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Gots Vitalii
Postgraduate student at the Department of Project Management,
https://orcid.org/0009-0008-0481-3152
Kyiv National University of Construction and Architecture, Kyiv
Verenych Olena
DSc (Eng.), professor, professor of the project management department,
https://orcid.org/0000-0003-0972-636
Kyiv National University of Construction and Architecture, Kyiv

MODEL FOR ADAPTIVE PROJECT PORTFOLIO RECONFIGURATION IN A BANI ENVIRONMENT

Abstract. *The contemporary business landscape has undergone fundamental changes towards the BANI paradigm (Brittle, Anxious, Non-linear, Incomprehensible), rendering traditional deterministic approaches to Project Portfolio Management (PPM) largely ineffective. Static planning methods fail to account for the stochastic nature of modern threats, leading to organizational fragility and resource misalignment. This study addresses this problem by developing a comprehensive mechanism for adaptive management based on integrating Artificial Intelligence technologies with strategic management principles to create a dynamic, self-regulating system capable of functioning in high-entropy environments. The primary result of the research is the developed Model of Adaptive Project Portfolio Reconfiguration in a BANI Environment (Intelligent Dynamic Portfolio Reconfiguration Model, IDPR-Model). The developed system consists of four interconnected models, each designed to counteract a specific BANI component. The Semantic Monitoring Model utilizes Natural Language Processing (NLP) algorithms to detect «weak signals» from unstructured external data, overcoming the challenge of «Incomprehensibility». The Predictive Model applies «Digital Twin» technology and Monte Carlo simulations to model probabilistic future scenarios, mitigating «Non-linearity» and «Brittleness». The Decision Model acts as an orchestration mechanism, using multi-objective optimization algorithms to propose reconfiguration strategies (such as freezing or accelerating assets), while retaining the human role for strategic and ethical verification. The Execution and Communication Model focuses on reducing organizational «Anxiety» through proactive communication mechanisms and Zero Trust security protocols. The proposed model provides significant methodological progress by shifting the managerial paradigm from «planning for stability» to «managing for resilience». It is substantiated that the synergy of AI-based predictive analytics with human strategic oversight will allow organizational management to minimize decision latency and dynamically optimize resource usage. The implementation of the developed model provides a reliable toolkit for enterprise managers to ensure long-term viability and competitive advantages in an unpredictable global environment.*

Keywords: Management; Project Portfolio Management; BANI environment; Artificial Intelligence; Dynamic Reconfiguration; Digital Twin; Risk Management; Decision Support System

Introduction

The contemporary business landscape has evolved into a configuration best described by the BANI acronym (Brittle, Anxious, Non-linear, Incomprehensible), necessitating a fundamental paradigm shift in how organizations manage their strategic development. In this context, traditional Project Portfolio Management (PPM) approaches, which rely heavily on static assumptions and subjective expert judgment, are increasingly proving insufficient. Consequently, there is an urgent need to integrate advanced technologies and dynamic methodologies to ensure organizational resilience and strategic alignment.

Recent research highlights that the effectiveness of portfolio management is directly correlated with the ability to leverage data for predictive decision-making. Tanim et al. demonstrate that traditional methods often fail to account for the dynamic nature of project environments, leading to inefficiencies and resource bottlenecks [1]. To address these challenges, they propose a data-driven framework integrating predictive analytics, time-series forecasting, and probabilistic risk modeling (such as Monte Carlo simulations). This approach allows organizations to move beyond simple financial metrics like ROI, enabling a more sophisticated evaluation of project success probability and resource demand in real-time [1].

However, the integration of technology must be balanced with human-centric strategic oversight, particularly in complex scenarios such as Mergers and Acquisitions (M&As) or high-uncertainty environments. Cihan argues for a «philosophical triangulation» that bridges data-driven (positivist) and human-centric (interpretivist) approaches [2]. By introducing the Complexity-Uncertainty-Risk-Value (CURV) model and the «portfolio space» concept, Cihan emphasizes that while algorithms provide objectivity and scalability, human judgment is essential for interpreting strategic fit and managing cognitive biases in decision-making [2]. This duality is critical for maintaining dynamic reconfigurability in a BANI environment, where strictly algorithmic rigidity might fail against non-linear strategic shifts.

Furthermore, the role of Artificial Intelligence extends beyond backend analytics to the interface of stakeholder management and real-time adaptability. Joshi highlights that AI tools, particularly those utilizing Natural Language Processing (NLP), significantly enhance communication efficiency and decision support [3]. By automating routine interactions and providing predictive insights through AI-powered interfaces, organizations can reduce the latency in information exchange – a crucial factor in mitigating the «Anxiety» component of the BANI framework. This integration facilitates a more agile response to stakeholder needs and ensures that the project portfolio remains aligned with evolving expectations [3].

Synthesizing these perspectives, it becomes evident that a model for dynamic portfolio reconfiguration must rely on a synergy between robust data mining algorithms for risk and resource optimization [1], AI-driven real-time responsiveness [3], and a structured framework that accommodates human strategic oversight [2].

