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Co-Designing Shared Mobility in Fredrikstad: A Clearing for Citizens and Multi-Stakeholders

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Abstract. Shared mobility is gaining traction as cities seek sustainable alternatives to private car use, but its development and implementation remain complex, particularly in the public sector where diverse stakeholders' interests, regulation, and evolving user needs converge. Co-design has emerged as a promising approach to address these challenges. This paper presents a co-design case from the Seamless Shared Urban Mobility (SUM) project in Fredrikstad, Norway which aims to integrate an electric automated ferry line to improve accessibility and promote commuting by bike, foot and shared mobility. Two rounds of co-design workshops were conducted with citizens, planners, ferry operators, and service providers to identify problems and co-create solutions. Different tools were designed to support the capturing, visualization, and concretization of ideas. The process has already generated actionable ideas that take into consideration the journey beyond the ferry transfer. Identified co-design process challenges range from recruitment of participants to the need for flexibility, adapting the process to real-world conditions and changes. Nevertheless, the paper argues that co-design offers a clearing, a conceptual space where diverse perspectives converge, and mobility solutions can take shape organically.

Keywords: Co-design · Shared Mobility · Multi-stakeholder · Living Lab

1 Introduction

Shared mobility, the shared use of travel modes such as bikes, scooters, or cars on an "as-needed" basis [1], has been widely promoted as a means to reduce private car dependency and enable flexible, sustainable urban travel. Often introduced to complement public transport and bridge "first-mile/last-mile" gaps, shared mobility is framed as part of a broader shift away from private car ownership [2, 3]. This vision has made shared mobility an attractive area of investment and experimentation for a wide range of stakeholders. In practice, translating this car-alternative vision is fraught with complexity. Challenges include car dependence and systemic lock-ins [4, 5], multi-level governance in transport [6, 7], blurred public-private roles [8, 9], and nuanced user needs in retrofitted urban contexts. These issues call for stronger collaboration and communication between otherwise isolated actors.

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Co-design has been proposed as one way to address the complexity of mobility transitions by directly engaging citizens and stakeholders. Recent studies highlight how co-design helps uncover user needs, navigate practical challenges, and empower marginalized voices [10–12]. However, since its inception, co-design has often been conflated with co-creation and interpreted in diverse ways [13], making it difficult to assess its potential contribution. In this study, co-design is defined as the simultaneous involvement of citizens and stakeholders in collaboratively addressing challenges, and we ask: How can co-design, as a method of engaging citizens and stakeholders, help address the complexity of shared mobility transitions?

2 Method

To explore the research question, we conducted a co-design process in collaboration with the municipality of Fredrikstad, Norway, focusing on how a new, potentially autonomous ferry line could be integrated into the public transport system to improve commuting experiences and offer a viable alternative to car use, as part of the EU project Seamless Shared Urban Mobility (SUM). Fredrikstad's free-to-use ferries are vital means of crossing the river dividing the city and deeply embedded in its identity. The route piloted in SUM will provide a shortcut between residential areas and an industrial zone employing 2,500 people, constituting a competitive alternative to driving.

The study applies co-design, working together with "everyday people" in the design process [14], as the primary method for developing service-based mobility solutions, situated within a research-through-design framework [15]. Generative sessions that facilitate "making" as a way of surfacing tacit and latent knowledge and learn what participants know, feel, and dream [16], are used to elicit deeper knowledge than interviews and observations. In line with the fourth direction of co-design [13], the process involves "not only users" in the collaboration but also diverse stakeholders: municipal planners, ferry operators, service providers, and SUM partners. Thus far, the co-design process comprises two stages, with in-person workshops held in Fredrikstad (Fig. 1).

