Orchestrate: An AI-Powered Cross-Device System to Enhance Group Cohesion and Collective Intelligence at Workshops

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Figure 1: (left) During the Mingle stage, workshop participants get personalized questions to introduce themselves; (middle) During the Ideate stage, participants use their mobile phones to see personalized inspiration questions for ideation and submitting their ideas; (right) During the Synthesize stage, all the the submitted ideas will be clustered as themes. The large room display will show these themes and tha tables that will discuss each of these themes. Participants will be assigned to their theme discussion, based on the content of their submitted ideas. Each table will also have a volunteer to take down notes. After this stage, they will move onto the Reflect stage where participants from other groups can provide feedback.

ABSTRACT

An important ingredient for collective intelligence is creating space for exchange and exposure of new perspectives between individuals. Workshops have the potential to facilitate CI, but real-world constraints can impede communities from building cohesion, exchanging perspectives, and capturing and integrating new insights into existing knowledge representations. We propose a cross-device system to facilitate workshops by coordinating information across personal and shared displays and by leveraging Generative AI to create conversation cues based on participant interests and ongoing conversation.

1 INTRODUCTION

Collective Intelligence (CI) thrives when there are opportunities to share diverse perspectives [9], to create group cohesion [3], and to capture new knowledge on top of existing knowledge [5]. The citizen science game FoldIt, for instance, captures individual decisions and actions to get insights on protein designs that could help prevent or treat important diseases [7]. Online voting systems, like conversational swarm intelligence, explore different strategies for reaching consensus [15]. Workshops, on the other hand, are a more common and flexibly approach for enabling CI; workshop participants interact fluidly, share ideas, and chart out agendas for future collaborations [8].

Whether virtual or in-person, the workshop format can pose a number of difficulties. The constrained time frame for workshops whether it's several hours or days — places a burden on organizers and limits opportunities for exploration and exchange of information [16]. For instance, participants from different backgrounds can struggle to establish common ground [14] or to connect with others who may provide new insights, due to a lack of time for direct interaction. Even with effective methods to enable mingling among participants [18, 22], the challenge of initiating conversations persists. Also since many in-person workshops use paper and other analog resources, it creates a challenge around preserving new knowledge in a digital form that can be viewed and built upon later [2]. Online or virtual workshops can ease the burden of travel and thus enable more people to participate, including underrepresented or under-resourced groups [4]. However, remote communication technology (connectivity issues, learning curve for new tools, etc) [14]. While the virtual format makes it easier to digitally capture insights discussed at a workshop, social interactions often suffer [2, 18]. Hybrid workshops that attempt to blend in-person and online interactions are difficult to manage and often treat the remote people like second-class participants [17, 20].

The research community has offered solutions to increase the momentum and productivity of workshops. For example, the FreeForm Templates project explored how to computationally model "design data" captured on a collaborative digital whiteboard to augment later thinking exercises [11]. Capturing design data across a community enables the creation of interactive visualizations, such as stakeholder maps [10]. To bridge the communication gap between participants joining remotely and in-person during conferences, researchers explored various approaches to telepresence to enhance togetherness such as movable cameras [12], robots [21], and virtual avatars [24].

Recent advances in technology could help unlock the full potential of CI-oriented workshops. For one, most in-person workshop attendees have mobile devices with internet connectivity that could be used to deliver personalized information; large and relatively inexpensive displays can be positioned in workshops to convey shared information. Researchers have also explored the concept of proxemics surrounding devices allowing unique interaction opportunities based on their proximity to the user [1, 6, 23]. Meanwhile, advances in Generative AI (Gen AI) have made it possible to quickly interpret and generate responses to long form text inputs. Given the challenges and opportunities, our research explores: How can we combine advances in Gen AI and multi-display environments to create more effective workshops? We propose Orchestrate, a workshop system that addresses challenges pertaining to organizing in-person workshops and leverages Gen AI to enhance team cohesion, awareness, and collective intelligence.

