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Preface to the Special Issue on 'Reconsidering "Awareness" in CSCW'

Kjeld Schmidt[1,2] & Dave Randall[2]
[1]*Copenhagen Business School, Copenhagen , Denmark (E-mail: schmidt@cscw.dk);* [2]*University of Siegen, Siegen , Germany (E-mail: schmidt@cscw.dk)*

The issue of 'awareness' has been on the agenda of CSCW research since the field first formed in the 1980s, yet nothing remotely similar to consensus about what the issue is and how to understand it has been achieved.

This Special Issue is an attempt to bring this central research problem forward.

The centerpiece of this Special Issue is the article by Josh Tenenberg, Wolff-Michael Roth, and David Socha (2016) in which some of the established positions on 'awareness' are subjected to critical discussion and an alternative conceptualization is proposed. To give this bold attempt its due, we have invited a number of scholars from different schools of thought within CSCW to respond to the challenge. We are pleased that Gutwin and Greenberg (2016); Harper (2016); Koschmann (2016); Robertson (2016); and Stahl (2016) found time to write thoughtful, critical, and constructive commentaries. Co-editor Kjeld Schmidt also contributes with a commentary (2016). Tenenberg, Roth and Socha have, of course, the opportunity of replying to the six commentaries (Roth et al. 2016). To wrap up the discussion, for now, co-editor Dave Randall summarizes the discussion and maps out the various positions as they appear at this stage (Randall 2016).

To bring readers who may not be familiar with the research tradition that has developed under the label 'awareness' up to speed, a brief account of the different sources to the tradition may be helpful. (For a systematic overview of the research that has been conducted under the 'awareness' label, see Gross 2013).

In the 1980s computer technologists began to explore the issues of developing 'multiuser interfaces' that would facilitate the collaborative use of application programs, both ordinary single-user programs used collaboratively and application programs specifically designed to facilitate human interaction such as 'group editors', 'conferencing systems', etc. (cf., e.g., Sarin and Greif 1984; Stefik et al. 1987). To distinguish, the latter were referred to as having 'collaboration awareness' or

being 'collaboration aware' (e.g., Lauwers and Lantz 1990; Dewan and Choudhary 1991), that is, they were conceived of as computational artifacts that reflect the presence and actions of distinct users. In other words, 'awareness' was here a label for certain operational characteristics of computational artifacts, not patterns of competent conduct in work. While this conception of 'awareness' never became part of the mainstream understanding of 'awareness' in CSCW, it has led its own life (e.g., in the form of notions such as 'context-aware computing', Albrecht Schmidt et al. 2004).

More importantly, however, it was realized very early in the development of CSCW as a research area that computerization of the workplace in general raises important issues of coordination that were seen as manifestations of loss of or otherwise deficient 'awareness' among cooperating workers. When workers, in their cooperative activities, work with tangible tools and objects, with pen and paper, with stacks of files in front of them, or for that matter with manually operated tools and work pieces, they are, in their aspiration to perform their activities in a coordinated fashion, typically able to exploit, opportunistically, so to speak, the various accidental features of the material setting that make the ongoing activities in the setting easily observable. However, when workers work with and coordinate their activities by means of digital applications and thus with digital representations of the tools and objects of their work, typically displayed on a screen in front of them and manipulated by means of keyboard and pointing devices, workers are no longer able to adjust, in the same 'inexpensive' way, their individual activities in accordance with the evolving state of affairs in the setting at large. This became evident in different ways.

On one hand, early ethnographic studies demonstrated the ubiquity of these 'inexpensive' ways of coordination of work. As summarized by Kjeld Schmidt in his introduction to the Special Issue on 'Awareness in CSCW' published in 2002:

> 'It quickly became obvious that cooperating actors somehow, while doing their individual bits, take heed of the context of their joint effort. More specifically, the early harvest of ethnographic field studies in CSCW (e.g., Harper et al. 1989a, b; Heath and Luff 1991) indicated that cooperating actors align and integrate their activities with those of their colleagues in a seemingly 'seamless' manner, that is, without interrupting each other, for instance by asking, suggesting, requesting, ordering, reminding, etc. others of this or that.' (Schmidt 2002, p. 285).

