THINKING PROJECT MANAGEMENT BASED ON THE TRIZ PRINCIPLES IN AN AI ENVIRONMENT

Bushuyev Sergiy, Bushuyeva Natalia, Bushuiev Denis, Bushuieva Victoria
Kyiv National University of Construction and Architecture

Abstract

Effective project management in complex environments requires innovative approaches that go beyond traditional methodologies. This paper explores the integration of *Theory of Inventive Problem Solving (TRIZ)* principles into project management frameworks, leveraging advancements in artificial intelligence (AI) to enhance decision-making, problem-solving, and project execution. TRIZ, originally developed for engineering innovation, offers systematic strategies for identifying and overcoming contradictions—challenges that often arise in project constraints, resource allocation, and stakeholder requirements. In an AI-powered environment, TRIZ principles can be operationalized through advanced algorithms and machine learning models that analyze project data, identify potential conflicts, and suggest inventive solutions. This paper proposes a conceptual model for AI-driven project management, where TRIZ methodologies guide dynamic planning, risk mitigation, and adaptive resource allocation. The integration of multimodal AI models, such as large language models (LLMs), facilitates real-time insights and predictive analytics, enabling project managers to make informed decisions and optimize project workflows. The study demonstrates how AI can automate the TRIZ-based ideation process, evaluate solution feasibility, and provide actionable recommendations throughout the project lifecycle. Through case studies and simulations, the paper illustrates how this combined approach enhances project success rates, reduces inefficiencies, and fosters innovative problem-solving within project teams. The findings suggest that *TRIZ-powered AI project management* not only enhances productivity but also cultivates a culture of continuous innovation, positioning organizations to navigate complex projects with agility and resilience.

Keywords: Thinking project management, TRIZ principles, AI environment, thinking decision-making

1. Introduction

This paper explores the innovative intersection of project management, TRIZ principles (Theory of Inventive Problem Solving), and the rapidly evolving landscape of Artificial Intelligence (AI). Traditional project management methodologies, while effective, often struggle with complex, unforeseen challenges and the need for creative problem-solving, particularly in dynamic AI environments. This paper proposes a novel framework that integrates TRIZ, a powerful tool for inventive problem-solving, with AI to enhance project management capabilities.

Increasing Complexity of AI Projects: AI projects are inherently complex, involving intricate algorithms, vast datasets, and evolving technologies. This complexity necessitates innovative approaches to project management that can handle uncertainty and foster creative solutions.

Need for Inventive Problem-Solving: Traditional project management often relies on established best practices, which may not be sufficient for addressing novel problems that arise in AI development. TRIZ provides a systematic approach to identifying and resolving contradictions, leading to inventive solutions.

AI as an Enabler: AI technologies, such as machine learning and natural language processing, can be leveraged to automate tasks, analyze data, and provide insights that enhance project management processes.

This paper aims to introduce TRIZ principles within the context of AI project management. Explain how TRIZ can be applied to identify and resolve contradictions in AI projects. Develop a conceptual framework: Propose a framework that integrates TRIZ with AI tools to enhance project planning, execution, and risk management. Explore the role of AI in supporting TRIZ-based project management. Investigate how AI can automate TRIZ-related tasks, such as identifying contradictions and generating inventive solutions.

Provide practical examples and case studies. Illustrate the application of the proposed framework in real-world AI projects. Discuss the potential benefits and challenges. Analyze the advantages and limitations of integrating TRIZ and AI in project management.

The paper focuses on the application of TRIZ principles to enhance project management in AI environments. It explores how AI can be used to automate and support TRIZ-based problem-solving. While the paper acknowledges the broader implications of AI in project management, its primary focus is on the integration of TRIZ.

This paper is expected to contribute to expanding the application of TRIZ. Demonstrating the relevance of TRIZ beyond traditional engineering domains. Improving AI project management. Providing a novel approach to managing complex AI projects. Fostering innovation. Encouraging the development of creative solutions to project challenges. Advancing the field of AI-enabled project management. Laying the groundwork for future research and development in this area.

