



Editorial

Alexander Richter, Michael Koch* and Michael Prilla

CSCW – past, present and future

<https://doi.org/10.1515/icom-2024-0023>

1 Introduction

In 1984 Irene Greif and Paul Cashman invited to an interdisciplinary workshop on “Computer-Supported Cooperative Work”.¹ Some of the topics presented at this workshop or published soon after were:

- Coordination Technology (Holt)
- The Coordinator (Flores, Winograd)
- First studies on “work practice” (Suchman)
- Workflow management systems (“Domino” – Kreifelts)
- New approaches to office automation (“Gameru” – De Cindio, De Michelis, Simone)

Upon examining these papers and their research objectives, and reflecting on recent years, we can observe that Computer-Supported Cooperative Work (CSCW) has been one of the research fields instrumental in enabling a swift transition to hybrid communication, interaction, and collaboration. The way we work, the way we connect with friends, and the way we engage in society are increasingly intertwined with concepts that have been at the core of CSCW research since “day one”. Recent emerging topics are fostering hybrid cooperation while also integrating its concepts and tools into new collaboration scenarios and broader social life. Given that most applications today are not

limited to single-user experiences but involve communication and collaboration among individuals, CSCW is relevant in various emerging themes. This is particularly prominent in the Metaverse, as well as in areas like AI-powered conversational agents.

In this extended editorial for the i-com Special Issue on the past, present and future of Computer-Supported Collaborative Work, we try to briefly summarize some issues about the past and present of CSCW and reflect on its role and relevance in a broader scientific discourse that tends to reinvent topics and concept that have been explored in CSCW since a long time (e.g. in human-AI interaction). In this encounter, we focus on a European perspective on CSCW – since the authors all come from Europe and have been raised in the European CSCW community. Also see the interviews about “The European Tradition of CSCW” with Volker Wulf and Myriam Lewkowicz published in Richter and Koch¹.

2 Past

From the beginning CSCW research mainly focused on situations where two or more actors are mutually dependent upon each other while involved in a common field of work using computer systems. The need for working on these issues came from the dramatic change in the 1980th from computers as large-scale machinery to personal computing.

The computer systems used to support collaboration are often called groupware. Marca and Bock (p. 60)² state that the development of groupware was not just another evolutionary step in the history of computer science but “a conceptual change, a change in our understanding. The traditional computer paradigm saw the computer as a tool for manipulating and exchanging data. The groupware paradigm, on the other hand, saw the computer as a shared space in which people collaborate; a clear shift in the relationship between people and information”.

This conceptual shift has far-reaching consequences. The statement implies that groupware is neither characterized by individual isolated applications with some collaborative aspects nor should the computer be seen only as a means of processing information. Instead, the computer is a medium for communication and collaboration.

¹ See <https://dl.eusset.eu/handle/20.500.12015/4097> for a detailed documentation of this workshop.

*Corresponding author: **Michael Koch**, Computer Science Department, Universität der Bundeswehr München, München, Germany, E-mail: michael.koch@unibw.de. <https://orcid.org/0000-0002-9694-6946>
Alexander Richter, Wellington School of Business and Government, Victoria University of Wellington, Wellington, New Zealand, E-mail: alex.richter@vuw.ac.nz. <https://orcid.org/0000-0002-3699-6466>
Michael Prilla, Interactive Systems, Department for Human Centered Computing and Cognitive Science, Faculty for Computer Science, University of Duisburg-Essen, Duisburg, Germany, E-mail: michael.prilla@uni-due.de. <https://orcid.org/0000-0002-6095-6114>

These important aspects of the computer were foreseen decades ago by visionaries such as Vannevar Bush, Douglas Engelbart, and Joseph Carl Robnett Licklider.^{3–5} See in particular “The Mother of All Demos²” by Douglas Engelbart and team.

Two years after the previously mentioned interdisciplinary workshop on Computer-Supported Cooperative Work, the first CSCW conference was held in the USA. Two papers from Europe were presented at this conference:

- “The AMIGO Project: advanced group communication model for computer-based communications environment”⁶
- “Chaos as coordination technology”⁷

The second CSCW conference in the USA followed in 1988. And 1991 finally saw the birth of the European CSCW Journal and the European CSCW Conferences. The history of (European) CSCW has been documented in several book chapters (e.g. Ciolfi et al.⁸) or interviews like those documented in Richter and Koch¹ or Koch and Schwabe⁹.

