DOI: 10.32347/2412-9933.2026.65.6-13
UDC 005.311.6:004.89

Vitalii Gots
ORCID: https://orcid.org/0009-0008-0481-3152
Kyiv National University of Construction and Architecture, Kyiv, Ukraine
Postgraduate student at the Department of Project Management

Article history:
Received: 30.01.2026
Accepted: 17.02.2026
Published: 26.03.2026

COGNITIVE PROJECT MANAGEMENT MODEL IN A BANI ENVIRONMENT BASED ON HUMAN-IN-THE-LOOP ARCHITECTURE

Abstract. *The contemporary business environment, characterized by the BANI (Brittle, Anxious, Non-linear, Incomprehensible) paradigm, presents unprecedented challenges to strategic decision-making in project management. Traditional, deterministic planning frameworks increasingly fail to account for systemic non-linearity and pervasive cognitive biases, leading to organizational rigidity and suboptimal resource allocation. This study addresses this critical gap by developing an integrated approach to strategic governance. The primary objective is to enhance managerial rationality in high-entropy contexts by embedding behavioral insights into decision-making architectures. To achieve this, the research develops the Cognitive Synergy Architecture, a holistic framework that bridges algorithmic precision with human strategic oversight. The central result of the study is the development of the Cognitive Decision Trajectory method, which enables the systematic detection and correction of cognitive distortions, such as overconfidence and anchoring bias, during the strategic planning process. This method operates through a multi-layered system comprising the Debiasing filter model, the Shared sensemaking model, and the Adaptive reflexive loop model. These models function as a cybernetic feedback system that transforms unstructured, chaotic inputs into validated, adaptive strategic decisions. The research provides empirical evidence that the integration of «Human-in-the-Loop» protocols into strategic project governance significantly improves the quality of managerial choices. By formalizing the dialogue between AI-driven predictive insights and expert human judgment, the proposed framework minimizes decision latency and mitigates the impact of cognitive traps. The study concludes that the implementation of the Cognitive Synergy Architecture and the Cognitive Decision Trajectory method allows organizations to shift from reactive adaptation to proactive antifragility. This methodological advancement provides project managers with the necessary instruments to navigate extreme uncertainty, ensuring long-term institutional viability and enhancing the rationality of strategic choices in the BANI era.*

Keywords: Cognitive management; Human-in-the-Loop; BANI environment; Cognitive Decision Trajectory; Debiasing filter model; Shared sensemaking model; Adaptive reflexive loop model

Introduction

In the contemporary BANI (Brittle, Anxious, Non-linear, Incomprehensible) business environment, strategic decision-making has evolved from a linear, data-driven process into a high-stakes cognitive challenge. The escalating degree of turbulence and unpredictability in IT project ecosystems renders traditional management frameworks increasingly inadequate, as they often fail to account for the interplay between complex external dynamics and the inherent psychological constraints of human decision-makers. As organizations become more reliant on artificial intelligence to navigate these chaotic conditions, a critical «cognitive gap» emerges: the discrepancy between the raw predictive power of algorithms and the bounded rationality of human managers. Addressing this gap is of paramount importance, as decision-makers frequently fall prey to systematic cognitive biases – such as overconfidence, the illusion of control, and anchoring – which can distort the interpretation of AI-generated insights and lead to sub-optimal strategic outcomes. The objective of this research is to bridge this disconnect by developing a robust methodological framework for Cognitive Project Management, centered on a Human-in-the-Loop (HITL) architecture. This study aims to formalize a decision-making model that not only integrates AI-driven predictive analytics but also proactively mitigates human-centric cognitive distortions, thereby fostering organizational antifragility. By synthesizing principles from behavioral economics, cognitive science, and project portfolio governance, this research introduces a novel, adaptive approach to managing uncertainty, ensuring that strategic choices remain both data-informed and cognitively sound in an increasingly volatile global landscape.

The contemporary operational landscape is increasingly characterized by what has been termed the BANI paradigm – an environment defined by the brittleness of optimized systems, pervasive organizational anxiety, non-linear cause-and-effect relationships, and the intrinsic incomprehensibility of complex circumstances. Under such conditions, traditional deterministic planning frameworks prove inadequate, necessitating a shift toward adaptive, data-driven management approaches. Recent research confirms that managing complex projects under fundamental uncertainty requires agent-based cognitive models that account for individual human variability and organizational learning dynamics [1].