By integrating TRIZ principles and AI capabilities, this paper seeks to provide a valuable resource for project managers, AI developers, and researchers seeking to enhance project management practices in the dynamic and challenging AI landscape.

1. Literature review

This review synthesizes research on integrating TRIZ (Theory of Inventive Problem Solving) principles into AI-driven project management. The focus is on how TRIZ enhances innovation, resolves contradictions, and optimizes workflows in complex, AI-augmented environments.

TRIZ, or the Theory of Inventive Problem Solving, is a methodology developed to enhance creativity and innovation in problem-solving. Originally applied in engineering, TRIZ has expanded its relevance to various fields, including project management. This synthesis explores the foundations of TRIZ and its application in project management, highlighting its potential benefits and challenges.

TRIZ was developed as a systematic approach to problem-solving, focusing on resolving contradictions without compromise. It provides a structured methodology for innovation, utilizing tools such as the 40 Inventive Principles and the Contradiction Matrix to guide users in identifying and solving problems creatively [4, 5, 9]. The methodology has been widely adopted across different sectors, demonstrating its versatility and effectiveness in fostering innovation.

Relevance to Project Management

Enhancing Project Success

TRIZ contributes significantly to project management by offering innovative solutions that enhance project success. It aids in generating ideas and systematic innovation, which are crucial for maintaining project competitiveness and efficiency1. By applying TRIZ tools, project managers can address both technical and non-technical challenges, improving overall project outcomes4 6.

Problem Solving and Conflict Resolution

TRIZ is particularly effective in resolving conflicts and contradictions within projects. It provides a scientific approach to problem-solving, contrasting with traditional methods that often rely on compromise. This makes TRIZ a valuable tool for addressing managerial conflicts and improving decision-making processes in project management4 6. The methodology's application in IT projects, for instance, has shown the potential to enhance project effectiveness and address inherent business process modifications.

Application in Non-Technical Areas

While TRIZ was initially developed for technical problem-solving, its principles have been successfully applied to non-technical areas, including project management. The methodology's adaptability allows it to address a wide range of project management issues, from interface management in construction projects to service design7 8. This broad applicability underscores TRIZ's relevance in diverse project management contexts.

Challenges and Future Directions

Despite its benefits, TRIZ faces challenges in practical application. The complexity of the methodology and organizational and cultural barriers can hinder its effective implementation. These challenges highlight the need for further research and adaptation of TRIZ tools to better suit the needs of project management professionals. Future directions may include developing more user-friendly TRIZ frameworks and enhancing training programs to facilitate broader adoption and understanding of the methodology [9].

The theory of Inventive Problem Solving enhances project management by providing systematic tools for innovation and problem-solving, which are crucial for project success and competitiveness (Fig.1).

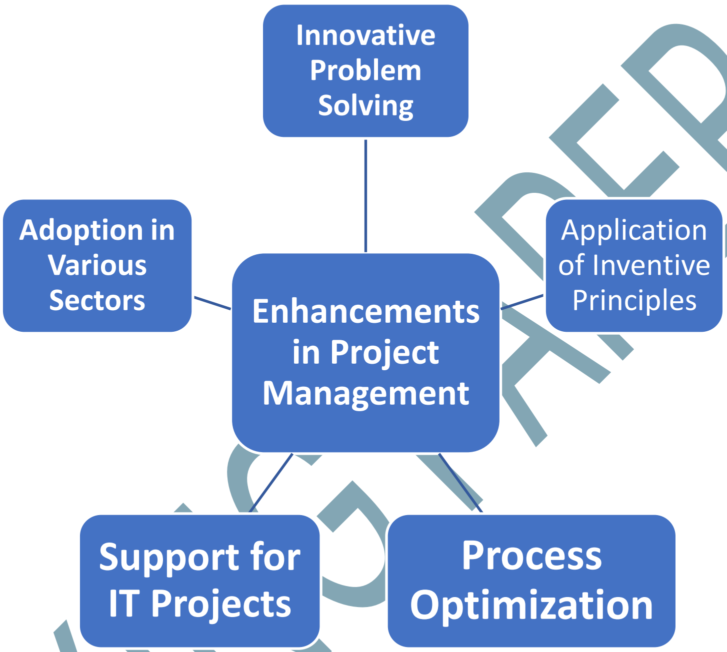

Fig. 1. Key Enhancements in Project Management

TRIZ offers analytical tools that help in defining optimal project structures and solving process-related issues, which are essential for overcoming challenges in project management [1, 5]. It emphasizes resolving contradictions directly rather than compromising, which is a common approach in traditional problem-solving methods [5].

