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Chapter 6

Writing Acceleration and the Future of Writing

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Introduction

Writing is a technology, that has been evolving for more than five thousand years already (Daniels & Bright 1996; Robinson, 2009). Historically, it is a process that involves skillful gestures for composing a sequence of characters into a text. It has been developed throughout several millennia, and begun as a craft, by careful engraving on different surfaces and materials. Since the advent of digital writing, there has been an increase in writing production, and with the emergence of large language models (LLMs), a noticeable imbalance has arisen between input text and generated output text. A single sentence provided as input can generate several hundred or several thousand words when fed to an LLM. Before the 2020s, digital writing systems could autocomplete individual words, maybe up to a few words, but this noticeable imbalance between input and output text is what I refer to as *writing acceleration*.

One important question arises; whether LLM generated text is equivalent to writing, as text is nothing more than printed words or a container for writing (Lindgren, 2025). My motivation to write about LLMs as a writing technology has emerged because of what I do, see and hear about the use of these models. It is common practice that students, professionals, academics, artists, policy makers, make use of LLMs to produce a wide variety of texts. Can this (co-writing) practice been considered equivalent to the writing process? Håkan Lindgren¹, a professional writer and author, sees writing as a “tool for thinking” – and I could not agree more to this view, as I often make my understanding about different phenomena, concepts and artifacts that I am studying throughout the writing process. Otherwise, if I had a crystalised view about the different phenomena, concepts and artifacts, I would not be writing about them, I could just document what I am doing, using different media (e.g., sketches, images, videos, speech recordings). I experience writing as an act of exploring ungraspable knowledge, something that is beyond our senses, experiences and imagination – similar to how art is about exploring the unseen and unheard. Writing is also about analyzing and synthesising new knowledge, and LLMs are a technology that can do both analysis and synthesis. Hence, the large attention and investment on LLMs as a technology that off-loads humans from synthesis, although LLMs are not very successful with planning (Maslej et al., 2025, p. 5) – which can be seen here as a combination of analysis and synthesis.

1. Member of Cybioses who kindly reviewed my article.

The term writing acceleration refers to the concept of social acceleration, which was introduced by Hartmut Rosa (2003). There are three spheres of social acceleration: (i) *technological acceleration*, (ii) *acceleration of social change*, and (iii) *acceleration of 'the pace of life.'* Rosa sees a feedback loop between technological acceleration, the acceleration of social change, and acceleration of the pace of life. As writing is a technology, writing acceleration is a case of technological acceleration, which triggers an acceleration of social change. For instance, Frontiers Media SA, a well-known and high-quality publisher of peer-reviewed research articles, published a white paper where AI's potential is seen as an elevator to the research quality² (Markram, 2025). This white paper demonstrates a case of acceleration of social change within academia; motivating, or even nudging, researchers to accelerate research discovery with a goal to elevate research practices. This act of nudging constitutes a case of accelerating the pace of life for academics, as more research articles and more research findings will be produced, demanding increased attention by researchers and potentially breaking "academic circadian rhythms", such as presenting the annual findings – if any – to annual conferences. Current research practices in fastly growing research fields, such as Computing and AI, have left behind the need for peer-review and conference proceedings by publishing their findings as pre-prints in arXiv e-print archive and similar research repositories.

In education, the use of LLMs presents several challenges and opportunities (Ng, 2024), but it is yet unclear what the

2. <https://www.frontiersin.org/news/2025/12/15/most-peer-reviewers-now-use-ai-and-publishing-policy-must-keep-pace>

long-term impact of learning and understanding is when co-writing with LLMs. My stance here is not to unquestionably defend an arguably ancient technology (i.e., writing), and its means of production, but to examine using Rosa's framework how writing may be affected by the advent of LLMs. A particular focus is placed on pedagogy in higher education, research publishing, and academic research.

