A Sociomaterial Framework for Orchestrating Knowledge Co-Creation in Expert Communities

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Abstract: Complex societal challenges increasingly require knowledge co-creation that unites diverse expertise across organisational and sectoral boundaries. Such collaboration does not usually arise spontaneously but requires orchestration practices to coordinate actors from different fields. Previous research on orchestration has examined networks, expert communities, digital platforms, collaborative processes, and material artifacts largely as separate streams of research. However, less attention has been paid to sociomaterial orchestration in voluntary expert communities on digital collaboration platforms. Therefore, the research question is "How is knowledge co-creation orchestrated in expert communities on a digital collaboration platform?" The empirical setting is based on the Fast Expert Teams model developed at LUT Business School, which invites volunteer experts from different sectors to engage in pro bono work on complex societal challenges through a four-week digitally mediated collaboration process. The study adopts a Participatory Action Research (PAR) approach and qualitative methods, through which the research team both implemented FET initiatives and conducted research. The empirical data consist of six FET collaboration processes, ranging from approximately 50 to over 100 participants, from which rich longitudinal qualitative data were collected. The study draws on process analysis and practice-based theorizing. The study develops a sociomaterial framework for orchestrating knowledge co-creation in expert communities. Sociomaterial orchestration aligns social, processual, technological, and material dimensions to enable collective outcomes. The framework is scalable and suitable for orchestrating initiatives across different forms of collaboration, from small-scale local projects to global networks.

Keywords: Sociomaterial orchestration, Knowledge co-creation, Digital collaboration platform, Expert community, Participatory action research (PAR)

1. Introduction

Complex challenges, such as climate change, require systemic multi-stakeholder collaboration across organisational boundaries (Briley et al, 2015). Experts can be invited to a digital collaboration platform to generate knowledge on an ad hoc basis for complex tasks that require integrating multiple perspectives (Kryzhanivska, Tuomisalo, Blomqvist, & Kuivalainen, 2025). Orchestration is defined as the management of network collaboration without hierarchical authority, coordinating the contributions of decentralized actors, and is realized through practices that build and manage multi-actor networks (Reypens et al, 2021).

Previous orchestration research has examined actors, platforms, collaborative processes, and artifacts as analytically separate phenomena. Network orchestration typically examines the coordination of actors, relationship management, and the steering of collaboration within networked structures (Dhanaraj & Parkhe, 2006; Hurmelinna-Laukkanen et al, 2022). Platform orchestration research has emphasized the role of digital platform affordances and AI-enabled functionalities in orchestrating distributed actors (Marchese et al, 2026; Treem & Leonardi, 2013; Leonardi, 2013).

Across these perspectives, social, technological, processual, and material elements often remain analytically separated, even though in practice they are constantly intertwined (Orlikowski & Scott, 2008; Hultin, 2019). A sociomaterial perspective would view the social and the technological as mutually constituting practices and relationships (Hultin, 2019). Therefore, this paper adopts a sociomaterial perspective and asks: "How is knowledge co-creation orchestrated in expert communities on a digital collaboration platform?"

The Fast Expert Teams model was developed at LUT University, which invites volunteer experts to co-create knowledge on a digital collaboration platform. These experts co-create knowledge in sub-teams over a four-week period to address themes of local, national, or international significance (Blomqvist, 2022a; OECD, 2021). The LUT team has served as a central actor by bringing together experts and participants from diverse sectors of society to address socially impactful themes (Ritala et al, 2023).

This study adopts the Participatory Action Research (PAR) approach, which involved the research team both implementing FET initiatives and conducting research. The cases presented in this paper are six Fast Expert Teams processes ranging from approximately 50 to over 100 experts from various sectors of society, including education, the public and private sectors, municipalities, ministries, local and international networks (Zandee & Coghlan, 2025). This study contributes to orchestration research by offering a sociomaterial perspective on

knowledge co-creation (Hultin, 2019). It develops a scalable framework that conceptualizes orchestration as the shaping of sociomaterial conditions.

