

# Chapter XLII

## Situational Awareness in Collaborative Work Environments

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### ABSTRACT

*This chapter addresses awareness support to enhance teamwork in co-located collaborative environments. In particular, the authors focus on the concept of situational awareness which is essential for successful team collaboration. Mutual situational awareness leads to informal social interactions, development of shared working cultures which are essential aspects of maintaining working relationships. First, an overview of the studies on team coordination and situational awareness support is presented. Second, a collaborative working environment is described for scientific teams in a molecular biology omics experimentation domain. Then, the results of practical case studies are discussed, as well as situational awareness support for scientific teams in collaborative environments. Finally, the authors discuss practical challenges in design and evaluation of group support systems for collaborative working environments and our multi-level analysis approach. The chapter gives new insights into how shared displays support group awareness, and how to design and evaluate interactive systems and visualisations that afford awareness in order to stimulate existing and new forms of collaboration in advanced working environments.*

*Discovery is seeing what everyone has seen, and thinking what nobody else has thought*

—Albert Szent-Gyorgy

## **INTRODUCTION**

The diversity of multiple disciplines in teams positively impacts collaborative problem solving (Coughlan and Johnson, 2006; Shalley and Gilson, 2004). It is essential to analyse how such collaboration takes place in daily work practices. Team collaboration can be supported by providing an appropriate environment and a certain context (Coughlan and Johnson, 2006). However, introducing a new environment and new technologies, like multiple visualisations on a large display, may increase the cognitive load of team members and influence the way they collaborate (Varakin et al., 2004). Awareness information in such shared workspace environment is always required to coordinate team activities (Dourish and Bellotti, 1992).

The overwhelming amount of visual information on multiple displays, and the multitude of personal and shared interaction devices in new collaborative environments lead to a lack of awareness of team members on ongoing activities, a lack of understanding of shared visualisations, and a lack of awareness on who is in control of shared artefacts. The focus of our research is on the awareness support of co-located teams working on long-term scientific projects in collaborative working environments. Understanding who you are working with, what is being worked on, and how your actions affect others, is essential for effective team collaboration (Dourish and Bellotti, 1992). Such shared awareness helps getting jobs done that cannot be done by a single expert, or by experts that only have a limited range of disciplines covered. Moreover, shared awareness also leads to informal social interactions and development of shared working cultures which are essential aspects of maintaining good working relationships in a team.

## **Situational Awareness**

Situational awareness (SA) concerns “knowing what is (and has been) going on”, basically being aware of what is happening around you in the environment and having a shared understanding of the information. Before giving the extensive definition, we will first explain the importance of SA for team collaboration.

Situational awareness is expected to be an important determinant of team performance (Bolstad et al., 2005; Endsley, 1995). Especially in multidisciplinary settings situational awareness information is affected by abilities of individual members, their interaction with other team members, and the environment in which they collaborate (Bolstad et al., 2005). Various factors affect individual situational awareness formation: context (physical location, display arrangement and size, system capabilities etc.) and group aspects (communication, use of collaboration tools, team processes etc.). In order to assess SA during evaluation of collaborative interfaces or awareness displays, specific factors need to be identified relevant to a particular domain.

Situational awareness is critical in such complex multi-display environments that change rapidly and that provide a lot of information to keep up with. Recent studies (Borchers, 2006; Brad et al., 2002; Huang, 2006; Rogers and Lindley, 2004) clearly point out that people are less aware of their visual surroundings than they think they are. Data overload, fatigue and other stressors can undermine the development and maintenance of situational awareness (Bolstad, 2006). The phenomenon of change blindness shows that even if people have an accurate representation, they may still fail to notice changes (Martens, 2007; Varakin et al., 2004). Actively capturing attention at the location of the change by means of spatial cues improves the detection of the information and detection of

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