Team Fürth 1

LUISENBOT

Hybrid Design Thinking Process

Mission Statement:

Our mission is to transform public participation by making it truly inclusive, accessible, and impactful through a hybrid concept that combines digital intelligence with collaborative co-creation.

(SOT86750)
sustAInability

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Table of Contents

1. Introduction[1]

Redesigning public spaces is key to creating livable, sustainable, and inclusive cities, but often faces major challenges. In Fürth, the Luisentunnel, an underpass between Südstadt and Oststadt, is set for transformation. Currently uninviting due to poor lighting and accessibility, it acts more as a barrier than a link. However, the tunnel holds great potential as part of a larger urban development project, the creation of a "green pedestrian axis" to make Fürth more pedestrian-friendly and sustainable. The aim is to redesign it through an inclusive participation process, raising the central question: How can participation be made truly inclusive and accessible to generate the greatest value for the city and its residents?

2. Problem[1]

Public transformation processes often face the same key challenges such as being uninviting and inaccessible. This was also confirmed in expert interviews during our research. Dr. Claudia Nicolai, Academic Director of the HPI d-school, emphasized that traditional participation formats are often too complex, time-consuming, or formal, making them discouraging for many people. As a result, participation often attracts the same small, relatively homogeneous group, typically those who are already well-informed and have enough spare time. This lack of inclusivity means that important perspectives, such as those of people with disabilities, full-time workers, or non-native speakers, are frequently left out. Their voices remain underrepresented, which can reduce acceptance and lead to solutions that fail to address the needs of all affected citizens.

3. Concept

Rethinking public participation processes holds significant potential. By making participation more accessible and inclusive, cities can unlock valuable perspectives. Inspired by the HPI d-school's Design Thinking project in Berlin (Hasso Plattner Institute, 2025), we propose a hybrid DT approach to overcome traditional participation limits and empower citizens in shaping their urban environment.[1]

In our approach, the first three phases of the Design Thinking Process, ***Empathize, Define***, and ***Ideate***, are facilitated by LuisenBot. In the ***Empathize*** phase, the chatbot introduces the project and collects user impressions of the tunnel along with basic personal information to understand individual needs and

[1] Nina Lermer

challenges. During the ***Define*** phase, LuisenBot analyzes responses to identify common patterns and create representative personas that reflect typical user groups. In the Ideate phase, users are encouraged to suggest improvements that would make them more likely to use the tunnel. These inputs are clustered and synthesized, forming the basis for the subsequent in-person workshop.[1]

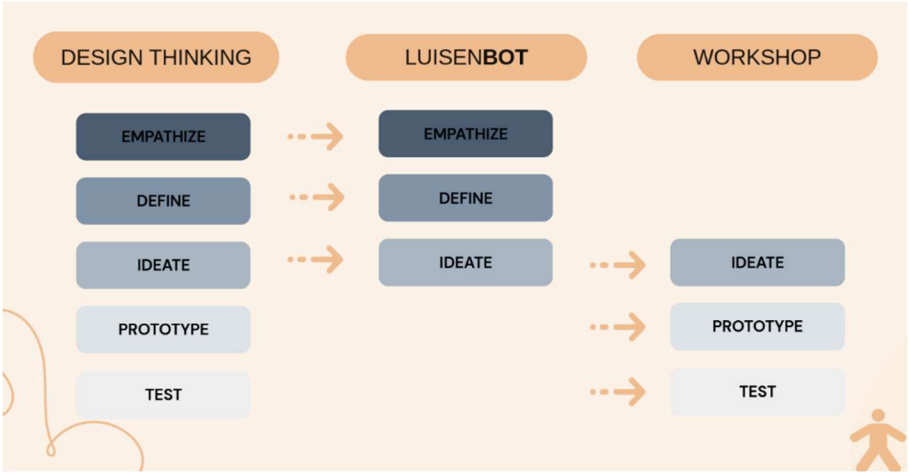

Figure 3-1: Design thinking process structure

Based on the input gathered, user groups and personas are developed that reflect the diversity of the local population. These insights are then brought into a structured analogue workshop setting. The participants for the analog workshop are chosen based on the social groups identified during the digital phase. This ensures that different perspectives are represented, especially those that are often left out in traditional participation formats. In addition, representatives from civil society and public administration are invited to develop solutions together.[2]

Through this hybrid process, we aim to combine the broad reach and flexibility of digital tools with the creative and collaborative potential of face-to-face interaction. This makes public participation more inclusive, more effective, and ultimately more democratic.[2]

