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# Collaborative Work without Large, Shared Displays: Looking for “the Big Picture” on a Small Screen?

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**Abstract.** Large, shared displays – such as electronic whiteboards – have proven successful in supporting actors in forming and maintaining an overview of tightly coupled collaborative activities. However, in many developing countries the technology of choice is mobile phones, which have neither a large nor a shared screen. It therefore appears relevant to ask: How may mobile devices with small screens support, or fail to support, actors in forming and maintaining an overview of their collaborative activities?

**Keywords:** overview, awareness, collaborative work, small-screen devices

## 1 Introduction

In tightly coupled collaboration, the actors coordinate their activities by monitoring what the others are doing and by displaying their own activities for others to monitor [1]. The ways in which this monitoring and displaying is accomplished vary across contexts, as evidenced by the considerable research on awareness [e.g., 2] and overview [e.g., 3]. Unless the actors are permanently co-located, awareness and overview must be mediated by technology. These technologies include large, shared displays, which are becoming increasingly common in settings where the actors are locally mobile but co-located part of the time. Hospitals are a prominent example of such work settings. In European and North American hospitals wall-mounted electronic whiteboards are replacing dry-erase whiteboards [4], and the clinicians who use these large, shared electronic displays experience an improved overview of their work [5]. In contrast, the technology of choice in many developing countries is mobile phones with comparatively small screens [6, 7]. Thus, in systems that target

developing countries the need for supporting actors in maintaining an overview of their collaborative work will often have to be accomplished on a small screen.

Before proceeding it should be noted that it obviously is a simplification to associate display size with country. The argument is neither that large, shared displays such as electronic whiteboards are non-existent in developing countries, nor that small interfaces are rare in developed countries. Rather, the argument is that the ways in which large, shared displays support actors in maintaining an overview are irrelevant in settings characterized by small interfaces. To develop for these settings we need to understand how small interfaces may support, or fail to support, actors in maintaining an overview of their collaborative work. Clearly, this need is accentuated if the application of large, shared displays is not feasible, economically or otherwise.

## 2 Overview and Large, Shared Displays

Hertzum and Simonsen [8] find that in a collaborative setting with an electronic whiteboard the users adopted a strategy that could be described as: visual overview, oral detail. That is, they glanced at the whiteboard to get “the big picture” and augmented this visually acquired overview with asking their colleagues for clarification and detail. This finding can be seen as a collaborative-work extension of Shneiderman’s [9] visual information seeking mantra (overview first, zoom and filter, then details-on-demand). Specifically, the focus on (collaborative) work emphasizes that an overview is the user’s awareness and understanding of the information relevant in the situation; it is not merely a property or component of a user interface [10]. The overview is a collaborative accomplishment in that the individual actors consult each other for information that elaborates and supplements the information they glean from the whiteboard. Apart from the obvious difference in screen real estate between a 52-inch whiteboard and a 4-inch smartphone the large, shared displays have at least three strengths that appear to be absent on small screens:

- *Artefactual multiplicity.* The whiteboard may hold different pieces of information that are relevant to different groups of users, and it may also interrelate these pieces of information, thereby facilitating the coordination among user groups [11]. The interrelating of the pieces of information is accomplished through their simultaneous presence on the display.

- *Social translucence.* Because the whiteboard is shared it makes the same information visible to all actors. The actors are, however, not simply made aware of information they are also held accountable: As an actor I know that everybody knows what information I can read on the whiteboard [12]. Thus, actors can rely on each other regularly glancing at the whiteboard and reacting on its content.
- *Information hotspots.* The whiteboard is not simply an information display, it also creates a physical place where actors meet [13]. They may visit the area around the whiteboard to interact with the whiteboard or to consult a colleague, who is there to interact with the whiteboard, consult a colleague or make herself available for consultation [14].

While the three strengths are described on the basis of studies of whiteboards, it appears likely that the same strengths exist for wall-size displays, tabletop interfaces, and other large, shared displays. The situation is different for small, mobile devices.

### 3 Overview and Small, Mobile Devices

On a mobile device the functionality of the applications is narrowly focused to fit the small screen. This narrow focus reduces the possibilities for artefactual multiplicity. In addition, the personal nature of the device reduces social translucence because it is less apparent to others what information I have available and when I have the opportunity to access it. Finally, the mobility of the device prevents it from functioning as a physical location for actors to meet. While it is tempting to presume that actors who collaborate using small, mobile devices need other means of achieving these three ends, it is also possible that they transmute artefactual multiplicity, social translucence, and information hotspots into alternative ways of gaining and maintaining an overview. Either way, it is important to human work interaction design to understand how the actors gain and maintain the overview they need to conduct their activities collaboratively and competently. Studies of the use of mobile phones in developing countries are beginning to address these issues, but tend to investigate loosely coupled activities. The studied activities include societal as well as local collaborations that exploit the wide adoption of mobile phones:

- Nearly everybody has a mobile phone, thus making it possible to reach most people with information and include many people in collaborative activities. For example, multiple African initiatives use mobile phones as

tools to disseminate and collect health information via text messages, to improve the transparency and accountability of elections by sending local observations about polls to central monitoring groups, and to promote reforestation by transferring payments to rural farmers for planting trees [7].

- The actors carry their mobile phones everywhere, attend to them repeatedly, and may, thereby, interact with each other when needed rather than when they happen to be in the same place at the same time. For example, geographically distributed herders of livestock in rural Kenyan communities use mobile phones to share information about the changing location of water resources for the livestock and of rangers likely to disrupt herding practices [15].
- Mobile phones can broadcast information about the whereabouts and activities of actors, thereby providing information for others to monitor. However, this possibility may primarily have been exploited in developed countries. For example, studies of collaborative web search have found that such activity information supports remotely located actors in aligning their search activities and progressing on a shared task [16].

The ways in which mobile devices may support actors in forming and maintaining an overview of their collaborative activities appear an important research area. Similarly, it is important to research the ways in which collaborative work arrangements may transmute what overview is about or what role technology plays in supporting it. This research should, in particular, attend to the conditions in developing countries, in which mobile phones are widespread whereas large-display technologies are not.

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