2. Conceptual Framework: Sociomaterial Orchestration of Knowledge Co-creation in Expert Communities

A central company or key network actor typically acts as an ecosystem orchestrator, intentionally coordinating dispersed expertise and resources to create and capture value (Shen et al, 2024; Dhanaraj & Parkhe, 2006). Orchestrators are intermediaries that influence, coordinate, and shape relationships within the ecosystem (Ritala et al, 2023). Shen et al (2024) present key orchestration practices, such as strategic ecosystem planning, resource integration, technology utilization, innovation, and relational practices. Previous orchestration research has identified numerous practices for coordinating actors, resources, technologies, and collaborative activities (Dhanaraj & Parkhe, 2006; Reypens et al, 2021; Shen et al, 2024).

This study conceptualizes orchestration as the shaping of sociomaterial conditions that enable distributed knowledge co-creation. From a sociomaterial perspective, knowledge co-creation emerges through the entanglement of social, processual, material, and technological elements in practice (Reypens et al, 2021; Hultin, 2019; Orlikowski, 2002; Orlikowski & Scott, 2008). Sociomateriality holds that "the world is constituted by or comprised of ontologically distinct entities (social and technical) that interact or connect to produce organisational phenomena" (Priharsari & Abedin, 2021; Hultin, 2019, p. 91). This study proposes four interdependent dimensions of sociomaterial orchestration: expert community, knowledge co-creation process, digital collaboration platform, and artifacts and boundary objects. Together, these dimensions form the foundation of sociomaterial orchestration and provide the analytical structure for this study (Figure 1).

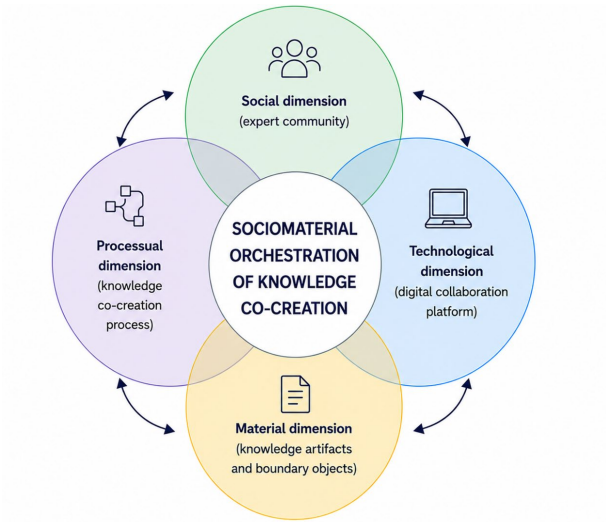

Figure 1: A framework of sociomaterial orchestration of knowledge co-creation in expert communities

2.1 Social Dimension: Expert Community

The expert community forms the social dimension of orchestration. Online communities are groups with shared goals that operate virtually despite geographic dispersion and enable knowledge sharing (Faraj et al, 2011; Faraj et al, 2015; Faraj et al, 2016). Priharsari and Abedin (2021) introduced the concept of communities of interest—online communities united by a common interest or passion. These communities comprise experts from various fields who contribute dispersed expertise to the shared co-creation process. Previous orchestration research has emphasized the importance of fostering trust, developing shared identity, promoting interorganisational socialization, and enabling knowledge mobility among participants to support collaboration and value creation (Dhanaraj & Parkhe, 2006; Reypens et al, 2021; Shen et al, 2024).

2.2 Processual Dimension: Knowledge Co-creation Process

The knowledge co-creation process constitutes the processual dimension of sociomaterial orchestration, as experts' tacit knowledge does not automatically become shared, explicit knowledge. Individual perspectives, experiences, and expertise must be made explicit, shared, refined, and gradually integrated into a shared understanding and collective solutions (Nonaka & von Krogh, 2009). Experts often come from diverse professional backgrounds and may therefore interpret problems differently. Participants use distinct concepts,

and may employ several approaches or practices, creating knowledge barriers that orchestrators have to actively bridge (Bechky, 2003; Carlile, 2004). Previous orchestration research has emphasized the importance of coordinating collaborative activities, aligning participants' contributions, and guiding collective processes toward shared goals (Dhanaraj & Parkhe, 2006; Reypens et al, 2021; Shen et al, 2024).

2.3 Technological Dimension: Digital Collaboration Platform

The technological dimension comprises digital collaboration platforms and technological tools. When experts work in distributed settings, they leverage technological affordances, turning the collaboration platform into a shared space for interaction (Faraj et al, 2011). Recent research on platform orchestration emphasizes the role of digital technologies in coordinating distributed actors, enabling ecosystem-wide collaboration, and supporting dynamic orchestration capabilities in digitally mediated environments (Marchese, Gastaldi & Corso, 2026). Digital technologies enable synchronous and asynchronous communication (Faraj et al, 2011; Marchese et al, 2026), while platforms can orchestrate autonomous actors in collaborative environments (Weber et al, 2025). They offer affordances such as visibility, editability, persistence, and association (Treem & Leonardi, 2013).

