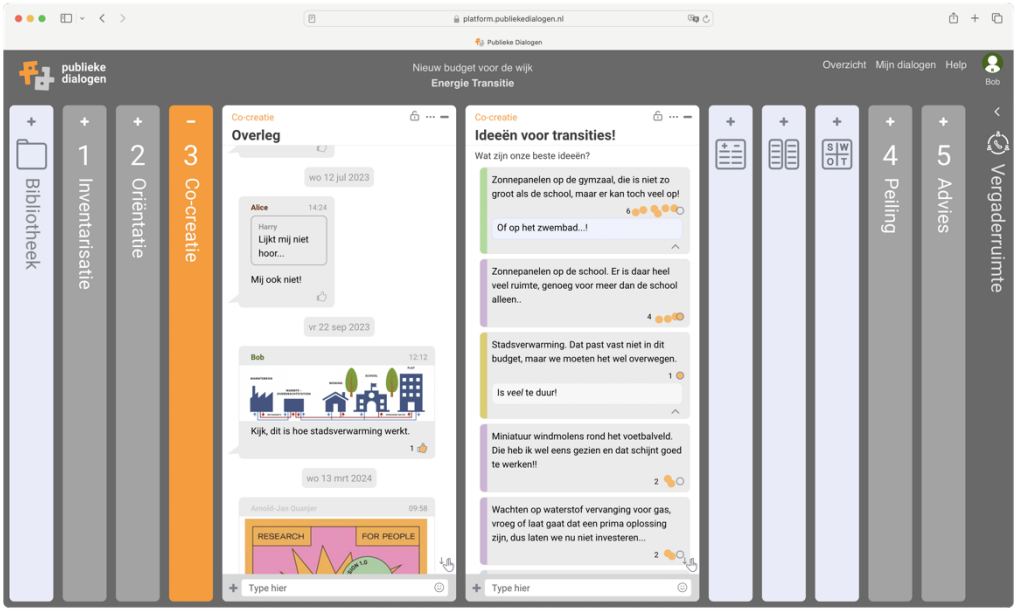

Figure 1. Online deliberation platform 'Publieke Dialogen'

THUAS research group Future Urban Systems

The Future Urban Systems research group focuses on urbanization and methods to accelerate transitions towards smart, sustainable and inclusive cities, also in alignment with the international vision for people-centred smart cities (Sebastian, 2024; UN

Habitat, 2023). Proof of concepts and outcomes of this research effort will be showcased in the Innovation Playground – Experience Centre at the main university campus.

DutchVR

DutchVR is an agency in The Hague, dedicated to creating high-quality experiences in virtual environments. Through its platform or custom applications, DutchVR tailors solutions to clients' needs. Early in The Hague's city development plans, the municipality commissioned DutchVR to develop a serious game for citizen participation. In this game, participants shape the area around The Hague Central Station by placing virtual buildings and designing public spaces. Their choices impact variables like safety, greenery, and relaxation, allowing users to see the effects of their urban planning decisions.

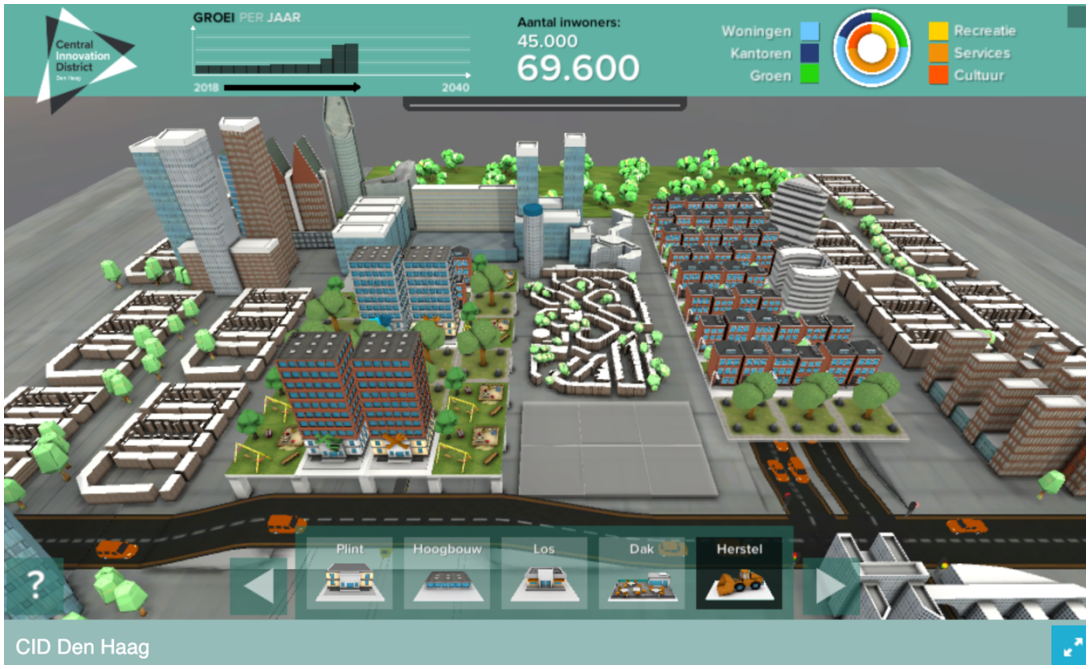

Figure 2. Demonstration of immersive experience in inclusive development of Central Station. Image source: DutchVR.

3. Research, development and demonstration

In the search of immersive ways to shape citizen participation on a more visual way the following research question has been defined:

How can immersive techniques such as Augmented Reality and Virtual Reality effectively contribute to the communication of local spatial data and to citizen participation in municipal activities, both physically and online?

