Speculative Design as a Post-Phenomenological Practice

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Abstract

This paper analyzes a Speculative Design workshop conducted in an undergraduate Information Systems course with 38 students. The activity explored how generative artificial intelligence (GenAI) and the Theory of Technological Mediation (TTM), inspired by post-phenomenological approaches, can support critical reflection on the role of technologies in shaping sociotechnical futures. Conducted in four stages, the workshop involved mapping sociotechnical networks, using GenAI to project future scenarios, designing technological solutions, and evaluating them through the Technological Mediation Cards. The analysis presented in this paper focuses on the speculations of two groups and on insights gathered from a focus group discussion, enabling a deeper examination of how students articulated technology, ethics, and agency within their speculative narratives. The findings show that, although students initially accepted GenAI outputs passively, they progressively adopted a more critical and curatorial stance when analyzing the mediating effects of technologies. This shift fostered an understanding of technologies as co-constitutive agents of future realities and encouraged ethical and reflective discussions about their implications. The study contributes to more-than-human HCI and design education by demonstrating how integrating GenAI and TTM can transform speculative design into a practice of critical reflection.

Keywords

Speculative Design, Post-Phenomenology, Theory of Technological Mediation, Sociotechnical Futures

1. Introduction

The advancement of digital technologies has been reshaping social structures, as well as practices of perception, interaction, and world-making [1, 2]. Increasingly intelligent and ubiquitous artifacts permeate bodies, routines, and environments, shaping relationships and sociotechnical futures. When driven by logics of efficiency and performance, this technological advancement often overlooks ethical dimensions, social justice, and sustainability [3, 4].

In this context, Speculative Design emerges as an approach that goes beyond solving immediate problems by fostering the imagination of alternative futures, anticipating sociotechnical implications, and expanding ethical and sociotechnical responsibility in the act of designing [5, 6]. When articulated with post-phenomenological approaches, its scope expands, enabling designers not only to envision futures but also to understand how technologies actively participate in mediating experiences, producing meaning, and shaping lived worlds.

This paper presents an experience conducted within an undergraduate Information Systems (IS) course, where students participated in a Speculative Design workshop. Structured in four stages, the activity involved mapping sociotechnical networks, speculating on their futures, and designing Information Technology (IT) solutions that redefine these ecosystems and their narratives. Finally, participants critically evaluated the projected scenarios and solutions from a post-phenomenological perspective, using a tool based on the Theory of Technological Mediation (TTM).

The main objective of the workshop was to demonstrate how a tool based on the TTM can support students in conducting a phenomenological analysis within a speculative design practice mediated by Generative Artificial Intelligence (GenAI). Instead of simply accepting the outputs provided by the

PhenoHCI'25: Phenomenological Concepts and Methods for HCI Research Workshop, September 09, 2025, Belo Horizonte, MG, Brazil

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CEUR Workshop Proceedings ceur-ws.org ISSN 1613-0073

published 2025-12-15

CEUR-WS.org/Vol-4131/paper4.pdf

GenAI, participants were encouraged to act as curators, critically analyzing the results and reflecting on how the technological extrapolations could impact people's lives in practice.

The results indicate that participants moved beyond a purely functional view of technologies, recognizing them as co-constitutive agents of the speculated future scenarios and as producers of effects in the world. The post-phenomenological lens was essential in supporting reflections on how these future technologies may mediate practices, reconfigure relationships, and impact experiences in the world.

2. Theoretical Background

In this section, we present the key concepts and foundational aspects necessary to understand the theoretical and methodological foundations that underpin this work.

2.1. Speculative Design

Speculative Design is an approach that uses fictional and provocative scenarios to imagine and discuss alternative futures [5, 7]. Unlike traditional design, which focuses on solving immediate problems, this practice is dedicated to exploring uncertainties, formulating questions, and problematizing values, ideals, and assumptions that are often taken for granted in the present.

At the core of this approach are speculative artifacts and narratives, which serve as critical instruments to question the relationships between technology and society. Rather than predicting the future, Speculative Design seeks to make visible the tensions, dilemmas, and impacts that are often overlooked, creating space to imagine futures that are more plural, ethical, and inclusive [8, 9, 10].