2.4 Material Dimension: Knowledge Artifacts and Boundary Objects

The material dimension consists of artifacts that function as carriers of knowledge and boundary objects between experts (Bechky, 2003; Carlile, 2004). From a sociomaterial perspective, knowledge is constructed through the intertwined interactions of people, technologies, and material artifacts, in which artifacts actively mediate and shape the knowledge (Orlikowski & Scott, 2008; Hultin, 2019). Material orchestration involves creating and leveraging artifacts and boundary objects that enable knowledge sharing across experts and communities.

3. Methodology

This study employs participatory action research, which enables the simultaneous examination of practice and the generation of scientific knowledge (Kemmis & McTaggart, 2000; Sandberg & Tsoukas, 2011; Zandee & Coghlan, 2025). This methodology is "based on a collaborative problem-solving relationship between researchers and clients. Its aim is to solve problems and create new knowledge" (Coghlan, 2011, p. 54). The approach intertwines research and practice, as when the study addresses questions of practical significance while producing practical and scientific outcomes (Sandberg & Tsoukas, 2011; Zandee & Coghlan, 2025).

3.1 Participatory Action Research as a Research Approach

Action research is tied to practice and involves iterative cycles of action and reflection (Orlikowski, 2002; Sandberg & Tsoukas, 2011). It is interventionist and context-bound, with data being inherently contextual and the researcher acting as an agent of change (Coghlan, 2011). Practitioners are viewed as co-researchers whose experiential and practical knowledge is central to knowledge creation (Zandee & Coghlan, 2025).

3.2 Research Setting: Fast Expert Teams

This study draws on six action research cases (Zandee & Coghlan, 2025) in which the research team built, implemented, orchestrated, and studied expert communities known as "Fast Expert Teams (FETs)" (Blomqvist, 2022a; 2022b). The Fast Expert Teams model has also been recognized in OECD work examining twenty-first-century knowledge co-creation initiatives (OECD, 2021). These communities worked on knowledge-related issues using a digital collaboration platform and technological tools (Table 1).

Table 1: Illustrative case examples of Fast Expert Teams processes under several themes

Case / Initiative	Theme	Key Objective / Outcome	Participants
Corona-FET 2020	Crisis response (COVID-19)	Rapid problem-solving during the pandemic; development of an FFP2/FFP3 respirator cleaning method and pilot facility	over 100 experts
Work2030 Hybrid Work and FET Model 2021	Future of work	Development of the FET operating model and hybrid work recommendations for the Ministry	92 experts
Work2030 Technology Industries of Finland, International Talent 2023	Talent mobility and integration	Development of a digitalized immigration and recruitment process, supporting integration into Finnish society and workplaces	50 experts

Case / Initiative	Theme	Key Objective / Outcome	Participants
Work2030 Growth Corridor 2023	Skills shortage and talent integration	Proposals for integrating international students into Finnish working life; enhancing interaction between education, employers, and society	62 experts
P2X Investments FET 2024	Energy transition (Power-to-X) and investment opportunities	Exploration of Power-to-X solutions and ecosystem-level opportunities in energy transition	65 experts
Civil Engineering FET 2026	Vision building for a new civil engineering program	Co-creation of future visions for civil engineering, integrating multidisciplinary expertise across sectors	79 experts

3.3 Data Sources and Empirical Material

Qualitative data were collected from the collaboration processes of six FETs, including interviews, digital traces, meeting transcripts, shared documents, and memos (Table 2). The orchestration practices reported in this study are based on the experiences of project managers, team leaders, and community facilitators and are grounded in empirical observations derived from action research (Orlikowski, 2002; Coghlan, 2011).