A promising response to this challenge lies in hybrid decision-making architectures that combine the computational capacity of Artificial Intelligence (AI) with human strategic oversight. In high-stakes domains – including healthcare, finance, and fraud detection – fully autonomous AI systems carry risks of algorithmic bias and insufficient interpretability. The Human-in-the-Loop (HITL) approach has emerged as a means of mitigating these risks by preserving human judgment as a critical safeguard within automated workflows [2]. This framework ensures that AI-driven decisions remain accountable, interpretable, and responsive to contextual nuances that exceed the capacity of purely algorithmic reasoning [3]. Accordingly, the contemporary strategic challenge resides at the intersection of technological integration and adaptive human leadership, where algorithmic speed and scalability must be balanced by human oversight of ethical risks, ambiguous scenarios, and stakeholder trust.

A central dimension of this challenge concerns the governance of uncertainty in IT-project environments. Koptieva demonstrates that the fundamental uncertainty inherent in IT initiatives – driven by technological novelty and volatile requirements – renders classical risk management tools insufficient [4]. Her research identifies cognitive biases, particularly optimism bias and the sunk cost effect, as systematic sources of project failure, and advocates for the integration of structured debiasing mechanisms – such as stop/go decision rules and premortem analysis – directly into project governance architectures [4]. Complementing this behavioral perspective, empirical evidence from capital-intensive sectors indicates that the structural success of large-scale initiatives depends critically on team collaboration stability. Cui demonstrates that human-AI integration serves as a moderating variable in this relationship: advanced AI systems enhance the decision-making effectiveness of stable teams rather than merely automating discrete tasks [5]. The technical realization of such adaptive capabilities, in turn, requires sophisticated modeling tools. Dolhopolov et al. propose a hybrid approach for cyber-physical systems that integrates deep learning with physics-based modeling, providing robust environments for prediction and control even in data-scarce conditions [6]. Together, these contributions point to the simultaneous optimization of behavioral governance [4], collaborative stability [5], and technical predictability [6] as the foundation of effective project management under uncertainty.

The behavioral dimension of this problem warrants particular attention. Strategic decision-making is demonstrably susceptible to systemic cognitive biases – such as the illusion of control – that distort the application of management strategies regardless of the sophistication of the deployed technology [7]. Any framework designed for the BANI environment must therefore integrate mechanisms for counteracting flawed heuristics at the level of individual judgment. On the technical side, Dolhopolov et al. demonstrate that purely data-driven AI models often lack the interpretability required in safety-critical domains, and that the fusion of deep learning with physics-informed modeling offers both predictive accuracy and the transparency necessary for managerial scrutiny of AI outputs [8]. These technical and behavioral requirements converge at the level of corporate governance: strategic decisions in growth-oriented organizations involve a combination of rational analysis and intuitive judgment that is inherently susceptible to cognitive interference [9]. Managers must therefore develop the capacity to recognize and manage their own biases, particularly in high-risk contexts such as acquisitions and large-scale investments [9]. A truly adaptive management model must consequently integrate AI-driven predictive capabilities [8] with debiasing protocols [7] and an explicit awareness of the cognitive limitations of human decision-makers [9].

The complexity of decision-making is further amplified by socio-economic and cultural context. In emerging market economies, restricted access to reliable information exacerbates the reliance on cognitive heuristics, making structured decision-making processes essential for mitigating the adverse effects of overconfidence and the illusion of control on firm performance [10]. In parallel, high-risk domains such as healthcare illustrate the potential of collaborative human-AI systems to achieve decision-making improvements that neither humans nor algorithms can accomplish independently. Ahmad et al. argue that successful AI utilization depends on establishing ethical, trust-based relationships between practitioners and AI systems, wherein computational analytical power is complemented by human empathy and situational awareness [11]. At the organizational level, these cognitive and technological dynamics are moderated by corporate culture. Korobkina et al. introduce the concept of a «corporate culture of dignity» as a neurobehavioral regulatory mechanism: an organizational environment characterized by psychological safety and transparency serves as an internal infrastructure for metacognitive control, reducing the dominance of heuristic-driven errors and mitigating the accumulation of social and technical debt [12]. The transition to effective management in the BANI era thus requires a multi-dimensional strategy that addresses the cognitive architecture of decision-makers [10], fosters deep human-AI collaboration [11], and cultivates a resilient organizational culture capable of regulating behavioral distortions [12].