The stochastic nature of the modern strategic environment requires a departure from rigid planning in favor of adaptive modeling. Alazzam et al. emphasize that effective management of commercial activities in unstable conditions demands a methodical approach that accounts for the alternativeness and variability of management decisions. By proposing a block-object-oriented modeling approach (using IDEF3), they demonstrate that business management strategies must be viewed as continuous processes of implementing changes, where the readiness for change is a key determinant of long-term profitability and competitiveness [4].

This necessity for adaptability is further amplified when viewed through the lens of the BANI framework. Abdullah et al. argue that in a world characterized as Brittle, Anxious, Non-linear, and Incomprehensible, traditional complexity handling is no longer sufficient. Their research on state-owned holding companies suggests that sustainable business control requires an «orchestration model». This paradigm shifts the focus from simple strategic alignment to the active orchestration of the business ecosystem, creating synergy and integration to withstand chaotic and unpredictable world conditions [5]. This concept of «orchestration» directly supports the need for a dynamic portfolio reconfiguration mechanism.

To achieve such dynamic orchestration and handle the «Incomprehensible» volume of data, the integration of advanced technologies is indispensable. Hashimzai and Mohammadi highlight that Artificial Intelligence (AI) has emerged as a game-changer in project management, shifting the discipline from reactive to proactive. Their systematic review indicates that AI applications, particularly in predictive analytics and resource optimization algorithms, significantly enhance decision-making efficiency. By automating routine tasks and analyzing historical data patterns to forecast risks, AI enables the real-time adjustments necessary for a dynamic portfolio, although challenges regarding implementation costs and data privacy remain critical barriers to address [6].

To operationalize dynamic reconfiguration, it is essential to move beyond general AI applications to specific predictive mechanisms. Ibraigheeth and Abu eid provide empirical evidence that machine learning approaches, specifically Support Vector Machines (SVM) and Artificial Neural Networks (ANN), can accurately predict project failure probabilities by analyzing historical failure factors [7]. This capability is fundamental for the proposed model, as it allows the system to treat «risk» not as a static variable, but as a dynamic probability that triggers immediate portfolio adjustments when a specific threshold is breached.

However, the application of these algorithmic tools must be grounded in a deep understanding of the environmental shift. Bushuyev et al. argue that the transition from VUCA to BANI represents a fundamental «transformation of values» in high-technology projects [8]. They emphasize that in a non-linear and incomprehensible world, traditional safety and stability measures are insufficient. Instead, the focus must shift towards acknowledging «brittleness» and countering «anxiety» through flexible, value-oriented management models that prioritize empathy and rapid adaptability over rigid procedural compliance [8].

Furthermore, the resilience of a project portfolio in a BANI environment is heavily dependent on the human element and information flow. Dyachenko and Shadura propose a model of «proactive communication», asserting that reactive approaches are obsolete in the face of BANI challenges [9]. They demonstrate that a transition to proactive management – where stakeholder expectations are anticipated and conflicts are mitigated before they escalate is crucial for maintaining the structural integrity of logistics and enterprise projects. This suggests that a robust reconfiguration model must integrate algorithmic decision-making with a communication framework that ensures transparency and reduces the «incomprehensibility» of strategic shifts for all stakeholders [9].

To operationalize these predictive and communicative capabilities into a cohesive reconfiguration mechanism, the underlying project management framework must shift from rigid linearity to adaptive flexibility. Kalathoti demonstrates that traditional stage-gate models often fail to keep pace with the volatility of complex sectors, such as clinical trials. Instead, he proposes an Adaptive Project Management (APM) framework that integrates «rolling-wave planning» and «digital twins» – virtual replicas of the portfolio that allow for scenario simulation. This approach significantly reduces decision latency and budget variance, proving that the integration of real-time analytics allows for the rebalancing of timelines and resources in response to emergent shocks [10].

The integration of such AI-driven tools inevitably transforms the functional role of project management leadership. Duică et al. argue that while AI algorithms are increasingly capable of handling complex tasks such as resource optimization and schedule prediction, they do not replace the manager but rather elevate their role. The focus shifts from routine administration to strategic oversight and the application of emotional intelligence, which remains essential for interpreting AI-generated insights and managing team dynamics during periods of digital transformation [11]. Thus, the proposed model for portfolio reconfiguration relies on a symbiosis where AI provides the data-driven «compass», while the manager steers the strategic course.

Finally, the technical infrastructure supporting this dynamic model must be robust enough to handle the «Brittle» nature of digital systems. Sheikh emphasizes that as organizations move to cloud-based environments to ensure scalability, they face significant security challenges, including data breaches and insider threats. To mitigate these risks, the adoption of a «Zero Trust» security model and AI-driven threat detection is essential. Ensuring data integrity through advanced encryption and regulatory compliance (such as GDPR) is a prerequisite for any AI-based decision support system, as trust in the data is the foundation of effective portfolio reconfiguration [12].