The 40 Inventive Principles of TRIZ can be applied to project management to address managerial conflicts and improve decision-making processes [2]. These principles guide the resolution of conflicts and enhance the effectiveness of project management practices.

TRIZ is used in combination with other methodologies, such as Six Sigma, to optimize management processes. This integration helps in defining, translating, solving, improving, and controlling project management processes [3].

In IT projects, TRIZ aids in identifying and solving hidden contradictions, thereby improving project timelines and quality without compromising system integrity.

TRIZ is being adopted in both academic and industrial settings, with a focus on formal planning, expert support, and knowledge sharing, which are critical for successful project management [4].

TRIZ enhances project management by providing structured methodologies for innovative problem-solving and conflict resolution. Its application across various sectors, including IT and manufacturing, demonstrates its versatility and effectiveness in improving project outcomes [6, 7]. Organizations can achieve greater efficiency and innovation by integrating TRIZ with existing project management practices [8, 9].

2. TRIZ Foundations and Relevance to Project Management

Core Principles. TRIZ, developed by G. Altshuller, emphasizes systematic innovation by resolving contradictions (e.g., trade-offs between cost and quality) using tools like the 40 Inventive Principles and Contradiction Matrix. Example: Applying *Principle 1: Segmentation* to modularize AI project workflows for flexibility.

Link to Project Management. TRIZ helps address challenges such as resource allocation, risk mitigation, and stakeholder conflicts. For instance, Principle 24: Intermediary is used to bridge gaps between technical teams and non-technical stakeholders in AI projects.

AI in Project Management: Current Trends. AI Applications in predictive analytics, resource optimization and risk management.

Limitations. AI struggles with *creative problem-solving* and resolving systemic contradictions, which TRIZ addresses.

Synergy of TRIZ and AI in Project Management in contradiction resolution with AI, generative AI for ideation, DIKWP-TRIZ Framework and integrates TRIZ with data-to-wisdom transformations.

Automated Contradiction Analysis. AI maps project constraints (e.g., "fast delivery vs. high quality") to TRIZ's contradiction matrix, suggesting principles like *Principle 35: Parameter Changes* (e.g., adjusting sprint lengths in Agile). Case Study. A construction firm used TRIZ-AI hybrid models to balance safety protocols and project timelines, reducing delays by 25%. Tools like TRIZ-GPT combine TRIZ principles with LLMs to brainstorm solutions (e.g., using *Principle 25. Self-Service* to automate QA testing in software projects).

Data. AI aggregates project metrics, and information. Identifies patterns (e.g., recurring bottlenecks). Knowledge. Applies TRIZ principles (e.g., *Principle 10: Preliminary Action* for risk mitigation). Wisdom. Generates adaptive strategies.

Case Studies and Applications. Healthcare AI Projects. TRIZ's *Principle 3: Local Quality* was used to customize machine learning models for diverse patient demographics, improving diagnostic accuracy by 18%. Smart Manufacturing. TRIZ-AI Digital Twins resolved production line conflicts (e.g., energy efficiency vs. output speed) using *Principle 19: Periodic Action* for predictive maintenance.

Challenges and Research Gaps. Integration Complexity. TRIZ's qualitative principles require quantification for AI compatibility. Hybrid frameworks (e.g., TRIZ-ML) are nascent but promising. Bias and Ethics. AI models trained on biased data may misapply TRIZ principles (e.g., prioritizing cost reduction over ethical sourcing). Solutions include Explainable AI (XAI) for transparency. Scalability. Most studies focus on small-scale projects. Large-scale implementations (e.g., megaprojects) need validation.