The practical realization of these principles is increasingly associated with the methodological convergence of AI and Agile project management. Enabulele et al. demonstrate that the integration of Generative AI (GenAI) into Agile environments enables a fundamental shift in project execution – automating requirements elaboration, code generation, and real-time risk sensing – while simultaneously requiring robust governance frameworks to manage risks such as algorithmic bias and over-reliance [13]. The delineation of human and AI roles within these frameworks is critical: Elgeddawy shows that the most effective collaboration models are those facilitating HITL interaction, where humans provide contextual judgment while AI manages data-intensive tasks such as forecasting and optimization, with the quality of this interaction moderated by organizational trust and model transparency [14]. Importantly, these technological and procedural efforts must be grounded in the psychological outcomes of project teams. Shahid et al. demonstrate that Agile practices drive project success through the mediating mechanism of psychological empowerment, confirming that human-centric aspects of Agile methodologies – autonomy, team interaction, and shared accountability – are essential for sustaining motivation and innovative behavior in complex IT projects [15].

Despite the breadth of existing research addressing individual facets of this problem, a significant gap remains in the integration of these perspectives into a unified, implementable management model. The present study addresses this gap by proposing an adaptive reconfiguration model that unifies AI-driven predictive capabilities [13], structured human-AI interaction protocols [14], and organizational mechanisms for psychological empowerment [15] within a coherent framework for project management in the BANI era.

Main Research

The contemporary operational landscape is characterized by an escalating degree of turbulence and unpredictability, which often exceeds the processing capabilities of traditional management models. To navigate this complexity, the research proposes a novel Cognitive Synergy Architecture. This framework operates as a cybernetic system that moves beyond reactive adaptation. It treats the organization as a living, learning entity that constantly refines its strategic stance. The general conceptual framework, illustrated in Figure 1, demonstrates the cyclical nature of this interaction. It positions the BANI environment as a dynamic context layer that provides continuous inputs. These inputs are processed by the AI predictive analytics layer, which serves as the data layer of the system. The processed insights are then interpreted by the portfolio manager within the cognitive layer, ultimately leading to an adaptive strategic decision that functions as the synthesis output. A feedback loop ensures that the outcomes of these decisions enrich the initial context, thereby fostering organizational learning.

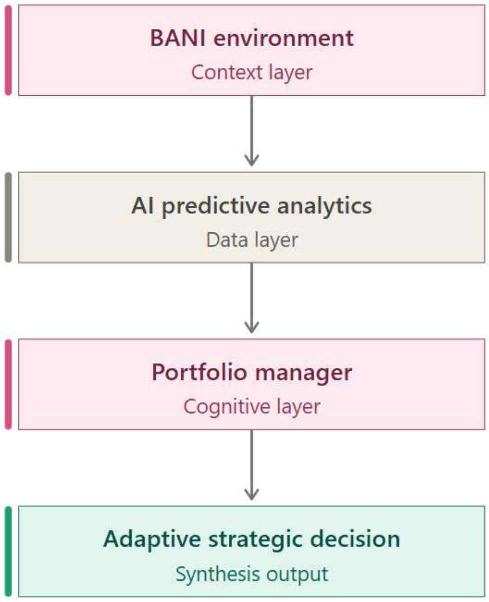

Figure 1 – General conceptual model of the cognitive synergy approach in strategic project management

The fundamental hypothesis of this model posits that organizational resilience is achieved not through rigid adherence to static, pre-defined roadmaps, but through a continuous, reflexive dialogue between algorithmic precision and human intuition. In the BANI era, static plans are rendered obsolete by the speed of external change; thus, resilience becomes a byproduct of agility. By structuring the model into these distinct, specialized layers, the research creates a protected cognitive environment where machine-driven insights are rigorously validated by human expertise. This architecture actively mitigates the risks associated with «automation bias» – the tendency of decision-makers to over-rely on algorithmic suggestions – by mandating a collaborative check-and-balance mechanism. This ensures that every strategic choice remains firmly grounded in both high-fidelity data and the broader, long-term organizational purpose.

The core of the proposed solution is a multifaceted cognitive synergy architecture, which functions as an integrated Human-in-the-Loop (HITL) system. As detailed in Figure 2, this model is structured into three specialized loops that systematically address the challenges posed by the BANI paradigm. The architecture transitions from environmental monitoring to reflective adaptation, ensuring that the organization remains in a state of perpetual readiness.

