

Understanding and Supporting Collaborative Academic Writing as a Fragmented Process

Ida Larsen-Ledet

Department of Computer Science, Aarhus University, Denmark

Contact Email: ida.ll@cs.au.dk

Abstract. I present an overview of findings from a qualitative study regarding territorial functioning and fragmentation in collaborative academic writing. The findings demonstrate how collaborative writing may be characterized as a fragmented process, due to territorial functioning manifesting in segregation of the work as well as fragmentation across constellations of tools with similar functionality. I describe co-writers' appropriation of existing tools to achieve double-level language and outline a focus for future design efforts for a co-design process.

Introduction

Collaborative work presents a particular challenge compared to individual work due to the added effort of placing material in common in a way that it is understandable and useful to multiple actors (Bannon & Bødker, 1997). Characterizing this challenge in order to address it necessarily involves understanding the practices of those multiple actors as well as the interplay of their individual motivations.

Classifications of cooperative work often take a perspective in which the collaboration is categorized based on characteristics of the group and the mode of collaboration (Posner & Baecker, 1992; Lowry et al., 2004). While these aspects

Copyright 2018 held by Authors, DOI: 10.18420/ecscw2019_dc6.

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists, contact the Authors.

are significant, in particular when attempting to understanding the impact of technological facilitation, restricting the view to those aspects enforces a static perspective that may result in a poor match between the classification and reality (Grudin, 1994). My work falls into the body of research that supplements this view by concentrating on human practice and how it is mediated by technologies for collaboration.

Collaborative writing processes in particular are usually studied with a focus on the text (Olson et al., 2017) and/or on the main writing tool (Neuwirth, et al., 1992; Noël & Robert, 2004). The focus of my research extends to a more ecologically comprehensive view that acknowledges the presence and use of multiple documents and tools during the production of a collaboratively authored text. In addition to examining practices around these multitudes, emphasis is put on writers' motivations for these practices. In particular, I focus on territorial functioning and motivations for territorial behavior in academic collaborative writing. My findings on this so far, which are summarized below, have led to my framing of the collaborative writing process as fragmented¹, in terms of both content distributed across multiple tools (Bergman et al., 2006; Dearman & Pierce, 2008) and separation of work (Clement & Wagner, 1995). The research questions I address are the following:

- (1) What are co-writers' motivations for segmenting writing between each other and across tools?
- (2) What means and strategies do co-writers apply to facilitate fragmented work?
- (3) What challenges can be identified for HCI/CSCW research and design regarding the mediation of collaborative writing as a fragmented process?
- (4) What are potential answers to those challenges?

Questions 1 and 2 are covered by my current findings (Larsen-Ledet & Korsgaard, 2019). Question 3 is partly addressed in these findings and will be addressed further in future work along with Question 4. It is too soon for me to say what form answers or solutions to the challenge posed by collaborative writing as a fragmented process may take. I imagine that it might take multiple directions at once: Design guidelines, implementation of concrete tools, or a push for a paradigm shift.

¹ This terminology is inspired by Clement and Wagner's (1995) paper on disarticulation in collective communication spaces.

Methodological Approach

My current findings come from a combination of interviews about co-written projects and programmatically facilitated visual analysis of revision logs from project documents.

The interviews involved 13 university students and 19 researchers whom I talked to about their experiences with collaborative writing, focusing on a particular recent project but allowing the conversation to turn to other cases. The interviews totaled 23 (some were group interviews) and covered 18 different projects. The questions focused on both practical and social aspects of the collaborations: The tools and text production strategies applied when writing; ways of editing text written by others; ways of coping with others editing one's own text; personal strategies for draft writing; and approaches to decision-making during the writing process.

To support the analysis specifically of how territorial functioning manifests in the writing, a colleague and I developed a tool that allows visual exploration of revision logs of GOOGLE DOCS documents. Since only a subset of the interview participants used GOOGLE DOCS, only documents from this subset were analyzed.

Current Findings

As already stated, participants' accounts of their writing practice and experiences paint a picture of a process that is fragmented in multiple ways. Firstly, the writing and other involved work is spread across multiple tools with overlapping functionality: Text editing takes place in different writing tools at different stages of the writing; and multiple means of communication are used, even in collaborations involving only two people. The reconciliation of co-writers' multiple views of the situation and the object of work is highly effortful, involving copy-pasting to transfer text and manually porting formatting, coordinating the state of the text across multiple instances being worked on, and maintaining awareness of the activities of co-writers. Furthermore, oftentimes communication is decoupled from the content addressed in the communication.