Working definitions

For writing

Humans have been writing for different reasons. We use writing as a tool for thinking, for producing unreadable scripts that have no specific semantic content^{3, 4, 5}, for documenting and archiving information, and as means for speech representation. When using writing as a tool for thinking we may write text that can be read aloud, or we may write encoded scripts such as computer programs. Early writing systems did not afford reading aloud, as reading was dependant on decoding instructions. The development of full writing, that is, writing that can accurately represent speech, was a decisive moment for the development of arts and science (Daniels & Bright 1996). Full writing demonstrated a landmark in the evolution of writing systems, and Socrates, being sceptical about the impact

3. <https://en.wikipedia.org/wiki/Pseudo-Kufic>

4. https://en.wikipedia.org/wiki/Asemic_writing

5. <https://forum.algoritmickpattern.org/t/fictional-alphabet-patterns/538/8>

of writing on our memory, was considering writing as “visible speech” (Robinson 2009, p. 2).

For writing acceleration

Rosa (2003) identifies the driving forces for each of the three spheres of social acceleration. These are called ‘key-accelerators’ and are independent of one another. They are being determined by the principles of speed and growth, and for technological acceleration the driving force is the *economic motor*, for the acceleration of social change is the *structural motor*, and for the acceleration of the pace of life the key accelerator is the *cultural motor*.

The concept of writing acceleration is seen here as a case of technological acceleration; when connecting the key-accelerators with the technological sphere we see an evident relationship between the economical motor and writing acceleration. Research and development in LLMs has drastically repositioned the role of AI at the forefront of world’s investment and public interest. Commercial products, such as ChatGPT, present the first large-scale market opportunity for AI. For several decades, the AI industry could not find a strong argument for boosting investment interest, as there was no real-world application with such an impact in the society; thus, unique market value. Current market projections show a dramatic increase in the expected value of AI by 2033, estimating a market value of \$4.8 trillion^{6,7}. The selling point of LLMs is that they can boost productivity

6. <https://unctad.org/news/ai-market-projected-hit-48-trillion-2033-emerging-dominant-frontier-technology> [Accessed: 2025-12-26]

7. As a comparison, the automotive industry has global revenue of \$2.75 trillion in 2025, https://en.wikipedia.org/wiki/Automotive_industry [Accessed: 2025-12-26]

and narrow skill gaps (Maslej et al., 2025, p. 3), while generative AI is seen as a platform for AI.⁸

The second key-accelerator is the structural motor which is driving the acceleration of social change. The structural motor is determined by the principle of *functional differentiation*, which is a case of social differentiation in modern societies. The basic premise being that social differentiation is both a structure and a process within a society. Structurally, social differentiation means that different societal parts exist within a societal unit, such as politics, arts, sciences, and are interdependent of one another. “As a process, social differentiation is the dynamic that brings about and changes a given structure of differentiation” (Smelser & Baltes, 2001, p. 3664). There are four causal factors of functional differentiation: (i) improvements of performance, (ii) evolution, (iii) cultural ideas, and (iv) interests of actors (Smelser & Baltes 2001, p. 3665).

Within the context of writing acceleration, LLMs are being used by a wide variety of actors. The actors are parts of a social subsystem, such as economy, policy, education and so on. Each subsystem has different means of production, different historical evolution and different motivation for improvements, which brings about a vast complexity on the impact of LLMs within a society. For instance, in higher education and research publishing, LLMs are having an increasing impact that makes almost impossible for all actors to act in a coordinated manner. Senior academics are probably sceptical about the use of LLMs in writing and review practices (Chawla, 2025), whereas early

8. <https://mitsloan.mit.edu/ideas-made-to-matter/generative-ai-a-new-platform-applications-development> [Accessed: 2025-12-26]

career academics are enthusiast adopters of this technology (Markram, 2025).

The third key-accelerator is the cultural motor, denoting an acceleration of the pace of life within the society. The cause of this acceleration is the vast number of options we have to pursue a good life, when living in an era where “the only scarcity is the scarcity of scarcity” (Rosa, 2003 p. 5). Given the large number of options, also known as hyper-optionality, the only option we have is to compress our actions and experiences in everyday life. By suppressing the time spent on each activity we can compress more activities within our lifespan. Thus, we have “the paradoxical phenomenon of simultaneous technological acceleration and increasing time scarcity” (Rosa, 2003 p. 14).