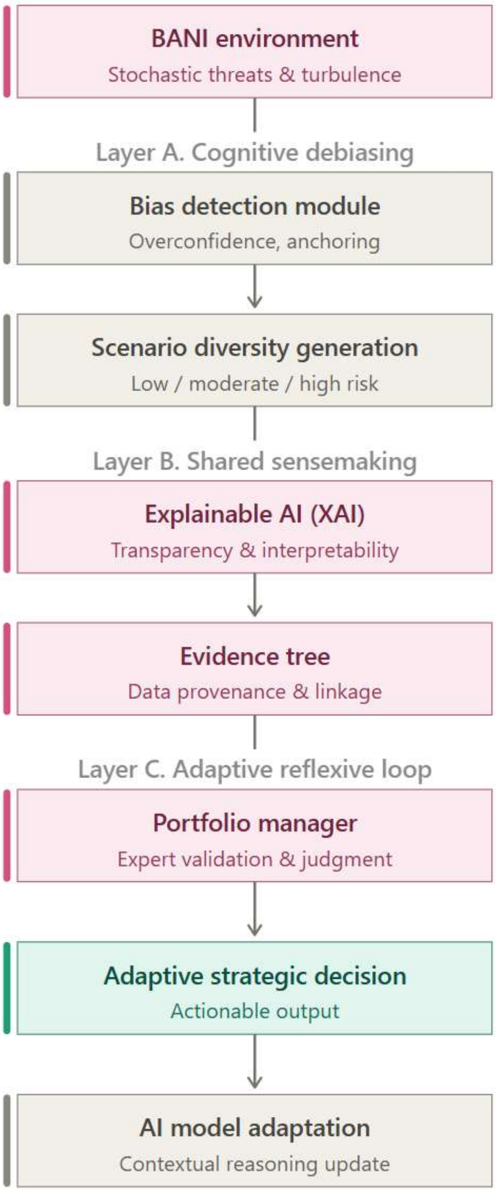

Figure 2 – Architectural framework of the integrated Human-in-the-Loop model for cognitive synergy

At the foundational level, the system initiates a self-learning cycle that spans from the detection of stochastic threats in the BANI environment to the final implementation of an adaptive strategic decision. This cycle is not merely a linear sequence but an iterative process where each stage informs the next. The cognitive synergy model relies on the integration of explainable artificial intelligence and human expert validation, ensuring that the transition from chaotic data to actionable strategy is both transparent and ethically sound. This systemic integration allows for the proactive management of organizational stress and non-linear dynamics, effectively equipping leaders with the necessary tools to maintain long-term viability in high-entropy settings.

The initial stage of the model addresses the propensity of decision-makers to fall into cognitive traps. The Debiasing filter, visualized in Figure 3, functions as a pattern recognition engine that scans incoming strategic signals to identify potential distortions before they influence decision-making.

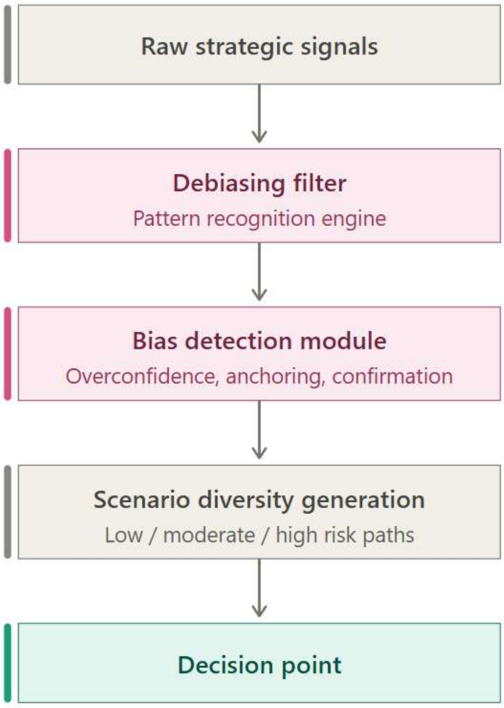

Figure 3 – Structural model of the cognitive debiasing filter (Loop A)

In environments marked by high complexity, managers are frequently susceptible to cognitive biases such as overconfidence, anchoring, and confirmation bias. The Debiasing filter systematically scans raw strategic signals and passes them through an analytical engine that flags these patterns. By performing this pattern recognition, the model forces the system to consider a diversity of scenarios, ranging from low to high risk. This stage essentially acts as a cognitive safeguard, preventing the organization from prematurely committing to flawed strategies based on skewed perceptions of reality. The outcome of this process is a decision point, where the refined data is passed to the next stage for deeper sensemaking, thereby ensuring that the foundation of the strategic decision is free from systemic psychological distortions.

Building upon the initial debiasing phase, the model transitions to the Shared Sensemaking contour. In the context of the BANI paradigm, the inability of managers to construct a coherent mental model from overwhelming and erratic data streams is a critical barrier. This layer addresses that «Incomprehensibility» by transforming complex AI outputs into understandable evidence. As illustrated in the structural design of the integrated model in Figure 2, this layer acts as the bridge between raw algorithmic processing and the human cognitive space.

