How Advances in Human-Machine Collaboration in Documentation Support Successful Aging

Sascha Donner

Berlin School of Library and Information Science, Humboldt University of Berlin

1 Motivation and Position

The World Wide Web, e-mail, messenger services, and numerous digital applications have led to a surge in the volume of digital documents. We are witnessing a steady increase in digital documents by volume and variety accompanied by an increase in screen time. Increasingly we live in a document society (Buckland, 2017), or as Le Deuff (2021) terms it in reference to Paul Otlet, “the time of hyperdocumentation has begun, and it is not about to be over”. Typically, when we are young, our brains are more open to new things and naturally learn to use current technologies, whereas as we age, we are less open and more attached to the technologies we learned earlier in our lives. One aspect that will need to be considered concerning successful aging (SA) is therefore that the growing amount and the developing variety of digital documents makes it increasingly difficult for the aging subject to manage its digital documents across devices and applications, and to follow trends towards new forms of documentation which in turn may lead to the risk for the aging subject to lose connection and be excluded from communication or documentation at some point to some extent.

A second aspect that can be noticed is, that a change from the documenting subject to the documented subject is increasingly taking place. A subject that is so busy creating itself through its documentation and fitting itself into the documented reality to such extent that the non-documented reality almost seems to wither away into something artificial. It is not that far yet, but the cognitive confrontation with the documenting self and the documented reality is already on the everyday agenda. It will be interesting to understand how our documented self develops over time and what might need to be considered over time for meaningful development of our documented self so that this first, does not restrict but supports our private and professional life in later stages of life and second, does not force us into a constructed role that does contradict or is inconsistent with our true self in the course of life.

Besides the ever-increasing volume and variety of documents, one of the trends which could change the way how we think and talk about documentation is the application of Artificial Intelligence (AI) to document-related tasks. Possibly, in the future there will be few document-related tasks that are not at least supported to some extent by AI-based tools. AI technologies are performing today what were previously thought to be impossible tasks. News articles, social media posts, and other documents are already authored order co-authored by AI algorithms today, and thanks to great language models such as GPT3 this trend of “effectively automating some information services and knowledge work” will possibly continue (Dinneen & Bubinger, 2021). AI algorithms are also part of human-in-the-loop (HITL) document management processes (Wu et al., 2021). Some first AI-based prototypes have also been proposed for file organization (Brackenbury et al., 2021). Such increasing support of artificial agents could be both hindering and supporting SA. Against this background, I am reviewing existing document theoretical concepts to what extent they can offer directions to research Human-Machine Collaboration from the perspective of the documenting human being, and I am trying to describe the related activities with the support of an activity theory-based model of documentation. Document theory is concerned with questions around the creation of documents (or the process of “documentation”) which includes information, communication, and documentation in physical, mental, and social dimensions. In this respect, I am convinced that a clear model of documentation can form a suitable crystallization point for the study of SA.

2 Background

The framework which supports and informs my research includes thoughts and models from document theory, activity theory, personal information management, human-computer interaction, information theory, and philosophy of information.

2.1 Document theory adapted to new PIM challenges

Much has been written and discussed about the concept of the document in the past decades since the beginning of the 20th century when the first documentalists like Paul Otlet, Robert Pagès, and Suzanne Briet started to ask questions about the document and to develop ideas and concepts around it. “The interest in documentation within Library and Information Science has varied over the years” (Lund, 2009), and shifted mostly between Europe and the Americas, especially in the pre-digitalization area. In the last decades, the basic building blocks of document theory have been built but the theoretical framework must be transferred to the developments of the digital age which offers new concepts, new tools, new devices, and new possibilities. “Documents have not disappeared and […] documentary contexts remain present and have, on the contrary, grown in size and complexity.” (Le Deuff, 2021). Especially as we are step by step entering a completely new area that will see more and more AI-based tools involved in documentation. The word “document” in the ordinary sense is intellectually connected with a textual record or a written human memory, however, the concept of the document is much broader, and it becomes even less clear in the digital age (Buckland, 1997, 1998). Any document preserved by a subject for later use or reuse is subject to PIM, a relatively “new field with ancient roots” (Jones et al., 2017) which can be argued to be deeply eradicated in document theory. My hypothesis is, that document theory can provide a valuable framework to think about and cope with the arising challenges in PIM such as SA.

