

Executive Summary

Title: *Generative Artificial Intelligence influence on Human Cognitive Forms in Future-Making*

Laurea Magistrale in Management Engineering – Ingegneria Gestionale

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1. Introduction

In a world increasingly defined by complexity, volatility, and technological acceleration, organisations face the challenge of not merely adapting to change but actively shaping the futures they wish to inhabit. The emergence of **Generative Artificial Intelligence**, capable of producing text, images, code, and multimodal artefacts, has profoundly transformed how individuals and teams imagine, reason, and collaborate.

This thesis explores how GenAI influences human cognition and creativity in collective foresight activities, focusing on its impact on how people construct, visualise, and evaluate possible futures. It investigates not only what GenAI produces but *how* it reshapes the processes of reasoning,

imagination, and reflection that underpin the act of future-making.

The research was conducted within the 2024/2025 edition of the *FUTURES Observatory | Sense Making by System Thinking* at Politecnico di Milano, an initiative that applies system thinking to explore how design and foresight practices can anticipate desirable futures. Across three workshop sessions, participants engaged in co-design activities with GenAI tools such as ChatGPT and Midjourney, collaboratively constructing scenarios of distant futures. Through qualitative analysis, this thesis examines how human–machine interactions alter cognitive balance, creativity, and collective sense-making.

2. Literature Background

2.1 Future-Making as an Epistemic Process

The first conceptual pillar concerns **future-making**, the collective act of imagining, reasoning about, and constructing potential futures. As Wenzel (2022) argues, future-making has evolved from predictive forecasting to a social and epistemic process of meaning construction. Rather than describing what will happen, it explores what *should* happen, translating uncertainty into a creative and ethical arena. Similarly, Augustine et al. (2019) notes that distant futures require a different mode of cognition, enabling transformation instead of mere adaptation.

From this perspective, the future is not a fixed destination but an ongoing negotiation of possibilities. Future-making therefore involves imagination, reflexivity, and abductive reasoning, where individuals construct hypotheses about what could or should exist. It is an iterative, interpretive process grounded in narrative, speculation, and collective dialogue. This epistemic framing makes it a powerful lens through which to explore how emerging technologies like GenAI reshape human thought.

2.2 Generative Artificial Intelligence and Co-Creation

The second theoretical foundation lies in **Generative Artificial Intelligence**, which differs from traditional AI by its ability to generate original artefacts rather than merely classify or predict. Systems such as ChatGPT, DALL·E, or Midjourney create content through transformer-based architectures that respond to human prompts. Scholars such as Floridi (2023) and Crawford (2021) describe these systems as “*synthetic cognitive agents*”, participating in the epistemic act of meaning construction. They do not simply assist human reasoning but actively shape it, mediating between linguistic, visual, and conceptual forms.

In collaborative settings, GenAI operates as a **cognitive partner**, capable of stimulating abductive leaps and associative thinking by providing alternative interpretations or representations. When prompted effectively, it can enhance *epistemic exploration*, which is the search for knowledge through reasoning under uncertainty. However, its fluency also presents risks. The phenomenon of *cognitive outsourcing* (Floridi, 2023) occurs when humans unconsciously delegate cognitive responsibility to the system, accepting outputs as authoritative. Moreover, as Rahwan et al. (2019) observes, algorithmic fluency can accelerate convergence toward plausible yet superficial ideas, leading to a *closure of creative exploration*.

Thus, GenAI embodies a dual role: an amplifier of imagination and a potential constraint on autonomy. Understanding this tension is central to the epistemological focus of this thesis.

2.3 Human Cognition and Cognitive Forms

The third theoretical foundation concerns **human cognition** and its diverse reasoning forms. Building on design cognition and creativity research (Boden, 2004; Gero, 2020), the study adopts a tripartite model comprising three cognitive clusters:

- The **Inferential Cluster** (inductive, deductive, abductive reasoning) deals with the generation and testing of hypotheses.
- The **Generative Cluster** (imaginative, creative, productive reasoning) concerns the creation of new ideas, narratives, and representations.
- The **Evaluative Cluster** (critical and reflective thinking) encompasses judgment, self-assessment, and ethical evaluation of ideas.

These forms rarely operate in isolation. Instead, they constitute a hybrid ecology of reasoning that evolves dynamically in response to collaborative and technological stimuli. GenAI can modify this ecology by externalising cognition, making reasoning visible and manipulable, but also by introducing new biases and dependencies (Smith

et al., 1995). Exploring how these cognitive forms shift in the presence of GenAI is at the heart of this research.