The model utilizes Explainable AI (XAI) to dismantle the «black box» nature of traditional algorithms. Instead of generating opaque recommendations, the system produces an Evidence Tree that ensures data provenance and logical linkage. This transparency allows portfolio managers to interrogate the underlying rationale of the system, verifying the specific correlations between BANI-driven market events and proposed strategic pivots. By transforming chaotic signals into a reliable, traceable narrative, the shared sensemaking process fosters organizational trust and psychological safety, effectively neutralizing the anxiety that typically impedes decision-making in volatile environments.

The architecture culminates in the Adaptive Reflexive Loop, which operationalizes the interaction between human judgment and machine precision. This process follows a systematic trajectory: Detection of environmental signals, Debiasing through historical pattern matching, and a Dialogue phase where managers must provide robust rationales for high-risk deviations from AI suggestions (Figure 4). This structured interaction ensures a critical cognitive check, preventing intuitive errors while leveraging algorithmic speed.

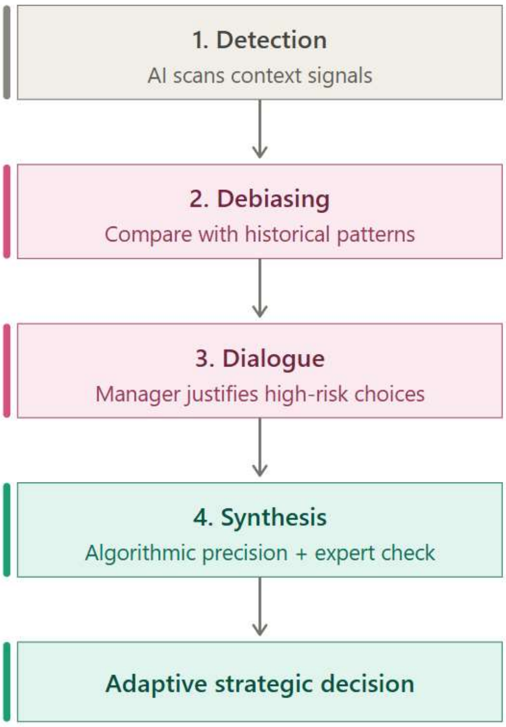

Figure 4 – Methodological workflow of the cognitive decision trajectory for strategic project reconfiguration

The final Synthesis yields a hybrid strategic decision that integrates the scalability of AI with the manager's ethical and contextual vision. This phase is supported by a continuous feedback mechanism; empirical outcomes are channeled back into the system to perform AI model adaptation. By updating contextual reasoning parameters based on real-world results, the framework enables the organization to function as a self-learning organism, progressively enhancing decision accuracy as BANI dynamics evolve.

To ensure the functional efficacy of the Cognitive Synergy Architecture, the model formalizes specific interaction protocols. These protocols facilitate a robust integration of algorithmic outputs with the human cognitive apparatus. The transition from raw signals to strategic decisions is governed by a set of rules that explicitly delineate the boundaries between machine-driven optimization and human-centric judgment. This structured interaction is detailed in Table 1, which serves as the methodological baseline for the practical deployment of the IDPR-Model.

The methodological synergy described in Table 1 is central to the model's ability to minimize decision latency. By establishing these protocols, the organization avoids the common pitfalls of «automation bias,» where managers might accept flawed AI suggestions without critical review, or «over-intervention,» where intuition overrides data-driven forecasts in high-risk domains. Instead, the protocols foster a partnership where the AI acts as an expansive cognitive amplifier, enabling the portfolio manager to explore more possibilities, simulate broader risk profiles, and maintain a focus on long-term value creation.

The proposed model necessitates a shift from centralized hierarchy to adaptive, decentralized project governance. By providing project leads with real-time, evidence-based insights, the model diminishes the need for top-down approval for incremental pivots, allowing senior leadership to focus on high-level strategic orchestration. This delegation of authority is supported by a shared cognitive infrastructure that fosters psychological safety, enabling teams to treat failures as iterative data points rather than catastrophic risks.

Consequently, the project manager's role evolves from a traditional administrator to a «Cognitive Orchestrator.» In this capacity, the manager's value shifts from processing vast datasets – a function optimized by the AI core – to synthesizing complex insights, managing team dynamics, and navigating the socio-ethical dimensions of strategy. The model serves as a cognitive scaffold, ensuring that the human element remains the primary driver of strategic vision, supported rather than replaced by machine-driven foresight.

