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Artificial Intelligence as a Socratic Agent in Innovation Management Systems

From AI Decision tools to AI as a cognitive mentor that strengthens innovators' reasoning

Severine Herlin*¹

¹Vianeo, Sophia Antipolis, France

Executive Summary: Artificial intelligence is increasingly integrated into innovation activities, from technological scouting to idea generation and strategic analysis. While AI is often perceived as a tool capable of optimizing innovation decisions, this perspective may conflict with the exploratory and experienced-centred nature of all innovation processes.

This paper proposes a conceptual reframing of the operational role of AI in innovation management systems. Rather than positioning AI as a substitute for human reasoning, we argue that AI should be considered a **cognitive mentor** that expands the reasoning capabilities of innovators. The paper further conceptualizes AI as a **cognitive resource embedded within the innovation capability infrastructure of organizations**, supporting exploration, learning and sense-making without replacing human judgment. Drawing on the structure of the ISO 56001 innovation management system, we analyse how AI can support innovation activities at strategic, tactical and operational levels.

Paper: Artificial intelligence as a cognitive mentor for innovation management systems

Introduction

The rapid development of artificial intelligence (AI) is profoundly transforming organizational environments. Advances in machine learning, generative AI and large-scale data processing have expanded the capacity of organizations to analyse information, automate tasks and support decision-making processes.

AI tools are increasingly used in innovation activities: scanning technological trends, analysing markets, generating ideas or supporting strategic decisions. As a result, AI is progressively embedded in the structures through which organizations manage innovation.

Many organizations therefore perceive AI as a means to improve the predictability and efficiency of innovation processes. By identifying patterns in large datasets, AI appears capable of reducing uncertainty and guiding organizations toward promising opportunities.

However, innovation fundamentally differs from routine optimization processes. Innovation unfolds under conditions of uncertainty and ambiguity. It requires organizations to explore emerging possibilities, interpret incomplete signals and construct new problem framings that cannot be derived solely from historical data.

The innovation process is based above all on a firm grounding in reality, which allows us to identify opportunities and the best ways to address them through experience at a given moment in time.

Innovation therefore relies on cognitive processes that extend beyond data analysis, including creativity, interpretation and critical reflection based on experience. Excessive reliance on AI-based analytical tools may therefore paradoxically constrain the exploratory dynamics that innovation requires.

This paper addresses a central question: **may AI replace or augment the cognitive processes through which innovation emerges?**

We argue that AI should not be positioned as a substitute for human reasoning but as a **cognitive mentor** supporting innovators. The argument is developed through three fundamental perspectives for any organization: the posture of users in their interaction with AI, the integration of AI within innovation management systems as described in ISO 56001, and the role of AI as a complementary cognitive resource for innovators.

1. Innovation and the limits of data-driven decision-making

Innovation research has long emphasized the central role of uncertainty in innovation processes. Unlike operational decision-making, innovation involves exploring unknown possibilities and constructing new value propositions.

These activities require organizations to interpret incomplete information, experiment with alternative solutions and learn through iterative feedback accepting failure as a part of the process. Breakthrough innovations often emerge precisely in areas where historical data offer limited guidance or where unexpected connections are made between very different fields.

AI technologies provide powerful capabilities for analysing complex datasets and identifying correlations. However, they remain constrained by the nature of the data on which they are trained. Most AI systems rely on historical information and statistical inference.

An excessive reliance on predictive models may therefore encourage organizations to prioritize opportunities that resemble past successes while neglecting more exploratory paths. This dynamic may favour incremental innovation while limiting the discovery of radically new opportunities.

Recognizing these limitations does not imply rejecting AI in innovation management. Instead, it highlights the need to rethink how AI is integrated so that it supports exploration rather than narrowing it.

The innovator must at all times maintain control over the information and the cognitive pathway that leads them to a decision to act. The risk in delegating this process to an AI is that they may no longer understand why or how they arrive at that decision. If they become blind in this way, it is clear that their innovation will ultimately have no chance of reaching real use and the market. Indeed, in a process that is by definition highly iterative, they must be able to control each of the variables in the reasoning pathway in order to continually improve their understanding.

2. Two imaginaries of AI in innovation: crutch or mentor

The way organizations integrate AI into innovation processes reflects underlying assumptions about the relationship between human cognition and technology.

Two contrasting imaginaries can be identified.

AI as a crutch

In the first imaginary, AI is perceived as a tool capable of reducing uncertainty and providing optimal answers. AI systems are expected to analyse large datasets, prioritize ideas or optimize strategic decisions.