2.2. Post-Phenomenology

Post-phenomenology is a contemporary philosophical approach within the philosophy of technology that seeks to update and transform classical phenomenology to address the increasingly pervasive role of technology in everyday life [11].

Developed by Don Ihde in the 1990s, this approach starts from things, observing how real objects, such as microscopes, smartphones, or software, participate in human experiences and social practices [11, 12]. Ihde proposed a typology of human–technology relations, including the embodiment relation, in which the artifact becomes part of the body, such as eyeglasses or canes; the hermeneutic relation, in which the artifact provides interpretations of the world, such as thermometers or medical scans; the alterity relation, when we interact with technology as if it were another agent; and the background relation, in which the artifact shapes the environment without direct interaction, such as ventilation systems.

2.3. Theory of Technological Mediation

The TTM, proposed by Verbeek [13], integrates philosophical analysis with empirical investigations into how concrete technologies operate in everyday life. In doing so, it aligns with Science and Technology Studies (STS) [14], but with a specific focus on lived experience and ethics. TTM demonstrates that technical artifacts possess a form of agency: they shape social practices, moral decisions, interpretations of the world, and even how humans perceive themselves as moral subjects [15, 16]. In this sense, technology plays a constitutive role in how humans perceive, interpret, and act. It helps us do things and contributes to shaping who we are.

Verbeek's proposal moves away from the idea that there is a separate subject (human) and object (technology) merely connected by functional mediation. Instead, he argues that subjects and objects are mutually constituted through mediation; technology actively participates in the formation of the subject and in how the subject relates to the world [17, 18].

To analyze how technologies mediate the relationship between humans and the world, Verbeek [15] identified seven types of technological mediation, as presented in Table 1. This framework enables an

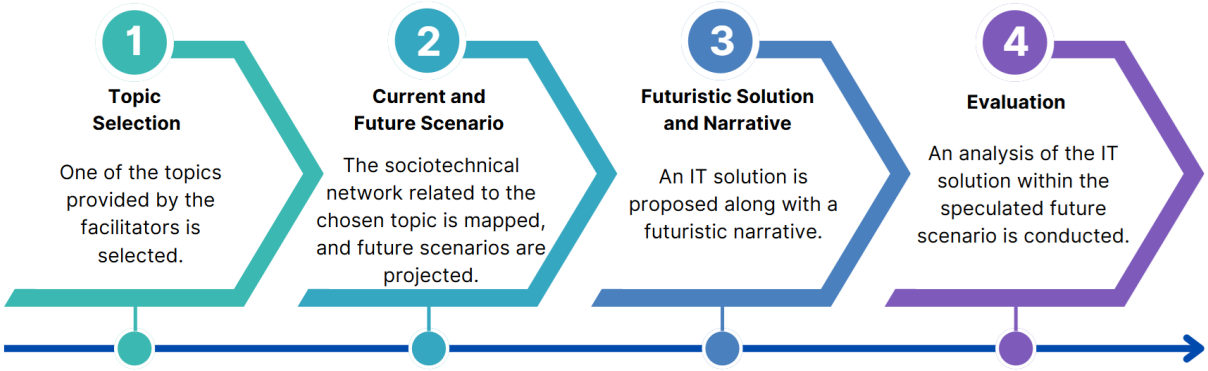

Figure 1: Workflow of the Speculative Design Workshop

understanding of how technologies shape perceptions, actions, and relationships, while simultaneously being shaped by social practices.

Table 1
Verbeek's Types of Technological Mediation

Type of Relation	Description
Embodiment	Technology becomes part of the body, functioning as an extension of it and reshaping perception and action.
Hermeneutic	Technology helps interpret the world, making data or phenomena more understandable.
Alterity	Technology is perceived as an "other" with which one interacts, almost as if it has agency or personality.
Background	Technology operates discreetly, shaping the environment without drawing attention.
Cyborg	Technology is physically integrated into the body, altering its capabilities and identity.
Augmentation	Technology amplifies human abilities, such as strength, vision, or cognition.
Immersion	Technology creates immersive virtual environments that temporarily replace the real world.