Table 1 – ***Operational Protocols for Human-AI Synergy***

Processing Phase	Cognitive Barrier Addressed	System Action	Managerial Response
Signal Detection	Incompre-hensibility	Data aggregation and weak signal extraction	Reviewing environmental shifts and initial alert verification
Debiasing	Overconfi-dence / Anchoring	Pattern matching against historical data failures	Adjusting subjective risk perceptions based on evidence
Sensemaking	Information Overload	Constructing evidence trees and logical provenance	Deep inquiry into the rationale of proposed strategic paths
Synthesis	Cognitive Rigidity	Proposing optimized multi-criteria configurations	Final validation, ethical review, and policy alignment
Reflexive Loop	Structural Inertia	Continuous update of model parameters and reasoning updates	Analysis of decision outcomes and identification of new learning cues

Unlike traditional management where learning is a post-hoc activity, this model embeds learning into the operational lifecycle through a continuous, cybernetic feedback loop. As teams execute adaptive strategies, performance data and feedback are channeled back into the system, transforming the organization into a «learning organism» that updates its contextual reasoning in real-time. This iterative cycle bridges the gap between historical knowledge and emergent BANI dynamics, allowing the system to refine its decision-making parameters continuously.

Ultimately, this framework aims to cultivate Organizational Antifragility. Beyond simple resilience – which merely withstands shocks – antifragility implies that the organization gains strength from stressors and volatility. Through the combination of the Debiasing filter and the Reflexive Loop, the organization develops «cognitive immunity.» Teams learn to treat near-misses as essential intelligence, reducing the long-term cognitive load on managers by enhancing their ability to recognize early BANI-driven threats. By replacing fragile predictive precision with a repertoire of pre-considered adaptive responses, the model enables organizations to transition from paralysis during systemic shocks to immediate, pre-simulated strategic action.

The evolution from static, plan-based governance to the proposed dynamic framework represents a significant maturation of management science. The following table synthesizes the core differences in how these paradigms address environmental and cognitive challenges.

This transition redefines project governance, moving the focus from «deviation monitoring» to «value orchestration.» In an era where interpreting volatility is more critical than milestone adherence, this model provides the necessary framework for sustaining long-term viability.

To contextualize the transformative potential of the IDPR-Model, it is necessary to contrast it with traditional governance frameworks. The evolution of project management from a static, plan-based approach to a dynamic, synergy-based framework represents a significant maturation of management science. The following synthesis outlines the core differences in how these paradigms handle environmental and cognitive challenges.

As shown in Table 2, the transition to Cognitive Synergy Governance involves a fundamental reimagining of the manager's core responsibilities. The shift from «deviation monitoring» to «value orchestration» reflects the necessity of operating in an era where the ability to interpret and learn from volatility is more critical than the ability to adhere to a pre-defined set of milestones.

Table 2 – ***Comparative Analysis of Strategic Management Paradigms***

Dimension	Traditional Governance (Static)	Cognitive Synergy Governance (Adaptive)
Environmental View	Linear, predictable, stable	Non-linear, volatile, incomprehensible
Data Usage	Historical, fragmented, siloed	Real-time, fused, predictive analytics
Decision Logic	Deterministic, top-down	Probabilistic, distributed, «Human-in-the-Loop»
Cognitive Approach	Ignores biases, assumes rationality	Active debiasing, metacognitive monitoring
Learning Process	Post-project «lessons learned»	Continuous, real-time cybernetic feedback loop
Strategic Goal	Minimize deviation from plan	Maximize resilience and strategic value
Risk Perspective	Risk avoidance (Threat-focused)	Risk orchestration (Opportunity-focused)

Conclusions

This research has substantiated that in the contemporary BANI era, the paradigm of project management must undergo a fundamental transition from purely deterministic or agile frameworks toward Cognitive Synergy Governance. Traditional management models, which rely on the assumption of boundedly rational actors operating in stable environments, prove increasingly insufficient when facing the non-linear disruptions and cognitive distortions prevalent in the modern IT and engineering landscape. To address this, the study conceptualized the Cognitive Synergy Architecture, a sophisticated cybernetic system that effectively harmonizes algorithmic predictive precision with human strategic intuition.

The scientific novelty of the proposed solution lies in the development of the Cognitive Decision Trajectory method, which provides a structured mechanism for neutralizing systemic cognitive biases such as overconfidence, anchoring, and the status quo effect. By organizing this method into a three-layered framework – comprising the Debiasing filter model, the Shared sensemaking model, and the Adaptive reflexive loop model – the research creates a formal environment for cognitive de-biasing. This architecture systematically converts environmental entropy into actionable strategic intelligence, ensuring that decision-makers are not merely reacting to events but are actively orchestrating their response based on data-driven, yet humanly validated, insights.