2.2 Activity theory to explore SA in human-machine collaboration

With the current development toward (partly autonomous) AI-based systems the hierarchical layering of documentation activities from meaning-driven mental activities to operational actions could be advantageous to explore the possible division of tasks or actions between humans and machine. Activity Theory (AT) which was developed primarily by Lev Vygotsky and Sergei Rubinstein in the 1920s and 1930s offers a viable framework for understanding human activities as systemic and socially situated phenomena (Kaptelinin & Nardi, 2012). Important contributions have been made by Bødker (1989) and Kuutti (1991). Since then, AT has developed into one of the most fundamental concepts in HCI research (Kaptelinin, 2011). AT, as presented by Engeström (1987), offers a rich framework that includes instruments (e.g., documents that are physical, even if stored digitally), the mental dimension with the subject who carries out actions to achieve goals, and the social dimension given by the community, division of labor, and governed by rules. Putting the subjects’ goal-oriented documentation actions but also its mental dimension and social relations in the focus of research offers the possibility to research SA based on an AT-based model of documentation by changing the hypothetical age of the documenting subject but also to research the subjects’ actions over time (i.e. during the process of aging).

3 Planned related research during my Ph.D. studies

In my research, I explore a topic that has not been the focus of the existing literature in document theory so far, the mental dimension or the active role of the human involved in document-related processes. Document theory literature was long mainly focused on a third-party perspective and is missing out on the mental dimension or the active role of the human involved (Buckland, 2015). Given the current controversy and uncertainty about the future of artificial intelligence, I also plan to summarize the current state of research and theorize machine agency in documentation by applying concrete criteria derived from document theory, inter alia Ferraris (2013), Gorichanaz (2016, 2020), Le Deuff (2021) and Smith (2014). Finally, I will explore and describe the impact of AI on the subject's role. My overall research goal is to explore, based on the framework of document theory and activity theory, how human-machine collaboration in documentation can help humans to cope with the challenges that come with an increasing volume and variety of digital documents and hat such collaboration in documentation could be designed to remain both helpful and meaningful to humans in the future.

To create new ideas in an interdisciplinary field such as PIM it might be useful to provide a model which can serve as a common crystallization point for the different fields of research. Therefore, I will provide an activity theory model of documentation.

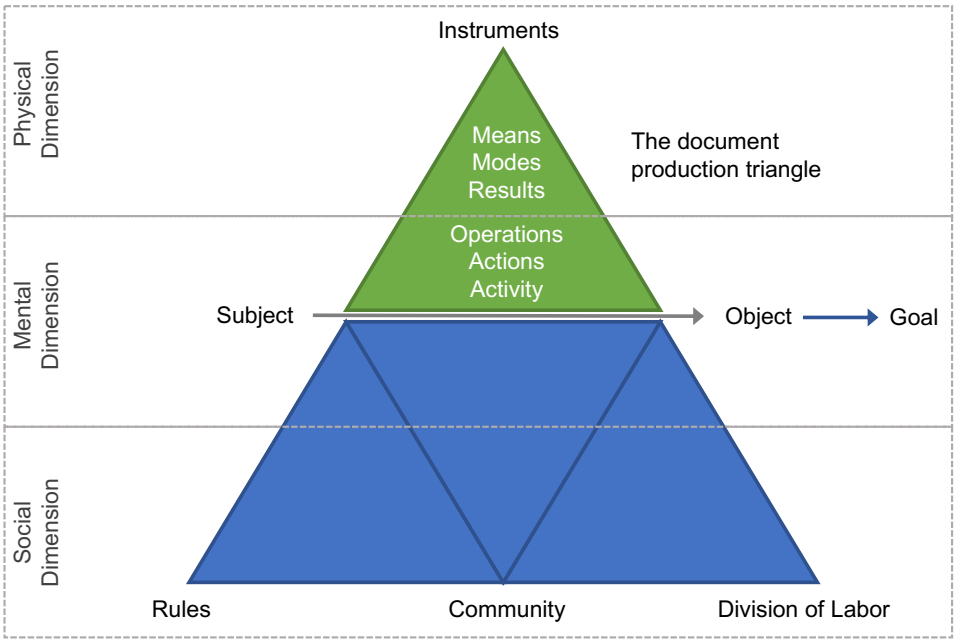

Figure 1: The AT model of documentation

Current documentation models such as the model of complementarity (Lund, 2004), the ontology of human expression (Olsen et al., 2012), and the document phenomenology (Gorichanaz & Latham, 2016) contain valuable indications from which we can learn something about the process of document production, but their model ontologies lack some clarity in a view to transferability to documentation as an activity which would allow us to draw conclusions concerning real-world situations that we try to explain or predict. In my research I will map applicable concepts and descriptions from document theory to the roles of the AT model to the extent it might help to include the missing aspects of the real world in today's