3. Speculative Design Workshop

The workshop brought together 38 undergraduate students of Information Systems, organized into 12 groups, along with three researchers acting as facilitators. Most students were in their sixth semester, with a profile oriented toward the job market.

Conducted over two days with a total duration of approximately five hours, the workshop followed four stages, illustrated in Figure 1, which presents the methodological flow adopted.

In **Stage 1**, participants were introduced to Speculative Design, organized into groups, and guided to choose one of the following themes previously defined by the facilitators: dating apps, streaming platforms, betting platforms, short-video platforms, distance learning platforms, and circular economy platforms. Participants used a collaborative board as a support tool to map the relationships between human and non-human actors, discuss the dynamics of the current scenario, and identify relevant sociotechnical elements.

In **Stage 2**, the groups deepened the mapping of the current sociotechnical network related to their chosen topic, identifying actors, relationships, and interdependencies. Based on this diagnosis, they developed projections of how this network could evolve over a 5-to-10-year horizon, considering signals, trends, and emerging forces. To support this extrapolation exercise, participants employed GenAI, supplying prompts with the information gathered from the current mapping. Through this process, they explored possible developments—both positive and negative—that could impact the functioning, values, and dynamics of the speculated scenario.

All groups used ChatGPT as their primary GenAI tool during the speculative activities. Although the participants did not explicitly report the reasons behind this choice, it is plausible that their decision was influenced by the facilitators' initial instruction, which encouraged the use of a GenAI platform such as ChatGPT to assist in producing speculative content.

Based on the projected future, **Stage 3** focused on the development of a technological solution capable of intervening in the future scenario, with the goal of mitigating undesirable outcomes. In addition, the groups created a speculative narrative that describes how this solution reconfigures relationships, practices, and experiences within the future sociotechnical network. To support this process, they once again employed GenAI tools, feeding prompts with descriptions of the designed technology and their expectations regarding how this intervention would affect the speculated future sociotechnical network.

Finally, in **Stage 4**, participants carried out a critical evaluation of the designed solution using the *Technological Mediation Cards*[1], developed by Loutfi et al. (2024). This tool guides reflection based on the seven types of technological mediation proposed by Verbeek [13], enabling the groups to analyze how the designed technology mediates sociotechnical relationships, producing transformations in ways of being, acting, and perceiving within the speculated scenario.

3.1. Data Collection

To facilitate data collection, participants recorded their extrapolations and evaluations using a simple tool that stored this information in a MongoDB database. However, it is important to note that this data collection could have been performed using alternative supports, such as a text document, a spreadsheet, or even paper, since the focus was on the content produced rather than the tool itself.

In addition, a focus group session was held at the end of the workshop to capture participants' perceptions of the activity. The facilitator who conducted the session used open-ended questions, encouraging participants to freely share their impressions and experiences. All relevant comments and insights were carefully documented by the facilitator for subsequent analysis.

3.2. Data Analysis

The facilitators, who also served as researchers in this project, conducted an interpretative analysis aimed at understanding how participants used the Technological Mediation Cards to reflect on the effects of the designed artifacts on the sociotechnical dynamics of the speculated futures.

Due to space constraints in this article, we chose to illustrate the analysis based on two groups. Table 2 provides an overview of the speculated futures and the technological solutions developed by these groups, which served as the basis for the interpretative analysis conducted.

Table 2
Speculated Futures and Technological Solutions by Theme

Group	Theme	Speculated Future	IT Solution
1	Short-Form Content Platform	By 2029, generative AI dominates content creation, making it highly personalized. However, this leads to risks of homogenization and the proliferation of sensationalist content.	CurateAI, a platform that uses AI for ethical curation and balanced recommendations, combined with monetization through digital tokens and community governance to balance authenticity and engagement.
2	Streaming Platform	By 2035, hyper-personalized streaming leads to unique but socially isolating and more expensive experiences, due to the high cost of algorithms and increased technological dependency.	Multidimensional Personalized Streaming Platform with emotionally responsive AI, algorithmic transparency, and a collaborative community that fosters social interaction among users.