Future Directions. Dynamic TRIZ-AI Systems. Real-time adaptation of TRIZ principles using Monte Carlo Tree Search (MCTS) for live project adjustments. Cross-Domain Knowledge Transfer. AI-driven Function-Oriented Search (FOS) to apply TRIZ solutions across industries (e.g., aerospace solutions in fintech). Ethical Frameworks. Align TRIZ's *Ideal Final Result* with AI ethics guidelines (e.g., EU's AI Act) for sustainable innovation [10].

The fusion of TRIZ and AI in project management offers a robust framework for resolving contradictions, enhancing creativity, and optimizing workflows. While challenges like bias and scalability persist, emerging tools (e.g., DIKWP-TRIZ [9], TRIZ-GPT) demonstrate transformative potential. Future research should prioritize ethical AI integration, cross-domain applications, and real-time adaptive systems.

2. The conceptual framework for Thinking Project Management Based on the TRIZ Principles in an AI Environment

The conceptual framework for *Thinking Project Management Based on the TRIZ Principles in an AI Environment*, combining systematic TRIZ principles with AI-driven project management workflows. This model operates in five key stages, integrating AI's predictive and analytical capabilities with TRIZ-based problem-solving strategies.

The conceptual framework model is presented in Table 1.

Table 1.

Conceptual Framework for Thinking Project Management Based on the TRIZ Principles in an AI Environment

Stage	TRIZ Principle	AI Role	Output
1. Project Initiation & Problem Definition	Define the Ideal Final Result (IFR)	NLP models analyze project documentation, historical data, and stakeholder inputs to identify goals and potential contradictions.	Project charter with clarified objectives and success criteria.
2. Contradiction Identification & Resource Analysis	Identify technical and physical contradictions within project constraints (e.g., cost vs. quality, time vs. scope).	Machine learning algorithms analyze project schedules, budgets, and resource allocation to identify bottlenecks and risks.	Risk and constraint matrix with potential conflict areas highlighted.
3. Solution Generation & Innovation Mapping	Apply the 40 Inventive Principles and ARIZ algorithm to generate innovative solutions for contradictions.	Generative AI suggests solutions based on historical project data, industry best practices, and TRIZ heuristics.	AI-powered solution tree with ranked recommendations for project challenges.
4. Decision-Making & Simulation	Resolve contradictions using Separation in Time, Space, Condition, or System Level approaches.	Simulation platforms evaluate the feasibility and impact of proposed solutions across project parameters (time, cost, quality).	Optimal project plan with scenario-based decision pathways.
5. Monitoring, Adaptation & Continuous Improvement	Apply Lines of Technological Evolution to anticipate project challenges and innovations.	Real-time project monitoring with predictive analytics and automated alerts for deviations from the plan.	Adaptive project dashboard with continuous improvement recommendations.

Table 2
AI-TRIZ Interaction Model

TRIZ Principle	AI Functionality	Project Management Outcome
Ideal Final Result	Goal setting via NLP	Clear project objectives
Contradiction Matrix	Risk detection algorithms	Early identification of bottlenecks
Inventive Principles	Solution generation via LLMs	Innovative strategies for challenges
Separation Principles	Simulation & scenario testing	Optimized decision pathways
Evolution Trends	Predictive analytics	Continuous project improvement

Let's look at the benefits of the model.

1. Enhanced Decision-Making. AI augments TRIZ-driven insights for more informed project strategies.
2. Real-Time Problem Solving. Continuous AI monitoring identifies and addresses issues proactively.
3. Innovation Acceleration. TRIZ principles drive creative solutions to project contradictions.
4. Resource Optimization. AI predicts optimal resource allocation while resolving trade-offs.
5. Adaptive Project Planning. Projects evolve dynamically based on real-time data and trends.