The transition from a digital to an analog format is a key feature of our process. The chatbot ensures low-threshold, asynchronous participation, making it possible for a broader and more diverse audience to engage with the project in their own time and language. By using simple language and offering multilingual support, LuisenBot makes participation accessible even to those who may not speak German fluently. It also addresses time constraints, enabling people with full-time jobs or caregiving responsibilities to contribute outside of regular working hours. Additionally, it is designed with

accessibility in mind, allowing people with physical or cognitive limitations to take part more easily than in traditional formats.[2]

4. LuisenBOT[3]

LuisenBot is the *digital front door* of our participation concept. While Chapter 3 already explained *why* we follow a hybrid Design-Thinking approach, this section clarifies *how* the bot fits in: it takes care of the first three DT phases (Empathise → Define → Ideate), gathers raw impressions, and pre-clusters them before the ideas move into the on-site workshop. In other words, LuisenBot equals breadth, the workshop equals depth.

4.1 How the bot works

Every user message reaches us via the Telegram Bot API and is forwarded to one compact n8n flow. The flow has three logical lanes—text, voice, and images:

Text lane: If the payload is plain text, a short phase-specific prompt is sent to our language model (currently GPT-4o). The reply comes back in < 2 s and is pushed to the chat.

Voice lane: Voice notes are downloaded, transcribed locally with Whisper-small, and the transcript is fed through the same prompt as above. Keeping transcription on-premises avoids cloud round-trips and protects privacy.

Image lane: When users upload a sketch or photo, a small Python script calls GraphicsMagick to paste the image onto a high-res photo of the tunnel wall. The preview is delivered to the user in roughly 3 s. No diffusion model is involved, just classic bitmap math.

A tiny Postgres table holds the chat state (current DT phase, language, user ID) so the bot remembers what it already asked. All of this runs on an old Laptop, reused as Server.

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[2] Katharina Kaun

[3] Oskar Breitfeld

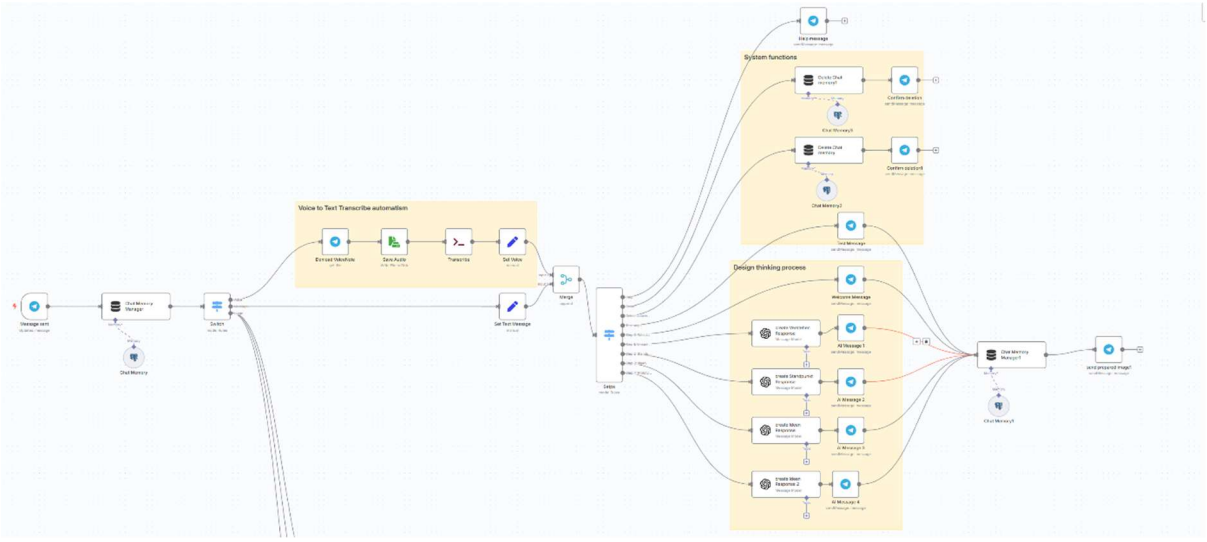

Figure 4-1: Backend view of Voice and Text Lane for Luisenbot in n8n

4.2 Key usability Functions

LuisenBot adapts its wording to each Design-Thinking phase, so the chat stays focused and never feels like small talk. Users who prefer speaking can simply dictate their thoughts; a local transcription service turns the audio into text on the fly. When someone uploads a sketch or photo, the bot returns a preview that shows the image projected onto the tunnel wall, instant visual feedback that sparks creativity. The commands /reset, /help and /delete let participants restart the session or wipe their data whenever they want, providing unobtrusive but complete GDPR control.

