"Infinity Book": Critical Speculation on How Generative AI Shapes the Socio-Material World

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Abstract

Recent advancements in Generative Artificial Intelligence (GenAI) and its promising impact on shaping human-computer co-creativity relationships have attracted speculation on this issue. Despite a call for more design-oriented research and many works using critical and speculative design to understand the socio-technical implications of GenAI, few of them have made design artifacts for a more concrete examination. As a response, we carried out three speculative design workshops to explore this issue by introducing a speculative concept named *Infinity Book*, a system creating any kind of fictional text from minimal user input. The data collected from the workshops was analyzed through reflective thematic analysis. The results pointed out the double-edged role of GenAI in extending human capabilities while highlighting ethical issues such as cultural decay and social fragmentation. We also reported our preliminary insights into the relationship between human and nonhuman actants shaped by GenAI under the theoretical background of Actor-Network Theory and Postphenomenology.

Keywords: speculative design, critical speculation, creative writing, generative artificial intelligence

Introduction

Nowadays people are exposed to intelligent computational systems capable of autonomously generating novel data more than just classifying information (Ghajargar, Bardzell, and Lagerkvist 2022). Generative Artificial Intelligence (GenAI) is one such computational technology that surged during the 2020s facilitated by large language models (LLMs) such as GPT-3 and GPT-4. GenAI is a set of machine learning algorithms capable of generating new, plausible content (e.g., images, texts, music, code, and other forms of design) based on existing content, usually responding to prompts (Muller et al. 2022; Sun et al. 2022). In 2020, GPT-3 demonstrated its ability to produce non-fictional work that can hardly be distinguished from human work (Floridi and Chiriatti 2020). It can be fairly certain that GenAI writing coherent yet artistic literature is designated to happen (e.g., in the next 5 years).

Therefore, it is crucial to foster reflective and critical engagement not just with the current state but with what and how things could be in the future (Redström and Wiltse 2018). As pointed out by (Liu, Huang, and Holopainen 2023), there are two gaps in current research on GenAI. First, most of the current literature is technology-oriented, neglecting the nature of design in the human-GenAI relationship. Second, researchers talk about the utopia or dystopia that GenAI can create either in an abstract way or in a specific field. A "middle ground," the concrete enough and critically speculated future of GenAI, is missing. These two gaps jointly lead to a call for more critical speculative design in GenAI research.

In response to the call, we are curious about the impact of GenAI on the socio-material world through critical speculation on human-AI co-writing systems. Specifically, we propose *Infinity Book*, a future fictional system that can intelligently generate all kinds of fictional text, e.g., books, short stories, poems, self-help manuals, and so on. The direct inspiration for *Infinity Book* comes from the great science-fiction writer Stanislav Lem's short story First Sally (A) or Trurl's Electronic Bard, which depicts the development and consequences of a machine capable of producing vast amounts of poems with quality surpassing even the best of human poets. The concept of infinite library as explored by various authors, including Jorge Luis Borges, Terry Pratchett, and Umberto Eco, provided further inspiration. Books, serving as essential vehicles in preserving and disseminating knowledge across generations and cultures, are considered relatively stable cultural artifacts compared to other cultural forms. The current developments suggest that the emergence of fully AI-generated fiction books will likely precede AI-generated movies, making our speculative work more pertinent. Finally, the similar engagement patterns observed between books and other high-focus media forms, including movies and video games, suggest that the speculations could also extend to these media.

In this paper, we reported three speculative design workshops around the concept of *Infinity Book* to answer the following research questions:

- How do human-AI co-writing systems like *Infinity Book* shape the relationship between technology and the socio-material world?
- What are the ethical implications of human-AI co-writing systems like *Infinity Book*?

Background

The general approach for this research is research through speculative design. We situate our findings under Actor-Network Theory (ANT) and Postphenomenology.