While these tools can provide efficiency gains, they also introduce several risks.

- First, excessive reliance on algorithmic outputs may lead to **the erosion of cognitive engagement** among innovation teams. If AI systems are perceived as providing authoritative answers, individuals may become less inclined to collect and validate information, challenge assumptions or explore alternative interpretations.
- Second, predictive models trained on historical datasets may **reinforce existing patterns** of innovation and cognitive bias rather than enabling genuine novelty. This phenomenon, sometimes described as algorithmic conservatism instead of promoting confrontation of diverse perspectives, can lead organizations to reproduce past trajectories instead of exploring disruptive possibilities.
- Third, the perceived objectivity of algorithmic recommendations may **weaken pedagogical approaches and collective deliberation processes**. Innovation relies on specific cognitive process decisions that require specific mindset and methods. When algorithmic outputs are given, they may restrain curiosity and discourage debate rather than enrich it.

AI as a mentor

An alternative imaginary positions AI not as a substitute for human reasoning but as a **mentor supporting cognitive exploration**.

The mentor metaphor draws inspiration from the **Socratic tradition of inquiry**, in which knowledge emerges through questioning rather than through the transmission of ready-made answers. In this

perspective, the role of a mentor is not to provide solutions but to stimulate reflection and reveal implicit assumptions.

Applied to artificial intelligence, this perspective suggests that AI systems should be designed to **expand the space of inquiry** rather than to close it.

Based on expertise specific to the field of innovation and incorporating dedicated methods and approaches, a Socratic AI agent can challenge the innovator without ever giving them the answer. They will guide them, give them some advice or analogies, but never give them the answer. AI can generate alternative hypotheses, propose unconventional analogies, simulate contrasting scenarios, and reveal hidden assumptions embedded in strategic discussions. AI can also guide innovators through the right cognitive pathway by giving them advice about what to do next.

In this model, AI functions as a catalyst for dialogue and reflection. The value of AI lies not primarily in the correctness of the answers it generates but in its capacity to stimulate new questions and support deeper exploration.

This approach is the one we have chosen at Vianeo to develop "Neo", the first Socratic Agent dedicated to innovators, an AI expert in exploration reasoning. Unlike many chatbots currently being developed, which aim to provide innovators presenting their ideas with a comprehensive roadmap, Socratic AI ensures that innovators have asked themselves the right questions and followed the right cognitive path in developing their strategy. This allows innovators to find their own way and see AI as a sparing-partner that challenges them.

Neo is currently being tested within French ecosystems PUI (Pole Universitaires d'innovation) as a means of improving the flow of innovative projects both qualitatively and quantitatively. (Cf. Fig 1 - illustration of two conversational agents crutch-ChatGPT vs mentor-Neo by Vianeo).

The innovation process thus becomes a **human-machine dialogue**, in which computational capabilities amplify the cognitive capacities of human actors.

3. Integrating AI into innovation management systems

For this mentor paradigm to be effective, AI must be embedded within the architecture of the innovation management system rather than introduced as isolated tools.

The ISO 56000 family of standards, particularly ISO 56001, provides a systemic framework that distinguishes three complementary levels: strategic orientation, tactical governance mechanisms and operational innovation practices (fig 2).

Within this structure, AI can function as a cognitive infrastructure supporting innovation activities across the organization.

At the strategic level, organizations define the ambition, direction and principles guiding their innovation activities. Within the framework of ISO 56001, this level involves articulating innovation intent, identifying domains of opportunity and aligning innovation efforts with the broader mission and values of the organization.

At this level, AI supports sense-making and foresight by analysing technological, societal and market signals. It helps leaders explore alternative futures and identify emerging opportunity spaces while leaving strategic choices to human judgment.

At the tactical level, innovation management systems translate strategic intent into concrete governance mechanisms. According to ISO 56001, this level encompasses activities such as portfolio

management, resource allocation, innovation process design and oversight by governance bodies such as innovation boards or steering committees.

At this level, AI can support governance processes such as portfolio management and innovation process design. By analysing patterns across projects and simulating resource allocation scenarios, AI provides insights that enrich decision-making within innovation boards and steering committees.

At the operational level, innovation management systems materialize in the daily practices of innovation teams. According to ISO 56001, these practices include 5 processes: exploring opportunities, generating concepts, validating concepts, designing and testing solutions, and learning from experimentation.

At this level, AI acts as an augmentation tool for innovation teams. It can assist in problem framing, idea generation, concept development and experimentation by suggesting alternative perspectives or analysing feedback from prototypes and user tests.