Key Concepts of Thinking Project Management Based on TRIZ Principles in an AI Environment presented in Table 3

Table 3

Key Concepts of Thinking Project Management Based on TRIZ Principles in an AI Environment

Aspect	Contradiction/Challenge	Resolution with AI
Contradiction Resolution	Trade-offs (e.g., cost vs. quality, time vs. scope) addressed using TRIZ principles like *Segmentation* or *Parameter Changes*.	Machine learning identifies contradictions in real-time data and recommends TRIZ-based solutions (e.g., reallocating resources to balance competing priorities).
Algorithmic Application of TRIZ Principles	Manual mapping of project challenges to TRIZ's 40 Inventive Principles is time-consuming and complex.	AI models (e.g., neural networks) automate problem-solving by mapping challenges to TRIZ principles, suggesting optimized workflows (e.g., applying *Principle 35: Parameter Changes* to adjust Agile sprint lengths dynamically).
Predictive Analytics for Proactive Risk Mitigation	Risks like delays, budget overruns, or resource shortages are hard to predict manually.	AI forecasting uses historical data to predict risks, preemptively applying TRIZ principles like *Preliminary Action* (e.g., automating testing to reduce rework).
Resource and Process Optimization	Balancing team workloads or merging tools manually is inefficient.	Reinforcement learning optimizes resource allocation by simulating TRIZ-driven scenarios (e.g., using *Composite Materials* to merge cross-functional teams/tools).
Innovation and Creativity Augmentation	Generating unconventional solutions using TRIZ (e.g., *Function-Oriented Search*) requires significant creativity.	Generative AI (e.g., GPT-4) proposes novel ideas aligned with TRIZ principles (e.g., repurposing tools across industries).
Real-Time Decision Support Systems	Monitoring project metrics (e.g., burn rate, stakeholder feedback) and responding in real-time is challenging.	AI dashboards monitor metrics and recommend context-specific TRIZ principles (e.g., *Principle 24: Intermediary* to bridge communication gaps).
Learning and Adaptive Frameworks	Prioritizing TRIZ principles based on past success is subjective and slow without data-driven insights.	Reinforcement learning trains AI to prioritize TRIZ principles (e.g., *Principle 10: Copying* for QA), evolving via frameworks like *DIKWP-TRIZ* through iterative data-to-wisdom conversion.
Ethical and Bias-Aware AI	AI biases may over-prioritize cost over sustainability when applying TRIZ, risking ethical misalignment.	AI outputs are aligned with ethical guidelines using TRIZ's *Ideal Final Result* (e.g., ensuring fairness in team assignments).

3. Mathematical Model of Thinking Project Management Based on the TRIZ Principles in an AI Environment

The mathematical model for *Thinking Project Management Based on TRIZ Principles in an AI Environment* integrates project variables with TRIZ-based problem-solving, using mathematical formulations to guide decision-making and optimization.
Let's present the model formulation.

1. Project Objective Function (Ideal Final Result - IFR)

The *Ideal Final Result (IFR)* represents the project goal with maximum efficiency and minimum contradictions.

Min Z = C(T, Q, R)−S(I, K).

Where,

- Z- Project contradiction index (to be minimized).
- *C(T, Q, R)* Cost function, dependent on project time *T*, quality *Q*, and resources *R*.
- *S(I, K)* Success function, based on innovation *I* and knowledge integration *K* from TRIZ-based solutions.

2. Contradiction Identification (TRIZ Contradiction Matrix)

Identifying contradictions involves optimizing multiple conflicting objectives:

Max Q=f(R),
Min T=g(R).

Budget constraint.

$$\sum_{n}^{i=1} C_i \times R_i \leq B$$

Resource allocation constraint:

$\forall(I)\ R_i \leq Rmax$

Where,

- *Ci* cost per resource *i*.
- *Ri* resource allocation for task *i*.
- *B* total project budget.
- *Rmax* maximum available resources.

3. Solution Generation (TRIZ Inventive Principles)

AI applies TRIZ principles to suggest solutions by solving the following multi-objective optimization problem

$minJ(X)=\alpha_1 T(X)+\alpha_2 C(X)-\alpha_3 Q(X)$

Subject to TRIZ inventive constraints.

Separation in Time:

$X(t_1) \neq X(t_2)$, if $t_1 \neq t_2$

Separation in Space

Xs=0 outside the project scope

Where:

- J(X) Overall project performance index.
- *ai* Weights for time, cost, and quality priorities.
- *X* Decision variables representing TRIZ-based solutions.