In addition to the main findings, the focus group revealed further insights into participants' engagement and reflections throughout the workshop, summarized in Table 3.

4. Results and Discussion

This section presents and discusses the main findings of the workshop.

[1]Available at https://especule-21835.web.app

Table 3
Participants' Impressions from the Focus Group Discussion

ID	Participant Impressions
i)	Participants reported that they would have liked to have more time to explore the Technological Mediation Cards and to analyze in greater depth the results generated by the AI.
ii)	They indicated feeling more engaged during the more playful and interactive stages of the workshop—particularly at the beginning of Phase 2 and during Phase 4—when they worked directly with the Technological Mediation Cards.
iii)	Lower engagement was observed during the stages involving the use of GenAI for creating the IT solution and speculative narrative, which were perceived as more technical and less participatory.
iv)	Participants expressed concerns about the multiple possibilities generated by GenAI and reported discomfort with potential AI "hallucinations," suggesting that such deviations could compromise the feasibility of the proposed solution.

4.1. Dimensions of Technological Mediation in Speculative Scenarios

Group 1 identified that the CurateAI app plays a significant mediating role in users' relationships with information and with the social environment. In the dimension of *alterity*, participants highlighted that the recommended content actively influences behaviors and perceptions, leading users to reproduce patterns and adhere to certain biases, often unconsciously. From the perspective of *hermeneutic mediation*, they observed that AI algorithms deliver highly personalized content that shapes the user experience and influences their perception of reality. This process produces illusions and exerts subtle emotional control, affecting users' critical autonomy. Regarding the *immersion* dimension, they emphasized that the continuous consumption of short-form videos amplifies the desire for idealized and virtualized worlds.

Group 2 emphasized that the extreme personalization of the Multidimensional Streaming Platform generates a mediation that resembles interaction with an almost-human agent. The *embodiment* mediation was associated with the indispensability of the system, whose absence is perceived as a concrete loss in everyday life. Through the lens of *cyborg* mediation, participants observed that the content functions as an emotional modulator, influencing the user's mental state in a manner analogous to devices that release controlled doses of medication, promoting psychological comfort, mood regulation, and an increasing dependency on the platform.

Overall, the results demonstrate that the Technological Mediation Cards proved to be effective tools for supporting the critical analysis of future sociotechnical scenarios from a post-phenomenological perspective, even though participants had no prior familiarity with these theoretical frameworks. Moreover, the groups explicitly recognized the agency of the designed artifacts, expanding their understanding beyond intended functionalities and engaging in meaningful discussions about the ethical implications of these mediations within the speculated future ecosystem.

4.2. The Use of IAGen

The use of GenAI played a central role in the workshop, both as a tool supporting the creation of scenarios and narratives and as a mediator of the speculative process itself. However, it was observed that, at first, student engagement was limited. The GenAI-generated extrapolations and narratives were so complete that many participants accepted the results passively, without questioning the social, technical, or ethical implications of the projections presented. Although some expressed skepticism regarding the feasibility of certain ideas, labeling them as "impossible," few went beyond that initial observation.

The turning point occurred when the groups began using the Technological Mediation Cards to critically analyze the GenAI-generated solutions. At that moment, participants started to identify mediation dimensions that had not been addressed by the generative systems, bringing to light ethical, perceptual, and relational implications associated with the use of the speculated technologies. The cards therefore functioned as a device for cognitive and ethical reorientation, shifting the focus from passive acceptance of results to a critical and reflective stance toward the technological mediations

suggested by the AI.

In other workshops conducted with the same tool, the Technological Mediation Cards were used to support the design of technological solutions, an exercise aimed at anticipating possible design effects. In the present workshop, however, their use was different: the cards were applied not to design technologies but to reflect on the results produced by the AI itself. This shift in focus revealed the potential of the cards as an analytical instrument for thinking about AI as a mediator as well.