The practical realization of such adaptive management models necessitates the deployment of sophisticated information systems capable of handling multidimensional data structures. Honcharenko emphasizes that solving general planning problems in complex environments requires advanced cluster methods for forming metadata, which allows for the effective structuring of chaotic information flows into coherent planning units [13]. Complementing this theoretical basis, recent advancements in applied AI demonstrate the efficacy of multi-stage modeling approaches in high-stakes industries. As noted by Dolhopolov et al., the integration of Artificial Intelligence with technologies such as Building Information Modeling (BIM) allows for the creation of precise digital representations and simulations, thereby validating the potential of AI-driven modeling to enhance strategic decision-making and operational planning efficiency in high-uncertainty sectors [14].

Main Research

To address the stochastic and chaotic nature of the BANI (Brittle, Anxious, Non-linear, Incomprehensible) environment, this research proposes the Intelligent Dynamic Portfolio Reconfiguration Model (IDPR-Model). Unlike traditional deterministic approaches that treat project portfolio management as a linear execution of a pre-defined plan, the IDPR-Model functions as a cybernetic system with a closed feedback loop. Its primary scientific objective is to minimize the entropy of the management system by continuously transforming high-volume, unstructured external data into structured, actionable strategic signals.

The fundamental hypothesis of the proposed model posits that organizational resilience in a chaotic environment is achieved not through rigidity or adherence to a static roadmap, but through the continuous, data-driven reconfiguration of project assets. As visually conceptualized in Figure 1, the model is architected as a cohesive system comprising four distinct but deeply interconnected functional layers, where each layer is specifically engineered to counteract a corresponding component of the BANI framework. The first model, designated as Monitoring & Ingestion, directly addresses the challenge of Incomprehensibility by acting as a sophisticated filter that separates informational noise from strategic signals, thereby structuring diverse data streams into a coherent format. Following this, the AI Predictive Core tackles the issues of Non-linearity and Brittleness by employing advanced probabilistic modeling to simulate future scenarios and quantify potential points of failure before they materialize. The third layer, the Decision Engine, focuses on the Orchestration of resources, solving complex optimization problems to balance strategic value against dynamic constraints. Finally, the Execution & Feedback layer is designed to mitigate organizational Anxiety by ensuring transparent communication of decisions and providing a secure, adaptive mechanism for their implementation.

Figure 1 provides a high-level abstraction of the data flow within the system, demonstrating the cyclical nature of the reconfiguration process.

The system operates within discrete temporal intervals, where each time step represents a snapshot of the portfolio's ecosystem. At any given moment, the overall state of the portfolio is determined not merely by endogenous performance metrics such as budget utilization or task completion rates but also, and crucially, by the exogenous pressure exerted by BANI factors. The transformation from an external, chaotic environment into an ordered internal strategy commences at the first layer of the model.

This initial contour functions as the organization's «sensory nervous system», tasked with perception and initial comprehension. In a BANI environment, the sheer volume and velocity of data are overwhelming, rendering traditional manual analysis both inefficient and prone to cognitive bias. Consequently, Semantic Monitoring & Data Ingestion Model is engineered to automate the continuous ingestion of heterogeneous data streams. Its primary objective is to perform semantic processing to identify «weak signals» – subtle, early-warning indicators of strategic shifts or emerging risks that have not yet coalesced into obvious financial trends or operational disruptions.

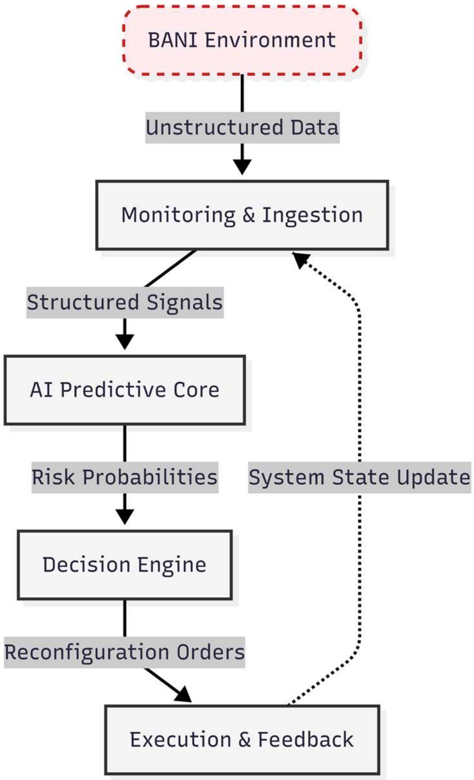

Figure 1 – High-level conceptual architecture of the IDPR-Model

As detailed in Figure 2, this layer synthesizes two diametrically opposed categories of data sources. On one side are structured internal records, which provide a clear, quantitative picture of the organization's current status. On the other are unstructured external intelligence, which offers a qualitative, often ambiguous view of the broader environment.

The model rigorously defines the input space as a fused vector of these internal and external factors. Internal sources encompass quantitative datasets harvested from the organization's ecosystem, including Project Portfolio Management (PPM) systems, Enterprise Resource Planning (ERP) software, and task trackers. These metrics reflect the historical trajectory and current «health» of the portfolio, providing a baseline for stability. Conversely, external sources capture the volatile essence of the BANI world. These include qualitative, unstructured data streams such as real-time regulatory updates, breaking geopolitical news, and market sentiment analysis derived from social media or industry reports. By integrating these disparate data types, the model creates a holistic, multi-dimensional view of the strategic landscape.