In the context of co-writing with LLMs, the cultural motor brings about possibilities of use and non-use. Satchell and Dourish (2009) examined six forms of non-use: lagging adoption, active resistance, disenchantment, disenfranchisement, displacement, and disinterest. In the context of LLM, lagging adoption was the case for non-Western societies when ChatGPT was first released. More specifically, Western universities were in advantageous position to employ LLMs in their research and educational practices early on. Almost three years after the public release of ChatGPT this gap has been narrowed and currently LLMs are becoming more accessible across the world. When focusing on cases of use of LLMs, the large number of web services that provide LLM services have been boomed since late 2022. Every six months, there is a vast improvement in cost reduction and model performance. When discussing about the use of LLMs when writing, the plethora of LLMs bring about a

hyper-optionality of possibilities. Imagine a scenario where an early-career scholar, when writing their doctoral dissertation, is engaged with different LLMs that may offer slightly or radically different opinions on a specific matter. Could such engagement lead to paralysis-by-analysis?

Writing acceleration and social deceleration

Hartmut Rosa sees a counter force to the phenomenon of social acceleration. He identifies five areas that afford slow-down and deceleration: (i) natural and anthropological speed limits, (ii) territorial as well as social and cultural ‘niches’, (iii) phenomena of slow-down as an unintended consequence of acceleration, (iv) intentional forms of (social) deceleration, and (v) ‘hyper-accelerated standstill’ or ‘polar inertia’ as an outcome of hyper-optionality and unlimited openness (Rosa, 2003 p. 16).

Below I discuss different facets of writing and examine how applying Rosa’s framework in the context of writing acceleration may bring about phenomena of social deceleration and desynchronization of social and functional spheres.

Writing production

The underlying idea in text generation systems using formal systems (e.g., regular expressions) or predictive models (e.g., LLMs, Markov models), is that there is a decision-making space for predicting the next character or the next word. While the idea of combinatorics for text generation has been explored

since the 1960s, with the Oulipo group and the concept of a *potential literature* (Montfort & Wardrip-Fruin, 2003), which was put into practice with the famous “A Hundred Thousand Billion Poems”⁹, here, I aim to focus not so much on the production rules, but on the relationship between writing and “cardinal change in temporal patterns” (Rosa, 2003 p. 5) while writing.¹⁰

Taking the abovementioned working definition of writing – as a tool for thinking, producing scripts with no semantic meaning, documenting and archiving, and as a representation of speech – there is an evident imbalance between speech and contemporary means of writing production. Co-writing with LLMs can no longer be in-sync with “inner speech”, which can serve as phonetic representation, as LLMs generate texts in large quantities in a very short temporal window. Given the historical relationship between speech and the development of full writing, maybe we are entering in the era of the end of writing (or written) history. Another possibility may be that we will adapt to the anthropological limits and cultural niches of writing, by becoming faster readers and faster writers. The relationship between reading and writing systems does not depend on prosodic information and phonological representation is not identical to written language (Mattingly, Kavanagh & Mattingly, 1972, p. 142), which is also supported by evidence of high-speed readers who do not depend on listening while reading.

9. https://en.wikipedia.org/wiki/A_Hundred_Thousand_Billion_Poems

10. I may see that as an ‘unruly’ writing production, as anything goes when asking a LLM.

On the other hand, there is an increased interest and use of voice interfaces when interacting with LLMs¹¹, and an increasing interest in developing robots that can use speech communication in an efficient and reliable manner. To the best of my knowledge, when interacting with such AI models, two main technical parts are involved for producing the oral output. A text-to-text is generating a written response, and then a text-to-speech model is using this output to render the speech sounds. For this type of model design, there is an open question how spoken language will be influenced by ‘oralized’¹² versions of written language, when interacting with robots in everyday life scenarios.