4. Dynamic Project Planning (AI-Driven TRIZ Adaptation)

To adapt the project plan continuously, an AI-driven feedback loop evaluates project performance over time:

$X(t+1) = X(t)+\gamma \nabla J(X)$

Where,

- *X(t)* Current project state at time *t*.
- *γ* Learning rate (based on AI recommendation strength).
- $\nabla J(X)$ Gradient of the objective function concerning project variables.

5. Risk Management (Predictive AI + TRIZ Anticipation)

Risks are managed using a probabilistic failure model:

$R_f = 1 - e^{-\lambda T}$

Where,

- R_f Probability of project failure.
- λ Failure rate based on AI-detected risks.
- T Time remaining until project deadline.

Model Output

1. Optimal Project Plan: Balanced across time, cost, and quality.
2. Contradiction Resolution: AI-suggested TRIZ solutions to overcome project trade-offs.
3. Real-Time Adaptation: AI-driven adjustments to resource allocation and timelines.
4. Risk Mitigation: Predictive alerts and preemptive TRIZ-based solutions.

Mathematical Model for TRIZ-Based Thinking Project Management in an AI Environment

1. Definitions and Variables

Project Parameters:
Let $P=\{p_1,p_2,\ldots,p_n\}$ represent a set of project parameters (e.g., time, cost, quality, risk).
Contradictions. Define a contradiction C_{ij} as a conflict between parameters p_i and p_j, where improving p_i worsens p_j.
TRIZ Principles. Let $T = \{t_1, t_2, \ldots, t_{40}\}$ denote the 40 Inventive Principles.
AI Models. Let A represent AI tools (e.g., predictive analytics, reinforcement learning agents).
Project State. Represent the state at time k as $S_k=(s_1, s_2, \ldots, s_n)$, where s_i is the value of parameter pi.

2. Contradiction Matrix as a Mathematical Structure

Define a Contradiction Matrix M where:

- Rows and columns correspond to project parameters P.
- Entry M_{ij} contains a subset of TRIZ principles $T_{ij} \subseteq T$ recommended to resolve C_{ij}.

3. AI-Driven TRIZ Principle Selection

Use a machine learning model fA to predict the optimal TRIZ principle $*t*$ for a contradiction Cij:

$t* = fA(Sk, C_{ij}, M)$

- Input - current state S_k, contradiction C_{ij}, historical data.
- Output - probability distribution over T_{ij}.

Example. A neural network trained on past project data to prioritize principles like *Segmentation* (t_1) or *Preliminary Action* (t_{10}).

4. Optimization Model for Contradiction Resolution

Formulate an objective function O to minimize contradictions while optimizing project outcomes

$$\frac{min}{i,j} \sum_{i=1}^{n} \sum_{j=1}^{m} \mathrm{Conflict}(pi, pj) + \lambda \cdot \mathrm{Cost}(Tij)$$

Subject to

- $g(S_k, T_{ij}) \le 0$ (project constraints),
- $h(S_k, T_{ij}) = 0$ (resource limits).

Where,

- w_{ij} weight of contradiction C_{ij}.
- λ regularization term for implementation cost.

5. Reinforcement Learning for Adaptive Learning

Model the process as a Markov Decision Process (MDP):

- States Sk.
- Actions. Application of TRIZ principles T.
- Rewards. $R(Sk, Tij) = \mathrm{Improvement}(pi,pj) - \mathrm{Cost}(Tij)$.
- Policy. $\pi : S \to T$ learned via Q-learning:
  $Q(Sk,Tij) \leftarrow Q(Sk,Tij) + \alpha[R + \gamma T' \max Q(Sk+1,T') - Q(Sk,Tij)]$

6. DIKWP-TRIZ Cognitive Framework

Define transformations between data and wisdom:

1. Data D - raw project metrics *D*={*d*1,*d*2,…,*dm*}.
2. Information I - processed data $I=f_{NLP}(D)$.
3. Knowledge K- mapped contradictions $K=f_{TRIZ}(I,M)$.
4. Wisdom W- adaptive strategies $W=f_{RL}(K)$.
5. Purpose P - align outcomes with $P=\text{argmax}_{Utility}(W)$.