Table 2: Overview of data sources and analytical focus

Data source	Aim	Analysis
Digital trace data	Capturing behavioral data and actual knowledge co-creation process	Observing orchestration practices
Orientation interviews	Initial framing and participants' expertise	Identifying relevant themes and participants' interests
Individual interviews	Participants' experiences of FET processes	Qualitative research questions on participation, motivation and feedback
Focus group interviews	Collective reflection on FET processes	Analyzing group-level dynamics and collective learning
Meetings and memos	Capturing ongoing discussions	Contextual knowledge

3.4 Process-oriented Analysis

Data analysis is based on a process-theoretical approach (Langley, 1999), in which phenomena are viewed as chains of events unfolding over time (Van de Ven & Huber, 1990). Process data are multidimensional and context-dependent (Pettigrew, 1992; Langley, 1999). The analysis process is structured into temporal phases (temporal bracketing), which help identify the key stages of knowledge co-creation and the transitions between them (Langley, 1999). The analysis aims to identify the mechanisms and practices that guide the process forward. Theoretical understanding develops iteratively through cycles of action and reflection with theory-building and practical interventions intertwined throughout (Coghlan, 2011; Zandee & Coghlan, 2025). Theoretical concepts and proposals thus evolve through the interaction among practical interventions, empirical data analysis, and reflective interpretation (Figure 2).

Figure 2: Data analysis and implementation in participatory action research

4. Findings: Sociomaterial Orchestration of Knowledge Co-creation in Expert Communities

The key dimensions of sociomaterial orchestration are the social (community of experts), the processual (knowledge co-creation process), the technological (digital collaboration platform), and the material (artifacts and boundary objects). Orchestration is the coordination of these four interdependent elements, enabling the emergence of shared outcomes (Figure 3).

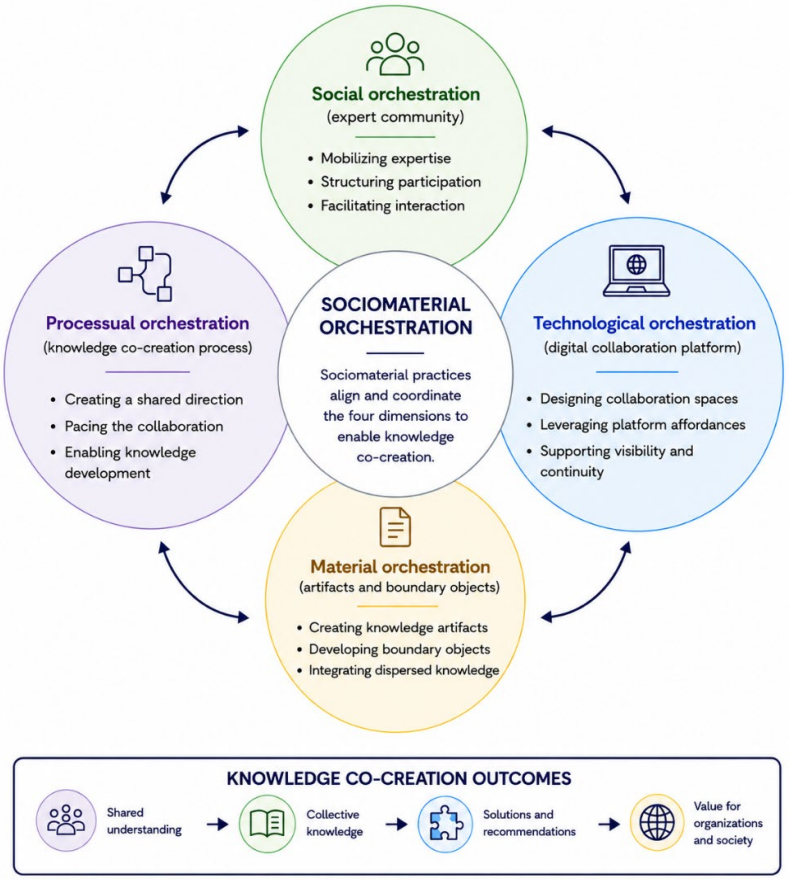

Figure 3: Sociomaterial orchestration of knowledge co-creation in expert communities

4.1 Social Orchestration: Building and Mobilizing the Expert Community

Mobilizing dispersed expertise: Social orchestration begins by identifying and inviting experts with diverse knowledge, experiences, and perspectives relevant to the focal challenge. Experts from different sectors are then invited to engage in a joint knowledge co-creation process. Fast Expert Teams have addressed diverse thematic topics, for example P2X investments, hybrid work, and visions for the future of education.