AI can also contribute to the documentation and communication of innovation activities by synthesizing insights, structuring knowledge and facilitating the sharing of learning across projects and teams. This support helps free time for high-value human activities such as dialogue, collaboration with users and the integration of innovations within organizational contexts.

Across these three levels, AI being used as a mentor contributes to strengthening the cognitive capabilities of the innovation system while preserving the central role of human interpretation and decision-making.

Through the Sophia Club Entreprise at Sophia-Antipolis (France), a working group comprising around ten companies from Sophia-Antipolis meets every month to explore each other's practices in terms of innovation system management with regard to the chapters of the ISO 56001 standard. The use of AI is a key topic of discussion.

4. Artificial intelligence as a cognitive resource for innovators

Innovation projects evolve under conditions of uncertainty where both problems and solutions emerge progressively through experimentation and learning. Like a detective, innovators must master their analysis process, which involves the following steps: appropriately questioning reality, gathering relevant information to validate hypotheses, analysing the information gathered by linking it together, and ultimately identifying the actions to be taken based on this analysis. Innovators therefore rely on multiple resources to structure their reasoning: technological knowledge, market insights, experimentation platforms and collaborative networks.

Within this perspective, AI should be understood as an additional **cognitive resource** available to innovators. Rather than replacing human reasoning, AI expands the analytical capacity available to actors operating under uncertainty.

The notion that decision-makers operate under conditions of limited information and cognitive constraints was formalized by Herbert A. Simon through the concept of **bounded rationality**. According to this perspective, individuals rarely possess sufficient information or computational capacity to determine the optimal course of action in complex environments. Instead, they rely on heuristics, iterative learning and available resources to make decisions that are satisfactory rather than optimal.

Innovation processes represent a particularly clear example of bounded rationality. Innovators must formulate hypotheses about technological possibilities, user needs and market dynamics without having access to complete or reliable data about future outcomes. Decision-making therefore relies on iterative exploration rather than predictive certainty.

Artificial intelligence can be interpreted within this framework as a **resource that expands the effective cognitive capacity of innovators**. By analysing large volumes of information, identifying patterns across heterogeneous datasets and generating alternative hypotheses, AI systems can support decision-making processes without removing the fundamental uncertainty that characterizes innovation.

In this sense, AI contributes to strengthening bounded rationality rather than replacing it.

Another important theoretical perspective on innovation is the distinction between **exploration and exploitation** introduced by James G. March. Exploration refers to activities that involve experimentation, discovery and the search for new possibilities, while exploitation focuses on the refinement and optimization of existing capabilities.

Innovation management requires organizations to maintain a balance between these two modes of action. Excessive emphasis on exploitation may lead to incremental improvements but limit the emergence of breakthrough innovations. Conversely, excessive exploration may generate ideas without delivering sustainable value.

Artificial intelligence is often associated with optimization and predictive analytics, which primarily support exploitation activities. However, when used differently, AI can also reinforce exploration processes. By generating alternative perspectives, suggesting unconventional associations between ideas and revealing emerging patterns in complex environments, AI systems can help innovators expand the space of possibilities they consider.

From this perspective, AI functions as a **cognitive amplifier for exploration**, enabling innovators to explore a wider range of hypotheses while maintaining a structured reasoning process.

Finally, the integration of artificial intelligence into innovation processes can also be interpreted through the lens of **dynamic capabilities**, a concept developed by David J. Teece. Dynamic capabilities refer to the ability of organizations to sense opportunities, seize them through strategic decisions and transform their resources and processes in response to changing environments.

Within this framework, AI can strengthen the three key dimensions of dynamic capabilities:

Sensing opportunities

AI can support organizations in detecting weak signals, technological trends and emerging societal needs, thereby expanding their capacity to identify new innovation opportunities.

Seizing opportunities

By synthesizing complex information and supporting scenario exploration, AI can contribute to more informed strategic discussions about how to mobilize resources around promising innovation initiatives.

Transforming capabilities

AI can also facilitate organizational learning by helping teams analyse experimentation results, identify patterns across projects and codify insights that improve future innovation processes.

When integrated in this way, AI becomes part of the broader **innovation capability infrastructure** of the organization.

Importantly, the role of AI is not to eliminate uncertainty but to support the **progressive rationalization of innovation decisions**. By providing structured insights and alternative perspectives, AI is one more resource available to support innovators' reasoning and make it more efficient in uncertain and complex environments.