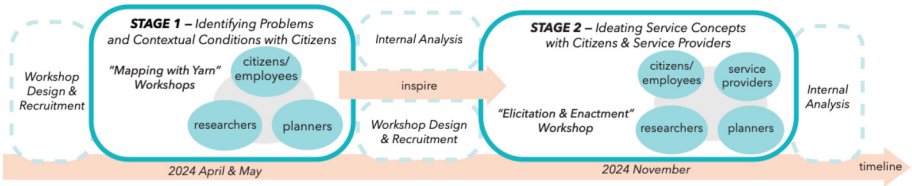

Fig. 1. Co-design timeline and completed stages

Stage 1 of the co-design process was held shortly after the new ferry line's full operation (April 2024) and aimed to identify problems and contextual conditions with participants who had first-hand experience of the new route. Stage 2 (autumn 2024) generated service ideas to improve "the ferry ride and beyond", bridging people's everyday mobility practices with potential solutions from service providers. The process was

designed to be adaptive, with each stage building on the insights and dynamics of the previous one.

With the belief that all people can be creative given the proper conditions, each stage used carefully tailored tools to help capture, visualize, and concretize ideas. Informed by the tell–make–enact framework [17], the tools position participants as active contributors in imagining and shaping potential futures. In Stage 1, tactile foam maps, yarn, pins, and stickers were used to visualize citizens' travel routines, identify challenges, and co-create new ferry-inclusive routes. To elicit relevant ideas in Stage 2, a "Service Idea Buffet" manual was created based on Stage 1 insights. Prompts were intentionally ambiguous (e.g. "leave something," "pick up something," "do something while waiting") to boost creativity and discussion. Participants prototyped service concepts for daily life scenarios, which were recorded, discussed, and voted on with all groups.

Across stages, the tools and techniques reflect a core design principle: playfulness as a catalyst for creativity. Enjoyable, playful activities fuel engagement, especially for participants unfamiliar with one another. Thus, materials and activities were chosen to be easy-to-engage-with, visually intuitive, and culturally familiar. Yarn is e.g. easily pinned and modified on the foam map, and links Norway's knitting culture. Sketches and illustrated instructions increased accessibility and supported communication across language barriers, while lighthearted roleplaying by facilitators energized and guided participants.

Participants were recruited by the local Fredrikstad team through open calls via municipal channels and ferry ads. This drew limited turnout, but participation snowballed as attendees invited others. Later, targeted email invitations through earlier attendees and municipal networks enabled more deliberate inclusion of relevant stakeholders. Groups were intentionally made to balance power dynamics and foster inclusivity, considering roles, authority, expertise, and creativity.

The co-design process was documented via audio recordings, photos and workshop artefacts (e.g., maps, notes, videos). Recordings were transcribed and analyzed thematically to link participants' spoken reflections with hands-on actions, supported by artefacts and researcher observations. The analysis focused on recurring tensions, design opportunities, and shared priorities. Visual and performative outputs were interpreted both for their content on participants' explicit ideas and the situated knowledge they embodied about underlying needs and aspirations.

3 Results and Discussion

3.1 Stage 1: Identifying Problems and Contextual Conditions

In the first-stage workshops, eight citizens worked alongside two ferry operators, two city planners, and one ferry company representative. Groups of 2–3 citizens with 1–2 facilitators mapped their commutes using yarn, while other participants rotated between groups to maximize input, sparking vibrant, reflective conversations (Fig. 2). The mapping activity revealed practical and experiential barriers to shifting from car use to shared mobility via the new ferry line. Safety concerns were a major deterrent, especially along industrial roads, which were seen as "horrible for biking" and "just a boring road, it

never ends!" with heavy trailers that "don't stop when you come". Seasonal discomfort, limited shelter infrastructure, and low awareness of park-and-ride facilities further discouraged active transport. Despite these challenges, the workshops fostered creative, context-based ideas such as integrated bike routes, youth-friendly mobility, and supportive services like a bus connection to workplaces. Practical considerations also shaped modal choices: participants calculated savings from tolls and congestion taxes, noting "win-wins" like fitness and affordability. Errands such as shopping, childcare, and gym visits were discussed as part of route planning, highlighting the need for integrated services for the ferry ride and beyond. Emotional and symbolic connections to the ferry also emerged, reinforcing its potential as a cultural anchor. As one participant put it, "we have the culture for taking the ferries; the culture is there". In summary, the Stage 1 approach enabled participants to articulate needs, evaluate trade-offs, and co-create feasible improvements grounded in lived experience.