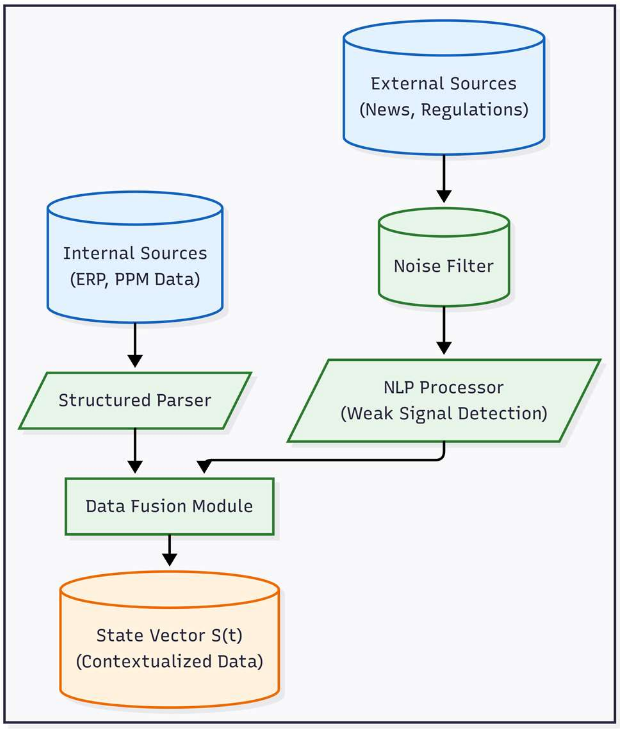

Figure 2 – Semantic Monitoring & Data Ingestion Model

To address the Incomprehensible aspect of BANI, the raw data must pass through a Noise Filter. This module utilizes pre-trained thresholds to discard irrelevant data, such as minor market fluctuations or information from non-credible sources, ensuring that only significant signals are processed.

The filtered unstructured data is processed by the Natural Language Processing (NLP) Processor. This component is critical for detecting weak signals. It employs semantic analysis to convert text into quantitative indicators. For instance, a news report regarding potential supply chain sanctions is analyzed to extract sentiment and context, converting it into a numerical risk score.

The final output of Semantic Monitoring & Data Ingestion Model is the Data Fusion Module, which amalgamates the structured internal metrics and the quantified external signals. This results in a consolidated

State Vector – a comprehensive digital snapshot of the portfolio's environment at the current moment, containing parameterized data on both external threats and internal resources. By converting the abstract BANI environment into a structured data format, Semantic Monitoring & Data Ingestion Model effectively solves the problem of data incomprehensibility.

While Semantic Monitoring & Data Ingestion Model focuses on perception (gathering and structuring data), AI Predictive Core Model is responsible for cognition – the interpretation of these data points to forecast future states. In a BANI environment, linear extrapolation of historical data is ineffective because cause-and-effect relationships are Non-linear. Therefore, AI Predictive Core Model employs advanced computational methods to simulate thousands of potential futures, thereby quantifying the Brittleness of the current portfolio.

The architecture of this predictive mechanism is visualized in Figure 3, which illustrates the cyclical process of risk assessment and impact analysis.

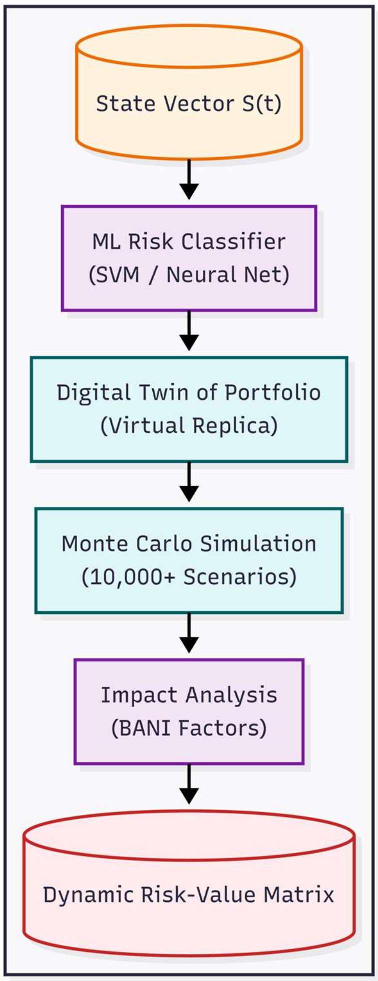

Figure 3 – AI Predictive Core Model

The primary input for this layer is the State Vector, a structured dataset synthesized by the preceding monitoring layer. This vector serves as the fuel for the Machine Learning (ML) Risk Classifier, a sophisticated predictive module. Unlike traditional risk registers, which often rely on static expert judgment and periodic updates, this module employs supervised learning algorithms such as Support Vector Machines or Deep Neural Networks – to dynamically assess the probability of project failure. The classifier is trained to recognize complex, non-linear patterns where specific combinations of internal performance metrics and external environmental pressures have historically precipitated failure. Consequently, it outputs a real-time, dynamic probability of failure for each individual project within the portfolio.