7. Uncertainty Handling via Bayesian Networks

Model uncertainty in parameter outcomes using Bayesian networks

$$P(S_k+1 \mid S_K T_{ij} = \prod_{i=1}^{n} P(s_{ik} \mid P_a(s_{ik}+1))$$

– $P_a(s_i)$ parent nodes (applied principles, external factors).

Model Workflow

1. Identify Contradictions. Detect *Cij* from *Sk*.
2. AI-TRIZ Mapping. Use *fA* to select ∗*t*∗.
3. Optimize Action. Solve *O* to apply ∗*t*∗.
4. Update State. Transition to *Sk*+1.
5. Learn. Update *fA* and *Q*-values via RL.

Example Application. Scenario. Balancing cost (p_1) and quality (p_2) in software development.

1. Contradiction: C_{12}.
2. TRIZ Principles: *T*12 = {*t*10(Preliminary Action), *t*35(Parameter Changes)}.
3. AI Prediction: *fA* selects *t*10 (automate testing to reduce rework).
4. Optimization: Minimize cost increase while maintaining quality.
5. Outcome: Updated state S_{k+1} with resolved C_{12}.

This model formalizes the integration of TRIZ and AI for project management, enabling systematic contradiction resolution, adaptive learning, and cognitive decision-making. Future work could expand it to multi-agent systems or quantum-enhanced optimization.

Conclusion

The integration of TRIZ principles with AI-driven project management offers a transformative approach to handling complex projects. By combining TRIZ's systematic problem-solving framework with AI's predictive and analytical capabilities, project managers can effectively identify contradictions, generate innovative solutions, and adapt plans in real time. This hybrid model enhances decision-making by balancing project constraints—such as time, cost, and quality—while promoting continuous improvement through dynamic feedback loops. The mathematical formulations presented demonstrate how project variables can be optimized, ensuring efficient resource allocation and risk mitigation. Ultimately, *Thinking Project Management* based on TRIZ principles in an AI environment fosters a culture of innovation, resilience, and operational excellence. This approach not only improves project success rates but also equips organizations to navigate evolving challenges with agility and creativity. Future work can explore advanced AI algorithms, such as reinforcement learning and deep neural networks, to further refine TRIZ-based project management frameworks and extend their application to diverse industries.

References

1. Altshuller, G. (1984). *The Innovation Algorithm: TRIZ, Systematic Innovation, and Technical Creativity*.
2. Zhang, Y. et al. (2023). *TRIZ-GPT: Bridging Inventive Principles and Generative AI for Project Innovation*.
3. Navas, H., Tenera, A., & Machado, V. (2011). Integrating TRIZ in Project Management Processes: An ARIZ Contribution. *Procedia Engineering*, 131, 224-231. https://doi.org/10.1016/J.PROENG.2015.12.381.

4. Woźniak, M. (2018). TRIZ Potential for IT Projects. , 169-178. https://doi.org/10.1007/978-3-319-96532-1_16.
5. Reusch, P., & Zadnepryanets, M. (2015). TRIZ 40 inventive principles application in project management. *2015 IEEE 8th International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)*, 2, 521-526. https://doi.org/10.1109/IDAACS.2015.7341360.
6. Leu, S., Yang, C., & Hsu, Y. (2021). A Novel Development of TRIZ-Analogic Construction Interface Problem Identification and Solutions Framework. *Advances in Civil Engineering*. https://doi.org/10.1155/2021/7752258.
7. Chai, K., Zhang, J., & Tan, K. (2005). A TRIZ-Based Method for New Service Design. Journal of Service Research, 8, 48 - 66. https://doi.org/10.1177/1094670505276683.
8. Ilevbare, I., Probert, D., & Phaal, R. (2013). A review of TRIZ, and its benefits and challenges in practice. Technovation, 33, 30-37. https://doi.org/10.1016/J.TECHNOVATION.2012.11.003.
9. Liu, W. (2022). *DIKWP-TRIZ: A Cognitive Framework for AI-Driven Project Management*.
10. IBM (2023). *AI in Project Management: Trends and Case Studies*.