1. What processes are essential for creating an effective immersive representation of local spatial data?
2. Which immersive visualization forms are most effective for citizen participation?
3. How can a physical immersive experience of local spatial data contribute to citizen participation during municipal meetings?

4. How can immersive techniques be integrated into an online participation process, possibly following a physical citizen participation meeting?

3.1 Development of serious gaming in AR Tabletop using the data from Data Lab

The pilot project introduced an Augmented Reality (AR) Tabletop, combining AR with physical interactive elements for an immersive experience. Using DataLab data, the installation presents a small section of the city (Vijverhof, The Hague), allowing residents to shape the area by placing virtual buildings and designing public spaces, while monitoring impacts like safety and greenery. These images can be uploaded to the Public Dialogues platform, encouraging broader discussions on urban development ideas. In public dialogues, you can admire and comment on the designs created, as well as gain insight based on three parameters: safety, green spaces, and relaxation. These metrics are based on the number of elements that influence those parameters.

This pilot informs future iterations of this project: (1) an immersive representation of the new Campus Quarter, (2) a representation for other neighbourhoods, and (3) a virtual version integrated into Public Dialogues. With that iterations this visual participation tool can be widely used throughout The Hague and other cities.

In February 2025, citizens of The Hague can visit an exposition with the five best examples of an Open Government at the Atrium of the city hall. In addition to these examples, the AR Tabletop installation is presented to gather first observations of how people experience using this form of participation.

Figure 3. Players using the AR Tabletop Game during the exposition Open over Open located at The Hague city hall

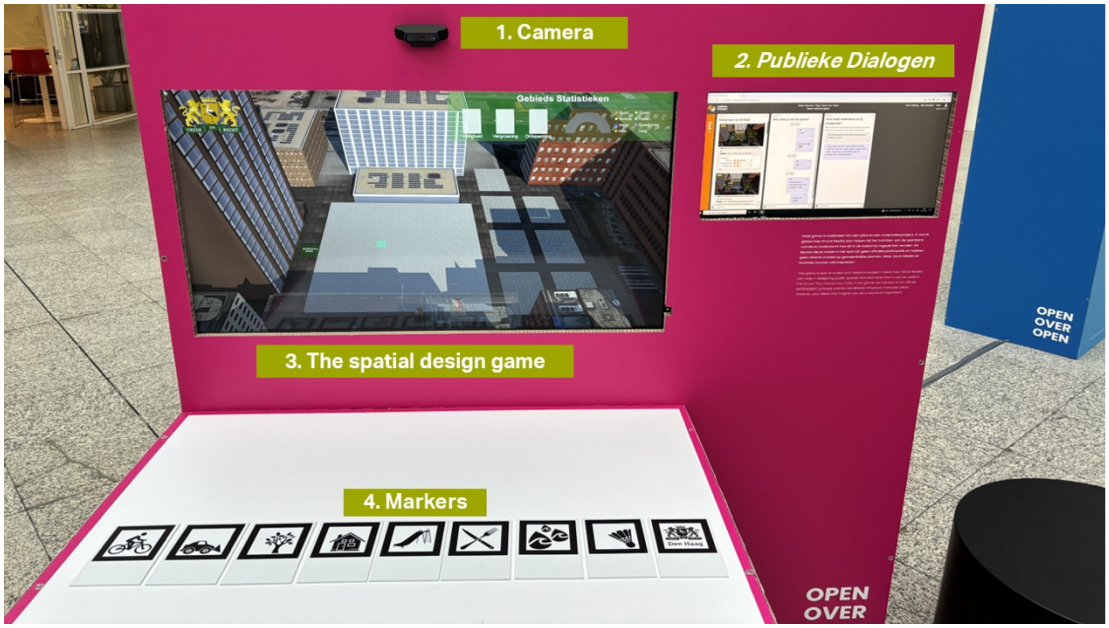

Figure 4. Overview of the components of the AR tabletop game
1. Camera – Scans markers.
2. Public Dialogues – Online platform to view and discuss designs.
3. Spatial Design Game – Players digitally shape the Vijverhof area, impacting safety, greening, and socialization.
4. Markers – Physical icons detected by the camera to place buildings, parks, and facilities or remove objects.

4. Outcome and reflection

During the exhibition, we identified several areas for improvement:

Usability & Intuitiveness : A grid helps users orient markers, but fine positioning remains challenging, leading some to give up. Simplifying the grid (8x8 instead of 12x12) made placement easier. Flipping the camera also improved intuitiveness.

Interaction & Experience : Animations (e.g., cyclists on bike paths) enhanced engagement. Marker switching was too fast (one second). Extending this to three seconds improved usability.

Target Audience & Engagement : Children engaged more easily than adults, who often lacked time or interest. Providing seats and headphones for video content could encourage deeper engagement. The interactive installation has a 1-3 minute learning curve, impacting participation rates.

5. Conclusion and discussion

This project aimed to explore how immersive technologies could enhance citizen participation in urban planning of a city. By integrating data with immersive experiences, we aim to create engagement in and understanding of city developments. The pilot demonstrates that such approaches can engage residents in meaningful ways, allowing them to shape urban spaces, monitor the impact of their decisions, and discuss their plans afterwards.

The outcomes reveal several key insights. First, usability improvements, such as simplifying the grid and extending interaction times, made the installation more user-

friendly. Additionally, targeting a broader audience, especially children, was successful, though engaging busy adults remained a challenge.

Acknowledgements

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