Important fundamental topics that have been worked on and that are highly relevant for today’s work on collaboration support in CSCW and other fields were

- benefit orientation, critical mass, ... – challenges in implementing and introducing collaboration support¹⁰
- awareness (see an overview in Gross¹¹)
- practice orientation (see for example Bjørn et al.¹²)

3 Present

Since its birth in the 1980ies, CSCW, as an interdisciplinary research field, has made considerable advances in elucidating how humans collaborate and coordinate their efforts in diverse settings, leveraging IT to enhance productivity and foster collaboration. The foundational work in CSCW has provided rich insights into the dynamics of work practices, emphasizing the intertwined relationship between technology and social processes.^{13,14} Interestingly, Grudin’s eight challenges in implementing and introducing collaboration support¹³ – revisited in Bullinger-Hoffmann et al.¹⁵ and now in this issue in (Duckert and Bjørn, 2024¹⁶) are still valid. Grudin himself stated in 2015 that this does not mean that we have not made any progress in CSCW (see Koch and Schwabe⁹).

As the work landscape undergoes significant transformations, particularly with the increasing prevalence of hybrid work arrangements, it is imperative to revisit and

build upon the foundational principles and findings of CSCW. Recent discussions in various academic disciplines regarding the adaptation to and optimization of hybrid work models often overlook the wealth of knowledge accumulated in CSCW research, particularly from the 1990s and 2000s. This oversight represents a missed opportunity to apply proven frameworks and insights to contemporary challenges in work practice and technology design.^{17,18}

The body of CSCW research from this period offers critical perspectives on the social and technical dimensions of cooperative work, providing evidence-based strategies for designing IT systems that genuinely support collaborative work practices. For instance, studies on the role of context in technology use¹⁹ and the design of collaborative systems that accommodate the fluid and dynamic nature of human practices²⁰ are particularly relevant for today’s hybrid work environments. By leveraging these insights, researchers and practitioners can avoid the pitfalls of designing technology in isolation from the social contexts in which it is embedded.

In light of the changing nature of work, particularly in response to global shifts towards remote and hybrid work models, there is a critical need for interdisciplinary collaboration that draws on the rich empirical and theoretical contributions of CSCW. This approach not only ensures that technological innovations are grounded in an understanding of human practices and contexts but also enables the design of more effective and human-centered sociotechnical systems. As such, current and future research on work practices and technology design must integrate the foundational insights of CSCW, thereby avoiding the redundancy of “reinventing the wheel” and instead building on a solid foundation of established knowledge to address the challenges of the 21st-century workplace.

4 Future

Some important issues where CSCW should actively engage are highlighted in the quote “Digitization is implemented with far too little imagination and far too little consideration for the user and practices”.¹⁵ What we need to improve digitalization or digital support for collaborative work is imagination based on knowing the technology and on knowing the users and the practices.

Jonathan Grudin stated in an interview in 2015⁹ that in the beginnings of CSCW, he thought that the “insufficient understanding of organizational processes and team processes” was the primary reason for groupware failures¹⁰ – and that this insufficient understanding would be quickly overcome. But the problem stayed. First, since

² https://en.wikipedia.org/wiki/The_Mother_of_All_Demos.

the situations regarded grew more and more complex, and second since more and more people needed to gain this understanding.

CSCW has contributed a lot by trying to document and understand work practices. This should be continued. Case studies should become a valid contribution to research again. Additionally, it is always important how their results (from ethnographic work) informs design. Therefore, this also has to be addressed: just documenting how people work in a particular setup is not enough.

The past, present and future work of CSCW researchers and practitioners is highly relevant for many areas, as new technologies shape how we cooperate and collaborate, and as new settings such as hybrid teams emerge. New systems like Shared Workspace Systems or (Enterprise) Social Networks enable completely new divisions of labor between collaborating actors and computer systems in an organizational setting. Particular examples are crowdsourcing, open innovation, or the inclusion of external experts in internal processes. This has important implications for organizational structures, management, and motivation.