3. Methodology and Research Question

The study employs a **qualitative, ethnographically informed methodology**, chosen to capture the depth and complexity of human-machine interaction. Three co-design workshops were conducted using Miro’s collaborative platform, each lasting eight hours and involving eight stable teams. Every session was facilitated and progressively built upon the previous one, guiding participants. The workshops generated a multimodal dataset: transcriptions, images, prompts, and AI-generated artefacts. Through **thematic analysis** (Saldaña, 2013), data were coded and categorised. Frequencies were normalised to identify distributional patterns across three modes of collaboration: human-to-human, text-to-text, and text-to-image.

The guiding research question was:

How can different modes of GenAI influence human cognitive forms in future making?

4. Results

The findings reveal distinct cognitive profiles across modes of collaboration:

1. In the **human-only** setting, teams

exhibited strong generative and evaluative cognition, signs of imagination expansion and reflective monitoring, but low inferential reasoning, suggesting cognitive fixation on shared assumptions.

2. In the **text-to-text** mode, inferential reasoning slightly increased, showing improved logical engagement and epistemic exploration. However, generative thinking decreased, revealing *closure of creative exploration* as participants prematurely converged on GenAI's suggestions.
3. In the **text-to-image** mode, inferential reasoning dropped markedly, while evaluative reasoning intensified. The visual dimension triggered interpretive, emotional, and ethical reflection, but limited analytical engagement.

Overall, the results suggest that GenAI reconfigures the cognitive balance within teams, shifting emphasis from generative exploration to reflective evaluation. It acts as a powerful stimulus for reflection but risks dampening divergent creativity when overrelied upon.

5. Discussion

The discussion highlights a nuanced understanding of GenAI's cognitive impact. On one hand, GenAI promotes *epistemic exploration* and reflective reasoning by providing rich multimodal stimuli that externalise ab-

stract thought and foster collective negotiation of meaning. This aligns with Nickerson (2021) and Schön (1983), who emphasise that external representations, either verbal or visual, enhance cognition and shared reflection.

On the other hand, the results reveal two persistent cognitive risks. First, **cognitive fixation**: as Smith et al. (1995) suggests, exposure to salient exemplars (in this case, GenAI outputs) can restrict ideation to the boundaries of what is already represented. Second, **cognitive outsourcing**: when participants rely on machine fluency, they relinquish epistemic responsibility, echoing the concerns of Floridi (2023) regarding the erosion of human agency in hybrid cognition.

Furthermore, the decline in generative reasoning across AI-supported sessions indicates that automation reduces the “creative tension” that arises from uncertainty. As Rahwan et al. (2019) notes, friction and failure are essential to innovation; their removal by AI efficiency can lead to premature satisfaction. Conversely, the significant increase in evaluative reasoning, particularly in visual interactions, illustrates a growing ethical and reflective awareness. Participants engaged in interpretive debates, questioning meaning, aesthetics, and implications, signalling a form of “critical co-creation” rather than passive acceptance.

In summary, GenAI neither amplifies nor diminishes cognition uniformly but it redis-

tributes it across new epistemic boundaries. The managerial and design challenge lies in creating conditions where this redistribution sustains creativity rather than substitutes it.

6. Conclusion and Implications

This thesis contributes to understanding how generative technologies transform the epistemology of future-making. It shows that GenAI can serve as a **co-creative partner**, expanding collective imagination, enhancing reflective dialogue, and fostering shared meaning-making. Yet, this potential depends on intentional orchestration and human oversight.

For practitioners and managers, the findings emphasise the need to design GenAI-supported foresight processes that balance automation with human reflection. Dedicated roles, such as *AI facilitators* or *prompt designers*, may be necessary to guide interaction, sustain abductive reasoning, and ensure that ethical and cultural dimensions remain central. GenAI should be approached not as a substitute for creativity but as a collaborator in cognitive diversity.

For researchers, this study advances current understanding of human–AI collabora-

tion by empirically mapping how Generative AI reshapes cognition across inferential, generative, and evaluative dimensions. It contributes to an emerging theoretical shift—from AI as a creative assistant to AI as a *cognitive reconfigurator* that redistributes reasoning and imagination within hybrid human–machine systems. The findings highlight the need for new models of *hybrid cognition* that account for how humans and machines co-produce meaning, rather than simply exchange information.

Ultimately, this research affirms that the value of GenAI in foresight lies not in prediction but in *co-creation*. As Augustine et al. (2019) reminds us, “the future is not discovered, but designed.” Through responsible integration of GenAI, organisations can transform uncertainty from a threat into a creative frontier, reshaping not only how futures are envisioned but how they are collectively built.

Key References:

- Wenzel (2022)
- Augustine et al. (2019)
- Floridi (2023)
- Crawford (2021)
- Rahwan et al. (2019)
- Boden (2004)