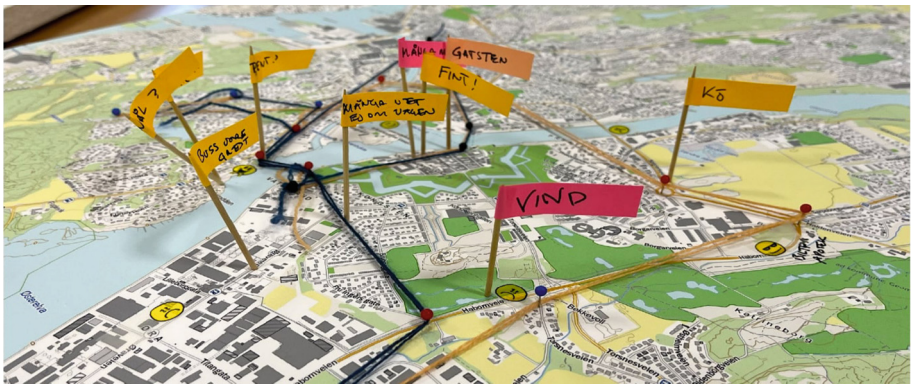

Fig. 2. Example of mapped commutes. Participants mapped their current route (orange) and proposed ferry-based route (blue), adding thoughts and feelings with stickers and flags

3.2 Stage 2: Ideating Service Concepts

The second-stage workshop gathered 34 participants from varied backgrounds, including returning attendees and newcomers such as community representatives, architects, students, consultants, a shoemaker, tourism and hospitality professionals, librarians, a car-share provider, and municipal planners (tourism, culture, cycling, town planning). Participants were divided into 6 groups (A - F), each with two citizens, one service provider, and two municipal representatives from different departments, ensuring that non-decision-makers outnumbered decision-makers. The service providers were positioned as leads to foster ownership over potential service design concepts.

Groups co-created service concepts ranging from infrastructure improvements to experiential offerings across three themes: 1) commuting enhancements (waiting room amenities, real-time traffic updates, exclusive environments); 2) cultural experiences (storytelling, local history, social interaction aboard the ferry); and 3) practical services

(food vending, phone charging, shared bookshelves, repair stations). A playful enactment activity, introduced through humorous facilitator roleplay, sparked high energy and creativity. Each group produced a short film illustrating their ideas, showing how ferry-based services could reduce car use and enhance everyday mobility (Fig. 3).



Fig. 3. A comic-form interpretation of the service idea films from each group

The six short films illustrated diverse service concepts—from joyful moments like enjoying coffee in a sheltered waiting area, to practical solutions such as phone charging stations, multimodal shopping trips, and waiting rooms with real-time info and services. Ideas also included integrated service exchanges and sightseeing app with AI functions.

Most groups returned early and enthusiastically, claiming their film was "the best." A quick vote followed, with Group C winning for its clear narrative and "bringing back something old that often gets forgotten." Group A was praised for its fun and local business potential, and Group E for simplifying everyday life. While the films and votes offered lively and immediate insights, the final interpretation of service concepts was not based solely on these outputs. Given the spontaneous nature and limited time of the activity, the video data were further analyzed alongside other artefacts, participants' preferences, and broader goals of city planners, to present three refined proposals for future testing in a proposed stage 3. These were: an on-demand ferry service that feels fun, seamless, and reliable; added ferry stop services to utilize waiting-time to simplify multi-task trips; and a waiting experience that emphasizes comfort and local identity.

3.3 Co-Design as a "Clearing" for Shared Mobility

Drawing on Heidegger's concept of the clearing (Lichtung) [18], we understand co-design not merely as a method, but as a condition—a space where diverse perspectives can unfold, needs and possibilities are revealed, and shared understanding can take root. In this sense, participants are not just informants or users, but co-creators of meaning and direction. The clearing is not simply an open space, but a moment of revelation where beings emerge as they are, amidst the boundless forest of complexity.

In the first-stage workshops, map-based and hands-on interactions created such a clearing. While physically mapping their routes, participants revealed latent preferences while moving pins: "I cycle through Kongsten… it's safe… actually nice", insights that otherwise may remain hidden to themselves and to research. The yarn mapping slowed down conversation, enabled reflection and quick spatial references ("here," "there"). This supported shared understanding and let ideas take shape organically when participants articulated challenges and imagined possibilities, "building scaffolds" [19] for "what could be done". Two employees pictured supporting each other: "you could have parked in my yard… and then just taken the ferry over". Joint reflections on operational constraints and early-hour commutes led to the idea of an on-demand ferry: "they press the button and the ferry goes over".