To effectively address the profound uncertainty inherent in the BANI framework, the model integrates a Digital Twin of the portfolio. This component functions as a comprehensive virtual replica of the entire project ecosystem, meticulously mapping resource interdependencies, budgetary constraints, and critical path trajectories.

The Digital Twin facilitates the execution of large-scale computational simulations, specifically utilizing Monte Carlo methods. By running thousands of iterations, the system rigorously stress-tests the portfolio's resilience against stochastic variations in the BANI variables identified in Semantic Monitoring & Data Ingestion Model. For instance, should the monitoring layer detect an escalating risk in the global supply chain, the simulation engine will artificially inject probabilistic delays into all relevant procurement tasks across the Digital Twin. This process yields a probabilistic distribution of potential outcomes for project duration and cost, replacing the fragility of single-point deterministic predictions with a robust range of possibilities.

The culmination of AI Predictive Core Model is the synthesis of these simulation outputs into a Dynamic Risk-Value Matrix. This matrix constitutes the critical analytical output that informs the decision-making process in the subsequent layer. For every project, the system computes two pivotal metrics: a Risk Index, representing the likelihood and impact of failure, and a Strategic Value, reflecting the projected benefit adjusted for prevailing market conditions. If the aggregated risk profile of the portfolio surpasses a pre-defined tolerance threshold, the system automatically flags the portfolio as unstable, thereby triggering an immediate requirement for strategic reconfiguration.

While AI Predictive Core Model is dedicated to the identification and quantification of risks, Decision & Reconfiguration Engine Model is tasked with determining the optimal strategic response. Functioning as the system's «orchestrator», this layer addresses a complex multi-objective optimization problem to rebalance the portfolio effectively. A defining characteristic of this model is its rejection of fully automated strategic decision-making. Instead, it enforces a «Human-in-the-Loop» approach, ensuring that critical ethical considerations, long-term corporate vision, and tacit managerial knowledge are integrated into the final course of action. The logic flow governing this sophisticated decision-making process is visually represented in Figure 4.

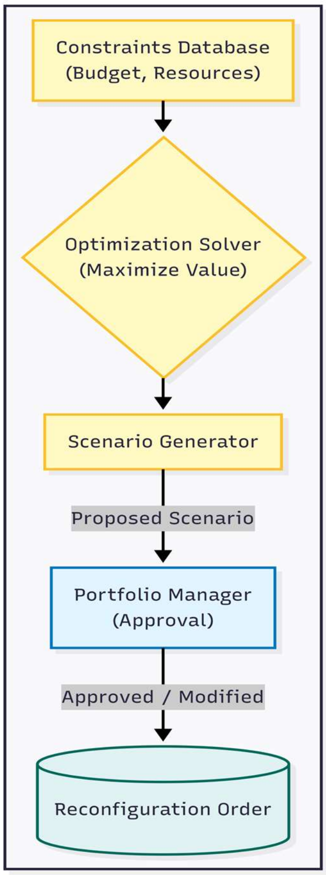

Figure 4 – Decision & Reconfiguration Engine Model

The operational core of this layer is the Optimization Solver, a computational engine designed to reconcile conflicting demands. It ingests the Dynamic Risk-Value Matrix generated by AI Predictive Core Model and rigorously evaluates it against the organization's high-level Strategic Objectives, such as Objectives and Key Results (OKRs). The solver's primary mandate is to identify a portfolio configuration that maximizes total strategic value. However, this maximization is subject to strict constraints: the overall risk exposure must remain below a critical safety threshold, and the allocation of resources must not exceed the organization's available capacity. This ensures that the pursuit of value does not compromise the structural integrity of the enterprise.

Building upon these optimization results, the Scenario Generator translates mathematical outputs into actionable business intelligence. It formulates specific reconfiguration actions by utilizing a structured logic matrix. This matrix serves as a decision-making framework that maps specific types of detected BANI turbulence – whether brittle failures or non-linear market shifts – to corresponding, pre-defined reconfiguration strategies. By doing so, the model ensures that the organizational response to chaos is not reactive or ad-hoc, but consistent, scientifically grounded, and strategically aligned. The detailed operational logic that guides this scenario generation is presented in Table 1.

A distinctive feature of the IDPR-Model is the mandatory Human Verification Step. The AI proposes the optimal mathematical solution based on the logic described in Table 1, but the Portfolio Manager makes the final decision. This step is essential to address the «black box» problem of AI and to ensure alignment with corporate ethics and long-term vision. The manager reviews the proposed scenarios and can approve, modify, or reject them. Once approved, the decision is converted into a formal Reconfiguration Order.

The final contour of the IDPR-Model addresses the human and operational dimensions of reconfiguration. In a BANI world, the rapid shifting of priorities can lead to organizational Anxiety and loss of focus. Therefore, Execution & Feedback Model is designed not just to transmit orders, but to manage the cognitive load on teams and ensure the integrity of the reconfiguration process.