The practical significance of this study is the provision of an actionable toolkit for project managers operating in high-entropy contexts. The implementation of the Cognitive Synergy Architecture enables organizations to minimize decision latency while maintaining high standards of accountability and ethical compliance. By shifting the focus from «full automation» to a «Human-in-the-Loop» (HITL) protocol, the model ensures that the human element remains the primary driver of strategic vision, supported by AI-driven predictive capabilities that manage the complexities of big data. This methodology prevents irrational continuations of unviable projects and promotes a culture of reflective, evidence-based decision-making.

Future research directions will focus on the empirical validation of the Cognitive Decision Trajectory method within specific high-volatility sectors, such as fintech or defense, to calibrate thresholds for different levels of strategic uncertainty. Furthermore, there is significant potential in developing autonomous learning agents that can continuously evolve the model's parameters based on historical decision outcomes. Ultimately, this research provides the foundation for a new paradigm of humanistic management, where the integration of behavioral economics and AI-driven predictive systems facilitates genuine organizational antifragility.

Conflict of Interest. The author confirms that there are no financial, personal, or other interests that could be considered a potential conflict of interest regarding the publication of this article.

Funding. This research was conducted without external financial support.

Data Availability. All data is available in digital or graphical form within the main text of the manuscript.
Use of Artificial Intelligence. The author confirms that no artificial intelligence tools were used in the creation of this work.

References

1. Afroze, T., & Sarker, M. A. (2025). Cognitive biases and firm performance among entrepreneurs in Bangladesh SMEs: Unwrapping the mediating role of strategic decision making. *Khulna University Studies*, *22*(1), 89–100. https://doi.org/10.53808/kus.2025.22.01.1296-mb

2. Balamurugan, M., Shanmugasamy, K., & Balaguru, S. (2025). Humans in the loop, lives on the line: AI in high-risk decision making. *European Journal of Computer Science and Information Technology*, *13*(51), 27–31. https://doi.org/10.37745/ejcsit.2013/vol13n512731

3. Cui, J. (2025). Nexus of team collaboration stability on mega construction project success in electric vehicle manufacturing enterprises: The moderating role of human-AI integration. [Insert Journal Name].

4. Dolhopolov, S., Honcharenko, T., & Chernyshev, D. (2025). NeuroPhysNet: A novel hybrid neural network model for enhanced prediction and control of cyber-physical systems. In *Mathematical Modeling and Simulation of Systems. MODS 2024. Lecture Notes in Networks and Systems* (Vol. 1391). Springer. https://doi.org/10.1007/978-3-031-90735-7_27

5. Dolhopolov, S., Riabchun, Y., Delembovskyi, M., & Molodid, O. (2025). Explainable artificial intelligence for multimodal sentiment analysis in revitalization project management. *Radioelectronic and Computer Systems*, *2025*(4). https://doi.org/10.32620/reks.2025.4.07

6. Elgeddawy, Y. G. (2026). Human–AI collaboration models in supply chain decision-making. *International Journal of Scientific Research in Science, Engineering and Technology*, *13*(1), 183–198. https://doi.org/10.32628/ijsrset2613110

7. Enabulele, A. B., Ojo, D. A., Egwatu, J. O., & Thomas, G. A. (2025). AI-augmented agility: A comprehensive review of generative AI applications in agile project management. *Journal of Global Economics, Management and Business Research*, *17*(3), 349–360. https://doi.org/10.56557/jgembr/2025/v17i39877

8. Gonçalves, C. A., & Rocha, C. E. (2023). Cognitive biases in decision-making: Applications on strategic management and rationality improvement. *International Journal of Scientific Management and Tourism*, *9*(3), 1722–1744. https://doi.org/10.55905/ijsmtv9n3-023

9. Koptieva, H. (2025). Managing uncertainty in IT projects: An adaptive model integrating behavioral factors. *Actual Problems of Economics*, *8*(290), 268–279. https://doi.org/10.32552/1993-6788-2025-1-290-268-279

10. Korobkina, T., Dashenkova, N., Danchenko, I., & Omelchenko, H. (2025). The impact of corporate culture of dignity on cognitive biases, strategic decision-making and technical debt management in IT engineering. *Technology Audit and Production Reserves*, *3/4*(83), 6–13. https://doi.org/10.15587/2706-5448.2025.329635

11. Midtgård, K., & Selart, M. (2025). Cognitive biases in strategic decision-making. *Administrative Sciences*, *15*(6), 227. https://doi.org/10.3390/admsci15060227

12. Pantoja-Rojas, L. M., Alzate-Monroy, M. A., Medina-García, V. H., & Moreno-Sandoval, L. G. (2025). Cognitive agent-based modeling to optimize complex project management under uncertainty. *IEEE Access*, *13*, 127263–127279. https://doi.org/10.1109/ACCESS.2025.3588816