On the other hand, similar insights arose from experiences with experimental designs in a strong current of early CSCW research pursued under what can be called a 'conversation' paradigm. The main idea was to exploit the prospects offered by real-time interaction via networked computers to provide means for geographically dispersed workers to cooperate as efficiently as when co-located. 'However', as Carl

Gutwin and Saul Greenberg candidly put it in 1995, 'interactions within groupware workspaces are impoverished when compared with their physical counterparts'. The reason was this:

> 'Recent work has shown how a shared physical workspace (such as a chalkboard, a control panel, or a tabletop) and the artifacts in that space act as stage and props for rich person-to-person interaction [(Tang 1989; Tatar et al. 1991; Brinck and Gomez 1992; Segal 1994)]. Information available in and through the physical workspace allows people to maintain an awareness of others' locations, activities, and intentions relative to the task and to the space — awareness that enables them to work together more effectively. We call this *workspace awareness*: the collection of up-to-the minute knowledge a person uses to capture the state of another person's interaction with the workspace. As will be shown, workspace awareness helps people move between individual and shared activities, provides a context in which to interpret other's utterances, allows anticipation of others' actions, and reduces the effort needed to coordinate tasks and resources' (Gutwin and Greenberg 1995, p. 1).

These problems were found to not only apply to designated 'virtual workspaces' and similar forms of real-time 'groupware' support for cooperative work across geographical distance. They were also found to apply to other approaches under the 'conversation' paradigm such as 'media spaces', etc. (Gaver 1992; Heath and Luff 1993).

In fact, they were also generally found to apply to 'coordination technologies' such as database systems, traffic control systems, workflow systems, project management systems, and document management systems. Thus, with the introduction of computational technologies, the material make-up of the work setting changes in important ways and many of the rich resources that workers otherwise would exploit in order to stay tuned to developments disappear (e.g., Sellen and Harper 2001). Consequently, coordination technology, in practice, is not just an issue of the 'flexibility' of coordination technologies but also one of the 'visibility' of the ongoing activities of the members of the cooperative work arrangement (Schmidt 1994, passim).

Although, the term 'awareness' is used in widely different ways in CSCW, it is most often used, broadly, in reference to the skillful ways in which competent workers in their individual activities orient to the unfolding state of affairs. That is, the term is used to distinguish such effortless alignment from alignment achieved as a result of 'conversation' and similar forms of interaction in which actors interrupt the line of work in which they are engaged in order to coordinate by giving and receiving orders or advice, by pointing, etc., as well as from the specialized coordinative practices in which alignment is achieved by means of pre-established procedures, such as workflows, production schedules, project plans, classification schemes, etc., with complementary

coordinative artifacts, that have been deliberately designed for specific coordinative purposes (by ordinary workers, engineers, planners, administrators, or consultants). More than that, what is referred to as 'awareness' — the ways in which workers in their individual activities orient to the unfolding state of affairs —provides the background for conversations as well as the specialized coordinative practices to function.

It is this — broadly characterized — understanding the issue of 'awareness' that is the baseline of the present Special Issue.

References

Brinck, Tom; and Louis M. Gomez (1992). A collaboration medium for the support of conversational props. In M. M. Mantei; R. M. Baecker; and R. E. Kraut (eds.): *CSCW'92: Proceedings of the Conference on Computer-Supported Cooperative Work, 31 October–4 November 1992, Toronto, Canada*. New York: ACM Press, pp. 171–186.

Dewan, Prasun; and Rajiv Choudhary (1991). Primitives for programming multiuser-user interfaces. In J. R. Rhyne (ed.): *UIST'91: Fourth Annual Symposium on User Interface Software and Technology, South Carolina, USA, 11–13 November 1991*. New York: ACM Press, pp. 69–78.

Gaver, William W. (1992). The affordances of media spaces for collaboration. In M. M. Mantei; R. M. Baecker; and R. E. Kraut (eds.): *CSCW'92: Proceedings of the Conference on Computer-Supported Cooperative Work, 31 October–4 November 1992, Toronto, Canada*. New York: ACM Press, pp. 17–24.

Gross, Tom (2013). Supporting effortless coordination: 25 years of awareness research. *(CSCW)*. Vol. 22, no. 4–6, August-December 2013, pp. 425–474.

Gutwin, Carl; and Saul Greenberg (1995). *Workspace Awareness in Real-Time Distributed Groupware*. Calgary, Alberta, Canada: Dept. of Computer Science, University of Calgary. – Report 95-575-27.

Gutwin, Carl; and Saul Greenberg (2016). Implications of we-awareness to the design of distributed groupware tools. *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].

Harper, Richard H. R. (2016). From I-awareness to we-awareness in CSCW: A review essay. *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].