4.3 Sustainability angle

Efficiency was a design requirement from day one. Whisper-small runs locally on our server, drawing about 15 W during short transcription bursts, so no audio ever leaves the premises. The tunnel preview relies on light-weight GraphicsMagick operations instead of energy-hungry diffusion models. In production we plan to swap GPT-4o for a fine-tuned Llama-3 8B hosted on municipal hardware; early tests suggest roughly 70 % less CO_2 per chat message. With these steps the bot meets the city's digital-sustainability goals and stays within the energy benchmarks set out by Strubell et al. (2019).

5. Value Proposition[4]

Public participation procedures are often overlooked. When they are noticed, they are frequently perceived as complex, time-consuming, and lacking real impact. As a result, these processes suffer from low engagement and limited involvement, leading to outcomes with low legitimacy and causing frustration within the broader community. Not just Fürth, but many other cities face a similar problem:

We argue that our concept addresses the root causes of this issue. Our hybrid, AI-supported approach makes public participation simpler, more transparent, and more accessible. Our goal is to engage a broader audience, especially underrepresented groups often excluded by traditional participation formats. We improve the conventional process in several ways. Digital features lower the threshold for commitment and reduce the time needed to participate. This benefits the majority of employees. Functions like multilingual support also empower marginalized groups to voice their opinions and contribute to shaping their environment.

This approach not only broadens participation but also enhances the process in terms of speed and quality. The analog design thinking process is both supported and optimized by digital steps. Data-driven insights can be leveraged to achieve better outcomes. Moreover, by using existing yet underutilized technologies, our solution offers a low-cost, low-effort alternative to labor- and time-intensive workshop planning.

While the concept was developed using the Luisentunnel as a use case, it is designed to improve public participation processes in general. With only minor adaptations, it can be applied to different topics and cities, making it versatile for a wide range of urban development challenges.

Our hybrid model can be white-labeled and scaled to other urban infrastructure projects, empowering municipalities to foster citizen-driven design processes under their own branding. In our case, the City of Fürth takes on a pioneering role in transforming public participation by combining digital tools with proven methods. This presents an opportunity for increased visibility, funding, and strategic positioning as a forward-thinking Smart City.

In the long term, we aim to form strategic partnerships with existing solutions to further develop our concept. For example, by integrating with digital public participation platforms and contributing to an ecosystem for digital design thinking processes.

[4] Duc Huy Nguyen

6. Teamwork[5]

The project was developed collaboratively by a team of four members. One team member focused primarily on the development of the chatbot, ensuring its technical functionality and user accessibility. Two others worked on shaping the overall concept, including the structure of the hybrid process and its integration into urban planning. The fourth member supported both the technical and conceptual aspects, helping to align the chatbot's capabilities with the goals of the participation process.

7. Limitations[6]

It should be made clear that this is a prototype. The basic concept has been developed but still needs to be refined in many respects. The individual steps would have to be expanded during further development.

The LuisenBot should be designed in such a way that it can ask in-depth questions to avoid superficial queries. In the analog workshop, it must be further developed how the data from the Luisenbot can be introduced and which exact methods are used in the DT steps.

There are also still conceptual challenges. The acceptance of the general public towards digital offerings must be tested. In particular, the challenge of ensuring that digital services can be used by people with no technological affinity.

8. Conclusion

This project has shown the potential of a hybrid participation model to improve inclusivity, accessibility, and the quality of public engagement in urban planning. By combining digital tools like LuisenBot with in-person workshops, it lowers barriers and reaches a broader, more diverse audience than traditional formats. At the same time, the in-person phase allows for deeper discussions and supports collaboration between different stakeholder groups.[7]

The prototype also brings to light several challenges: ensuring a seamless transition between digital and analogue phases, addressing potential biases in participant selection, and refining how personas guide

[5] Katharina Kaun

[6] Duc Huy Nguyen

[7] Nina Lermer

group work in the workshop setting. These issues must be addressed in future iterations to increase robustness and impact.[8]

Nevertheless, the concept is highly adaptable. With minimal modifications, it can be applied to a wide range of urban infrastructure projects beyond the Luisentunnel in Fürth. Its scalability and modularity offer municipalities a powerful tool to foster more democratic, user-centered, and sustainable urban development, positioning cities like Fürth as frontrunners in citizen-driven innovation.[8]

[8] Duc Huy Nguyen

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