*Table 1 – **Decision Logic Matrix for Portfolio Reconfiguration***

Detected BANI Condition	**Risk-Value Portfolio State**	**Recommended Reconfiguration Strategy**	**Strategic Rationale**
Brittleness (e.g., Supply chain rupture)	Critical Risk / Low Value	Freeze / Kill	Immediate suspension of the asset is required to prevent resource drainage and protect the core portfolio integrity.
Non-linearity (e.g., Shift in consumer behavior)	Moderate Risk / High Potential Value	Pivot (Rescope)	The project scope is adjusted (e.g., to an MVP) to adapt to the new trajectory of market demand without full cancellation.
Incomprehensibility (e.g., Contradictory regulatory signals)	High Risk / High Strategic Value	Sandboxing	The project is isolated with limited resources to gather more data, preventing it from negatively affecting other portfolio assets.
Anxiety (e.g., Internal stakeholder uncertainty)	Low Risk / Stable Value	Preservation & Communication	Maintenance of the current course with an increased frequency of monitoring and proactive stakeholder reassurance.
Positive Asymmetry (e.g., Competitor exit)	Low Risk / High Value	Acceleration	Immediate reallocation of freed-up resources to high-performing projects to capitalize on the emerging opportunity window.

The architecture of this execution layer is illustrated in Figure 5.

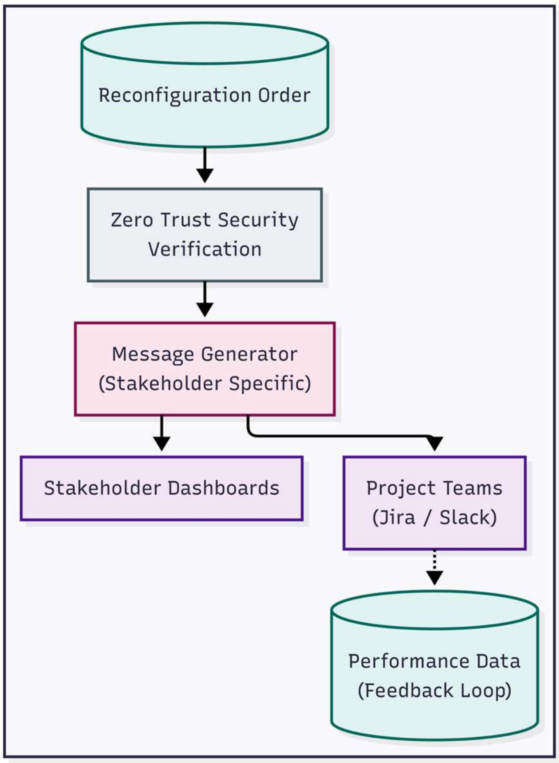

Figure 5 – Execution & Feedback Model

Before any reconfiguration order is broadcasted, it passes through a Zero Trust Security Layer. This ensures that the directive to change the portfolio originates from the authenticated Decision Engine and has been validated by management, preventing unauthorized manipulation.

To mitigate Anxiety, the Message Generator utilizes the context from Semantic Monitoring & Data Ingestion Model and the rationale from Decision & Reconfiguration Engine Model to construct personalized communication. Instead of generic notifications, the system generates transparent explanations tailored to different stakeholders (e.g., explaining to a team that their project is paused to protect resources, not because of their performance). This transparency transforms the «Incomprehensible» into the understandable, maintaining trust and morale.

The final step is Adaptive Execution. The Reconfiguration Order is automatically parsed into specific actions within the organization's operational tools (e.g., updating backlogs, adjusting budget codes). This minimizes the lag between decision and action. Crucially, the model is cyclical. As teams execute the new plan, performance data is generated. This data serves as a feedback mechanism, flowing back into Semantic Monitoring & Data Ingestion Model as updated internal inputs. This closes the cybernetic loop, allowing the IDPR-Model to continuously learn and adapt to the evolving BANI environment.

Beyond merely disseminating information, the communication engine plays a critical role in preserving organizational alignment. In highly volatile environments, the frequency of strategic pivots can lead to «change fatigue» among employees. By providing clear, data-backed rationales for every reconfiguration decision, the system effectively bridges the cognitive gap between high-level strategy and daily operations. This ensures that every team member understands not just what is changing, but why, fostering a culture of resilience and shared purpose rather than confusion and resistance.

The technical architecture of the Execution Gateway is designed for interoperability with modern enterprise ecosystems. It functions as an orchestration layer that connects directly via APIs to diverse project management platforms, financial systems, and HR tools. This seamless integration ensures that when a decision is made to reallocate resources, the corresponding adjustments such as access rights, budget limits, and task assignments are applied instantaneously across all systems. This automation eliminates the administrative bottleneck that often delays the implementation of critical strategic shifts in traditional models.