Given the availability of tools supporting both writing and communication, such as GOOGLE DOCS, OVERLEAF or GIT, an obvious question is why writers include multiple tools offering similar functionality into their tool constellations (Rossitto, et al., 2014). We found that co-writers' motivations for these practices partly pertain to territorial functioning (Taylor, 1988), including a desire for privacy or a need for a space in which to work uninterrupted. Multiple participants reported occasionally copying text into a local text editor, such as MICROSOFT (MS) WORD or NOTEPAD, to be able to work in private. This behavior was, for some, also due to preferences for certain kinds of functionality for certain tasks (e.g. better spell

checking in MS WORD). This practice results in work becoming fragmented and co-writers having trouble keeping up with the work of other co-writers.

From our interviews we also found that the original writer of a piece of text acquires a form of *local expertise*; a particular expertise in navigating the region of text that they have crafted. Participants both expect and demonstrate respect for this kind of local expertise, demonstrating an attentiveness to territorial affiliation.

Participants reported many forms of appropriation intended to support territorial functioning and/or achieve capabilities not included in a tool's design. To achieve better coupling of communication and content, many of the participants described communicating directly within the text being edited. In these cases, text formatting (most often coloring) is sometimes used to keep track of who is saying what in such discussions. To pay respect to the territories of co-writers participants described making changes in comments rather than changing text directly. In this way they would not directly “touch” the original writers work and/or the original writer would be able to reject the change, in either case remaining in control. In this way, writers make comments into a double-level language (Robinson, 1991): The comments in and of themselves contain edits or serve to explain rationale, but additionally they provide writers with a way to express compliance with territorial expectations. Based on our findings we may classify two kinds of double-level language: *expressive*, such as the color coding signaling expectations, and *operative* like the comments demonstrating compliance.

These findings expand the prevailing image of collaborative writing from the production of text in a document to a complex coordination effort around multiple tools and files that involves pragmatic as well as social concerns. Furthermore, the findings feed into a debate about application silos and current paradigms for software development (Nouwens & Klokmose, 2018).

Next Steps

To address the issues related to territorial functioning and the fragmentation of content and communication across constellations of tools, as well as the possibility for appropriation to support double level language, I plan to conduct a series of co-design workshops. The idea is inspired by traditional participatory design and will be dialogue-based and take outset in concrete writing projects, similar to the interviews. Visualizations of these projects will potentially be used to spur on the dialogue.

The theme of the co-design workshops will be to design (components) for flexible sharing and withholding in collaborative writing. Currently, my idea is to begin with open discussions, potentially in a focus group format. Following this, potentially in a new session a couple of weeks later, I plan to have an ideation session. Implementing the ideas envisioned will be worked on in a final session. In preparation for this my plan is to pre-construct program components based on

the generated ideas, to allow participants to construct a working solution while still facilitating quick progress (hopefully mitigating the problem of participants becoming disengaged (Bødker & Grøn­bæk, 1992)). For the implementation I plan to use Webstrates (Klok­mose et al., 2015), an open source document editor and toolkit that allows composition and exchange of software components (see Klok­mose, *The Webstrates project*).

I would particularly like to discuss ways of approaching the co-design process, both methodologically and regarding what to aim for (empirical take-aways vs. supplying participants with a usable tool or skills to continue on their own (Bødker & Kyng, 2018)). Methodologically I am mostly in doubt about how to facilitate ideation with the participants, but also to what extent participants can and should be involved in building/modifying the technology directly. In connection with this I would also like to discuss opinions on, and experiences regarding, how to balance discussion, ideation, and construction.

Biography

Ida Larsen-Ledet is a second year Ph.D. student in the Computer Mediated Activity (CMA) group in Aarhus University's Department of Computer Science. Her project is part of the Horizon 2020 project *Common Interactive Objects*² which explores possibilities for extending human understanding and control of technological artifacts used for collaborative purposes. Ida obtained her master's degree in computer science from Aarhus University with electives in cognitive semiotics and information studies in 2017. Ida's Ph.D. work is supervised by Professor Susanne Bødker.

Following the courses offered by the CMA group during her bachelor's and master's and doing her master's thesis under Professor Bødker has provided Ida with an activity-theoretical background. The activity-theoretical view of tools as mediators for human activity and behaviors is the foundation for her human-centered approach which focuses on people's practices and motivations, in general and as they relate to specific tools. Due to this focus she favors qualitative methods in her work, as she aims to provide nuanced accounts of collaborative practices and personal motivations.

Acknowledgments

I am thankful to Susanne Bødker for providing me with the opportunity to conduct this research. This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 740548).