13. Shahid, M., Iqbal, N., & Waseem, M. (2025). The impact of behavioral and cognitive outcomes of agile project management practices on project success. *Administrative and Management Sciences Journal*, *3*(2), 202–213. https://doi.org/10.59365/amsj.3(2).2025.145

14. Syed, S. H., Ahmad, W., Bibi, K., Talani, R. A., & Raja, R. (2025). Investigating the potential of collaborative human-AI systems to revolutionize decision-making in areas like medical diagnosis, financial forecasting and strategic planning. *Social Science Review Archives*, *3*(1), 2590–2605. https://doi.org/10.70670/sra.v3i1.567

15. Zhao, T., Taherisadr, M., & Elmalaki, S. (2023). *FAIRO: Fairness-aware adaptation in sequential-decision making for human-in-the-loop systems*. ArXiv. https://doi.org/10.48550/arXiv.2307.05857

Гоц Віталій Вікторович
ORCID: https://orcid.org/0009-0008-0481-3152
Київський національний університет будівництва і архітектури, Київ, Україна
Аспірант кафедри управління проєктами

МОДЕЛЬ КОГНІТИВНОГО УПРАВЛІННЯ ПРОЄКТАМИ В BANI-СЕРЕДОВИЩІ НА ОСНОВІ АРХІТЕКТУРИ «HUMAN-IN-THE-LOOP»

Анотація. *Сучасне бізнес-середовище, що характеризується парадигмою BANI (Brittle – крихкий, Anxious – тривожний, Non-linear – нелінійний, Incomprehensible – незбагненний), створює безпрецедентні виклики для стратегічного прийняття рішень в управлінні проєктами. Традиційні детерміновані підходи до планування все частіше виявляються неспроможними врахувати системну нелінійність та вплив когнітивних ухилів, що призводить до організаційної жорсткості та неефективного розподілу ресурсів. Це дослідження розв'язує зазначену критичну проблему шляхом розроблення інтегрованого підходу до стратегічного управління. Метою роботи є підвищення раціональності управлінських рішень в умовах високої ентропії шляхом впровадження поведінкових аспектів у архітектуру управління. Для досягнення цієї мети в дослідженні розроблено архітектуру когнітивної синергії – цілісну систему, що поєднує алгоритмічну точність із людським стратегічним наглядом. Основним результатом дослідження є розроблення методу когнітивної траєкторії прийняття рішень, який дозволяє систематично виявляти та коригувати когнітивні викривлення (зокрема, надмірну впевненість та ефект прив'язки) під час стратегічного планування. Цей метод функціонує через багаторівневу систему, що охоплює модель фільтру корекції когнітивних упереджень, модель спільного осмислення та модель адаптивної рефлексивної петлі. Ці моделі утворюють систему зворотного зв'язку, що трансформує неструктуровані хаотичні дані у валідовані адаптивні стратегічні рішення. Дослідження обґрунтовує, що інтеграція протоколів взаємодії «людина в контурі» (Human-in-the-Loop) у стратегічне управління проєктами суттєво підвищує якість управлінського вибору. Формалізуючи діалог між прогнозною аналітикою на основі штучного інтелекту та експертною верифікацією, запропонований підхід мінімізує затримки при прийнятті рішень та нівелює вплив когнітивних пасток. У висновках зазначено, що впровадження архітектури когнітивної синергії та методу когнітивної траєкторії прийняття рішень дозволяє організаціям здійснити перехід від реактивної адаптації до проактивної антикрихкості. Цей методологічний прогрес надає керівникам проєктів необхідний інструментарій для навігації в умовах крайньої невизначеності, гарантуючи довгострокову інституційну життєздатність та підвищуючи раціональність стратегічних виборів в епоху BANI.*

Ключові слова: когнітивний менеджмент; Human-in-the-Loop; BANI-середовище; метод когнітивної траєкторії прийняття рішень; модель фільтру корекції когнітивних упереджень; модель спільного осмислення; модель адаптивної рефлексивної петлі

Link to publication

APA Gots, V. (2026). Cognitive Project Management Model in a BANI Environment Based on Human-in-the-Loop Architecture. *Management of Development of Complex Systems*, 65, 6–13, dx.doi.org\10.32347/2412-9933.2026.65.6-13.

ДСТУ Гоц В. В. Модель когнітивного управління проєктами в BANI-середовищі на основі архітектури «Human-in-the-Loop». *Управління розвитком складних систем.* Київ, 2026. № 65. С. 6 – 13, dx.doi.org\10.32347/2412-9933.2026.65.6-13.