Furthermore, the feedback loop mechanism transforms the portfolio from a static entity into a learning organism. By continuously monitoring the outcomes of reconfiguration decisions comparing the predicted results from the Digital Twin against the actual performance metrics – the system refines its predictive algorithms. Over time, this iterative process enhances the accuracy of the risk classifiers in AI Predictive Core Model and the optimization logic in Decision & Reconfiguration Engine Model, making the organization progressively more adept at navigating future BANI disruptions.

Conclusions

The research has substantiated that in the contemporary BANI era, the paradigm of Project Portfolio Management (PPM) must undergo a fundamental shift from deterministic planning to probabilistic adaptability. Traditional static models, which rely on the assumption of a stable environment, prove increasingly insufficient when facing non-linear disruptions, brittle systemic failures, and incomprehensible data flows. To address this critical gap, the study developed and conceptualized the Intelligent Dynamic Portfolio Reconfiguration Model (IDPR-Model), a sophisticated cybernetic system designed to transform environmental entropy into a structured strategic advantage. This model represents a departure from reactive crisis management towards a proactive, data-driven resilience framework.

The scientific novelty of the proposed solution lies in its holistic, multi-layered architecture, which systematically neutralizes specific BANI challenges through targeted technological interventions. By integrating Semantic Monitoring, the model solves the pervasive problem of data incomprehensibility, converting unstructured informational noise into actionable, quantified state vectors. The AI Predictive Core, utilizing advanced Digital Twin technology and large-scale Monte Carlo simulations, effectively quantifies brittleness and non-linearity. This allows for the proactive identification of failure probabilities before they materialize into financial losses. Furthermore, the Decision Engine and Execution Gateway provide a robust mechanism for precise resource orchestration. This component not only optimizes asset allocation but also significantly reduces organizational anxiety through transparent, personalized communication and a rigorous «Human-in-the-Loop» verification process, ensuring that algorithmic efficiency is balanced with human strategic judgment.

The practical significance of this research is substantial, offering organizations a scalable and implementable framework that enables them to minimize decision latency and optimize resource allocation in real-time. By moving beyond simplistic binary «go/no-go» decisions to a nuanced set of reconfiguration strategies such as Pivot, Freeze, or Accelerate – the IDPR-Model ensures that the project portfolio remains a resilient engine of value creation rather than a rigid liability. It empowers organizations to maintain operational continuity even in the face of severe external shocks, turning volatility into a catalyst for strategic optimization.

Future research directions will focus on the empirical validation of the model within specific high-volatility industries, such as fintech, energy, or large-scale construction, where the cost of error is particularly high. Additionally, further studies will explore the development of specific reinforcement learning algorithms for the Decision Engine to enhance its autonomous adaptability over time. Another critical area for future investigation is the exploration of ethical governance frameworks for fully autonomous portfolio reconfiguration systems, ensuring that the increasing reliance on AI in strategic decision-making remains transparent, accountable, and aligned with human values.

References

1. Tanim S. H., Amin M., Ahamed F., Islam M. F., & Ahmed M. S. (2024). Exploring the role of big data in enhancing project portfolio management strategies. *International Journal of Science, Engineering and Management (IJSEM)*, *11* (12), 1–8. URL: https://doi.org/10.36647/ijsem%2F11.12.a002.
2. Cihan E. E. (2025). Future of project portfolio management: Bridging data-driven and human-centric approaches. *13th IPMA Research Conference: «Honoring 60 years of Project Management: Leading the Way into the Future»*, 1–19. URL: https://doi.org/10.56889/nxhl8876.
3. Joshi H. (2024). Artificial intelligence in project management: A study of the role of AI-powered chatbots in project stakeholder engagement. *Indian Journal of Software Engineering and Project Management (IJSEPM)*, *4* (1), 21–26. URL: https://doi.org/10.54105/ijsepm.b9022.04010124.
4. Alazzam, F. A. F., Tubishat, B. M. A.-R., Storozhuk, O., Poplavska, O., & Zhyvko, Z. (2024). Methodical approach to the choice of a business management strategy within the framework of a change in commercial activities. *Business: Theory and Practice*, 25(1), 1–10. https://doi.org/10.3846/btp.2024.19676.
5. Abdullah E. H., Sijabat R., Susilo W. H., & Herusetya A. (2024). Associated the bani problems and perspective of strengthening to pursue the formulation of strategic management business model holding company in indonesia. *Journal of Ecohumanism*, *3* (6), 52–68. URL: https://doi.org/10.62754/joe.v3i6.3890.
6. Hashimzai I. A., & Mohammadi M. Q. (2024). The integration of artificial intelligence in project management: A systematic literature review of emerging trends and challenges. *TIERS Information Technology Journal*, *5* (2), 153–164. URL: https://doi.org/10.38043/tiers.v5i2.5963.
7. Ibraigheeth M., & Abu eid A. I. (2022). Software project risk assessment using machine learning approaches. *American Journal of Multidisciplinary Research & Development (AJMRD)*, *4* (2), 35–41.
8. Bushuyev S., Piliuhina K., & Chetin E. (2023). Transformation of values of the high technology projects from a vuca to a bani environment model. *Innovative Technologies and Scientific Solutions for Industries*, *2* (24), 191–199. URL: https://doi.org/10.30837/ITSSI.2023.24.191.
9. Dyachenko P. V., & Shadura D. O. (2025). A model of proactive communication of logistics enterprise projects in the context of vuca-bani worlds. *Management of Development of Complex Systems*, *63*, 62–69. URL: https://doi.org/10.32347/2412-9933.2025.63.62-69.
10. Kalathoti R. (2025). Adaptive project management techniques for clinical trial portfolio realignment. *International Journal for Research in Management and Pharmacy (IJRMP)*, *14* (8), 11–19. URL: https://doi.org/10.63345/ijrmp.v14.i8.2.
11. Duică M. C., Vasciuc (Săndulescu) C. G., & Panagoreț D. (2024). The use of artificial intelligence in project management. *Valahian Journal of Economic Studies*, *15* (29), 105–118. URL: https://doi.org/10.2478/vjes-2024-0009.
12. Sheikh N. (2024). Securing the cloud: A comprehensive analysis of data security challenges and solutions. *International Journal of Science and Research Archive*, *13* (1), 3471–3483. URL: https://doi.org/10.30574/ijsra.2024.13.01.1779.