Theoretical Framing

ANT originally arose from the science and technology studies of the second half of the 20th century (Latour 2007). Lately, ANT has been increasingly used in understanding technological developments in human-computer interaction (Frauenberger 2019). The theory removes humans from the center by introducing non-human actors, such as objects, technology, processes, and even ideologies and beliefs, in the analysis on the same level as humans. The focus is also on the ever-shifting relations between these human and non-human actors and, as the name implies, these relationships form networks of influence and effect (Adams and Thompson 2016).

Postphenomenology studies what kinds of relationships humans form with technology. It asks questions such as: How does technology shape our actions, choices, experiences, and worldviews? How technology shapes our politics, economics, ethics, and everyday life? (Rosenberger and Verbeek 2015) Rejecting the classical phenomenology idea that regards technology as tools, postphenomenology assumes that technology plays a more proactive role in mediating human-world relationships (Rosenberger and Verbeek 2015).

As a trend, the traditional anthropocentric perspective has been continuously challenged, and more researchers are calling for decentering the role of humans. Shifts have appeared under the contemporary design contexts moving away from human-centered design to more than human-centered design (Coulton and Lindley 2019).

Design Theories

Research through design (RtD) is an approach to carrying out research using design methods and practices to gain new knowledge (Zimmerman and Forlizzi 2014). In RtD, tangible artifacts are designed and created to seek answers to specific research questions (Zimmerman, Forlizzi, and Evenson 2007). It leverages design's strength as a reflective practice to interpret and reinterpret the conventional perception of the world consistently (Zimmerman and Forlizzi 2014). In RtD projects, the actual design and concept ideas are not known at the start of the project, but they emerge later through concrete analysis and design work by utilizing existing technology or material.

Speculative design endeavors to envision alternative futures and how the designed objects would alter, shape, and redefine our human world (Auger 2013). The word "speculative" indicates that the standing point of speculative design projects is in the "future", and they look beyond what is technologically or culturally possible right now. Thinking beyond current limitations (in other words, taking a certain technology for granted although it has not been realized by now but is destined to), researchers are encouraged to envision new forms of interaction between humans and technology. Specifically, speculative design focuses on envisioning the ethical implications, and social and cultural impacts of a certain technology, as well as future scenarios and possibilities of applying this technology (Dunne and Raby 2013).

Thus, research through speculative design allows us to imagine different futures to prepare for them. The approach aims at widening our understanding of what would matter and to whom in our future worlds.

Table 1: Demographic information for all three workshops

Workshop	Female	Male	Professions
I	N=2	N=5	5 PhD students, 1 professor & 1 artist
II	N=3	N=3	6 PhD students
III	N=2	N=4	5 professional designers & 1 artists

"Infinity Book" Workshops

A prestudy of a systematic literature review was conducted on the current critical speculative design literature of GenAI. Following the steps of the systematic literature review work done by Liu et al. (2023), we collected data and performed a bibliometrics analysis and Latent Dirichlet allocation (LDA) topic modeling. Results showed that there have been studies critically speculating on how GenAI impacts the socio-material world. However, they mostly followed a human-centered perspective or didn't use design (e.g., (Biermann 2022; Yan 2023; Durante et al. 2024). This gap deserves our attention given the significance of creative writing in the human socio-technical world and design as a concrete middle ground for discussion [1].

Inspired by the prestudy's findings, we conducted three critical speculative design workshops (Dec 2023, Jan 2024, and Feb 2024) informed by postphenomenology. We used *Infinity Book*, a future fictional system powered by GenAI, as the initiation for discussion of future possibilities. All three workshops were designed and facilitated by the third author. Details are elaborated below.

Participants The participants, with backgrounds in creative practices and arts, all have had experience with GenAI tools. In each workshop, there was one facilitator (the third author) and 6 to 7 participants. Table 1 shows the demographic details.