2 SCENARIO

Imagine the 2025 Collective Intelligence Conference hosting a series of workshops dedicated to fostering awareness regarding the United Nations Sustainable Development Goals (SDGs) [13]. The participants are a diverse cohort, including experts in their respective fields, as well as enthusiastic novices who are looking forward to meeting new people. Their goals include networking and knowledge exchange, with a unified desire to gain new insights and innovate solutions to sustainable development.

2.1 Workshop Setup and Logistics

The co-located workshop will include 30-50 participants and organizers within the same space with room for standing discussions and tables for group discussions. A large common display visible to all participants will be used for topic introductions and instructions. Participants will scan a QR code with their mobile devices where a browser interface will guide them to meet and ideate with other attendees. Each table will have a discussion facilitator and medium-size shared display for group-level information. Gen AI will be weaved into the workshop by providing conversation cues during mingling and ideation, and by helping to organize ideas and synthesize group proposals.

Before the workshop starts, participants will be invited to complete a preliminary survey to assess their background, research interests, and particular engagement with and interest in the UN SDGs. The data collected from this survey will provide valuable insights into the participants' expertise and will enable Orchestrate to dynamically form groups and cues for effective discussions.

2.2 Stages of the Workshop

The stages described are tailored for a specific type of workshop, but the various components and time allocated to each stage can be modified as required to suit the workshop's objectives and constraints.

- Mingle (5-min per round for 5 rounds): In order to facilitate group members getting acquainted with one another and fostering team cohesion, Orchestrate will make recommendations on how to group people over the course of several rounds and provide them personalized cues to support socializing/mingling. The group assignments and cues will be displayed on their mobile phone. Members can find their groups in the standing area and participate accordingly.
- Ideate (8-min per rounds for 3 rounds): This stage enables participants to share their ideas and engage in discussions in smaller groups (2-3 ppl). With the help of personalized cues aimed at different dimensions of the problem space, the goal is to support divergence across the entire workshop by engaging everyone in parallel ideation. Members can request more inspiration cues through the same interface. Orchestrate will cluster ideas based on topic similarity and then also recommend which participants will continue developing each cluster during the Synthesize stage.
- Synthesize (45 min to 1 hour): Orchestrate will synthesize all the submitted ideas and cluster them as themes with the help of Gen AI. Additionally, members will now be assigned to each of those themes as a bigger group (7-8 ppl). Members will then sit down at assigned large tables and review all the ideas generated for a particular topic. Each table will have a large display and an assigned student volunteer. In this stage, Orchestrate will pick each member to talk about their best idea or the theme behind some of their submitted ideas to ensure turn-taking. Each member will be able to view their list of submitted ideas on their mobile phone. After each idea introduction, the other members will be given a set time to share their thoughts or feedback. This process repeats till every member gets to introduce their ideas or theme of ideas. Orchestrate will also be transcribing this conversation. The role of the student volunteer is to take down notes from the discussions to make sure the transcription did not miss out on any important information. Near the end of the timeframe, Orchestrate can generate a fleshed-out proposal for the group to collaboratively edit. The final proposal will be a synthesis of top ideas and the discussion transcripts/notes written by the student volunteer
- Reflect: Orchestrate could continue to support interactions post-workshop by asking participants from other groups to

give feedback on aspects of proposals and providing suggestions for collaborative action.

3 DISCUSSION

Orchestrate is aimed at accomplishing a set of goals to facilitate collective intelligence processes during workshops. Firstly, the system must successfully aid group cohesion but also needs to carefully strike a balance between creating connections and cues with tech, and distracting people from having genuine conversations (we don't want people staring at their displays the whole time). Qualitative analysis of conversation transcript data during the workshop such as communication sequences [19] can help us study discussion dynamics and group cohesion. Secondly, Orchestrate must also support the workshop organizer's specific plans and objectives, while remaining flexible to the situation on the ground. Some groups might want to talk for longer and might have to end discussions abruptly to stay aligned in time with the other groups. System log data will give insights into the time spent across different activities and the influence of Gen AI. Finally, Orchestrate must capture the knowledge generated during these discussions to facilitate reflection and to enable future groups to build upon it. We aim to prototype Orchestrate to get insights that could accelerate CI for a variety of workshop formats.

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