The clearing also enabled stakeholders to test assumptions and explore feasibility. Power dynamics surfaced through negotiation moments. When a bus connection idea was proposed, the city planner confirmed its upcoming implementation—validated by citizen needs. In response to shelter infrastructure suggestions, planners offered alternative solutions with less construction, which received approval.

Finally, the collaborative nature of co-design fostered a shift from "I" to "we." This was especially visible in the enactment activities, where most films addressed shared needs beyond individual concerns. This shift is not only about pride in ideas but exhibiting a trace of moving towards each other in getting closer to the problem. In this way, co-design becomes a clearing: a conceptual and practical space where daily routines are momentarily suspended, individual concerns are gently surfaced and broadened into shared needs, and the collective movement toward the defined problem is illuminated. Conflicts are empathized, possibilities imagined, and solutions co-created.

3.4 Lessons Learned from Real-World Co-Design

There is a strong need for flexibility and real-time responsiveness in co-design practice within shared mobility projects. Recruiting participants, especially when aiming for a balanced mix of citizens and stakeholders, proved to be more difficult than expected and required constantly adapting to fluctuating participation. Flexibility was particularly important when ferry routes changed and the participant base shifted, making it necessary to adjust activities and communicate transparently between sessions.

In the second stage, role alignment emerged as a factor influencing engagement and outcomes. For instance, a local shoemaker, invited as a service provider, preferred to contribute as a citizen, explaining that she "doesn't need more work." In fact, three of six service providers enacted citizen roles in their group videos. A carsharing provider noted

difficulty connecting his service to group needs, though the group still included carsharing in the final scenario. These moments illustrate how participants may reinterpret or resist pre-defined roles, underscoring the need to design flexibly around participants' own motivations.

This can also be interpreted from another angle: "everyday people" are not workshop experts. The activity aimed to connect participant needs with their assigned service provider's offerings, but some groups struggled to make such explicit links. Group D for example focused on general amenities rather than shoe-related services, group B (librarian) proposed more ferry stops near libraries but not digital or outreach services. In contrast, group F (hotel manager) emphasized the ferry as an experience, beginning at the nearby stop, suggesting apps and cultural content—ideas that aligned well with hotel business. This suggest that while participants can imagine services broadly, bridging them to specific business models requires more targeted facilitation.

Proving the impact of co-design is inherently challenging. As a dynamic and open-ended process, its outcomes often emerge informally, through spontaneous interactions, evolving relationships, and subtle shifts in tone, trust, and shared understanding, rather than visible workshop outputs. These intangible gains reflect the complexity of participation and may hold different value for researchers, stakeholders, and citizens, making it difficult to sustain shared interest over time. Here, the playful approach proved important, helping sustain interest by catalyzing creativity and shared joy. Interpreting co-design data also requires care. Multiple layers must be considered: participant voices, qualitative findings, stakeholder resources, and overarching project goals. Given the diversity of backgrounds and expectations, participants may benefit unevenly. These complexities stress the need for thoughtful coordination, especially in cross-country, cross-language collaborations, while acknowledging that full alignment is not always achievable.

While grounded in Fredrikstad, the findings highlight transferable aspects of co-design, such as surfacing solutions sensitive to user needs and negotiating practical constraints across stakeholders. Over time, such processes can support mobility transitions by fostering shared ownership, trust, and adaptable service developments.

4 Conclusion

This paper has shed light on how co-design can help navigate the complexity of shared mobility transitions through co-design workshops with citizens and multi-stakeholders. We argue that co-design in shared mobility offers more than generating ideas; it creates a clearing where people can imagine themselves as part of the system, not just users of it. In this clearing, diverse perspectives come into view, assumptions are tested, and shared understanding can take root. Here, creativity, practicality, and playfulness can coexist, offering a glimpse, for all involved, of what a more inclusive and responsive mobility future might look like.

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