document theoretical models in all dimensions: the physical, the mental and the social dimension. The role descriptions are then examined to further identify the actions involved in the documentation activity, including the influence and interdependencies of the roles within the framework of the AT model of documentation. I will discuss the findings in light of the results from comparable studies in the field of HCI, Computer-Supported Cooperative Work (CSCW), and neighboring disciplines.

After creating the model, the possible roles of artificial agents (AA) in documentation shall be explored. Many scholars point to the necessity the better understand the effects of artificial agents on the established roles of actors in documentation. According to Le Deuff (2021) “it is necessary to understand and study the evolution of man’s role in the new devices”. He cites Müller (2012): “The digital era we have entered […] does not only change our tools by computerizing them, it imposes new form of knowledge, new ways of thinking and of dividing intellectual work. This trend is now about to reach a new level with improved applications in the field of artificial intelligence. "Throughout this technological evolution, the roles and modes of human interactions are also projected to change" (Khuat et al., 2022). Sundar (2020) calls for action that “theory and research should be geared toward a deeper understanding of the human experience of algorithms in general and the psychology of Human–AI interaction (HAII) in particular”.

My research goal also includes exploring how an increased support of AA in document management can influence the (perceived) roles of the actors as well as the other components of the created model and what we can learn based on the model for a future scenario in which AA will increasingly take over human tasks. Research questions might include how increasing automation can support SA but also how the experience and self-perception of the subject change with increasing automation in documentation and PIM.

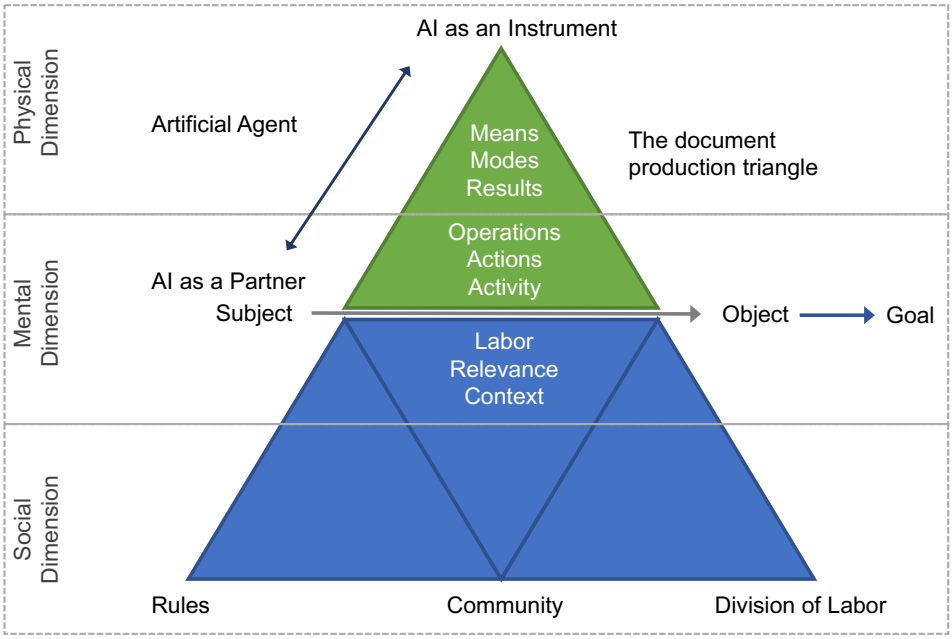

Figure 2: Exploring the role of AI in documentation

In recent years, the user perspective in document and file management has been discussed in related literature in Personal Information Management, Group Information Management, HCI, and information behavior literature (Bergman, 2020; Dinneen & Julien, 2020; Wilson,

2006). The outlined research might contribute to the development of additional theoretical linkages and improved theoretical and empirical rationale for existing linkages between document theory, personal information management, group information management, human-computer interaction, and the study of information behavior. The findings might offer points of departure for the further theoretical foundation of PIM.

Given the research goals I have outlined above, I believe it would be fruitful to attend the workshop and discuss how documentation and activity theory, among other aspects of PIM, can support successful aging.

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