13. Honcharenko T. (2020). Cluster method of forming metadata of multidimensional information systems for solving general planning problems. *Management of Development of Complex Systems*, *42*, 93–101. URL: https://doi.org/10.32347/2412-9933.2020.42.93-101.

14. Dolhopolov S., Honcharenko T., Savenko V., Balina O., Bezklubenko I. S., & Liashchenko T. (2023). Construction site modeling objects using artificial intelligence and bim technology: A multi-stage approach. *2023 IEEE International Conference on Smart Information Systems and Technologies (SIST)*, 174–179. URL: https://doi.org/10.1109/SIST58284.2023.10223543.

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Гоц Віталій Вікторович
Аспірант кафедри управління проєктами,
https://orcid.org/0009-0008-0481-3152
Київський національний університет будівництва і архітектури, Київ
Веренич Олена Володимирівна
Докторка технічних наук, професорка, професорка кафедри управління проєктами,
https://orcid.org/0000-0003-0972-6361
Київський національний університет будівництва і архітектури, Київ

МОДЕЛЬ АДАПТИВНОЇ РЕКОНФІГУРАЦІЇ ПОРТФЕЛЯ ПРОЄКТІВ У BANI-СЕРЕДОВИЩІ

Анотація. *Сучасний бізнес-ландшафт зазнав фундаментальних змін у бік парадигми BANI (англ. Brittle, Anxious, Non-linear, Incomprehensible; BANI – крихкий, тривожний, нелінійний, незбагненний), що робить традиційні детерміновані підходи до управління портфелем проєктів (англ. Project Portfolio Management, PPM) значною мірою неефективними. Статичні методи планування не здатні врахувати стохастичну природу сучасних загроз, що призводить до організаційної крихкості та невідповідності розподілу ресурсів. Це дослідження пропонує вирішення цієї проблемної задачі шляхом розроблення комплексного механізму адаптивного управління на основі інтеграції технологій штучного інтелекту з принципами стратегічного менеджменту для створення динамічної саморегульованої системи, здатної функціонувати в умовах високої ентропії. Основним результатом дослідження є розроблена модель адаптивної реконфігурації портфеля проєктів у BANI-середовищі (англ. Intelligent Dynamic Portfolio Reconfiguration Model, IDPR-Model). Розроблена модель складається з чотирьох взаємопов'язаних моделей, кожна з яких спрямована на протидію конкретному компоненту BANI. Модель семантичного моніторингу використовує алгоритми обробки природної мови (англ. Natural Language Processing, NLP) для виявлення «слабких сигналів» із неструктурованих зовнішніх даних, долаючи проблему «Незбагненності». Предиктивна модель застосовує технологію «Цифрового двійника» та симуляції Монте-Карло для моделювання ймовірнісних сценаріїв майбутнього, нівелюючи «Нелінійність» та «Крихкість». Модель прийняття рішень діє як механізм оркестрації, використовуючи алгоритми багатокритеріальної оптимізації для пропозиції стратегій реконфігурації (заморожування або прискорення активів), зберігаючи при цьому роль людини для стратегічної та етичної верифікації. Модель виконання та комунікації зосереджена на зниженні організаційної «Тривожності» через механізми проактивної комунікації та протоколи безпеки нульової довіри. Запропонована модель забезпечує значний методологічний прогрес, змінюючи управлінську парадигму з «планування стабільності» на «управління стійкістю». Обґрунтовано, що синергія предиктивної аналітики на основі ШІ з людським стратегічним наглядом дозволить менеджменту організацій мінімізувати затримки у прийнятті рішень та динамічно оптимізувати використання ресурсів. Впровадження розробленої моделі надає надійний інструментарій менеджменту підприємств щодо забезпечення довгострокової життєздатності та конкурентних переваг у непередбачуваному глобальному середовищі.*

Ключові слова: менеджмент; управління портфелем проєктів; BANI-середовище; штучний інтелект; динамічна реконфігурація; цифровий двійник; управління ризиками; система підтримки прийняття рішень

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