Harper, Richard H. R.; John A. Hughes; and Dan Z. Shapiro (1989a). Working in harmony: An examination of computer technology in air traffic control. In P. Wilson; J. M. Bowers; and S. D. Benford (eds.): *ECSCW'89: Proceedings of the 1st European Conference on Computer Supported Cooperative Work, 13–15 September 1989, Gatwick, London*. London, pp. 73–86. <http://www.ecscw.org/1989/p073_harper,hughes,shapiro.pdf>

Harper, Richard H. R.; John A. Hughes; and Dan Z. Shapiro (1989b). *The Functionality of Flight Strips in ATC Work: The report for the Civil Aviation Authority*. Lancaster, U.K.: Lancaster Sociotechnics Group, Department of Sociology, Lancaster University, January 1989.

Heath, Christian C.; and Paul Luff (1993). Disembodied conduct: Interactional asymmetries in video-mediated communication. In G. Button (ed.): *Technology in Working Order: Studies of Work, Interaction, and Technology*. London and New York: Routledge, pp. 35–54.

Heath, Christian C.; and Paul Luff (1991). Collaborative activity and technological design: Task coordination in London Underground control rooms. In L. J. Bannon; M. Robinson; and K. Schmidt (eds.): *ECSCW'91: Proceedings of the Second European Conference on Computer-*

Supported Cooperative Work, 24–27 September 1991, Amsterdam. Dordrecht: Kluwer Academic Publishers, pp. 65–80.

Koschmann, Timothy (2016). The trouble with common ground. *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].

Lauwers, J. Chris; and Keith A. Lantz (1990). Collaboration awareness in support of collaboration transparency: Requirements for the next generation of shared window systems. In J. C. Chew and J. Whiteside (eds.): *CHI'90 Conference Proceedings: ACM SIGCHI Conference on Human Factors in Computing Systems, Seattle, Washington, 1–5 April 1990*. New York, N.Y.: ACM Press, pp. 303–311.

Randall, David W. (2016). What is common in accounts of common ground? *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].

Robertson, Toni (2016). On rhetorical tricks and overloaded concepts. *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].

Roth, Wolff-Michael; Josh Tenenberg; and David Socha (2016). Discourse/s in/of CSCW. *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].

Sarin, Sunil K.; and Irene Greif (1984). Software for interactive on-line conferences. In C. A. Ellis and J. H. Bair (eds.): *COCS'84: Proceedings of the Second ACM-SIGOA Conference on Office Information Systems. Toronto, Canada, 25–27 June 1984*. New York: ACM Press, pp. 46–58.

Schmidt, Kjeld (1994). *Modes and Mechanisms of Interaction in Cooperative Work*. Roskilde, Denmark: Risø National Laboratory, March 1994. – Risø-R-666(EN).

Schmidt, Kjeld (2002). The problem with "awareness": Introductory remarks on "Awareness in CSCW". *Computer Supported Cooperative Work (CSCW)*. Vol. 11, no. 3–4, September 2002, pp. 285–298. – [Also in K. Schmidt: *Cooperative Work and Coordinative Practices*, London: Springer, 2011 (Chapter 8)].

Schmidt, Kjeld (2016). Treacherous ground: On some conceptual pitfalls in CSCW. *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].

Schmidt, Albrecht; Tom Gross; and Mark Billinghurst (eds.) (2004). Context-Aware Computing in CSCW. [Special issue of] *Computer Supported Cooperative Work (CSCW)*, vol. 13, no. 3–4. August 2004, pp. 221–345.

Segal, Leon D. (1994). Actions speak louder than words: How pilots use nonverbal information for crew communications. In B. Adelson; S. Dumai; and J. Olson (eds.): *Proceedings of the Human Factors and Ergonomics Society, 38th Annual Meeting, 1994*, pp. 21–25.

Sellen, Abigail; and Richard H. R. Harper (2001). *The Myth of the Paperless Office*. Cambridge, Mass.: MIT Press.

Stahl, Gerry (2016). From intersubjectivity to group cognition. *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].

Stefik, Mark, *et al.* (1987). Beyond the chalkboard: Computer support for collaboration and problem solving in meetings. *Communications of the ACM*. Vol. 30, no. 1, January 1987, pp. 32–47.

Tang, John C. (1989). *Listing, drawing and gesturing in design: A study of the use of shared workspaces by design teams*. PhD diss. Stanford, Calif.:Stanford University.

Tatar, Deborah G.; Gregg Foster; and Daniel G. Bobrow (1991). Design for conversation: Lessons from Cognoter. In S. Greenberg (ed.): *Computer-supported Cooperative Work and Groupware*. London: Academic Press, pp. 55–80.

Tenenberg, Josh; Wolff-Michael Roth; and David Socha (2016). From I-awareness to we-awareness in CSCW. *Computer Supported Cooperative Work (CSCW)*. Vol. 25, no. 4–5, 2016. – [Special issue: *Reconsidering 'Awareness' in CSCW*].