² cs.au.dk/research/pages/cio, *Common Interactive Objects*

References

- Bannon, L., & Bødker, S. (1997): 'Constructing Common Information Spaces', in J. A. Hughes, W. Prinz, T. Rodden and K. Schmidt (eds.): *ECSCW '97. Proceedings of the Fifth Conference on European Conference on Computer-Supported Cooperative Work*, Lancaster, UK, 7-11 September 1997, pp. 81-96.
- Bergman, O., Beyth-Marom, R., & Nachmias, R. (2006): 'The Project Fragmentation Problem in Personal Information Management', in R. Grinter, T. Rodden, P. Aoki, E. Cutrell, R. Jeffries and G. Olson (eds.): *CHI '06. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Montreal, Quebec, Canada, 22-27 April 2006, pp. 271-274.
- Bødker, S., & Grønbaek, K. (1991): 'Design in Action: From Prototyping by Demonstration to Cooperative Prototyping', in J. Greenbaum, & M. Kyng (eds.): *Design at Work*, Lawrence Erlbaum Associates, Hillsdale, New Jersey, pp. 197-218.
- Bødker, S., & Kyng, M. (2018): 'Participatory Design That Matters - Facing the Big Issues', *ACM Transactions on Computer-Human Interaction (TOCHI)*, vol. 25, no. 1, February 2018, pp. 4:0-4:31.
- Clement, A., & Wagner, I. (1995): 'Fragmented Exchange: Disarticulation and the Need for Regionalized Communication Spaces', in H. Marmolin, Y. Sundblad and K. Schmidt (eds.): *ECSCW '95. Proceedings of the Fourth European Conference on Computer-Supported Cooperative Work*, Stockholm, Sweden, 10-14 September 1995, pp. 33-49.
- Dearman, D., & Pierce, J. S. (2008): 'It's on My Other Computer!: Computing with Multiple Devices', in: *CHI '08. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Florence, Italy, 5-10 April 2008, s. 767-776.
- Grudin, J. (1994): 'Computer-Supported Cooperative Work: History and Focus', *Computer*, vol. 27, no. 5, May 1994, pp. 19-26.
- Klokmoose, C. N., 'The Webstrates project'. Retrieved December 28, 2018 from Webstrates: <https://webstrates.net/>
- Klokmoose, C. N., Eagan, J. R., Baader, S., Mackay, W., & Beaudouin-Lafon, M. (2015): 'Webstrates: Shareable Dynamic Media', in: *UIST '15. Proceedings of the 28th Annual ACM Symposium on User Interface Software & Technology*, Charlotte, North Carolina, 11-15 November 2015, pp. 280-290.
- Larsen-Ledet, I., & Korsgaard, H. (2019): 'Territorial Functioning in Collaborative Writing: Fragmented Exchanges and Common Outcomes', to appear in: *ECSCW '19: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work*, Salzburg, Austria, 8-12 June 2019.
- Lowry, P. B., Curtis, A., & Lowry, M. R. (2004): 'Building a Taxonomy and Nomenclature of Collaborative Writing to Improve Interdisciplinary Research and Practice', *The Journal of Business Communication (1973)*, vol. 41, no. 1, January 2004, pp. 66-99.
- Neuwirth, C. M., Chandhok, R., Kaufer, D. S., Erion, P., Morris, J., & Miller, D. (1992): 'Flexible Diff-ing in a Collaborative Writing System', in: *CSCW '92. Proceedings of the 1992 ACM Conference on Computer-supported Cooperative Work*, Toronto, Ontario, Canada, 1-4 November 1992, pp. 147-154.
- Noël, S., & Robert, J.-M. (2004): 'Empirical Study on Collaborative Writing': What Do Co-authors Do, Use, and Like? *Computer Supported Cooperative Work (CSCW)*, vol. 13, no. 1, March 2004, pp. 63-89.
- Nouwens, M., & Klokmoose, C. N. (2018): 'The Application and Its Consequences for Non-Standard Knowledge Work', in: *CHI '18. Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, Montreal Quebec, Canada, 21-26 April 2018, pp. 399:1-399:12.
- Olson, J. S., Wang, D., Olson, G. M., & Zhang, J. (2017): 'How People Write Together Now: Beginning the Investigation with Advanced Undergraduates in a Project Course', *ACM Transactions on Computer-Human Interaction (TOCHI)*, vol. 24, no. 1, March 2017, pp. 4:1-4:40.

- Posner, I. R., & Baecker, R. M. (1992): 'How people write together, in: *HICSS '92. Proceedings of the Twenty-Fifth Hawaii International Conference on System Sciences*, Kauai, Hawaii, 7-10 January 1992, pp. 127-138.
- Robinson, M. (1991): 'Double-level Languages and Co-operative Working', *AI & SOCIETY*, vol. 5, no. 1, January 1991, pp. 34-60.
- Rossitto, C., Bogdan, C., & Severinson-Eklundh, K. (2014): 'Understanding Constellations of Technologies in Use in a Collaborative Nomadic Setting', *Computer Supported Cooperative Work (CSCW)*, vol. 23, no. 2, April 2014, pp. 137-161.
- Taylor, R. B. (1988): *Human Territorial Functioning: An Empirical, Evolutionary Perspective on Individual and Small Group Territorial Cognitions, Behaviors, and Consequences*. Cambridge University Press , Cambridge, UK.