Structuring participation: Thematic sub-teams bring experts together around shared themes. These sub-teams create spaces for interaction where diverse expertise can develop ideas for systemic and complex phenomena. For example, in the P2X Fast Expert Teams process, the sub-teams focused on energy production, CO_2 capture, regulation, and investment conditions.

Facilitating interaction: Social orchestration also involves creating opportunities for interaction and dialogue among participants through organised meetings. Scheduled weekly meetings, summary discussions, and virtual morning-coffee sessions give rhythm to the community's work. In addition, breakout rooms and collaboration spaces are provided for teams to share their perspectives and discuss ideas. These interactions enable experts to exchange perspectives and combine dispersed expertise.

4.2 Processual Orchestration: Structuring and Sustaining the Knowledge Co-creation Process

Creating a shared direction: Since experts come from different organisations and backgrounds, it is important to establish a shared direction and understanding of the purpose, the community, and the teams' shared goals. Often, at the beginning of a collaboration, the direction can be vague, as the tasks to be solved are frequently

complex and can be approached from multiple angles. A preliminary sense of direction helps participants understand their own role in the collective effort.

Pacing the collaboration: Orchestration focuses on maintaining the rhythm and continuity of collaboration. The co-creation process is organised weekly. The content of the meetings is planned, and different types of meetings serve different purposes: morning coffee discussions spark new perspectives at the community level; weekly morning discussions define direction and purpose; wrap-up discussions conclude what has already been done; and, at team level, the focus is on concrete ideas and solutions. The digital collaboration platform enables continuous knowledge development between meetings through asynchronous interaction.

Enabling knowledge development: Process-oriented orchestration involves facilitating knowledge development by creating structures, phases, and opportunities for work that support co-creation at different stages of the process. As the process progresses, participants engage in tasks, discussions, workshops, and collaborative spaces that encourage knowledge sharing. In this way, orchestration creates the conditions for continuous knowledge development throughout the process.

4.3 Technological Orchestration: Designing and Utilizing the Digital Collaboration Platform

Designing collaboration spaces: Technological orchestration involves the design, construction, and maintenance of various collaboration spaces to meet the different needs of co-creation. Workspaces are designed to support the different stages of co-creation, and each page and collaboration space plays its own role in the process. Support pages provide instructions for using the platform, team-specific workspaces focus on developing themes, and community meeting pages bring together shared materials, recordings, and discussions.

Leveraging platform affordances: Technological orchestration also involves leveraging digital tools and platform features. Various collaboration spaces enable experts to work at both the community and team levels. Through these features, the platform supports collaboration and knowledge sharing among experts.

Supporting visibility and continuity: Technological orchestration supports the visibility of knowledge throughout the co-creation process. Discussions, materials, recordings, and other outputs remain available to participants, enabling them to review previous discussions and develop knowledge even between meetings. In this way, the digital collaboration environment forms an infrastructure that supports knowledge continuity.

4.4 Material Orchestration: Creating and Integrating Knowledge Artifacts

Creating knowledge artifacts: Material orchestration begins with the creation of knowledge artifacts through collaborative work. Experts participate in co-creation by producing content, sharing their perspectives, commenting on others' ideas, and developing ideas together. Discussions, documents, presentations, recordings, and other digital outputs externalize knowledge and make it accessible to other participants. Through these artifacts, knowledge can persist beyond individual interactions and enable the cumulative development of ideas over time.

Developing boundary objects: Material orchestration also involves developing boundary objects that enable the transfer and integration of knowledge. Team workspaces are visible to the entire expert community, allowing discussions to be followed and ideas generated in different teams to be combined. Visualizations, summaries, presentations, reports, and other shared artifacts serve as common reference points for experts to interpret, discuss, and develop knowledge together. In this way, artifacts help bridge the gaps between areas of expertise and perspectives.

Integrating dispersed knowledge: Material orchestration supports integrating distributed knowledge into collective knowledge. Meeting materials, recordings, notes, surveys, and AI-based summaries make the knowledge visible and easily accessible throughout the entire process. Through these artifacts, participants can revisit previous discussions, combine contributions made at different times, and continue developing the knowledge even between meetings. Through material orchestration, expert knowledge is gradually integrated into collective knowledge and shared outcomes.