When examining writing production during the act of co-writing with LLMs, it is largely unclear what would be the long-term impact on educational and research practices. There are certainly anthropological limits on comprehension and concept understanding. It may require several years of education to get acquainted with different concepts and phenomena. How a “ready-made” (or knowledge that requires minimum effort) and summarized knowledge (i.e., the output of LLMs) will be adopted by scholars and students for improving research quality and understanding? I have no answer to that. My solely opinion is that understanding takes time. Can such ready-made knowledge acquisition have an impact on cognitive

11. Voice user interfaces, also known as VUIs, became popular with the advent of Siri and Alexa, and currently broadly used by Google, drastically improving accessibility issues.

12. The term ‘oralized’ is a makeup word I created, to express oral renderings of written language.

or intentional slow-downs and mental confusions? I am only speculating, here, but I definitely see some dangers. Among those, is also the potential *resistance to change* our current teaching and learning practices.

On a more abstract level, can such ready-made intellectual exchange trigger a cognitive stand still? On one hand, the conversational aspect of AI is certainly something that we can benefit from, as conversation is a very prominent avenue for learning and discovery, but should always be aware of the dangers of anthropomorphization. On the other hand, a major limit of LLMs is that they will be always predicting a ‘statistical mean’¹³ within their given dataset. The model alone can never go out of their training dataset and start imagining the unseen and unheard. One may claim that the same holds true for humans, but I would disagree, especially given a human-human interaction model where all sorts of complex phenomena take place, such as firing of mirror neurons, bodily entrainment, empathic attunement and so on.

The writing process

When discussing about the writing process with different people, I have come to realize that there is a range of diverse writing practices. Some people, see writing as a *work to be done*,

13. I am using the term ‘statistical mean’ to refer to an averaging that is being performed by LLMs when taking decisions. As LLMs contain a huge network of interconnecting nodes with weights, the output will always be part of the network, and never something outside of it. Palle Dahlstedt introduced this idea in his Cybioses summer school presentation in Oslo 2023.

whereas others can *make their understanding* through the writing process. Regardless of people's conceptions, writing requires effort and time commitment.

When prompting an LLM writing becomes effortless. A small sentence can generate a paragraph, an article, or even a book. The obvious question, is who is reading all these generated texts, when the time commitment to generate a large chunk of text requires only a few seconds? Are people patient enough to devote the time commitment to listen to these generated outputs?¹⁴ This example, presents another case of hyper-optionalty and the scarcity of the scarcity.

Reading and writing are complementary skills. Since the advent of wikis, our reading habits have become increasingly non-linear. When reading about a topic, we follow a hyperlink to get a glance of the next lemma and so on. Reading linearly or non-linearly depends on what we are reading about. Academic reading is largely a non-linear process, while poetry or short stories require a linear approach. Similarly, writing can be performed as a linear or a non-linear process. When I was writing essays as a pupil, I learned to write in a linear manner – using pen and paper. Electronic writing facilitates a non-linear approach, as it became easy to move different text chunks around and combine different text chunks together.

Besides the linear and non-linear writing process, writing can be performed in a bottom-up or a top-down manner. A top-down approach is that of iterative refinement, whereas a novel method which carries many bottom-up characteristics is that of live writing. Live writing (Blackwell, Cox & Lee, 2016) is

14. Speech rate is slower than reading rate.

a defamiliarization technique for writing. Typing in a shared document, writing is public present two instances of this practice. Live writing emerged from live coding (Blackwell et al., 2022), and in the context of a musical live coding performance we may see the performers taking mixed-initiatives, turn-taking in typing, sonifying the typing sounds and many more. The intention is to bring at the forefront of attention the unfolding of performers' thought processes.

LLMs are agnostic to live writing. Instead, I see contemporary LLMs as rigid monolithic structures where the user is entrapped to comply to a WYGIWYG (What You Get Is What You Get) user interface (Sarkar, 2024). How can we incorporate live writing with LLMs? There are numerous opportunities, from typing-aware prompts to non-linear presentation of responses. Overall, the idea of defamiliarization is a prominent design technique for exploring new design spaces. Instead of trying to adapt to current metaphors we know they work well and existing popular designs, we may have to go to the opposite direction and explore the unimagined. After all, digital materials are radically different from physical materials, and creating bridges between the two is not an obvious task (Ishii & Ullmer, 1997).