Yet, there is a lot of work in topics such as cooperation and collaboration in Mixed Reality or cooperation and collaboration between humans and machines, artificial intelligent agents and robots, which could make good use of insights and concepts from CSCW, and which could also contribute to the body of knowledge in CSCW, but which does not seem to acknowledge or actively use these insights.

One reason for the challenge in adopting results from CSCW research lies in the nature of sociotechnical systems. It is not only about providing technology, but also about respecting and designing practices and processes. However, CSCW researchers could improve their efforts in building bridges between CSCW and other related topics and areas of research. By opening up to new settings and technologies and actively sharing results from CSCW research (on both traditional and new contexts and settings) with other research areas, they can enhance the relevance and impact of their work. This highlights the need to focus on what might be beneficial from CSCW research in other areas.

In our opinion, CSCW research in the future should concentrate more on what can be enabled with the collaboration tools. Documenting this from case studies in short lessons and advice and benefit-oriented case studies could already be helpful for practitioners. What CSCW guidebooks can and probably should do is to give people ideas or even imagination of what could be done and how it can be done. Then CSCW can be helpful in cases where the need for

change occurs suddenly (like during the pandemic) but also in “normal operation mode”.

For example, fifteen years ago, in the context of the application of social software in enterprises, two of the authors attempted to extract a list of lessons learned from case studies:

1. **Practices:** It is essential to focus on the benefits for the user, as highlighted in Grudin’s issues, and to communicate these benefits clearly, using a benefit-oriented approach (e.g. via “use cases”). The entire work system should be addressed, meaning that processes can and should be adapted.
2. **Policies:** Instead of developing user training focusing on individual system features, it is more effective to show users how they can integrate the application into their work processes. In line with this, the team should discuss how they want to communicate and establish policies as a way of managing expectations.
3. **Persistency:** Regularly assessing the benefits in team discussions is crucial; this should be a recurring topic in meetings. “The introduction of new tools or processes should not be seen as a one-time activity, but as part of an ongoing effort to improve collaboration and efficiency.”

Regardless of all these issues, where CSCW can do better in the future, CSCW already has been influential. Jonathan Grudin told us in 2015 that Microsoft and Google hired CSCW people and they had a lot of small influences in product development (see in Koch and Schwabe⁹). Nevertheless, the main influence of CSCW to practice has not been from developing theories, but from developing frameworks and even more from “developing intuition” in the people. This is relevant to many current and future fields, and CSCW can actively support the development of these fields.

5 CSCW in i-com and in this special issue

CSCW has been a topic in several former issues of i-com. So, we did include an introduction to Computer-Supported Cooperative Work in the initial issue in 2001:

Schlichter et al.²¹ Rechnergestützte Gruppenarbeit (CSCW). *I-Com Zeitschrift Für Interaktive Und Kooperative Medien*, 0, 5–11. <https://doi.org/10.1524/icom.2001.0.0.05>

Issue 4(2) in 2005 was a special issue on “Communities and Community Support”. With Issue 13(2) in 2014 we again had a special issue on “CSCW & Social Computing” – and in the

special issue on “20 Years i-com” in 2021 we had a paper reflecting on the initial paper in 2001:

Bullinger-Hoffmann et al.¹⁵ Computer-Supported Cooperative Work – Revisited. *I-Com Journal of Interactive Media*, 20(3), 215–228. <https://doi.org/10.1515/icom-2021-0028>

For this issue of i-com we had several interesting submissions of which the following have been selected for publication:

“Revisiting Grudin’s Eight Challenges for Developers of Groupware Technologies 30 Years Later” by Melanie Duckert and Pernille Bjørn

The authors review the eight challenges Jonathan Grudin has documented in 1988,¹⁰ and look into how relevant these challenges are today. They do this by revisiting the challenges empirically through ethnographic observations in two companies. The findings for example show that social and organizational challenges persist due to “additional complexities related to factors such as subgroups’ locations and organizational association, malleable group configurations, and dynamic contexts”.

“What Research Through Art Can Bring to CSCW: Exploring Ambiguous Futures of Work” by Kellie Dunn, Irina Shklovski and Pernille Bjørn

This article aims to explore what the role of CSCW researchers is in creating work futures, and what experiences CSCW researchers want to produce through technology design. To do this, the authors look at artistic practices and find that ‘futuring’ entails engaging with ambiguities of time, purpose, body, identity and agency as foundational.