4.5 Interrelationships Between Sociomaterial Orchestration Dimensions

Orchestration practices operate within the interplay of social, processual, technological, and material dimensions. For example, joint virtual meetings are conducted through technology. These meetings are part of social interaction in which collaboration and trust are built. Scheduled meetings also serve to maintain the process and generate recordings, notes, and summaries, which constitute the material dimension.

Orchestration practices therefore involve the continuous coordination of technological, processual, social, and material elements.

4.6 Challenges in Orchestrating Knowledge Co-creation in Expert Communities

Because participation is voluntary, commitment varies significantly among experts, making it difficult to fully leverage distributed expertise. Participants bring different perspectives, concepts, and areas of expertise to the process, so building a shared understanding does not happen automatically. Distributed work occurs at different times and locations, with varying intensity, making it challenging to coordinate collaboration and maintain shared progress. Experts generate many discussions, documents, and artifacts, and combining these into shared knowledge and concrete outcomes requires active orchestration.

5. Discussion

This study advances orchestration research by conceptualizing knowledge co-creation as a sociomaterial orchestration phenomenon emerging from the interplay of social, processual, technological, and material dimensions (Orlikowski & Scott, 2008; Hultin, 2019). Previous orchestration research has primarily focused on coordinating actors, relationships, and resources within networks and ecosystems (Dhanaraj & Parkhe, 2006; Reypens et al, 2021; Shen et al, 2024). This study extends that perspective by shifting attention from actor coordination to the orchestration of sociomaterial dimensions and their interrelationships through which knowledge co-creation emerges (Orlikowski & Scott, 2008; Hultin, 2019).

The results show that sociomaterial orchestration creates conditions for transforming dispersed expertise into shared knowledge and collective outcomes. Knowledge co-creation does not, therefore, arise automatically from bringing experts together or from the use of a digital platform. Instead, it requires orchestration practices that connect people, processes, technologies, and artifacts.

Previous studies have emphasized the affordances and technological features of platforms as enablers of collaboration (Majchrzak et al, 2013; Faraj & Azad, 2012). This study suggests that visibility, editability, persistence, and association offered by digital platforms become valuable when supported by practices of social, processual, and material orchestration (Treem & Leonardi, 2013).

Practically, the study offers a framework for evaluating and developing collaboration. The four domains of orchestration provide a tool for identifying the sources of challenges. Problems may relate, for example, to expert participation, process structure, the technological environment, or the development of knowledge artifacts. The framework helps identify challenges and direct interventions toward the dimensions where they are most needed.

6. Theoretical and Practical Implications

The framework provides an analytical lens for future research. It enables researchers to analyse different forms of collaboration through social, processual, technological, and material dimensions and to examine how these dimensions interact to enable or constrain knowledge co-creation. The practical contribution lies in providing a sociomaterial framework for orchestrating expert communities, which may be valuable for organisations, networks, and practitioners designing digital collaboration environments. The framework offers a scalable model for multi-stakeholder collaboration across contexts, including innovation networks, public sector development projects, research networks, and global expert communities.

7. Future Research

While this study identifies four sociomaterial dimensions of knowledge co-creation orchestration, it provides only an initial understanding of the complex interrelationships between them. Although the dimensions were presented separately for analytical clarity, the findings suggest that orchestration emerges through their continuous interaction and mutual influence. Future research could therefore examine how relationships between social, processual, technological, and material dimensions evolve over time and how different orchestration practices align these dimensions. Such work would provide a more dynamic understanding of sociomaterial orchestration.

8. Conclusion

This study argues that effective knowledge co-creation in distributed expert communities depends on the orchestration of sociomaterial dimensions through which dispersed expertise can be shared, developed, and integrated into collective outcomes. By introducing a sociomaterial perspective on orchestration, the study extends existing orchestration research beyond actor-centred coordination toward the creation of conditions that enable knowledge co-creation in digitally mediated environments.

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Ethics Declaration: Formal ethical clearance was not required for the research. This study was conducted in accordance with ethical principles. Prior to the study, participants were provided with a privacy notice and an informed consent form that outlined the study's purpose, data collection, and data security. Participation in the study was voluntary, and participants had the right to withdraw their participation at any time. All data were anonymized and stored in secure systems.

AI Declaration: The author used the Grammarly© application for language editing and proofreading. The tool was utilized solely to enhance grammar, clarity, and readability. The author developed conceptual models, analytical structure, and theoretical interpretations, while AI tools were used solely to support the figures' visual design.

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