

## Meeting support interface with integrated individual and shared spaces

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### 1 Introduction

Professionals spend 20–40% of their time in meetings [1]. For that reason alone meetings are considered the most important procedure for collaborative problem solving and decision-making in a very large variety of professions. For all its difficulty, teamwork is extremely important and technology is often considered a significant factor to improve the meeting process and outcomes [2]. However current technological support tools tend to be complicated and not user friendly, therefore they are often abandoned for traditional tools such as sketch boards, paper-based tools, etc. Our proposed solution is to offer users a fully mobile, user-friendly meeting support device that supports collaborative work in a shared space. To offer more privacy and encourage individual thinking, our system is equipped with a private space in which users can work individually while monitoring collaborative progress in the meeting's shared space. This paper reviews some of the existing support meeting tools, the design challenges faced, and describes our solution.

### 2 Related work

Previous systems closest to this work focus mainly on using large shared displays with multiple-touch SMART boards supporting dynamic team collaboration.

Dynamo [3] allows users to interact simultaneously by letting them share digital media from their mobile devices on large, interactive screens.

PointRight [4] is a peer-to-peer pointer and keyboard redirection system operating in multi-machine, multi-user environments created for interactive workspaces that include large, shared displays and individual laptops.

In contrast to Dynamo and PointRight, our system does not require additional tools to connect to a shared space for collaboration.

The NiCe [5] is a discussion room integrating digital and paper tools into a cohesive system with an intuitive pen-based interface. Here too we see that instead of replacing traditional tools it encourages their use instead of replacing them, whereas our interface offers an alternative to traditional tools.

Other work has appeared recently [6] but concentrates mainly on meeting recording and analysis, generating audio-visual content for offline review.

### 3 Problem and design challenges

The complexity of meetings, requiring teamwork on multiple tasks ranging from brainstorming to decision making, creates many challenges to the design of successful meeting support interfaces. These challenges can be divided into six categories [5].

**1. Diversity of tasks** Depending on the meeting itself the tasks might vary. A successful meeting interface should be able to respond to any kind of emergent task. According to Plaue et al. [7] meeting spaces should provide groups with many different, and even redundant, tools. Making the shared space into an interactive sketch board with meeting support features (sticky notes, media upload, etc.) responds to this challenge.

**2. Use of space and accessibility** Sitting arrangements depend on the type of the meeting. Access to, and manipulation of, objects requires that meeting attendees physically reach for them [8]. The interface should therefore be flexible, allowing reconfiguration of the meeting space. Our system uses tablets, imposing no fixed sitting arrangement and leaving participants free to organise the meeting room as they prefer.

**3. Fostering the creation of shared content** An interactive workspace must also provide a way to create and manipulate shared content collectively [5]. Our shared space fulfils this requirement.

**4. Integration of individual and shared spaces** The 'public' nature of a user's shared interactions exposes mistakes to others [9], potentially inviting criticism before the actions or data are ready to be shared with the group [10]. A private work space is highly desirable in collaborative work.

**5. Multiple and interrelated content types** Content varies depending on the meeting. A successful interface should allow easy navigation between different kinds of data. Our system provides media upload for users to share and manipulate any kind of data in either of the spaces.

**6. Integration into umbrella activities** Meetings and workshops usually exist in the larger context of 'umbrella' activities, often depending on a combination of related project data, personal data, and external resources [5]. Participants tend to use their personal devices for opportunistic search, communication with their colleagues, taking notes, and so on. The private space our system offers facilitate of this kind (online search, interactive chat, etc.) while allowing them to keep abreast of progress in the shared space.

### 4 System description

The design of our support interface responds to the above requirements and challenges by integrating two spaces on the same tablet screen, offering the participants both a private and a shared collaborative space, each easily accessible by simply rotating the tablet (**Figure 1**). The shared space can also be mirrored to a large screen, playing the role of a large digital whiteboard that users can use without physically moving.

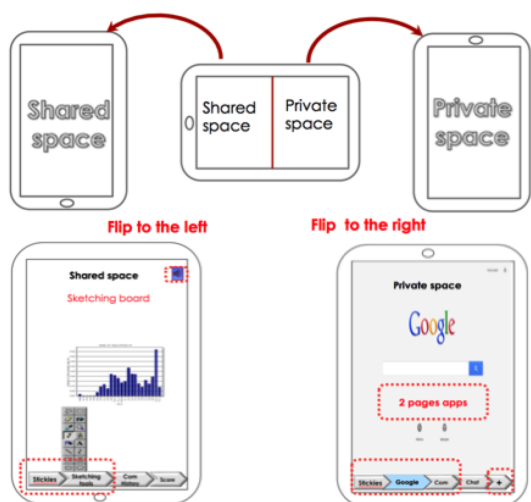


Figure 1: Access to private and shared environments

#### 4.1 Shared space features

The shared space is a virtual whiteboard where participants can collaborate on projects, sharing and editing documents simultaneously. Each contribution can be traced back to its originator. The shared space is equipped the following meeting facilitation tools.

**1. Sticky notes and sketching** Draggable sticky notes and sketches are essential brainstorming tools for productive meetings.

**2. Comments** The top of the shared space displays comments submitted by participants. After 30 seconds they disappear and are stored in a persistent comment history.

**4. Comment history** Stored comments can be recalled and read at any time during, or after, the meeting.

**5. Scoring system** The participation of each user in the shared space is monitored and a score generated at the end of the meeting. We believe this will motivate participants to share their ideas.

#### 4.2 Private space features

The private space simplifies individual work such as opportunistic search and personal note-taking, without risking premature disclosure. It is equipped with several tools.

**1. Sticky notes** Private notes can be taken that users could later share, by dragging them into the shared space.

**2. Search engine** Opportunistic searches can be made without prompting unwanted questions that might obstruct the meeting progress.

**3. Comments** Comments can be posted directly to the shared space, or used to notify the current speaker that the user desires to interrupt with a verbal comment.

**4. Upload** Uploaded documents can be shared by dragging them onto the shared space. Shared document editing can be limited to the original owner, or other participants can be invited to share ownership and editing privileges.

#### 4.3 Integrated shared and private spaces

The shared and private spaces are integrated on the same tablet display, with easy access from one space to the other by simply rotating the tablet. An intermediate position displays both spaces at the same time (Figure 1).

### 5 Conclusion and Future work

Our meeting support interface, with integrated shared and private spaces, can be used for a wide variety of meetings. It facilitates (and even completely replaces) traditional paper-based tools, help use meeting time efficiently, and encourages the participation of all meeting attendees. Future work on privacy management could make it a useful for highly-confidential meetings.

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