“Gesture Combinations during Collaborative Decision-Making at Wall Displays” by Dimitra Anastasiou, Adrien Coppens and Valerie Adrien

In this article the authors report about a user study during collaborative decision-making at large wall displays – aiming to analyze combinations of mid-air pointing gestures with other gestures or gaze.

In addition to the CSCW papers we have some other papers in this issue of i-com (which were managed and reviewed outside of the special issue):

“Hybrid Work – A Reconceptualisation and Research Agenda” by Alexander Richter and Shahper Richter

In their paper the authors look at different developments changing the nature of work (increasing proportion of remote work, use of (generative) AI applications and advancements in virtual world technologies and platforms) and argue that these developments ask for a rethinking of the traditional understanding of hybrid work.

The paper matches closely to the topic of this special issue but was acquired via a different submission and review path.

“Cognitive State Detection with Eye Tracking in the Field: An Experience Sampling Study and its Lessons Learned” by Moritz Langner, Peyman Toreini and Alexander Maedche

The authors report about collecting eye-tracking data and cognitive state labels at the same time in a field study, and discuss how this collection of data can be used. As one example of how to use the data they develop supervised machine learning models for the detection of two eye-based cognitive states: cognitive load and flow.

“Best low-cost methods for real-time detection of the eye and gaze tracking” by Amal Khaleel, Thekra Abbas and Abdul-Wahab Sami

In this paper the authors report on new (low-cost) methods for real-time gaze tracking with unmodified web cams.

“Miles apart but close at heart? Exploration of UX checklist for relatedness technologies based on focus groups” by Klara Schuster, Angelina Krupp and Sarah Diefenbach

In this paper in the UX Forum of i-com the authors aim at providing a better theoretical basis for the research and development of relatedness technologies by combining theory from psychology and HCI with empirical insights from four focus groups. As a result, they present a UX factors-checklist consisting of motivators, hygiene factors, and meta topics that can be used when designing and evaluating relatedness technologies to ensure actual use and a positive user experience and highlight next research steps.

Research ethics: Not applicable.

Author contributions: The authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Competing interests: The authors state no conflict of interest.

Research funding: None declared.

Data availability: Not applicable.

References

1. Richter, A.; Koch, M. Interviews with Volker Wulf and Myriam Lewkowicz on “The European Tradition of CSCW”. *Bus. Inf. Syst. Eng.* **2018**, *60* (2), 175–179.
2. Marca, D.; Bock, G., Eds. *Groupware: Software for Computer-Supported Cooperative Work*; IEEE Computer Society: Los Alamitos, CA, 1992.
3. Busch, V. As We May Think. *The Atlantic Monthly* **1945**, *176* (1), 101–108.