Co-writing, agency, and creativity

The length of input text prompts to an LLM – in comparison to the generated output – has causal effects for a reduced sense of the intent of the author (Kreminski, 2024; Sarkar, 2024). This reduced sense of author's intentionality is yet another piece on the discussion around authorship and agency of the user. This

fact resonates with the concept of *influential agency* (Dahlstedt, 2021), which denotes that the toolmaker (in this case the LLM developers) cannot predict the intentional stance of the user. Therefore, it may cause a reduced interest of actors with the use of LLMs. Senior academics show an active resistance on adopting LLMs in their daily practices, which cultivates an atmosphere of disinterest. The consequence of this intentional stance may result in a dichotomy within academics and publishing practices. Currently, in information technology industry, it is common practice that clients request “human-written code” when hiring a third-party for development. Is it likely to see a similar trajectory in academic publishing and funding applications in the near future? If such a dichotomy takes place within academic circles, it would cause a lot of disruption and may have detrimental consequences for research quality but also for knowledge production. I believe that this is unlikely to happen, but it is currently causing many concerns in peer-review practices (Chawla, 2025).

Focusing on cultural niches, such as research in creativity and the arts, it has been argued that co-writing with LLMs reduces creativity due to stylistic homogenization (Anderson, Shah & Kreminski, 2024). Several approaches exploring creative writing have been examined, such as mixed-initiative systems (Kreminski et al., 2022), where the human agent and the artificial agent collaborate for interactive storytelling. Mixed-initiative systems is a prominent way to go, and have also been used to successfully account for user’s attention investment, applied specifically to reduce user’s effort while making syntactic errors (Morris & Blackwell, 2023). In analogy to knowledge production, if our creativity is negatively influenced with

the use of LLMs, it will cause a disinterest of actors within the creative domains; consequently, to intentional forms of deceleration. That slow-down will cause a desynchronization between different creativity-related disciplines and other research disciplines. Creativity-related disciplines are particularly important as they are among the avant-garde of innovation and research experimentation, and particularly important for rethinking current practices.

The current market success of text user interfaces and voice user interfaces (VUI) are based on a personification of the LLM, which has been seen as problematic or even unethical design for user interaction (Morris & Blackwell, 2023; Shneiderman, 2022). An out-of-the-box redesign of LLM user interfaces is required to the well-established Google-style search interfaces. Services that do not employ a search interface cultivate a compliance culture or *accepting suggested changes*, which I find problematic (Diapoulis, 2025). After all, LLMs are not just for text generation. As mentioned above⁸, they are seen as a platform for AI and there is contemporary discussion on LLM-mediated computing (Rost, 2025), which in principle can radically transform our interactive practices when working with computers. Re-imagining human-computer interaction is where research efforts should be focused, and the research discovery may be a by-product of that.

The future imperfect of writing

We live in an era where we delegate machines to answer our questions or express our opinions by means of writing. Who will ever read this generated amount of text is an open

question, but current practices demonstrate that users skim the LLM responses, and prompt repeatedly until they find a desired answer. It is unclear how the user practices will evolve along with the design of the textual interfaces, but at the time of writing this article the dominant interface metaphor is that of a search interface (similar to Google search box), while the system's response is presented in natural language, mimicking a chat interface. Also, people's adoption of such design metaphor is likely biased by familiarity with the Google search service and other chat interfaces.

Writing systems were initially developed for accounting but were later evolved to represent verbal communication. Consequently, the latter enabled the flourishing of arts and science. It is truly questionable how modern writing practices will influence the world's writing systems, but I see a dissociation between writing and verbal communication, and the question is what the next step is. It is possible that in the future, new forms of human communication may be documented, even if verbal communication will likely remain the main means of human-human interaction.