This perspective emerged spontaneously when some participants asked how to deal with so-called "AI hallucinations." The facilitators' guidance was to understand these hallucinations not as failures but as speculative opportunities, that is, as expressions of deviation from algorithmic standardization that could themselves be explored as creative resources for Speculative Design. One student described this idea as "accessing the glitch in the matrix," recognizing the heuristic value of error and unpredictability. Another student, in turn, questioned the "infinite results" that AI could produce for the same context and how to decide which one would be the "right" one. We explained that this multiplicity highlights the uncertainty of futures and that it should be explored to (a) reflect on present-day decisions, (b) choose which futures we wish to activate, and (c) plan ways to intervene in those futures.

An interesting aspect observed during the workshop is that, at no point did participants question the fact that the solutions and narratives produced by the AI are themselves the outcomes of training models grounded in Eurocentric and North American contexts. This absence of critique reveals a latent risk: the imagined futures generated by GenAI may be inherently shaped by Western epistemologies and cultural imaginaries. Considering that the workshop took place at a university in São Paulo, a metropolis that mirrors a Western worldview, this uncritical adoption of such perspectives also reflects how students perceive and situate themselves in the world. Future iterations of this activity should therefore incorporate explicit discussions about these biases, encouraging students to use Speculative Design not only to imagine alternative futures but also to question whose futures are being imagined and from what positionality they are conceived.

4.3. Alignment with More-than-Human HCI

This study also aligns with the emerging more-than-human perspective in HCI, which has been established as a critical response to the limitations of the traditional human-centered paradigm [20, 21, 22]. This approach offers an essential theoretical lens for addressing contemporary challenges such as transhumanism, which advocates the overcoming of biological limits through biotechnologies, and posthumanism, which decentralizes the ontological and moral primacy of the human [23].

Within this context, Speculative Design functions as a reflective practice that enables participants to recognize technologies as co-constitutive agents in shaping future sociotechnical realities. The critical evaluation grounded in the TTM reinforces this understanding by revealing how designed artifacts not only serve human purposes but also mediate experiences, perceptions, and ways of being within the speculated scenarios.

The workshop results illustrate this dynamic. CurateAI, designed by Group 1, operates as an agentive participant in the constitution of collective experience, where cognition, ethics, and affect are distributed across human and non-human assemblages. Meanwhile, the Multidimensional Streaming Platform, created by Group 2, produces mediations that blur the boundaries between human affect and technological agency, exemplifying a relational ontology in which subjectivity and technology co-emerge through reciprocal mediation.

In this way, participants intuitively engaged in a more-than-human mode of design reasoning, recognizing technologies as moral and epistemic agents within the speculated sociotechnical ecosystems.

5. Conclusions

This study addressed two central aspects of contemporary design practices: the playfulness in speculative processes and the tendency toward passive acceptance of results produced by GenAI. Through this

process, post-phenomenology proved to be a valuable framework for critically examining what AI delivers, the forms of mediation embedded in its outputs, and the worlds that these mediations project.

To support this analysis, the Technological Mediation Cards, based on Verbeek's TTM, were employed. During the workshop, the cards served two complementary functions. The first was to critically evaluate the designed technologies, enabling participants to understand how the speculated solutions could reconfigure sociotechnical relations in future scenarios. The second, and more significant, was to analyze the AI itself, unveiling the mediations implicit in its responses, the values encoded in its models, and the worldviews it tends to reproduce. This dual function transformed the cards into an expanded reflective instrument, capable of mediating both the object of design and the agent proposing the design.

Despite their effectiveness in raising students' awareness of the mediating role of technologies, the cards proved limited when faced with the opacity and distributed nature of GenAI's mediations, whose algorithmic processes, training data, and embedded cultural imaginaries elude direct phenomenological analysis. Future research should therefore explore new hybrid or diffractive [24, 25, 26] instruments capable of making visible the layers of agency and bias underlying AI systems.

Declaration on Generative AI

The authors used ChatGPT to assist in text translation, improvement of writing style, and grammatical and spelling verification. After using these tools, all content was carefully reviewed and edited by the authors, who take full responsibility for the final version and the content of this publication.

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