4. Engelbart, D. C. A Conceptual Framework for the Augmentation of Man's Intellect. In *Information Handling*; Howerton, P. W., Weeks, D. C., Eds.; Spartan Books, Vol. 1, 1963; pp. 1–29.
5. Licklider, J. C. R.; Taylor, R. W. The Computer as a Communication Device. *Sci. Technol.* **1968**, *76*, 21–31.
6. Danielsen, T.; Pankoke-Babatz, U.; Prinz, W.; Patel, A.; Pays, P.-A.; Smaaland, K.; Speth, R. The AMIGO Project: Advanced Group Communication Model for Computer-Based Communications Environment. In *Proceedings of the 1986 ACM Conference on Computer-Supported Cooperative Work*, 1986; pp. 115–142.
7. de Cindio, F.; de Michelis, G.; Simone, C.; Vassallo, R.; Zanaboni, A. M. Chaos as Coordination Technology. In *Proc. Conf. on Computer-Supported Collaborative Work (CSCW)*, 1986.
8. Ciolfi, L.; Lewkowicz, M.; Schmidt, K. CSCW: History, Core Issues, and Approaches in Computer-Supported Cooperative Work. In *Handbook of Human Computer Interaction*; Vanderdonckt, J., Palanque, P., Winckler, M., Eds., 2023; pp. 1–27.
9. Koch, M.; Schwabe, G. Interview with Jonathan Grudin on “Computer-Supported Cooperative Work and Social Computing”. *Bus. Inf. Syst. Eng.* **2015**, *57* (3), 213–215.
10. Grudin, J. Why CSCW Applications Fail: Problems in the Design and Evaluation of Organizational Interfaces. In *Proc. Conf. on Computer-Supported Cooperative Work (CSCW)*, 1988; pp. 85–93.
11. Gross, T. Supporting Effortless Coordination: 25 Years of Awareness Research. *Comput. Support. Coop. Work* **2013**, *22*, 425–474.
12. Bjørn, P.; Ciolfi, L.; Ackerman, M. S.; Fitzpatrick, G.; Wulf, V. Practice-Based CSCW Research: ECSCW Bridging Across the Atlantic. In *Proc. ACM Conf. on Computer-Supported Cooperative Work*, 2016.
13. Grudin, J. Computer-Supported Cooperative Work: History and Focus. *IEEE Comput.* **1994**, *27* (5), 19–26.
14. Schmidt, K.; Bannon, L. Taking CSCW Seriously: Supporting Articulation Work. *Comput. Support. Coop. Work* **1992**, *1* (1–2), 7–40.
15. Bullinger-Hoffmann, A.; Koch, M.; Möslin, K. M.; Richter, A. Computer-Supported Cooperative Work – Revisited. *I-Com J. Interact. Media* **2021**, *20* (3), 215–228.
16. Duckert, M.; Bjørn, P. Revisiting Grudin's Eight Challenges for Developers of Groupware Technologies 30 Years Later. *I-Com. J.* **2024**, *23* (1), 7–32.
17. Olson, G. M.; Olson, J. S. Distance Matters. *Human-Computer Interaction* **2000**, *15* (2), 139–178.
18. Suchman, L. *Plans and Situated Actions: The Problem of Human-Machine Communication*; Cambridge University Press: Cambridge, 1987.
19. Dourish, P. What We Talk About When We Talk About Context. *Pers. Ubiquitous Comput.* **2004**, *8* (1), 19–30.
20. Ackerman, M. S. The Intellectual Challenge of CSCW: The Gap Between Social Requirements and Technical Feasibility. *Human-Computer Interaction* **2000**, *15* (2), 179–203.
21. Schlichter, J. H.; Reichwald, R.; Koch, M.; Möslin, K. M. Rechnergestützte Gruppenarbeit (CSCW). *I-Com J.* **2001**, *5*–11; <https://doi.org/10.1524/icom.2001.0.0.05>.

Bionotes



Alexander Richter's

Wellington School of Business and Government, Victoria University of Wellington, Wellington, New Zealand

alex.richter@vuw.ac.nz

<https://orcid.org/0000-0002-3699-6466>

Alexander Richter's research covers digital workplace transformation, especially human-AI collaboration, hybrid work practices, innovation & leadership, smart factories, and the value of using IT. He is a department editor at BISE, a co-editor at i-com, an ECIS track chair (since 2015) and deputy chair of the special interest group on CSCW & Social Computing in the German Computer Society (GI) where he was chair between 2014 and 2018.



Michael Koch

Computer Science Department, Universität der Bundeswehr München, München, Germany

michael.koch@unibw.de

<https://orcid.org/0000-0002-9694-6946>

Michael Koch is Professor for Human-Computer Interaction at Universität der Bundeswehr München (UniBwM) in Munich, Germany. His main interests in research and education are shaping cooperation systems, i.e. bringing collaboration technology to use in teams, communities and networks, and bringing integration and user interface technologies one step further to support this.



Michael Prilla

Interactive Systems, Department for Human Centered Computing and Cognitive Science, Faculty for Computer Science, University of Duisburg-Essen, Duisburg, Germany

michael.prilla@uni-due.de

<https://orcid.org/0000-0002-6095-6114>

Michael Prilla is a full professor at the University of Duisburg-Essen, Germany, where he heads the Interactive Systems work group. His work focuses on designing and evaluating individual and social human interactions with digital systems in application areas such as healthcare, education, industry, craftwork, and retail. Current areas of his work include human cooperation support by Augmented Reality and cooperation and collaboration of humans with robots and AI-based agents.