Why do we allow our system for documenting verbal communication to be infiltrated with computer generated content? A simple explanation is that maybe we do not know how to use these technologies. Maybe future redesigns of LLMs will focus more on responses using visual explanations or proto-writing. Maybe we are about to revisit the origins of the writing systems and come out with something new at the end of the next design iteration.

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References

- Anderson, B. R., Shah, J. H., & Kreminski, M. (2024, June). Homogenization effects of large language models on human creative ideation. In *Proceedings of the 16th conference on creativity & cognition* (pp. 413-425).
- Blackwell, A. F., Cocker, E., Cox, G., McLean, A., & Magnusson, T. (2022). *Live coding: A user's manual*. MIT Press.
- Blackwell, A., Cox, G., & Lee, S. W. (2016, October). Writing the Live Coding Book. In *International Conference on Live Coding 2016*.
- Chawla, D. S. (2025). “A serious problem’: Peer reviews created using AI can avoid detection.” *Nature*.
- Dahlstedt, P. (2021). *Musicking with algorithms: Thoughts on artificial intelligence, creativity, and agency*. Springer.
- Daniels, P. T., & Bright, W. (1996). *The world's writing systems*. Oxford University Press.
- Diapoulis, G. (2025). *Code acceleration: Rethinking modern programming practices* (Preprint). Chalmers University of Technology.
- Ishii, H., & Ullmer, B. (1997, March). Tangible bits: towards seamless interfaces between people, bits and atoms. In *Proceedings of the ACM SIGCHI Conference on Human factors in computing systems* (pp. 234-241).

Kreminski, M. (2024, May). The dearth of the author in AI-supported writing. In *Proceedings of the Third Workshop on Intelligent and Interactive Writing Assistants* (pp. 48–50).

Kreminski, M., Dickinson, M., Wardrip-Fruin, N., & Mateas, M. (2022, October). Loose Ends: a mixed-initiative creative interface for playful storytelling. In *Proceedings of the AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment* (Vol. 18, No. 1, pp. 120–128).

Lindgren, H. (2025). Personal correspondence.

Markram, K. (2025). Unlocking AI’s untapped potential: Responsible innovation in research and publishing (White paper). *Frontiers*. <https://www.frontiersin.org/documents/unlocking-ai-potential.pdf>

Maslej, N., Fattorini, L., Perrault, R., Gil, Y., Parli, V., Kariuki, N., Capstick, E., Reuel, A., Brynjolfsson, E., Etchemendy, J., & others. (2025). *Artificial intelligence index report 2025* (arXiv preprint arXiv:2504.07139).

Mattingly, I. G., Kavanagh, J. F., & Mattingly, I. (1972). *Reading, the linguistic process, and linguistic awareness*. ERIC.

Montfort, N., & Wardrip-Fruin, N. (2003). *Six selections by the Oulipo*. MIT Press.

Morris, T., & Blackwell, A. (2023). Prompt Programming for Large Language Models via Mixed Initiative Interaction in a GUI. In *34th annual workshop of the psychology of programming interest group* (ppig 2023).

Ng, L. (2024). Llms in education. *XRDS: Crossroads, The ACM Magazine for Students*, 31(1), 66–70.

Robinson, A. (2009). *Writing and script: A very short introduction*. Oxford University Press.

- Rosa, H. (2003). Social acceleration: Ethical and political consequences of a desynchronized high-speed society. *Constellations: An International Journal of Critical & Democratic Theory*.
- Rost, M. (2025). Reclaiming the Computer through LLM-Mediated Computing. *Interactions*, 32(5), 26-31.
- Sarkar, A. (2024). *Intention Is All You Need*. arXiv preprint arXiv:2410.18851.
- Satchell, C., & Dourish, P. (2009, November). Beyond the user: use and non-use in HCI. In *Proceedings of the 21st annual conference of the Australian computer-human interaction special interest group: Design: Open 24/7* (pp. 9–16).
- Shneiderman, B. (2022). *Human-centered AI*. Oxford University Press.
- Smelser, N. J., & Baltes, P. B. (2001). *International encyclopedia of the social & behavioral sciences* (p. 10507). Amsterdam, The Netherlands: Elsevier.