Workshop Design

Workshop I followed three steps. The host first introduced the concepts of *Infinity Book* and asked the participants to speculate from the more-than-human perspective. Then a session of "actors ideation" with the method of "6-3-5 Brainwriting" (Rohrbach 1969) was held. "Actors ideation" was informed by ANT where actors can be both

[1] See details at: https://github.com/HughXuechen/iccc-2024-infinity-book

human and nonhuman and always have relations with other actors (Adams and Thompson 2016). For example, an actor can be someone or something that uses the system, benefits from the system, exploits or is exploited by the system, etc. Participants were asked to describe the actors and their relations to *Infinity Book* and other actors in a concrete manner. 6 rounds of "actors ideation" were conducted. In each round, participants had 5 minutes to write down 3 ideas on 3 post-its and put them on his/her sheet. After each round, every participant gave his/her sheet to the person on the right and then the next round started. A total of 126 (3 ideas in 6 rounds with 7 people) ideas were gathered. The last step was to organize ideas using an affinity diagram (Nelson 2000). The participants went through each note and grouped notes that expressed similar ideas on the whiteboard. Each group was given a name, and this process iterated until every note was distributed to a certain group.

Workshop II & III shared almost the same procedures but with participants from different professions. For workshop II, 6 PhD students with design backgrounds were recruited; for workshop III, 5 professional designers from industrial companies and one artist participated.

Workshops II and III were opened with a brief introduction similar to workshop I. The main part of the two workshops was three idea sessions using the "Future Ripples" method (Epp et al. 2022). It starts with a "what if" scenario for creating ripples of consequences. For the two workshops, the "what if" scenarios were predefined by the researchers, which are *What if there were systems widely available that can produce full-length novels from scratch according to users' wishes?* and *What if there were systems that could create any kinds of fictional text, e.g., novels, poems, short stories, self-help manuals, and so on, from scratch?* accordingly. In the first idea session, each participant had 15 minutes to write the consequences of the "what if" pebble on notes. Then everyone presented their best two to three ideas and placed them on the whiteboard. After discussion within the group, participants drew lines between post-its on the board if the ideas were related. In the second and third idea sessions, participants got inspired by the consequences already on the board and repeated the exercise.

Data Collection & Analysis

We conducted reflective thematic analysis (RTA) to analyze the workshops, following the six phases proposed by Braun and Clarke (Braun and Clarke 2012; 2019). Unlike other thematic analysis (TA) methods, RTA relies on the researcher's reflection on theme interpretation and knowledge generation (Braun and Clarke 2019). In this case, our analysis was informed by both ANT and postphenomenology.

First, the notes on the whiteboard from the workshops were photographed and then placed on white A4 sheets, according to the original positional relationship. These white A4 sheets were then scanned into the PDF version. The first author got familiar with the data by re-reading and manually transcribing the text from the scanned PDF files on Miro [2] boards. *Second*, all the data on the Miro boards from the three workshops were pulled down and merged into one Excel table. Initial codes were generated through systematical consideration of each data item. These codes were the researcher's initial interpretation of the original data that could be informative for further developing themes. A total of 57 unique codes were identified after all the data items were coded. *Third*, the first author went through all the codes and reflected on how different codes could be grouped to inform a theme. As a result, the researcher determined four themes around the two research questions. At the *fourth* phase, themes were reviewed among all the authors. The *fifth* and the *last* phases include defining the themes and reporting them, which is included in the next section *Results*.

[2]https://miro.com/

Results

Revaluation of labor Apart from creating literature, the system was imagined to be able to communicate with and analyze humans, provide psychotherapy, generate new belief systems, and even participate in human politics. Humans will lose certain jobs because machines can do the same and probably even better. Obviously, fiction authors would be hit the hardest, but journalism and especially education would also transform. In both journalism and education, the focus could shift from "rote" tasks, such as day-to-day news reporting and knowledge-based teaching, to relying on and fostering critical thinking skills and a nuanced understanding of lived experience. At the same time, tasks and jobs that only humans can do will be valued higher. For example, some of the ideas mentioned the potential higher appreciation for live humans, especially improvised performances, and the use of writing for the sheer joy of creativity and pushing the boundaries of literature. This tendency to push creative boundaries can lead to new forms of literature, both pure human and human-AI hybrid ones. Lastly, new kinds of jobs could emerge such as training the author and curator systems for specific styles and genres.