Conclusion: AI as a Socratic agent in innovation reasoning

The diffusion of artificial intelligence raises a fundamental question for innovation management: should AI be used primarily to optimize decisions or to enrich the reasoning processes through which innovation emerges?

This paper argues for the second perspective. Innovation requires experience, exploration, interpretation and learning in uncertain and complex environments. Under such conditions, AI should not replace human judgment but support it.

The metaphor of the **Socratic agent** captures this role. In the Socratic tradition, knowledge emerges through questioning rather than the transmission of ready-made answers. Similarly, AI can stimulate inquiry by challenging assumptions, generating alternative hypotheses and revealing hidden patterns.

When integrated into innovation management systems, AI therefore acts as a **cognitive mentor**. It strengthens the ability of organizations to explore opportunities, structure complex information and learn from experimentation.

Ultimately, the value of AI in innovation lies not in the answers it provides but in the **quality of the dialogue it enables between humans and intelligent systems**.

In this sense, artificial intelligence does not replace the innovator. Instead, it helps innovators ask better questions, explore broader possibilities and build more robust innovation trajectories in uncertain environments.

Annexe

Image 1: Socratic reasoning

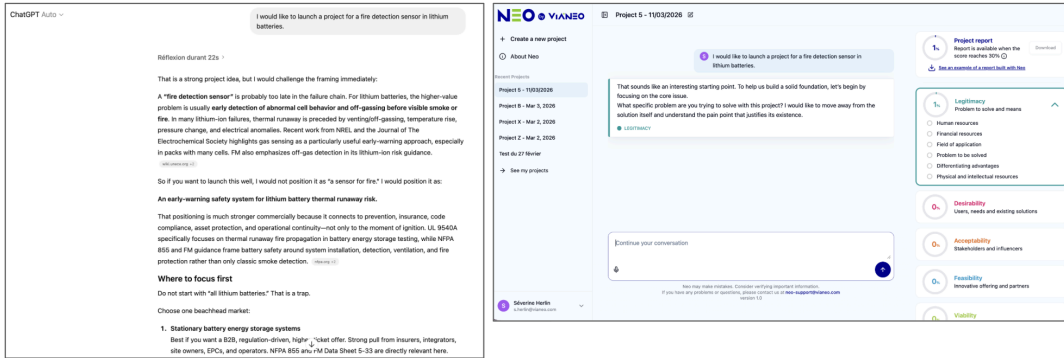


Illustration of two ways of reasoning with the same prompt: ChatGPT (left image) as a crutch, giving advice on how to position the project. Neo (right image) as a mentor, asking a question to start driving the project owner.

Image 2: AI crutch vs. AI mentor

Two competing imaginaries shape how organizations integrate AI.

Dimensions	AI as a “Crutch” (The Optimization Trap)	AI as a “Mentor” (The Socratic Agent)
Primary Goal	Reduce uncertainty & maximize efficiency	Expand exploration & structure ambiguity
Core Function	Answer generation & predictive prioritization	Hypothesis generation & assumption testing
Relationship to Past	Relies on historical data to predict the future	Uses historical patterns to provoke new analogies
Human Posture	Passive consumer of algorithmic recommendations	Active synthesizer of alternative perspectives
Innovation Outcome	Incremental optimization (Exploitation)	Radical & structural discovery (Exploration)

Image 3: Organizational levels to be considered

Management level	Role of AI	Typical contributions	Human responsibility
Strategic level	Sense-making partner	Horizon scanning of technologies, markets and societal signals; exploration of alternative futures; synthesis of stakeholder perspectives; identification of emerging opportunity domains; innovation value creation results	Define innovation intent, strategic priorities and value orientation; arbitrate between alternative strategic directions
Tactical level	Portfolio and governance sparring partner	Portfolio analysis and clustering of projects; simulation of resource allocation scenarios; identification of complementarities and conflicts across initiatives; insights for improving innovation processes	Decide resource allocation; approve, redirect or terminate projects; ensure alignment with organizational strategy and ethical principles
Operational level	Augmentation tool for innovation practices	Problem framing and reframing; idea generation and concept variation; experiment design; analysis of feedback and learning from tests; synthesis and documentation of insights	Interpret results; engage with users and stakeholders; select solutions and make go/no-go decisions

Taken together, these three levels illustrate how AI can be integrated into innovation management systems as a **distributed cognitive support structure**. By supporting strategic sense-making, strengthening governance processes and augmenting operational innovation practices, AI contributes to the development of innovation capabilities while preserving the central role of human judgment.

Keywords: AI-Augmented Leadership, Human–AI Interaction, human-centric innovation, innovation bridges, Uncertainty management