Redefining creativity and imagination Another often discussed issue was the impact on human creativity due to overreliance on the system. With the rise of AI creativity, it's hard to clearly define what humans and machines can and cannot create. Some have even worried that humans will gradually and unconsciously lose capabilities and skills for proper imagination (Huang and Liu 2023). The boundaries of human and machine creativity will become even more blurred and entangled.

Fragmentations and divisions Other concerns include the increasing physical, interpersonal, and even cultural isolation due to the massive increase in the availability and reliance on personalized content as manifested by a decrease in empathy, increasing narcissism, and even a rise in digital addiction. This further isolation can also lead to the loss of shared creative artifacts that act as cultural reference points, potentially further fragmenting the socio-cultural fields. Some mention that, although promising the democratization of creativity, the systems will cause even more economic and social divisions. For example, the higher value placed on live human performances could make shows of

famous performers prohibitively expensive for ordinary people. Another example would be the high cost of certified human-written literature compared to cheap AI literature. Last but not least, the ecological impact of both the development (including the materials required for the hardware) and maintenance of these systems was raised as an essential issue.

Content pollution and control The massive and constant content supply can exacerbate "information pollution" and the proliferation of fakes, eroding trust and the sense of authenticity. Explicit controls (either governmental or industry) for content creation and certification (cf. EU's Artificial Intelligence Act) could contain this, but this also raises the question of controls on freedom of expression and censorship. Even more frightening is the invisible and indirect control exercised by the platform owners, who can tweak and fine-tune the content output without explicitly revealing their biases and values. Additionally, copyright, authorship, and content ownership issues would need to be tackled in a new way. Back to human! The increased awareness and appreciation of authentic and "pure" humanity was a recurrent theme in the workshops. In addition to the newly found appreciation of live human performances, the participants mentioned the need to protect human creativity and that humans will still crave real and physical human connection. The participants mentioned ideas such as protected "GenAI-Free" economic zones, violent pressure groups, "The Analogues", sabotaging *Infinity Book* operations, and the new resurrection of back-to-nature communities.

Discussion

The themes touch upon many issues already presented in various media and scholarly fields. For example, some recent speculative design efforts on co-creative systems such as (Hohendanner et al. 2023; Ullstein and Hohendanner 2020) have highlighted similar themes from ethical concerns to shifts in authorship and sense of authenticity. This is hardly surprising, considering that one of the roles of these workshops was to distill "collective intelligence" regarding the imagined futures of GenAI.

From a postphenomenological perspective, the themes highlight the mediating role of AI, showcasing its double-edged role in extending human capabilities and restructuring societal roles. The concerns over cultural decay and creative dystopia reflect anxiety about the authenticity and value of AI-generated content versus human creativity, pointing to a shift in the essence of cultural production from human-centric to more-than-human entangled forms (Frauenberger 2019; Wakkary 2021). This shift also forces us to reconsider technology's role even in essentially human characteristics such as creativity and imagination (Wellner 2022; Hayles 2017). This perspective also emphasizes the existential impacts of technology on the sense of self and interpersonal relationships, noting how they alter human emotional and moral landscapes (Verbeek 2011).

Actor-Network Theory (ANT), on the other hand, focuses on the relational dynamics between humans and nonhumans, viewing AI as a powerful actant that reshapes networks of cultural production, social organization, and ethical practices. ANT highlights the complex meshes and cognitive assemblages (Hayles 2021) between human and nonhuman actors in defining the future of creativity, labor, and societal structures. It also sheds light on the complex entanglements of actors [3] involved in sustainability and ethical debates.

Limitations and Future Work

Despite we claimed that nonhuman actants shared the same importance as human actants, both workshops and data analysis were completed by humans in this research. In fact, we have tried to use ChatGPT for RTA, but the themes it generated did not give a more profound interpretation (as the RTA done by the human author) of the issues raised by our workshops. On the other hand, ChatGPT-interpreted RTA did give a comprehensive overview of these issues, which inspired us to automate the machine-RTA process to at least efficiently provide a high-quality overview of the themes.

As a trial, we also plan to conduct the "Future Ripples" workshop with ChatGPT to see how the machine as a participant would give different insights. To better visualize the causality between different "ripples" rather than basing it on a simple text-prompting interface, we will implement a Miro board plugin that integrates ChatGPT.

Meanwhile, we have started making storyboards for the user scenarios that emerged from the past workshops. In the further ones, we will focus on speculating the entity form and content of the *Infinity Book* for concrete interaction design prototypes. More thorough analyses from ANT and postphenomenology perspectives will be performed.

Conclusion

In this paper, we took up Liu et al.'s (2023) challenge and explored how speculative design is being used in research on Generative AI (GenAI). We discovered surprisingly little focus on concretely exploring the socio-technical effects of GenAI and its influence on humanity. To fill this gap, we ran three speculative design workshops using the idea of Infinity Book, a system capable of creating fictional texts such as full-length books from scratch, as a starting point. We analyzed the data from these workshops with reflective thematic analysis (RTA) through the lenses of Actor-Network Theory and postphenomenology. The analysis revealed four prominent themes: revaluation of work, redefining creativity and imagination, social and cultural fragmentations and divisions, and content pollution and control. Based on these initial results, we will develop more concrete speculative designs (e.g., detailed scenarios, interactive prototypes) and conduct comprehensive postphenomenology and actor-network theory analyses of the designs.

References

Adams, C., and Thompson, T. L. 2016. Introduction to Posthuman Inquiry. In Adams, C., and Thompson, T. L.,

[3] See Crawford and Joler's *Anatomy of an AI System* https://anatomyof.ai/ for an example analysis, even though the authors do not mention ANT.

eds., *Researching a Posthuman World: Interviews with Digital Objects*. London: Palgrave Macmillan UK. 1–22.

Auger, J. 2013. Speculative design: crafting the speculation. *Digital Creativity* 24(1):11–35.

Biermann, O. C. 2022. *Writers want AI collaborators to respect their personal values and writing strategies: a human-centered perspective on AI co-writing*. Ph.D. Dissertation, University of British Columbia.

Braun, V., and Clarke, V. 2012. Thematic analysis. In *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological*, APA handbooks in psychology®. Washington, DC, US: American Psychological Association. 57–71.

Braun, V., and Clarke, V. 2019. Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health* 11(4):589–597.

Coulton, P., and Lindley, J. G. 2019. More-Than Human Centred Design: Considering Other Things. *The Design Journal* 22(4):463–481.

Dunne, A., and Raby, F. 2013. *Speculative everything: design, fiction, and social dreaming*. Cambridge, Massachusetts ; London: The MIT Press.

Durante, I.; Dell'Era, C.; Magistretti, S.; and Pham, C. T. A. 2024. Predictive or imaginative futures? experimenting with alternative future-making approaches. *Creativity and Innovation Management*.

Epp, F. A.; Moesgen, T.; Salovaara, A.; Pouta, E.; and Gaziulusoy, u. 2022. Reinventing the wheel: The future ripples method for activating anticipatory capacities in innovation teams. In *Proceedings of the 2022 ACM Designing Interactive Systems Conference*, DIS '22, 387–399. New York, NY, USA: Association for Computing Machinery.

Floridi, L., and Chiriatti, M. 2020. Gpt-3: Its Nature, Scope, Limits, and Consequences. *Minds and Machines* 30(4):681–694. Publisher: Springer Verlag.

Frauenberger, C. 2019. Entanglement HCI The Next Wave? *ACM Transactions on Computer-Human Interaction* 27(1):2:1–2:27.

Ghajargar, M.; Bardzell, J.; and Lagerkvist, L. 2022. A Redhead Walks into a Bar: Experiences of Writing Fiction with Artificial Intelligence. In *Proceedings of the 25th International Academic Mindtrek Conference*, Academic Mindtrek '22, 230–241. New York, NY, USA: Association for Computing Machinery.

Hayles, N. K. 2017. *Unthought: The power of the cognitive nonconscious*. University of Chicago Press.

Hayles, N. K. 2021. *Postprint: Books and becoming computational*. Columbia University Press.

Hohendanner, M.; Ullstein, C.; Buchmeier, Y.; and Grossklags, J. 2023. Exploring the reflective space of ai narratives through speculative design in japan and germany. In *Proceedings of the 2023 ACM Conference on Information Technology for Social Good*, 351–362.

Huang, Y., and Liu, H. 2023. Humans will lose proper imagination unconsciously. In *14th International Conference on Computational Creativity (ICCC' 23)*.

Latour, B. 2007. *Reassembling the Social: An Introduction to Actor-Network-Theory*. Clarendon Lectures in Management Studies. Oxford, New York: Oxford University Press.

Liu, H. X.; Huang, Y.; and Holopainen, J. P. 2023. Call for critical and speculative design in human-computer co-creativity: An overview study. In *14th International Conference on Computational Creativity (ICCC'23)*.

Muller, M.; Chilton, L. B.; Kantosalo, A.; Martin, C. P.; and Walsh, G. 2022. Genaichi: Generative ai and hci. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems*, CHI EA '22. New York, NY, USA: Association for Computing Machinery.

Nelson, L. S. 2000. Improving performance through statistical thinking. *Journal of Quality Technology* 32(4):468–468.

Redström, J., and Wiltse, H. 2018. *Changing Things : The Future of Objects in a Digital World*. London: Bloomsbury Visual Arts.

Rohrbach, B. 1969. Creative using regen method 635, a new technique for solving problems. *Sales-economy* 12:73–75.

Rosenberger, R., and Verbeek, P. P. C. C. 2015. *Postphenomenological Investigations: Essays on Human-Technology Relations*. Lexington Books.

Sun, J.; Liao, Q. V.; Muller, M.; Agarwal, M.; Houde, S.; Talamadupula, K.; and Weisz, J. D. 2022. Investigating Explainability of Generative AI for Code through Scenario-based Design. In *27th International Conference on Intelligent User Interfaces*, IUI '22, 212–228. New York, NY, USA: Association for Computing Machinery.

Ullstein, C., and Hohendanner, M. 2020. Exploration of the future of co-creative systems through collaborative speculative design practices. In *A Workshop on Human-Computer Co-Creativity (ICCC'20). Association for Computational Creativity*.

Verbeek, P.-P. 2011. *Moralizing technology: Understanding and designing the morality of things*. University of Chicago press.

Wakkary, R. 2021. *Things We Could Design: For More Than Human-Centered Worlds*. The MIT Press.

Wellner, G. 2022. Digital imagination: Ihde's and stiegler's concepts of imagination. *Foundations of Science* 1–16.

Yan, W. 2023. *UNPREDICTABLE MEMES: Speculative Futures of meme creators' ownership through the Lens of Disruptive Technologies*. Ph.D. Dissertation, OCAD University.

Zimmerman, J., and Forlizzi, J. 2014. Research Through Design in HCI. In Olson, J. S., and Kellogg, W. A., eds., *Ways of Knowing in HCI*. New York, NY: Springer. 167–189.

Zimmerman, J.; Forlizzi, J.; and Evenson, S. 2007. Research through design as a method for interaction design research in HCI. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '07, 493–502. New York, NY, USA: Association for Computing Machinery.